

**National Aeronautics and
Space Administration**

July 10, 1998

AO-98-OES-02

**ANNOUNCEMENT
OF
OPPORTUNITY**

Triana

**Notice of Intent due July 24, 1998
Proposals Due August 24, 1998**

OMB Approval No. 2700-0087

Triana

**NASA Announcement of Opportunity
Soliciting Proposals
for
Period Ending
August 24, 1998**

**AO-98-OES-02
Issued July 10, 1998**

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

Triana AO

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1.0 DESCRIPTION OF OPPORTUNITY

1.1 Introduction

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct scientific investigations as part of the Triana Program. The Triana Program is intended to accomplish quality Earth remote sensing investigations from the Sun-Earth L1 point using innovative, streamlined management and implementation approaches.

The Triana Program will carry out Earth remote sensing investigations by means of spaceborne observations with low total cost. Proposals to the Triana Program will require a careful trade-off between science and cost, in order to produce a mission with the highest possible science value to NASA, which will be a determining factor in selection. Total cost includes mission management; spacecraft and instrument definition and development; mission systems integration and test; launch services; on-orbit operations; in-situ measurements necessary to enable optimum science return, which may include non-satellite or ground measurements; mission science/education team(s) support; algorithm development and data processing; calibration/validation; data product archiving and distribution; and publication of results in refereed science journals. All civil service or civil service support contractor resources must be proposed on a full cost basis. In writing the proposal the mission team should assume it will have full responsibility and authority to accomplish the mission.

Triana proposals are encouraged to include resource sharing to reduce NASA mission costs. Opportunities for commercialization and private investment may reduce the cost to NASA in accomplishing mission science objectives by providing commercial opportunities for industry to address target markets. Non-commercial domestic agencies and institutions may also propose to contribute, from their own resources, all or a portion of the scientific instruments, spacecraft, launch services, mission science support, mission operations, communications, data systems, or a combination of these. NASA encourages PIs to consider data purchase arrangements with commercial providers as an alternative approach. NASA also encourages PIs to include international partners on their mission teams. Non-U.S. participation will be conducted on a no-exchange-of-funds basis, as described in Section 3.3. In addition, non-U.S. PIs must make arrangements with a U.S. co-PI to fund U.S. participants on the mission team.

In order to meet the desired Triana Program launch date and cost goals, there are constraints limiting mission definition and development times. NASA envisions a Triana mission with the goal of launching an Earth-viewing satellite to L1 by the end of calendar year 2000, and providing images of the Earth over the Internet early in the new millennium.

The NASA Goddard Space Flight Center has begun the formulation of an implementation approach to meet this challenging schedule; however, participation

and contribution from the broad community is strongly desired. The GSFC efforts will continue until AO selections are made and successful proposals replace or are integrated with the GSFC (or baseline Government) approach. The baseline Government approach is described in paragraph 3.6.

The NASA Headquarters Office of Earth Science (OES) will be responsible for selecting the Triana mission, while the NASA Goddard Space Flight Center (GSFC), Greenbelt, MD, will manage programmatic activities associated with all implementation phases of the Triana mission. However, in the case of a data purchase arrangement supporting the PI, the Stennis Space Center will manage the associated programmatic aspects of the data purchase.

The goals of the program are both scientific and educational; therefore, each proposal will be required to include scientific investigations and student participation. A separate NASA Research Announcement will be issued to solicit proposals for educational application of the Triana images and data.

Proposers should recognize that the use of appropriated funds for the Triana program has not been approved by the Administration or the Congress at this time. The funding estimates shown in paragraph 3.1.1 do not reflect an agreed-to funding plan for Triana. Language included in House Report 105-610 accompanying H.R. 4194, the FY 1999 VA-HUD-Independent Agencies appropriations bill, states:

“The Committee understands that it is NASA’s intent to issue a competitive solicitation in the near future, inviting industry proposals, ranging from specific components to the entire spacecraft. Because the Committee has questions concerning the mission objectives, adequacy of plans for peer review of proposals, and availability of funding, the Committee has included bill language prohibiting use of fiscal year 1999 funds for this mission. The Committee expects to examine the results of NASA’s Announcement of Opportunity by September 1998. Before the Committee will consider removing the prohibition against expenditure of fiscal year 1999 appropriations for this mission, NASA must demonstrate for the Committee that the Agency has a plan for a public-private, peer-reviewed mission, which has resulted from a competitive process.”

Accordingly, at the conclusion of the competitive process, NASA will seek to make available such funds as may be necessary to carry out the intent of this Announcement of Opportunity.

1.2 Notice of Intent

To assist NASA's planning of the proposal evaluation process, a written and signed Notice of Intent should be submitted by all prospective proposers on or before July 24, 1998 in one of the following three ways:

by mail to:

Triana Announcement of Opportunity
Code Y
400 Virginia Avenue, S.W.
Suite 700
Washington, DC 20024

by E-mail to:

"dcardasc@hq.nasa.gov", with subject designated as "Triana NOI - (PI Name)"

or by Fax to:

Triana Executive Secretary
Attention: Ms. Dawn Cardascia
(202) 554-2970

Principal Investigators whose investigation teams include non-U.S. institutions should send their Notice of Intent to the same address, but should also send a copy (hardcopy only) to the NASA Office of External Relations at the address specified in Section 4.4.6. In cases where investigators or team members from non-U.S. institutions are to participate, their names, addresses and affiliations must be included in the Notice of Intent, even if the details of their participation cannot be formalized by the deadline for receipt of the Notice of Intent.

The Notice of Intent must be typewritten in English, no longer than 2 pages and include the following information:

- (a) Title of the proposed mission
- (b) A brief description of the proposed mission goals and objectives
- (c) A list of names, addresses, telephone numbers, fax numbers and electronic mail addresses of the following:

- (1) Principal Investigator
- (2) Co-Investigators
- (3) Lead representatives from each organization included in the mission team

All Notices of Intent must be received on or before 4:00 p.m. Eastern Time on July 24, 1998. NASA will not notify proposers that their Notice of Intent has been received.

1.3 Proposal Opportunity Period and Schedule

Successful proposals to this AO must support a Triana mission launch date no later than December 2000. This implies a less than two year design and development schedule. Mission and instrument concepts must be sufficiently mature at the time of proposal to meet this demanding schedule.

The opportunity described here is for proposal selection cycle according to the nominal schedule shown below:

Date of AO release	July 10, 1998
Notices of Intent due	July 24, 1998
Proposals due	August 24, 1998
Announcement of selections	September 25, 1998
Award of letter contracts	October 2, 1998
Final contracts	November 13, 1998

2.0 PROGRAM OBJECTIVES

2.1 Science Objectives

The Earth Science Enterprise uses NASA's space-based observing technology and scientific expertise for the study of our home planet. Planet Earth is an integrated system of land, ocean, atmosphere, ice, and biological processes. From the vantage point of space we are beginning to understand how they work and how they interact. The questions posed and answers found in the grand scientific inquiry not only satisfy our curiosity, but yield knowledge of substantial practical value to society - in weather and climate forecasting, in agriculture, in natural resource management, in urban and regional planning, and elsewhere. Earth Science is truly science in the national interest.

In furthering the investigation of Earth System Science from space NASA has taken advantage of the perspectives available from low earth orbit (LEO) and from geostationary orbit (GEO), and even observations available from passing interplanetary probes such as Galileo. However, NASA has not yet used the unique vantage point available at the Sun-Earth L1 point to continuously observe the Earth. At this point the full, sunlit disk of the Earth is continuously visible. In addition, more of the Earth's surface is visible than at GEO. This provides a unique opportunity for new ways of observing the Earth and offers the potential for new scientific discoveries.

The Triana program will take advantage of this opportunity by funding Earth remote sensing investigations from the Sun-Earth L1 point. Broad guidance on a minimum science investigation is given in section 3.4. Enhancements which fit within the available mission funding are also welcome.

Most NASA Earth Science missions yield a variety of practical applications of the resulting data. NASA has similar expectations for Triana. NASA expects applications of the data will be identified during the proposal phase, and during the operations phase once the data is available and distributed.

2.2 Cost and Contribution Objectives

NASA has a goal of accomplishing the Triana mission objectives within the \$50 million cost target. In addition, recognizing the education, applications, and complementary science potential of this mission, NASA encourages contributing collaborations in implementing or enhancing the program.

2.3 Educational Objectives

The picture taken by the Apollo 8 astronauts returning from the moon had a profound effect on the general public. For the first time the concept of the Earth as a precious island in space was manifest in a single image. The Triana program has a secondary goal of inspiring and enabling educational opportunities by providing similar images

continuously, that is, frequently-updated, sunlit, full-disk views of the Earth made available over the Internet.

One of the NASA Earth Science Enterprise's goals is to disseminate information about the Earth system. An excellent way to do this is by providing widely disseminated, frequently-updated images of the Earth from space. Triana, to be located at L1, could provide those full disk views continuously. The inspirational value of such images is incalculable. The potential educational value is equally great. A key Enterprise objective is to incorporate education and enhanced public understanding of science as an integral component of Earth Science missions and research. Anyone, anywhere in the world with Internet access (and perhaps other media depending on their interest in the images) will be able to see what the Earth looks like at that point in time.

NASA also envisions the potential for student involvement in all phases of the project as an educational opportunity. Students could participate in all aspects of the mission from design of the space segment and ground segment to operation of the various mission elements. Such participation is strongly encouraged and the level of involvement will be factored into the evaluation process.

NASA will issue a separate solicitation for educational products and services associated with the use of the images and data resulting from Triana.

2.4 Announcement Objectives

This Announcement of Opportunity (AO) is intended to solicit proposals for Earth remote sensing investigations from the Sun-Earth L1 point. A minimum science mission is defined in section 3.4. Proposals are welcome on provision of an enhanced science investigation or additional instruments which can meet science goals within the resource margins of the spacecraft and the available funding.

3.0 TRIANA PROGRAM CONSTRAINTS, GUIDELINES AND REQUIREMENTS

The following sections describe the constraints, guidelines and requirements of the Triana Program. Specific directions and requirements for proposal preparation are included in Sections 3 and 4.

3.1 General Program Constraints

3.1.1 Available Funding

NASA intends the Triana program to be implemented either as a data purchase or as a development program using the low cost, rapid development approaches pioneered in recent Earth and Space Science missions. To this end, NASA will limit the NASA funding, or NASA Mission Cost (NMC), of the mission selected under this AO.

Contributions from sources other than NASA are strongly encouraged, and are required for non-Earth remote sensing instrument packages.

FY 98-99	FY 00	FY 01	FY 02-05	TOTAL
35	11	2	2	50.0

Total funding under this AO is limited to \$50 million, including contingency. The funding profile for the data purchase option is nominally annual payments during the period of delivery with a net present value less than or equal to the above mission development funding profile totaling \$50 million. As noted in Section 1.1, the funding estimates shown above do not reflect an agreed-to funding plan for Triana. The use of appropriated funds for Triana has not been approved by the Administration or the Congress at this time. Consistent with the direction in House Report 105-610, at the conclusion of the competitive process, NASA will seek to make available such funds as may be necessary to carry out the intent of this AO.

3.1.2 Mission Readiness

NASA intends that images from Triana be available over the Internet as the new millennium begins. This implies a launch by the end of 2000, and a less than two year design and development cycle. The operational lifetime of Triana is planned as a minimum of two years, with a goal of five years.

3.1.3 Launch Services

NASA will provide a launch for the Triana mission out of the Space Shuttle bay. Mission concepts and cost estimates should include the upper stage required for transfer to a halo orbit at L1. Any proposal to use an expendable launch vehicle (ELV) must incorporate the ELV as a contribution to the mission at no cost to NASA. Expendable launch vehicles that may be considered for the Triana mission pursuant to this AO must be acquired and managed consistent with NASA Policy Directive (NPD) 8610, "Launch Services Risk Mitigation Policy for NASA, NASA-Sponsored Payloads". The demonstrated reliability of the proposed launch vehicle, the programmatic and technical risk associated with the proposed launch service, and the resultant probability of mission success will be evaluated.

While a launch using the Space Shuttle is a Government-provided service, the mission team is responsible for carrier hardware, mission integration, safety, deployment hardware, and an upper stage booster. Launch vehicle contact information is given in appendix B.

3.2 General Program Guidelines

3.2.1 Mission Teaming

Triana mission teams must be led by a single Principal Investigator who may be from any U.S. or non-U.S. organization including educational institutions, industry, nonprofit institutions, NASA Centers, Federally Funded Research and Development Centers (FFRDC's) and Government agencies. Teaming and partnering arrangements among these organizations are encouraged. Teams are encouraged to utilize U.S. commercial suppliers, commercial off-the-shelf technology, and other arrangements to support U.S. industry to the greatest extent practical. NASA field centers and the Jet Propulsion Laboratory (JPL) are welcome as Triana mission team members.

Another innovative approach that is explicitly encouraged by this AO is teaming between a PI, who defines the science investigation, and a commercial data provider supplying the required measurement data as a data purchase. This would still be a PI-led team, but in this case, the PI would buy the data required to perform the science investigation rather than develop and deploy the space and ground segments.

NASA institutional services may be proposed on a full cost basis through teaming arrangements between the mission team and NASA centers. In such cases, it is the team's responsibility to contact the appropriate NASA organization directly.

3.2.2 Contributions

Contributions to Triana of any kind, whether cash or non-cash (property and services), are encouraged. Contributions are defined as any portion of a mission provided on a no-exchange-of-NASA-funds basis. Such contributions may be applied to any part, or parts, of a mission, and may be from U.S. companies, U.S. Government agencies, and/or international participants (see Section 3.3). NASA Center civil service or support contractor resources (manpower, facilities or hardware) may not be contributed, unless they are being separately funded for an effort complementary to the proposed investigation.

Values for all contributions of property and services shall be established in accordance with applicable cost principles and included in the proposed Total Mission Life Cycle Cost (TMLCC), which is the sum of the NMC and all contributions. The cost of contributed hardware should be estimated as either: (1) the cost associated with the development and production of the item if this is the first time the item has been developed and if the mission represents the primary application for which the item was developed; or (2) the cost associated with the reproduction and modification of the item (i.e., any recurring and mission-unique costs) if this is not a first-time development. If an item is being developed primarily for an application other than the one in which it will be used in the proposed investigation, then it may be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone). The cost of contributed labor and services should be consistent with rates paid for similar work in the offeror's organization. The value of materials and supplies shall be reasonable and not exceed the fair market value of the property at the time of contribution.

Proposed contributions must be described in sufficient detail to allow an assessment of the adequacy of the contribution to fulfill the commitment made. This includes the provision of all requested cost, schedule, and management data in the proposal and subsequent reviews. Failure to document all cost and schedule data, management approaches and techniques, and the commitment of all contributing team partners may cause a proposal to be found non-responsive to this AO. If NASA selects a mission with domestic contribution arrangements, the appropriate agreements and/or contracts must be signed and copies delivered to NASA within 90 days of award of NASA mission contract.

3.2.3 Data Dissemination

U.S. Government information must be disseminated without restriction at no more than the cost of dissemination. Therefore, data from Triana, as funded by the U.S. Government, will be distributed in a similar way to other NASA Earth Science Enterprise data. However, for data from a mission in which there is significant U.S. private sector investment, NASA will consider innovative data management approaches that afford protection of commercial opportunities while still maximizing non-proprietary scientific and educational returns. Respondents proposing data purchase or other private sector investment arrangements must include the data dissemination and redistribution schema in their proposal. In all cases, the mission science team approved by NASA must have immediate and complete access to the basic data and products defined and produced by the mission. NASA will consider proposals for non-traditional data distribution arrangements as long as the full data set is ultimately available for long-term archival and open distribution. As with any NASA program, higher level products (i.e., beyond level-2) developed from Government-provided data by users outside of NASA-funded investigations are not subject to Government data policies or controls.

3.3 International Participation

Recognizing the potential scientific, technical, and financial benefits offered to all partners by international participation, participation by non-U.S. individuals and organizations as PIs or team members in Triana investigations is welcomed. Participation by international partners in Triana may include the contribution of all, or a portion of, the scientific instruments, spacecraft, launch services, mission operations, mission science (i.e., science team), communications, data processing, etc., on a no-exchange-of-funds basis. Any proposed international participation must be described at the same level of detail as that of other partners. This includes the provision of all requested cost, schedule, and management data in the proposal and subsequent reviews. Since participation of a non-U.S. PI in Triana will be on a no-exchange-of-funds basis, any non-U.S. PI must make arrangements with a U.S. co-PI to fund U.S. participants under the proposal.

Although NASA-provided dollars may not be used to fund non-U.S. PIs or mission team members, the direct purchase of goods and/or services from non-U.S. sources by

U.S. team members is permitted, but with the following restriction: NASA funds may not be used to purchase a launch service from a non-U.S. source. Potential Triana participants are advised that international purchases made using funds derived from NASA must meet NASA and Federal regulations and that these regulations will place an additional burden on investigation teams that should be explicitly included in discussions of the investigation's cost, schedule, and risk management. Information regarding regulations governing the procurement of foreign goods or services is provided in Appendix C.

Participation by non-U.S. individuals and/or institutions as team members or contributors to Triana investigations must be endorsed by the institutions and, where non-U.S. government funding is provided, the governments involved. Sponsoring organizations of non-U.S. participation should commit directly to the PI, not NASA, via these signed agreements. Some model language for the preparation of these agreements is included in Appendix D. NASA recognizes that unique circumstances or arrangements may dictate an agreement between the non-U.S. sponsoring organization and NASA. For the purposes of this AO, it is NASA's preference that such agreements be implemented under U.S. law. Therefore, all proposers with potential non-U.S. participation should contact the Office of External Relations at NASA Headquarters during the preparation of proposals to obtain information about U.S. Government law or policies (e.g., export control) relevant to any non-U.S. component of the Triana. Under any circumstance, all agreements with non-U.S. partners or U.S. co-PIs must be finalized and signed no later than the Mission Confirmation Review or six months after contract award, whichever comes first. Failure to provide such agreements in the time allotted may result in the deselection of the investigation.

3.4 Minimum Science Mission

The minimum science mission is expected to contribute to the goals of the Earth Science Enterprise. The minimum instrumentation to do such investigations must include a visible (red-green, blue), color camera imaging the full Earth in near real time. The baseline study at GSFC has assumed a refresh rate of once every three minutes. The camera resolution required is roughly equivalent to that of a high definition TV (HDTV) image.

Proposals that include enhancements to the visible color camera described here may be made if required by the science investigation and if they fit within the available mission funding. Addition of other channels, for example, near infrared, is one such possibility. The refresh rate of the Earth image is subject to trade-offs based on rate of visible change of the Earth disk, available bandwidth, and incorporation of other or enhanced science data in the downlink stream.

Proposals addressing one or more of the major science themes of the Enterprise are appropriate. These themes are: land cover and land use change, long term climate change, seasonal-to-interannual climate, atmospheric chemistry, and natural hazards.

Suggested investigations might relate to cloud characteristics, cloud movement, aerosols, storm tracks, snow/ice cover, variations in vegetation biomass, lightning, volcanoes, meteors, biomass burning, flood extent, fires, smoke plumes, vegetation cover, algae blooms, river flow into oceans, ocean currents, sunrise/sunset, eclipse, solar backscatter, desertification, erosion, pollution, hot spot observation and BRDF, retrosolar radiometry, short scale temporal variations, solar radiative forcing, albedo, urban expansion, agricultural production, and resolution effects. Other innovative ideas are encouraged.

The PI will define the science investigation to be performed. The PI is responsible for definition and implementation of the scientific instrument, spacecraft, ground stations, ground system, system integration, mission operations, data processing, and initial distribution of Triana images and data for the lifetime of the spacecraft. An upper stage and Shuttle carrier equipment or ELV must be included, as appropriate. Additional launch services information is provided in appendix B. The Shuttle launch itself should not be included in the proposed cost.

3.5 Additional Science Instruments

Science instruments in addition to the instruments necessary to perform the minimum science mission may be flown on the Triana spacecraft. Proposals to add additional instruments which cannot be accommodated within the \$50 million cost limit are acceptable only if the funding for instrument development, integration, operation, and all data processing is provided from another source. This AO will not fund any such investigations, but such instruments may be accommodated on the Triana spacecraft as experiments of opportunity. In this case, the PI will define the science investigation to be performed. The PI is responsible for definition, implementation, and operation of the instrument, associated ground systems, and the data processing software required for the science investigation. A proposal is required and the funding source must be indicated. The proposal must contain all required content relevant to the investigation and associated instrumentation including interfaces to the spacecraft and required spacecraft resources.

3.6 Baseline Government Approach

Under the baseline government approach, (which may be replaced in whole or in part by a successful proposal to this AO; see Section 1.1), a government PI will formulate science investigations which use the following system capabilities. Since the government PI may propose to this AO separately, the nature of these investigations is not described here.

The baseline government approach utilizes the SMEX•*Lite* spacecraft architecture (SMEX•*Lite* – NASA’s Next Generation Small Explorer technical paper and further information can be found at <http://sunland.gsfc.nasa.gov/smex/smexplite/>). The core SMEX•*Lite* system is configured to support an apogee kick motor, a hydrazine

propulsion system, a 3-axis stabilized attitude control system, a high gain communication system, and Space Shuttle Orbiter interface electronics. The core system also provides significant electronic and software data handling and compression services for the earth camera. The SMEX•*Lite* technology prototype will serve as the basis of the Triana spacecraft. The Triana observatory without the kick motor is estimated to weigh 220 kg and use 200 watts of power.

The spacecraft will be deployed spin stabilized from the Space Shuttle orbiter. Spin up will be accomplished via a spin table mounted on the HST Flight Support System Cradle B. The spin axis orientation will be chosen for proper orbit insertion burn of the kick motor to reach the L1 point. The spacecraft will be activated after this burn, deploying its solar arrays and acquiring 3-axis attitude control. Once stable and safe, the spent kick motor will be ejected. The hydrazine system will be used for trajectory adjustments and capture into the $\pm 10^\circ$ L1 halo orbit.

The Attitude Control System (ACS) utilizes four (4) reaction wheels for pointing control and hydrazine thrusters for momentum management. Sun sensors, an Inertial Measurement Unit (IMU), and a star tracker will be used to derive attitude knowledge. Pointing accuracy of 10 arcmin (1-degree roll) with jitter control better than 2 arcsec over 100 msec is baselined to produce smear-free earth images.

Power is provided by GaAs modular solar array. A Space Shuttle approved battery is used for the initial mission sequence until sun acquisition and for emergencies.

The Computation Hub data system controls all spacecraft activities. A high degree of autonomy is planned. Continuous data downlink of ~50 Kbps is expected. The spacecraft data system hardware and software will provide significant functionality for the instrument. Instrument data compression will be used to maintain a positive link margin.

The instrument produces true color (RGB) Earth images with 14 km resolution, utilizing 3 passively cooled 1K x 1K x 8 CCD arrays. The Triana instrument concept consists of a 25 cm Cassegrain telescope, fabricated from aluminum, as the optical front end. The optical beam will be collimated and spectrally divided into three beams (red, green, blue) using dichroic beamsplitters. Each beam will then be imaged onto a 1024 x 1024 silicon CCD detector array. An integral aluminum metering structure will maintain the tight alignment requirements of the optical system. The image will be unloaded from the CCD detectors, digitized by the flight electronics, and sent to the spacecraft for download. The instrument draws its power from the 28 volt, unregulated spacecraft bus. Image data is transferred to the spacecraft via three 5 Mbps high-speed serial interfaces. Instrument control and housekeeping is accomplished using the MIL-STD-1553B spacecraft data bus.

The baseline communication system incorporates a 1.3-meter high gain antenna and 5-watt S-band transponder. The transponder is used to provide orbit-tracking data as well. Continuous operation is planned.

The ground segment utilizes the Small Explorer (SMEX) common Mission Operations Center (MOC) to control the Triana satellite. Data is collected and commands uplinked from leased commercial ground stations located around the world. A 5-meter aperture is required to support the downlink. CCSDS protocols are used throughout the system.

Questions on the information in this section should be addressed to:

Jim Watzin
Goddard Space Flight Center, Code 730
Greenbelt, MD 20771
Phone 301-286-7417
James.G.Watzin@gsfc.nasa.gov

3.7 Cost Requirements

NASA funding of the missions proposed under this AO is limited by the funding profile in Section 3.1.1. Once established for a selected mission, the NMC baseline must assure adequate funding to meet cost-to-complete requirements. Where appropriate, this includes identification of credible, phased reserves, which are proportional to the development risk. The proposed NMC baseline will be considered to be fixed and committed at selection. The Triana Program does not maintain a reserve pool from which a mission exceeding its cost commitment may draw.

The TMLCC for a proposed Triana mission, which includes NASA and non-NASA costs, must also be proposed. The TMLCC includes but is not limited to:

- Mission definition and development of all flight and ground hardware and software, acquisition of launch services, launch, and operations of a mission to observe and understand some aspect of Earth System Science;
- Accomplishment of any correlative measurements necessary to ensure optimum science return by calibrating or validating these observations;
- Obtaining any support needed by the mission from other efforts;
- Development, operation, refinement, maintenance, documentation, and publication of all required algorithms to accomplish the mission;
- Processing, archiving, distribution, maintenance, documentation, and information management of all mission derived data products consistent with

interfaces required to permit community-wide access via appropriate existing mechanisms;

- Publication of results in the refereed science literature;
- Delivery to NASA, at the conclusion of the mission, of all data, supporting information, and available results to facilitate NASA-supported preservation and distribution.

Note that for missions that use the Shuttle for launch to low-Earth orbit, only the Shuttle carrier equipment and upper stage need be accounted for in the mission cost, not the cost of the Shuttle launch itself.

NOTICE TO PI-LED DATA PURCHASE OFFERORS: The Government recognizes that data purchase arrangements differ in cost approach from traditional implementation. The NMC for a PI-led data purchase would include the sum of the data purchase payment schedule and the other funds required by the PI to complete the mission. If there are outside contributions that are identifiable, they should be added to the NMC to obtain the TMLCC.

3.8 Management Requirements

The short development schedule and low costs associated with Triana demand innovative business and management practices. NASA's approach to Triana encourages teaming arrangements among industrial, government, international, and especially academic partners. A mission team selected for full implementation will have full responsibility and authority to accomplish the mission. This will permit them to utilize innovative approaches necessary to stay within the strict cost and schedule limits of the program. NASA oversight and reporting requirements will be limited to that which is essential to assure mission success and agreed-upon educational and science return in compliance with committed cost, schedule, performance, quality, reliability, and safety requirements.

Mission teams shall submit monthly and quarterly (533M and 533Q, or equivalent) financial management reports as described in NPG 9501.2C "Procedures For Contractor Reporting Of Correlated Cost And Performance Data" (23 April 1996). Mission financial management reports shall be prepared according to the WBS and cost element structure contained in the mission proposal. Mission financial management reports shall be required from prime contractors as well as first-tier subcontracts that meet the reporting requirements set forth in NASA FAR Supplement Section 18-42.7201 (b) (1). Mission teams shall also provide funding profiles and explain variances between projected and actual costs, as required during mission implementation. NASA intends to use existing mission team internal management reporting systems to the maximum extent feasible in satisfying mission financial reporting requirements.

The Triana mission shall be implemented in conformance with a quality management system that meets the intent of the ISO 9000 series, American National Standard, "Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing", ANSI/ASQC Q9001-1994. A product assurance program that is commensurate with Triana mission lifetime and probability of success requirements shall also be implemented.

NASA will require four reviews for Triana missions. The Preliminary Design Review (PDR) and the Mission Confirmation Review (MCR) will be held during the mission Definition Study Phase. The PDR will be conducted by the Triana Mission Team, with participation by the Triana Project Office. The purpose of the PDR is to assess the system design at the system and subsystem level as it relates to the mission requirements. The MCR, conducted by NASA, will follow the PDR, and combine the findings of the PDR with a programmatic and process review of the proposed mission implementation. The purpose of the MCR is to establish that the Mission Team has completed an acceptable mission Definition Study Phase and is prepared to complete flight and ground system development and mission operations within the identified mission cost cap. The MCR provides an independent assessment of mission readiness by identifying the technical, financial and management risks associated with development and operations. The MCR and a review of the mission cost plan will serve as a gate for the mission to proceed into development. The other required reviews are the Mission Readiness Review (MRR) and the Launch Readiness Review (LRR), both conducted by NASA. The MRR will verify that testing has been completed with no unacceptable open issues and to evaluate the readiness of the flight and ground segments. The LRR will take place at the launch site just prior to launch to certify flight readiness of all mission elements.

In order to assess the progress of the mission and to provide NASA with necessary technical and programmatic insight, the mission team shall also develop and propose a schedule of internal reviews. Although not prescriptive, the proposer may refer to NASA NHB 7120.5 "Management of Major System Programs and Projects" for guidance in this area. The purpose of these reviews is to assess the technical, management, cost and schedule progress of the mission to ensure that reasonable and sound engineering and management are being employed throughout the mission definition and development cycle. These reviews will provide the mission team with an assessment of the program, provide feedback through recommendations as necessary and indicate any potential problem areas.

A mission team will be totally responsible for the Triana mission, including science integrity and mission implementation. In this "PI-Mode", the Principal Investigator and mission team will have full responsibility for all aspects of the mission, including instrument and spacecraft definition, development, integration, and test; launch services (if acquired by mission team) or mission launch interfaces (if launch service is NASA provided); ground system; science operations; mission operations; and data processing and distribution. Each mission team member should consider themselves

responsible for mission success (i.e., delivery of science data products), rather than solely for their portion of the mission. The PI may select partners from industry, academia, nonprofit institutions, NASA Centers, FFRDC's, other Government agencies, and international organizations to assist in carrying out the responsibility for implementing the mission.

It is the intent of NASA to give the PI and the mission team the ability to use their own processes, procedures, and methods to the fullest extent possible. Triana mission teams should define the management and contractual approaches that are best suited for their particular teaming arrangement. These approaches should be commensurate with the investigation's implementation approach while retaining a simple and effective management structure necessary to assure the adequate control of development within the cost and schedule constraints. Contractual approaches are encouraged which incentivize team members toward successful delivery of science data products. Team member agreements and/or contracts must be signed and copies delivered to NASA within 90 days of award of NASA mission contract (see Section 3.3 for international agreements). The investigation team should develop and propose a Work Breakdown Structure (WBS) to manage mission implementation that best fits their organizational approach and mission design concept.

The PI is expected to be the central person in each Triana data purchase or full mission implementation, with full responsibility for the scientific integrity of the mission. The PI is responsible for assembling a team to propose and implement the mission. The PI must be accountable to NASA for the scientific success of the mission and must be prepared to recommend mission termination when, in the judgment of the PI, the successful achievement of the established mission objectives is not likely within the committed cost and schedule reserves. The selected mission team will propose and negotiate a set of performance metrics during the Definition Study Phase for program evaluation, including cost, schedule, and technical performance as appropriate. These metrics will be incorporated into the contract. Violation of the agreed upon metrics, as determined by NASA, may be cause for termination.

Each Triana mission team must have a Project Manager (PM) who will oversee the implementation of the mission. The role, qualifications and experience of the PM should be carefully considered to ensure that the programmatic and technical needs of the investigation will be met. Other key individuals, their roles, and the adequacy of their experience should be identified for each Triana investigation.

Each Triana mission must define the risk management approach it intends to use to ensure successful achievement of the mission objectives within established resource and schedule constraints. In addition, any manufacturing, test, or other facilities needed to ensure successful completion of the mission's objectives should be identified.

NOTICE TO PI-LED DATA PURCHASE OFFERORS: The Government recognizes that data purchase arrangements differ in level and type of oversight from traditional

mission implementation activities. The PI should tailor the management requirements above as required to ensure a successful mission outcome. As stated in section 4.2 below, this tailored approach must be described in the proposal.

3.9 Safety Requirements

The Space Shuttle and ELVs have safety requirements with which the Triana implementation must be fully compliant. Additionally, each launch range has safety requirements with which the Triana implementation must also be compliant. These safety requirements can be found in the documents in the Safety Section of Appendix E of this AO.

3.10 Student Participation

The PI should make every effort to incorporate meaningful student participation in the relevant design, development, operations, data processing, science analysis, and data dissemination activities in his/her proposal. Participation by students at all levels is encouraged including K-12, undergraduate, and graduate students. Innovative approaches to student involvement are highly desired and the level and type of involvement will be a key evaluation criterion.

3.11 Participation of Small, Small Disadvantaged, and Women-owned Small Businesses, and Minority Institutions

The PI and team members shall agree to use their best efforts to assist NASA in achieving its goal for the participation of small disadvantaged businesses, women-owned small businesses, Historically Black Colleges and Universities, and other minority educational institutions in NASA procurements. Investment in these organizations reflects NASA's commitment to increase the participation of minority concerns in the aerospace community, and is to be viewed as an investment in our future. Offerors, other than small business concerns, are also advised that contracts resulting from this AO will be required to contain a subcontracting plan which includes goals for subcontracting with small, small disadvantaged, and women-owned small business concerns. (See Appendix A, Section XIII.)

4.0 PROPOSAL SUBMISSION GUIDELINES

4.1 General Overview

The following guidelines apply to the preparation of Triana proposals by potential investigators in response to this AO. The material presented is not intended to be all encompassing. The proposer shall provide information relative to those items applicable or as otherwise required by the AO. The required proposal format, contents and instructions are summarized below. Failure to follow all proposal format, content and other instructions may result in reduced ratings during the evaluation process and could lead to rejection of the proposal.

Proposal content should be intelligently tailored by the offeror. Two particular cases are the proposals for additional instruments as discussed in section 3.5. The proposals should address only those proposal elements related to providing the instrument itself, its associated system components and operations, and the interface to the spacecraft.

Proposals where the PI obtains the data through a data purchase will also require tailoring of proposal elements to include appropriate information.

4.1.1 Proposal Instructions

All documents must be typewritten in English, use the International System of units (SI), and be clearly legible. All cost estimates, including non-U.S. contributions, must be in U.S. dollars. Submission of proposal material by facsimile (fax), videotape, etc., is not acceptable. All paper proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Photographs and color figures are permitted if printed on recyclable white paper only. The original signed copy should be bound in a manner that makes it easy to disassemble for reproduction. Each copy of the proposal shall be provided in a 3-ring loose leaf binder. If necessary, the Cost section (text and spreadsheets) may be provided in a separate binder. Two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits. In complying with page limits, no page should contain more than 50 lines of text and the type size should not be smaller than 12 points. Top, bottom and side margins of at least one inch should be used. Single or double column format is acceptable.

In addition to the bound paper volumes, the proposal shall also be provided on diskettes. These diskettes will be used primarily to assist evaluators with searches for information within the proposal. The actual evaluation will be performed utilizing *all* portions of the proposal submitted on paper. With the exception of the Cost section, only the text portion, plus table and figure titles, need to be provided on the diskettes; tables, figures and any other material of an essentially graphic nature need not be included. The entire Cost section shall be provided on a separate diskette.

INFORMATION NOT INCLUDED IN THE PAPER VOLUMES OF THE PROPOSAL SHALL NOT BE INCLUDED ON THE PROPOSAL DISKETTES. If the diskettes are

found to include information which differs from the paper volumes or are found to be defective (e.g., non-readable) the diskettes will be returned to the proposer and the proposer shall promptly provide replacement diskettes. Replacement diskettes will not be considered a late proposal under NFS 1815.412, Late Proposals, Modifications and Withdrawal of Proposals. If necessary to segment the proposal on multiple diskette files either because of diskette space or other limitations, the files should be as large as possible and have a logical relationship to the proposal structure.

All information shall be provided on DOS-compatible (version 5.0 or higher), high-density (1.44 megabytes), 3-1/2" diskettes. All text portions of the proposal shall be provided in Microsoft Word for Windows format (version 6.0 or earlier) and in ASCII (DOS) format on separate diskettes. The proposer shall submit the Cost section spreadsheets in the designated layouts properly formatted for use by Excel for Windows software version 5.0 on a separate diskette.

Three copies of each proposal diskette (all certified as virus-free) shall be provided. A brief description explaining the diskette file structure, naming conventions used and any other information that the proposer feels may be helpful to use these files effectively for the intended purpose shall be included. These pages do not count toward the proposal page limit.

4.1.2 Proposal Format

The following requirements pertain to proposal format. The cover page, signature page(s), table of contents, reference list, curriculum vitae, Executive Summary, certifications, non-U.S. participant MOUs, Statement of Work, cost spreadsheets and all other required contract documentation will not be counted against the page limits.

- Cover Page

The cover page must be signed by the Principal Investigator (or Co-Investigator) and an official by title of the investigator's organization and/or the organization(s) contracting directly with NASA who is authorized to commit the organization(s) that is directly responsible for the proposal and its contents. The cover page must include the name Triana; the full names, affiliations, addresses with zip codes, telephone and fax numbers, and electronic mail addresses of the Principal Investigator or Co-I and the authorizing official(s); and annual funding requirements for the mission in real year dollars by Government fiscal year, clearly identifying the amount requested from NASA and the amount to be contributed by partners. This cover page should be attached to the front of the proposal.

- Signature Page

A signature page containing the endorsements of the implementing, funding and sponsoring organizations on the mission team must be forwarded with the proposal, immediately following the cover page. The signatures shall serve as endorsements of the proposed mission cost, schedule and implementation as defined by the proposal, and commit each institution to carry out its proposed responsibilities for the resources proposed. The signature page must include the title of the mission being proposed and the name of the Principal Investigator (PI) as well as the full names, signatures, titles, affiliations, and addresses of the Project Manager, all Co-Investigators (Co-I) and lead representatives from every organization represented on the team (including contributing and non-U.S. members), as well as the authorizing official from each organization represented on the team who is authorized to commit that institution to the proposed investigation. In the case of non-U.S. participants, signatures from the institutional and/or government funding providers must be included. The Principal Investigator and authorizing official signatures, phone numbers, addresses, etc., included on the cover page need not be repeated on the signature page. Should it not be feasible to have all individuals sign the same sheet due to time or page constraints, more than one sheet may be used to enable concurrent signatures. Appendix I, Figure M-5 provides the format to be followed in preparing the signature page(s).

- Table of Contents

The table of contents should parallel the outline provided below to the greatest extent possible.

- Executive Summary

The Executive Summary should provide an overview of all aspects of the investigation. This summary should be presented in five parts reflecting the major sections of the proposal (Science, Technical, Student Participation, Cost, and Management). It is recommended that the Executive Summary be constructed by writing abstracts of each of the five major sections and should serve as the Introduction and Summary for the proposal. The Executive Summary is limited to a maximum of 3 single-spaced typewritten pages, without reduction. No foldout pages are allowed.

- Proposal Body

The proposal body shall consist of five sections in order: "Science", "Technical", "Student Participation", "Cost" and "Management".

The Science, Technical and Student Participation sections together are limited to a maximum of 30 single-spaced typewritten pages (15 pages for add-on instrument proposals), without reduction, including illustrations and tables, and may contain no more than 3 foldout pages (28 x 43 cm) (i.e., 11 x 17 inches).

The Cost and Management sections together are limited to a maximum of 25 single-spaced typewritten pages (15 pages for add-on instrument proposals), without reduction, including figures, tables, and charts. The proposed Statements of Work (SOW), contract list of deliverables, exceptions and/or changes to contract clauses, and the requested cost spreadsheets in the designated layouts will not be counted against the page limit.

The Science, Technical, and Student Participation sections must provide a clear statement of the scientific and educational objectives of the mission, and a description of the approach to be used in attaining those objectives, as well as any commercial opportunities offered by the mission. These sections should contain enough background information to be meaningful to a reviewer who, although not necessarily a specialist, is generally familiar with the field.

The Cost and Management sections must provide a clear statement of all costs associated with the mission, along with the management approach to be used in attaining the mission objectives.

- Curriculum Vitae

A two-page maximum length curriculum vitae is required for all key personnel and should be appended to the proposal.

- Certifications

Certifications required by Federal law are included as Appendices F and G to this AO and should be appended to the proposal.

Proposals submitted by NASA employees as PIs or Co-Is should contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources; submissions from and/or discussions with potential sources; and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the Principal Investigator verifying the

process for selecting contractors as proposed team members, including the absence of conflicts of interest. This information should be provided under separate cover and is not included against the page limit for proposals.

4.1.3 Technical and Scientific Inquiries

Inquiries of a technical or programmatic nature should be directed to the Triana Program Coordinator at the address below:

Triana Announcement of Opportunity
Ref.: AO-98-OES-02
Code Y
400 Virginia Avenue S.W.
Suite 700
Washington, DC 20024
Phone: 202-554-2775
Fax Number: 202-554-2970
e-mail: (Internet) dcardasc@hq.nasa.gov

4.2 Proposal Content

The following sections describe in detail the content requirements of proposals.

NOTICE TO PI-LED DATA PURCHASE OFFERORS: Proposal content shall address the science and student participation content exactly as specified below. The Government recognizes that data purchase arrangements differ in level and type of oversight from mission implementation activities. Therefore, the PI offering a data purchase approach should tailor the information provided to reflect the proposed teaming arrangement with the data provider. The proposal should still address technical, management, and cost information, but may discuss these in terms of the data provider's business plan. Sufficient detail must be provided for the Government to evaluate the feasibility of the business plan and associated implementation, and the risk of the proposed management approach and cost.

4.2.1 Science

The science section shall contain all pertinent information allowing for an evaluation of the scientific merit of the investigation. All of this information is counted as part of the proposal page limit.

SCIENTIFIC GOALS AND OBJECTIVES - This section shall provide a definition of the goals and objectives of the investigation, their value to Earth System Science and the Office of Earth Science priorities in general, and their relationships to past, current, and future investigations and missions (i.e., complementarity to EOS and approved OES flight programs). It shall describe the

history and basis for the proposed mission and discuss the need for such an investigation.

NATURE OF INVESTIGATION - This section shall provide an end-to-end overview of the mission. A more detailed description of the mission approach shall be included in the Technical section.

MEASUREMENT OBJECTIVES AND ANTICIPATED DATA RETURN - This section shall fully describe the measurements to be acquired during the course of the mission, the scientific data to be returned, and the approach that will be utilized in analyzing the observational data to achieve the scientific objectives of the investigation. This description shall identify the type of experiments to be performed (imaging, spectroscopy, sounding, ranging, etc.), the quality of the data to be returned (spatial and temporal resolution, coverage, pointing accuracy, measurement precision, etc.), and the quantity of data to be returned (number of bits, images, etc.). The relationship between the data products generated and the scientific objectives shall be explicitly described, as shall the expected results.

Finally, this section shall describe the plan for processing and distributing the data. The procedures for Triana mission data quality assessment (i.e., calibration, validation and evaluation), data product generation in geophysical data record format, and external data product dissemination shall be explicitly described. The anticipated format of the final data products shall be described, as well as the time required for calibration, validation and quality check evaluation.

INSTRUMENTATION - This section shall fully describe the proposed instrumentation and the criteria used for its selection. A description of the operational scenario/modes and an overall functional description and block diagram for all instrumentation shall be provided. The state of maturity of the instrumentation shall be described, including design heritage and existing instruments, breadboards, brassboards, and prototypes. Instrumentation concept, feasibility or definition studies already performed shall be summarized. The following preliminary information shall be provided:

- Size
- Mass with margins
- Power with margins (nominal, peak, duty cycle, standby)
- Data rate with margins
- Mechanical, electrical, and thermal layouts
- Optical layout including field of view (if appropriate)
- Ground and on-orbit calibration scheme
- Pointing requirements (knowledge, control, and stability)
- Command and control requirements

- Flight software development plan (use of existing or commercial off the shelf software shall be identified)

REFERENCES - This section shall list all cited references which appear in the Science section of the proposal. Cited references are encouraged to be from the extant literature (i.e. widely available journals, books, etc.), or available as preprints.

SCIENCE TEAM - This section shall identify the mission science team, and the activities of that team shall be described in detail. The capabilities and experience of all members of the proposed science team shall be described. In addition, the role of each science team member in the investigation shall be explicitly defined. Resumes or vitae of team members shall be included as attachments to the proposal. Any plans for producing an initial analysis of early mission data should be described.

4.2.2 Technical

The Technical section shall detail the method and procedures for investigation definition, design, development, integration, ground operations, and flight operations. For add-on instrument proposals, only those relevant portions should be described. This section must also detail the expected products and end items associated with each phase. Mission teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities in accomplishing mission objectives is encouraged when cost, schedule, and technical improvements can be demonstrated. The experience and qualifications of performing organizations shall be discussed.

This section must be complete in itself without the need to request additional data.

MISSION DESIGN - This section shall fully describe the design, development, launch and operation of the mission. Mission design and development, including systems engineering and requirements flowdown and allocation, shall be described. Information on the proposed launch service, orbital parameters and a preliminary mission timeline indicating periods of data acquisition, data downlink, etc. shall be included. The mission description shall also define the type and source of communications network interface required.

SPACECRAFT - This section shall describe the spacecraft design approach, particularly as it relates to new versus existing hardware and redundant versus single-string hardware. It shall fully identify the spacecraft and describe its characteristics and requirements. A preliminary description of the spacecraft design with a block diagram showing the spacecraft subsystems and their interfaces shall be included, along with a description of the flight software and a summary of the estimated performance of the spacecraft. The flight heritage

and/or rationale used to select the spacecraft and its subsystems, major assemblies, and interfaces shall be described.

Subsystem characteristics and requirements shall be described to the greatest extent possible. Such characteristics include: mass, volume, and power requirements; pointing knowledge and accuracy; new developments needed; spaceflight qualification plan; and logistics support. Any design features incorporated to effect cost savings shall be identified. A summary of the resource elements of the spacecraft design concept, including key margins, shall be provided. The rationale for margin allocation shall also be provided. Those design margins that are driving costs shall be identified. Plans for all phases of software development, including the use of existing (including "commercial off-the-shelf") software, shall be described. The method planned for development and validation of flight software shall be addressed.

The method for resolving any major open spacecraft issues, major systems trades, and technology development planned to be addressed in Phase B shall be addressed. A preliminary schedule for the spacecraft development must be included.

PAYLOAD INTEGRATION - This section shall characterize the interface between the science instrumentation and the spacecraft. The planned process for physically and analytically integrating the science payload with the spacecraft shall be described. Along with a description of the payload layout and configuration, the accommodation of the science instruments by the spacecraft shall be addressed as follows:

- Instrument location constraints
- Mechanical/structural interface
- Field of view, alignment and pointing
- Baffling or other protection
- Thermal environment/temperature limits
- Data collection and storage
- Data processing (onboard and on the ground)
- Telemetry
- Commands
- Timing (clocks)
- Environmental sensitivities (electrical cleanliness, magnetic fields, contamination, etc.)

MANUFACTURING, INTEGRATION, AND TEST - This section shall describe the manufacturing strategy to produce and verify the hardware/software necessary to accomplish the mission. It shall include a description of the main processes/procedures planned in the fabrication of flight hardware and software

development; use of production personnel resources; incorporation of new technology/materials; and the preliminary test and verification program.

The approach, techniques, and facilities planned for manufacturing, integration, test and verification, and launch operations phases, consistent with the proposed schedule and cost, shall be described. A preliminary schedule for manufacturing, integration, and test activities shall be included. A description of the planned end items, including engineering and qualification hardware, shall be included. The use of any existing test facilities and processes shall be described.

GROUND AND DATA SYSTEMS - This section shall discuss the ground operations support required for the proposed investigation. The approach to the development of the ground data system (GDS), including the use, if any, of existing facilities shall be described. Any mission-unique facilities must be adequately described. Include a block diagram of the GDS showing the end-to-end concept (acquisition through archiving) for operations and data flow to the subsystem level. Describe the use of standards, such as Consultative Committee for Space Data Systems (CCSDS) recommendations or commercial standards, on the space/ground communications link. Describe all communications, tracking, and ground support requirements, including space/ground link spectrum requirements and licensing approach. Describe the software development approach and its relationship to the flight system software development.

MISSION OPERATIONS - This section shall describe the planned approach for managing mission operations and all flight operations support, including mission planning. A description of the operational phase of the mission shall be included. Operational constraints, viewing requirements, and pointing requirements shall also be identified. Describe any special communications, computer security, tracking, or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel.

The acquisition of data and the processing of that data both onboard the spacecraft and on the ground shall be described. The plan for processing the data after it has been delivered to the ground shall be discussed, including the method and format of the data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving shall be discussed and the plan must include a detailed schedule for the submission of data to the public domain in the proper formats, media, etc. Delivery of the data to the public domain shall take place in the shortest time possible.

Specific features incorporated into the flight and ground system design that lead to low-cost operation shall be identified. The use of any existing mission operations facilities and processes shall be described, as well as any new facilities required to meet mission objectives.

4.2.3 Student Participation

The Student Participation section shall summarize the approach for including students in proposed activities. All relevant areas of proposed work should be addressed including science investigations; design and development of the overall system, system segments, and system components; operation of the spacecraft; and processing and distribution of the data. The grade level of students, whether high school, undergraduate, or graduate shall be explicitly characterized while defining the tasks to be allocated to them or in which they will participate. The offeror's established student participation programs, if any, should be described, along with a description of how these programs will contribute to student participation in Triana. Relevant relationships to existing NASA educational programs should also be described.

4.2.4 Management

The Management section shall summarize the management approach and the facilities and equipment required. This section sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions. This section shall specifically discuss the decision-making process to be used by the team, focusing particularly on the roles, responsibilities and authority of the Principal Investigator (PI) and Project Manager (PM) in that process. The Management section shall provide insight into the organizations proposed for the work, including the internal operations and lines of authority, together with internal interfaces and relationships with NASA, team members, major subcontractors, and associated investigators. It also identifies the institutional commitment of all team members, and the institutional roles and responsibilities. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated.

MANAGEMENT PROCESSES AND PLANS, SCHEDULE AND PROCUREMENT STRATEGY - This section shall describe the management processes and plans, schedules, and procurement strategy necessary for the logical and timely pursuit of the work, accompanied by a description of the work plan. This section shall also describe the proposed methods of hardware and software acquisition. Specifically, it shall include the following, as applicable:

- Capabilities that each member organization brings to the team, as well as previous experience with similar systems and equipment.
- Management processes which the mission team proposes to:

- ◇ develop and maintain the hardware and software requirements and specifications;
 - ◇ manage and control development progress;
 - ◇ manage and conduct technology development;
 - ◇ manage and conduct design;
 - ◇ manage, review, and control changes to hardware/software, documentation, etc.;
 - ◇ manage and conduct mission systems engineering and integration;
 - ◇ manage and conduct procurement, including make or buy decisions, subcontract management, etc.;
 - ◇ manage, control, and allocate resources, including reserves;
 - ◇ manage and conduct the testing and verification programs, including final checkout and calibration;
 - ◇ manage and conduct launch and mission operations;
 - ◇ manage and conduct data reduction and distribution;
 - ◇ coordinate with team members and document agreements;
 - ◇ provide NASA with insight; and
 - ◇ report progress to NASA.
- The specific decision-making process regarding all aspects of the mission, including distribution of reserves, and the individual with ultimate decision-making authority in such cases.
 - Availability of proposed personnel on the team to successfully administer the mission contract and subcontracts and technically monitor the implementation.

- A document tree which describes key proposed documentation, including development schedule and current status of each document.

The mission schedule and work flow should be clearly laid out, including critical path, schedule margins, deliveries of end items and major interdependencies. The method for internal review, control, and direction shall be discussed, including whether or not a form of performance measurement system will be used.

ROLES, RESPONSIBILITIES, AND EXPERIENCE OF TEAM MEMBERS - The roles, responsibilities, time commitment, and experience of all key personnel must be described in this section, with particular emphasis placed on the responsibilities assigned to the PI, the Project Manager and other key personnel. In addition, information shall be provided which indicates what percentage of time will be devoted to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the PI and science team members does not need to be included in this section since it would have been addressed in the Science section.)

- **PRINCIPAL INVESTIGATOR** - The role(s), responsibilities, and time commitment of the Principal Investigator shall be discussed. Provide a reference point of contact including address and phone number.
- **PROJECT MANAGER** - The role, responsibilities, time commitment, and experience of the Project Manager shall be discussed. Provide a reference point of contact including address and phone number.
- **OTHER KEY PERSONNEL** - The roles, responsibilities, time commitments, and experience of the Co-Investigators and other key personnel in the investigation shall be described.

The management organizational structure of the investigation team must be described in the proposal. The proposal must identify the teaming approach to be used and describe the responsibilities of each team member and their contributions to the investigation. The work of these individuals and institutions must be accounted for in the cost elements breakdowns provided in the Cost section.

Of special interest is the organizational approach and plan for efficient and effective management of the multi-organizational interfaces between cooperating partners and team members. Particular emphasis shall be placed on the organizational relationship between the PI and the PM. The capability of the team to respond quickly and effectively to problems and inter-organizational conflicts must be demonstrated. Proposed lines of communication and authority must be demonstrated.

The contractual/financial responsibilities and relationships of all team partners, including contributions, must be described. The mechanisms (contracts, subcontracts, cooperative agreements, memoranda of agreement, etc.) by which organizations commit to participate as partners on a proposing team must be clearly identified. Include a description of incentives and fee strategy, where appropriate, and their rationale. The proposal signature page must include the signature of an official from each organization represented on the team or contributing to the investigation who is authorized to commit that organization to the proposed investigation. Failure to include any such authorization may be grounds for rejection of the proposal. Non-U.S. organizations and funding sources participating as team partners must also meet this requirement. Information on procurement of long lead items and proposed major and critical subcontracts, including procurement activities of all team partners, must be provided. The information shall consist of, at a minimum, name of the item, scope of the work to be performed, name and location of supplier or subcontractor, proposed award schedule, deliverable items and delivery schedule, proposed performance assurance requirements, and contingency plans if a supplier or subcontractor fails to perform. Describe the relationships and controls you will exercise over suppliers and subcontractors from both cost and schedule standpoints.

The experience (successes *and* failures) of team partners in managing projects of similar scope, including cost and schedule performance within the last ten years shall be discussed.

COST MANAGEMENT - The specific means by which costs will be tracked, managed and reported to the Government shall be defined. A Work Breakdown Structure (WBS) and WBS dictionary, consistent with the plans set forth elsewhere in the proposal, shall be included. Specific reserves and the timing of their application, if needed, shall be described within the proposal. This shall include the strategy for maintaining reserves as a function of cost-to-completion. All funded schedule margins must be identified. The relationship between the use of such reserves, margins and potential descope options, and their effect on cost, schedule and performance, shall be fully discussed.

RISK MANAGEMENT - This section shall describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Particular emphasis shall be placed on describing how the various elements of risk will be managed to ensure successful accomplishment of the mission within cost and schedule constraints.

MISSION ASSURANCE - This section shall describe the process by which mission success is assured and achieved. This section shall describe mission assurance plans, including specific plans for reviews, problem/failure

resolution, inspections, quality assurance, reliability, parts selection and control, and software validation activities compatible with industry best practices, ISO 9000 quality.

SAFETY - This section shall describe the process by which safety standards are met and hazards mitigated. The mission team member responsible for implementing the system safety program for the proposed mission shall be identified. Past experiences of this mission team member in implementing system safety program from previous missions shall be described. This section shall also describe all safety plans and practices to be used in mission development.

REVIEWS, AUDITS AND INSIGHT - Propose a schedule of mission reviews (both NASA and internal), including reviews of technical and programmatic status and any other informal reviews intended to report status and accomplishments, discuss problems, and provide technical and programmatic information to NASA. Include review description, content, planned schedule and duration, planned documentation and schedule for document delivery. The proposed implementation of mechanisms which will provide NASA insight into the mission shall be described.

The approach to interfacing with the Government for the purpose of conducting audits shall be described. Describe the audit process from contract award through performance and contract close-out.

FACILITIES AND EQUIPMENT - All major facilities, laboratory equipment, and ground-support equipment (GSE) (including those of the team's proposed contractors and those of NASA and other U.S. Government agencies) essential to the mission in terms of its system and subsystems are to be indicated, distinguishing insofar as possible between those already in existence and those that will be developed in order to execute the investigation. The outline of new facilities and equipment shall also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

STATEMENTS OF WORK (SOW) - Provide Statements of Work/Task Plans for Phase B and Phase C/D/E covering all aspects of the mission. These documents shall cover all phases and include, as a minimum, Scope of Work, Deliverables (with emphasis on science data products), and Government Responsibilities (as applicable).

CONTRACTUAL REQUIREMENTS - In order to expedite mission contract awards, proposers are required to propose mission contract terms, conditions and deliverables. Each proposer shall submit a list of contract deliverables for both Phase B and the Phase C/D/E option.

All proposed contractual documentation, if accepted by NASA, shall be considered executable upon selection. If no exceptions are taken, the sample generic contractual documents will be used as the basis for selected mission contract formulation. NASA reserves the right to negotiate all contract terms and conditions following mission selection.

4.2.5 Cost

Proposals submitted in response to this AO must be of sufficient cost detail to enable NASA to make a fair and reasonable assessment of the NASA Mission Cost (NMC) and the Total Mission Life Cycle Cost (TMLCC) of the proposed mission. The term “cost” is defined as dollars actually expended for accomplishment of the mission during a given time period. Cost differs from “funding”, which is defined in the Funding Profile section below. The NMC represents the NASA-funded portion of the mission. The TMLCC is the total amount of resources used to produce the mission; that is, the NMC plus all non-NASA funded contributions. This includes direct and indirect costs that contribute to the mission, regardless of funding sources. The NMC for Triana must include the full cost of all civil service support to the mission, including science co-investigators, technical advisors, facilities, etc., unless contributed by their agency. If contributed, these resources must be included in the TMLCC.

Direct costs that can be specifically identified with a Triana proposal include: (a) salaries and other benefits for employees who work directly on the mission, (b) materials and supplies used directly in support of the mission; (c) various costs associated with office space, equipment, facilities, and utilities that are used exclusively to produce the mission; and (d) costs of goods or services received from other segments or entities that are used to produce the Triana mission.

Indirect costs include resources that are jointly or commonly used to produce two or more types of products but are not specifically identifiable with any of the products. Typical examples include labor overheads, material handling, cost of money (COM), general administration, general research and technical support, security, rent, employee health and recreation facilities, operating and maintenance costs for buildings, equipment, and utilities.

Cost estimating procedures shall be based upon generally accepted cost accounting principles and practices and must be in accordance with the proposer's approved accounting system. Additional information on cost principles, procedures and definitions are found in the Federal Acquisition Regulations (FAR) in parts 30 and 31.

The methods by which the cost estimates are derived shall be described. If an estimate is based on heritage, the performance and cost parameters that the proposed system has in common with the previous or existing system shall be provided. An analysis of the impact of the referenced heritage on the risk of the proposed mission and on the proposed mission cost estimate shall also be provided. If cost models are used, a description of the model and the assumptions used to derive the cost

estimates shall be documented. Identify any “discounts” assumed in the cost estimates for business practice initiatives or streamlined technical approaches. Describe how these have been incorporated in the cost estimate. Copies of applicable forward pricing rate agreements shall be provided. Costing of Federal Government elements of proposals must follow the agency cost accounting standards for full cost. If no standards are in effect for the agency, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board. NASA Centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, Cost Principles for Reimbursable Agreements.

All costs, including non-U.S. contributions, must be in U.S. Government real year dollars. Real year dollars are current fiscal year (FY) dollars adjusted to account for inflation in future years. The inflation rate index provided in Appendix I, Figure M-2 shall be used to calculate all real year dollar amounts unless an industry forward pricing rate is used and documented. Where cost phasing is requested, the cost plan shall provide data by U.S. Government fiscal year (October 1 - September 30) for Phases C/D and E and by Government fiscal quarter for Phase B. Requests for cost by "Phase" refer to Phases B, C/D, and E as defined in NASA Handbook (NHB) 7120.5. Costs shall be broken down to the system or subsystem level, as requested, in accordance with the proposer's Work Breakdown Structure (WBS), which shall be included for reference.

Separate Summaries of Elements of Cost by mission phase and Government fiscal year (fiscal quarter for Phase B) shall be provided at the appropriate WBS level for each major mission organization (i.e., the PI, each NASA-funded team member, each contributor, and each subcontract exceeding \$1,000,000) as defined below. In addition, a roll-up Summary of Elements of Cost shall be provided for each organization. Appendix I, Figure M-3 is provided as a template for these costs. This format can be expanded to show additional phases and fiscal years. Major categories of cost shall be provided at segment level. The value of reserves shall be included and separately identified by WBS at the system level. A mission level Summary of Elements of Cost for the total NMC and the total TMLCC, which represents the total of all separate Summaries, shall also be provided, but need not be broken down by skill categories, overhead centers, etc.

The Summaries of Elements of Cost shall contain the following direct and indirect elements:

- **DIRECT LABOR HOURS** - Show productive hours by individual skill categories for Phases B, C/D and E.
- **DIRECT LABOR COSTS** - The labor costs shall be itemized by skill categories for Phases B, C/D and E.

- **LABOR OVERHEAD** - Overhead shall be itemized by cost centers (engineering, manufacturing, etc.) for Phase B and as totals by fiscal year for Phases C/D and E. Rates shall be documented for Phases B, C/D and E.
- **SUBCONTRACTS** - Supporting information shall be provided for all subcontracts exceeding \$500,000 for phases B, C/D and E. This detail shall include name/address, cost, fee/profit, type of contract, number of quotes solicited/received, basis of selection, affiliation with the Prime, type of business, type of cost and price analysis accomplished, concise basis of estimate, and basis of selection.
- **MATERIALS** - Supporting detail for major vendors (exceeding \$500,000) in Phases B, C/D and E shall include WBS element, fiscal year or quarter, description, vendor name/address, quantity, and current/proposed unit prices. Material burden rates shall be documented for Phases B, C/D and E.
- **TRAVEL** - Travel shall be summarized as totals for Phases B, C/D and E.
- **OTHER DIRECT COSTS** - Other direct costs shall be summarized as totals for Phases B, C/D and E.
- **GENERAL AND ADMINISTRATIVE (G&A) EXPENSE** - G&A expense represents the institution's general and executive offices and other miscellaneous expenses related to business. G&A expense shall be itemized by cost pool for Phase B and summarized as totals for Phases C/D and E. Rates shall be documented for Phases B, C/D and E.
- **COST OF MONEY (COM)** - COM represents interest on borrowed funds invested in facilities. COM shall be itemized by indirect pools and overhead centers for Phase B and summarized as totals by fiscal year for Phases C/D and E. Rates shall be documented for Phases B, C/D and E.
- **PROFIT/FEE** - Document the basis, rate, and amount of fee for Phases B, C/D and E.
- **ESCALATION FACTORS** - Document the escalation factors used to determine real year dollars for Phases B, C/D and E.

In addition to the Summaries of Elements of Cost, the proposer shall provide the following mission level information:

- **TOTAL MISSION LIFE CYCLE COST PHASING** - Appendix I, Figure I-4 is provided as a template for the TMLCC phasing by fiscal year. Resources

provided as contributions by international or other partners shall be included and clearly identified as separate line items. This is the only chart where NASA-funded costs and contributions by other partners are presented together.

- **FUNDING PROFILE** - Provide a profile of required NASA-funding by fiscal year. The funding profile is derived from the cost profile which is the basis of the proposal. The funding for a given fiscal year is determined from the estimated costs in that year, less the funding carried over from the previous fiscal year, plus the forward funding needed to cover the costs of the first month in the following fiscal year, plus the forward funding required for “unfilled orders”. Unfilled orders refers to long lead items for which funding and costing takes place in different Government fiscal years. Because of forward funding, costs will not equal funding in any given fiscal year. Total costs shall equal total funding at program completion.

A complete cost plan as defined above is required. In addition, a Contract Proposal Cover Sheet, with level of information equivalent to an SF1448 (see Appendix G), shall be provided for NASA funding of (1) the total mission, (2) Phase B, and (3) Phases C/D/E combined.

NOTICE TO OFFERORS ON COSTING SHUTTLE LAUNCH: Because the Shuttle launch is to be provided by the Government at no cost to proposers the cost should not be included in the NMC; however, the nominal Shuttle launch cost should be included in the TMLCC. (See Appendix B for the source of information on Shuttle launches.)

4.3 International Participation

Participation of non-U.S. mission team members is allowed under the guidelines discussed in Section 3.3. All proposals for missions with non-U.S. participants shall include a draft Memorandum of Understanding (MOU) between the Principal Investigator and each non-U.S. organization. Principal Investigators are urged to contact NASA’s Office of External Relations (see Appendix H) for guidance with international affairs. The draft MOU is not required to be signed at the time of the proposal, but should be representative of the terms and conditions under which mission team members would operate. The MOU must clearly identify the roles of the two parties in the proposed mission and the resource(s) being provided, and must clearly commit and make available all identified resources to the mission by an identified time which is compatible with the mission’s proposed milestones. All MOUs must be finalized and signed as defined in Section 3.3. Some model MOU language can be found in Appendix D. Draft MOUs do not count as part of the page limit.

Non-U.S. institutions providing only Co-Investigators are not required to submit an MOU, but should submit a commitment letter. The Letter of Commitment must clearly identify the intended role of the organization in the proposed mission and the resource(s) being provided, and must clearly commit identified resources to the

mission upon selection for the Triana mission. The Letter of Commitment must be signed by an official with the authority to commit his/her organization's resources. Letters of Commitment do not count as part of the page limit.

4.4 Submittal of Proposals

4.4.1 Certification

The original copy of all proposals shall include a signature page(s) signed by an institutional official from each organization represented on the team authorized to certify institutional support and sponsorship of the investigation as well as concurrence in the management and financial parts of the proposal. This requirement includes all non-U.S. organizations. Additional certifications identified in Appendices F and G are required by law and must also be included.

4.4.2 Quantity

All proposers must provide 10 copies of their bound paper proposal, including the original signed proposal, on or before the proposal deadline. The proposals must be numbered sequentially from 1 to 10 in the upper right-hand corner of the cover page; the original signed proposal should be number 1. The requirements for submittal of diskette copies of the proposal are defined in Section 4.1.1.

4.4.3 Submittal Address

All proposals shall be mailed to the following address:

Triana Executive Secretary
Code Y
400 Virginia Avenue, S.W.
Suite 700
Washington, DC 20024
Phone: 202-554-2775

4.4.4 Submittal Deadline

All proposals must be received on or before 4:00 p.m. Eastern Time on August 17, 1998. Proposals received after the established closing date and time will be treated in accordance with NASA's provisions for late proposals (NASA FAR Supplement 1815.412, Late Proposals, Modifications and Withdrawal of Proposals).

4.4.5 Notification

NASA will notify proposers in writing that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should contact NASA at the address given in Section 4.1.3.

4.4.6 Proposals Involving International Participation

The procedures for submission of proposals with non-U.S. participants are the same as those for strictly U.S. proposals, as previously outlined in this section. Additionally, one copy (over and above the 10 copies identified in Section 5.4.2) of any proposal that includes non-U.S. participants shall be sent to:

Office of External Relations
Mail Code IY
Ref.: AO-98-OES-02
National Aeronautics and Space Administration
Washington, DC. 20546 USA
Phone: 202-358-0793

5.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

5.1 Evaluation Criteria

The selection of mission elements that best meet the educational, technical, scientific, and programmatic objectives stated in the AO is the fundamental aim of the proposal evaluation process. The evaluation approach is designed to determine the mission elements with the greatest potential to benefit NASA in accomplishing the Triana mission, adjusted for the probability that the proposed mission element can be achieved within established limits of cost and schedule. The information requested in Sections 3 and 4 will enable the evaluation panel to determine how well each mission team understands the complexity of the proposed mission and its technical risks. This information will also enable the evaluation panel to rank the proposed investigations, and will provide the necessary discriminators to permit the selection of those proposals which best meet all guidelines and constraints, and which address all elements viewed necessary for mission success.

The criteria that will be used to evaluate each proposal submitted in response to this AO are:

- the scientific merit
- the total cost to NASA, realism of the cost estimate, and cost risk
- the degree of student participation in the proposed effort
- the feasibility and innovation of the technical approach
- the completeness, soundness, and innovation of the management approach

The scientific merit and cost will be given the greatest, and approximately equal, weight in the evaluation. Student participation will be given a lower weight than scientific merit and cost. The remaining criteria will be given still lower, and approximately equal, weights.

NOTICE TO PI-LED DATA PURCHASE OFFERORS: The evaluation criteria for PI-led data purchase proposals are identical to those specified above. The Government recognizes that data purchase arrangements differ in level and type of oversight from mission implementation activities. Therefore, the tailored technical, management, and cost information provided by the PI will be evaluated in the context of the data provider's business plan.

5.1.1 Science Evaluation Criteria

Each proposed mission will be evaluated for its scientific return, feasibility, resiliency and the probability of success. In addition, the timeliness of dissemination of mission data product(s) to the broad user community and the methods to be employed will be considered. Feasibility will be determined by evaluating the degree to which the mission will address the stated scientific goals and objectives; the degree to which the instrument set can provide the necessary data; the maturity of scientific understanding

for retrieving the information content of the observations (i.e., algorithm development); the adequacy of any proposed correlative measurements to calibrate and/or validate the observations; and the approach to data quality assessment, production of science data products in geophysical data record format, and external data product dissemination. The proposed instrumentation will be evaluated for soundness, achievability, and the feasibility of making the required measurements. Risk mitigation plans will also be considered. Finally, the probability of success will be determined by considering the experience, expertise, and organization of the science team; the overall risk associated with the science objectives; and the technical maturity of the proposed instrumentation.

5.1.2 Cost Evaluation Criteria

The information provided in the Cost section will be used to evaluate the adequacy and realism of the total proposed cost within the constraints established in this AO for the Triana mission. The intent of the cost evaluation process will be to appraise the total mission cost and determine the overall risk associated with the cost elements. The basis, heritage and quality of the cost estimates and the probability that the mission can be achieved within the proposed schedule for the proposed resources (including NASA funding and contributions) will be assessed. The same evaluation standards will be applied to NASA-provided and contributed resources. Given the risks associated with full-up end-to-end missions, the adequacy of cost measures to decrease the risk to mission success will be evaluated. The clarity of the relationship between identifiable technical and schedule risks and the planning, identification, tracking, and application of reserves will be assessed. Past cost performance by the PI or Co-I and major partners on similar missions will be reviewed in terms of the probability of mission success.

5.1.3 Student Participation Evaluation

An important objective of the Triana project is to promote science education by engaging students in all phases of the mission development. Proposers must show how students at the high school, undergraduate, and graduate levels will contribute to the proposed effort.

A separate NASA Research Announcement (NRA) will be issued for curriculum support to involve students in the use of Triana data in the classroom, and to develop related educational resources and activities; therefore, these activities will not be evaluated as part of this AO.

The degree of student participation in the development of the proposed Triana mission element will be evaluated according to the following criteria:

- Involvement of undergraduate and graduate students in instrument, spacecraft, and ground station design, and in the processing and dissemination of data.

- The establishment of effective, long-term partnerships with institutions and/or personnel in the fields of educational and public outreach as the basis for and an integral element of the proposed program.
- The potential of the proposed activity to have a “multiplier effect” (e.g., prospects for broad dissemination or replication of a product)
- The degree to which the proposed effort contributes to the training of, involvement in, and broad understanding of science and technology by underserved and/or underutilized groups.
- The prospects for building on, taking advantage of, and leveraging existing and/or ancillary resources beyond those directly requested in the proposal.
- The linkage of the proposed task with existing NASA science and/or education programs and activities

Note that the originality of the proposed effort is not a criterion. Rather NASA OES seeks assurance that the PI is committed to carrying out a meaningful, effective, credible, and appropriate student participation activity; that such an activity has been planned and will be executed; and that the proposed investment of resources will make significant contribution toward meeting OES education/outreach goals and objectives.

The educational component of the proposals will be evaluated by appropriate scientific and professional Education and Public Outreach personnel, and the results of that evaluation will be factored into the overall evaluation of the proposal and the selection process.

5.1.4 Technical Evaluation Criteria

The Technical evaluation will consider the proposer's understanding of the processes, products, and activities required to accomplish development of the mission elements (e.g., flight segment, ground and data systems, mission operations etc.) required to execute the mission, as well as the adequacy of the proposed approach. The mission will be evaluated to assess the derivation of the proposed mission design from the stated objectives, requirements, and constraints of the proposed investigation. The technical approach will be examined in its entirety to ensure that: (1) all elements and processes are addressed; (2) weaknesses and design issues are understood and plans for resolution have been identified; (3) fundamental design trades have been identified and studies planned; and (4) primary performance parameters have been identified and minimum thresholds established. The overall approach (including schedule), the specific design concepts, and the known hardware/software will be evaluated for soundness, achievability, and maturity. The evaluation will consider proposed technologies, including commercial off-the-shelf technology, their benefit to

the mission and potential risk. Resiliency and margins will be a consideration in the evaluation. The probability of success will be determined by evaluating the experience and expertise of the technical organizations and the programmatic and technical risk associated with the mission design, including the launch service. The spacecraft concept will be evaluated to determine the maturity level of the proposed spacecraft design. In addition, innovative, cost-effective features, processes, or approaches will be rewarded if shown to be sound.

5.1.5 Management Evaluation Criteria

The information provided in the Management section will demonstrate the proposer's plans, processes, organization and personnel for managing and controlling the development and operation of the mission and will be evaluated on the soundness, completeness and specificity of the approach and the probability that the management team can assure mission success. The soundness and completeness of the approach will be determined by reviewing the organizational structure (including roles, responsibilities, accountability, and decision making process), the key personnel, and the processes, plans, and strategies the team will use to manage the various mission elements (including contributions and student involvement) and provide NASA insight. Criteria will include clear lines of authority; clean interfaces; prudent scheduling and cost control mechanisms and review processes; demonstrated awareness of all necessary management processes, etc. The probability of mission success will consider, for both NASA-funded and contributing organizations, the experience, expertise, and commitment of key personnel, as well as the organizations to which they are attached; the proposed contractual arrangement between NASA and the mission team as well as between team members, including contractual performance and incentives; the adequacy of facilities and equipment proposed for the mission; the adequacy of proposed mission assurance and safety plans; the adequacy of the team's approach to risk management; and the adequacy of the management and control mechanisms. The quality and specificity of the proposed Statements of Work and other required contractual documentation will be evaluated to assess the maturity of the mission management approach. Innovative management processes and plans which are expected to improve performance and reduce costs will be rewarded.

The level and scope of participation of small, small disadvantaged, and women-owned small businesses, and minority institutions in this proposal will also be evaluated.

5.2 Evaluation and Selection Process

Proposals received in response to this AO will be reviewed and selected in accordance with the procedures stated in NASA FAR Supplement 1872.4 as modified by this section. All non-U.S. proposals will go through the same evaluation, selection, and approval process as proposals originating in the U.S. Evaluation panels, using scientific, technical, management and administrative peers and experts, will assess

the strengths and weaknesses of each proposal and will provide the NASA Headquarters Office of Earth Science with a summary report.

All proposals will be subjected to a preliminary screening to determine their responsiveness to this AO. Proposals that are not in compliance with the constraints, requirements, and guidelines of this AO will be considered unacceptable and returned to the proposer.

The remaining proposals will be peer reviewed by a scientific and technical peer panel and evaluated according to the evaluation criteria in Section 5.1. Evaluation of the proposals is intended to assess the in-depth scientific merits, justification and maturity of the proposed mission element in relation to the goals and objectives of the Triana Project and the overall Earth Science Enterprise.

The level and scope of participation of high technology small businesses (SB), small disadvantaged (SDB), women-owned small businesses (WOSB), Historically Black Colleges and Universities (HBCU) and Other Minority Institutions (OMI) will be evaluated. The offeror's approach to utilizing these concerns in meaningful core technical work and the integration into the overall management process represents significant value to NASA. The offeror's approach will be detailed in a plan that provides support of their meeting or exceeding the Agency goal.

The educational, scientific, and technical aspects of each proposal will be assessed by individuals who are scientific peers of the proposers and technical experts. Concurrently, the implementation aspects (management and cost) will be evaluated by management, cost, technical and small business experts. After the individual evaluations, the evaluation panels will meet to consider the total quantitative and qualitative aspects of the evaluations in order to integrate the findings of the individual reviewers. The evaluation panels may also prepare questions requesting clarification, which will be transmitted to the appropriate proposers for prompt response. After these evaluations, the panels will meet in plenary in order to integrate the separate panel results. Panel evaluation reports will represent the final product of the combined evaluation team.

The Triana Evaluation Executive Committee, consisting of the Evaluation Chairperson(s) and the chairs of the individual evaluation panels will, upon consideration of the reports of the evaluation panels, integrate the science return, student participation, and cost evaluations of each mission to provide an assessment of science and educational value. The committee will then categorize all proposals in accordance with the category definitions contained in NASA FAR Supplement 1872.4. On the basis of these categorizations and review and recommendation of the Triana Project Office, the Associate Administrator for Earth Science will select the proposal to be supported. Contract award will be dependent on approval of the various implementation documents and other proposed contract documents.

NOTICE TO ALL OFFERORS: In the event that a Principal Investigator employed by NASA is selected under this Announcement of Opportunity (AO), NASA will award prime contracts to non-Government participants, including co-investigators, hardware fabricators, and service providers, who are named members of the proposing team, as long as the selecting official specifically designates the participant(s) in the selection decision. Each NASA contract with hardware fabrications and service providers selected in this manner will be supported by an appropriate justification for other than full and open competition, as necessary.

Certain key provisions concerning selections are also given in Appendix A.

5.3 Contract Administration and Funding

Different mission management approaches and organizational arrangements will require different contract administration and funding arrangements. The PI is expected to recommend, as part of the teaming arrangement, the organizations and contract mechanisms NASA should use in awarding work to the team. Participation by international partners will be on a no-exchange-of-funds basis. Therefore, any non-U.S. PI must make arrangements with a U.S. Co-PI to fund U.S. participants under the proposal.

For missions selected as a result of this AO, it is anticipated that cost-reimbursement contracts will be awarded for the design, development, mission operations and data processing and distribution phases. The proposed NMC will be considered to be fixed and committed at selection. A post-selection survey may be conducted by the Triana Project Office to ensure that commitments of equipment, technical resources, facilities, and letters of agreement between affiliated mission team members reflect the written proposal, Statements of Work, and other proposed contract documents.

In order to expedite contract award after selection, all proposed contractual documentation, if accepted by NASA, will be considered executable upon selection. However, NASA reserves the right to negotiate all contract terms and conditions following mission selection.

6.0 CONCLUSION

The Triana Program represents a challenging and innovative approach for NASA to accomplish important scientific and educational objectives. It provides an opportunity for observation of the Earth from a unique vantage point and a means to inspire the general public to ponder the Earth as a planet. NASA invites both the U.S. and international science and educational communities to participate in proposals for Triana.

Dr. Ghassem Asrar
Associate Administrator
Office of Earth Science
NASA Headquarters

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that the National Aeronautics and Space Administration (NASA) has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation, or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use of Government instrumentation or property that subsequently becomes available, with or without modification, that meets the investigative objectives.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. NASA may desire to select only a portion of the proposed investigation and/or that the individual participates with other investigators in a joint investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point.

III. SELECTION WITHOUT DISCUSSION

The Government intends to evaluate proposals and make selections without discussions with offerors (except for communications conducted for the purpose of minor clarification). Therefore, the proposal should contain the offeror's best terms from a cost or price and technical standpoint. However, the Government reserves the right to conduct discussions if later determined by the Contracting Officer to be necessary.

IV. NON-U.S. PROPOSALS

The guidelines for proposals originating outside of the United States are the same as those for proposals originating within the United States, except that the additional conditions described in Sections 3.3 and 4.3 shall also apply.

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or quotation and specify the information subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations 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.

RESTRICTION ON USE AND DISCLOSURE OF PROPOSAL AND QUOTATION INFORMATION (DATA)

The information (data) contained in (insert page numbers or other identification) of this proposal or quotation 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 for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS

The investigator's institution agrees that the cost proposal is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit cost information in accordance with FAR 15.8.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated, should such action be in the interest of the Government.

VIII. SOURCE OF SPACE INVESTIGATIONS

Investigators are advised that candidate investigations for space missions can come from many sources. These sources include those selected through the AO, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

IX. DISCLOSURE OF PROPOSALS OUTSIDE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal, the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desires to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY

By submitting a proposal, the investigator and institution agree to accept the following clause in any resulting contract:

During the performance of this contract, the Contractor agrees as follows:

- (a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
- (b) The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.
- (c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.
- (d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

- (e) The contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding the notice to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
- (f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
- (g) The Contractor shall furnish the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.
- (h) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.
- (i) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, the contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.
- (j) The Contractor shall include the terms and conditions of subparagraph (a) through (l) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.
- (k) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as means of enforcing these terms and conditions, including sanctions for non-compliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

XI. PATENT RIGHTS

1. For any NASA contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, "New Technology", shall apply. Such contractors may, in advance of contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, "Requests for Waiver of Rights to Inventions".

2. For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, "Patent Rights--Retention by the Contractor (Short Form)" (as modified by NFS 18-52.227-11) shall apply.

XII. DATA RIGHTS

For any NASA contract resulting from this solicitation, the clause at FAR 52.227-14, "Rights in Data - General" (as modified by NFS 18-52.227-14) shall apply.

XIII. PARTICIPATION OF SMALL, SMALL DISADVANTAGED, AND WOMEN-OWNED SMALL BUSINESSES, AND MINORITY INSTITUTIONS

A. Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns, women-owned small business concerns, Historically Black Colleges and Universities, and minority educational institutions, as these entities are defined in 52.219-8 of the FAR and 1852.219-76 of the NASA FAR Supplement. For this Announcement of Opportunity, NASA has established a recommended goal of 8 percent for the participation of these entities at the prime or subcontractor level. This goal is stated as a percentage of the total contract value.

NASA encourages all offerors to propose to meet or exceed this goal to the maximum extent practicable and to encourage the development of minority businesses and institutions throughout the contract period. Offerors will be evaluated on the proposed goal for participation of the entities listed above in comparison with the 8 percent goal and on the methods for achieving the proposed goal.

B. Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed \$500,000, and are with organizations other than small business concerns, the clause at FAR 52.219-9 shall apply. Offerors who are selected under this AO will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, and women-owned small business concerns. Note that these specific subcontracting goals differ from the 8 percent goal described in paragraph A above, and need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after selection shall make the offeror ineligible for award of a contract.

APPENDIX B

Triana LAUNCH SERVICES INFORMATION

The baseline launch service for Triana is the Shuttle with an appropriate upper stage. NASA will provide funding for the Shuttle launch itself. The cost of the Shuttle carrier equipment and the upper stage must be included in the cost of data purchase and full implementation proposals. For information relative to Shuttle launch service support, cost, and mission design, bidders should contact:

Jim Watzin
Goddard Space Flight Center, Code 730
Greenbelt, MD 20771
Phone 301-286-7417
James.G.Watzin@gsfc.nasa.gov

Expendable launch vehicle (ELV) services which are subject to a Department of Transportation commercial launch license may be proposed. In this case, the service will be directly acquired by the mission team, and the cost of the service must be included in the total mission cost cap. For information relative to launch service support and mission design, bidders should contact:

For small and medium ELV services:

Hobart Swartwood
Goddard Space Flight Center, Code 470
Greenbelt, MD 20771
Phone 301-286-0431
Hobart.P.Swartwood.1@gsfc.nasa.gov

For large ELV services:

Michael Carney
Kennedy Space Center, FL 32899
Phone 407-853-5846

APPENDIX C

REGULATIONS GOVERNING PROCUREMENT OF FOREIGN GOODS OR SERVICES

The following Federal Acquisition Regulation (FAR) clauses cover the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

- 52.225-3 Buy American Act -- Supplies (January 1994)
- 52.225-1 Certificate
- 52.225-7 Balance of Payments Program (April 1984)
- 52.225-8 Certification of Supplies or Services for use Outside the U.S.
- 52.225-9 Buy American Act -- Trade Agreements -- Balance of Payments Program (January 1994)
- 52.225-10 Duty-Free Entry (April 1984)
- 52.225-11 Restrictions on Certain Foreign Purchases (Oct 1996)
- 52.225-18 European Community Sanction for End Products (Jan 1996)
- 52.225-19 European Community Sanction for Services (Jan 1996)
- 52.225-21 Buy American Act -- North American Free Trade Agreement Implementation Act -- Balance of Payments Program (January 1997)

The proposer is directed to the Federal Acquisition Regulation for further information on these regulations.

APPENDIX D

ELEMENTS TO BE INCLUDED IN ARRANGEMENTS BETWEEN U.S. PRINCIPAL INVESTIGATORS AND COOPERATING FOREIGN PARTIES UNDER THE Triana PROGRAM

The following elements should be included in arrangements between approved Principal Investigators and foreign parties contributing to or cooperating in activities under the Triana Announcement of Opportunity.

SCIENCE DATA RIGHTS

Unless otherwise agreed between NASA and the Principal Investigator, all data resulting from this cooperative activity will be made available to all users without restriction at no more than the cost of dissemination, through appropriate data archives in the United States and [foreign country]. In the event that reports or publications based upon this data are copyrighted, the Parties and NASA shall have a right under the copyright to reproduce, prepare derivative works from, perform, display, and distribute copies of such copyrighted work for their own purposes royalty-free.

EXCHANGE OF TECHNICAL DATA AND GOODS

The parties are obligated to transfer only those technical data and goods necessary to fulfill the responsibilities under this Agreement, in accordance with the following provisions:

1. Interface, integration, and safety data (excluding detailed design, development, production and manufacturing data, and associated software) shall be exchanged by the Parties without restrictions as to use or disclosure, except as specifically required by national laws and regulations.
2. In the event a Party finds it necessary to transfer technical data or goods other than that specified in paragraph 1 above, in carrying out its responsibilities under this Agreement, the provisions of this paragraph shall apply. In transferring data and goods which are proprietary or subject to export controls, and for which protection is to be maintained, such technical data shall be marked with a notice and such goods shall be specifically identified that they shall be used and disclosed by the receiving Party, institutions acting on its behalf, and its contractors and subcontractors only for the purposes of fulfilling the receiving Party's responsibilities under this Agreement, and that the technical data and identified goods shall not be disclosed or retransferred to any other entity without prior written permission of the furnishing Party. The receiving Party agrees to abide by the terms of the notice, and to protect any such

marked technical data or identified goods from unauthorized use, retransfer, and disclosure. Nothing in this article requires the Parties to transfer technical data or goods contrary to national laws and regulations relating to export control or control of classified data.

3. The Parties are under no obligation to protect any unmarked technical data and goods transferred under this Agreement shall be used exclusively for the purposes of fulfilling the Parties' responsibilities under this Agreement.

LIABILITY

1. With regard to the activities undertaken pursuant to this Agreement, neither party shall make any claim against the other or the other's related entities (contractors, subcontractors, other providers, collaborating organizations, and contractors, subcontractors of these parties, or employees of the other or of the other's related entities) with respect to injury or death of its own employees or employees of its related entities, or with respect to damage of any kind to or loss of its own property or property of its related entities, whether such injury, death, damage or loss arises through negligence or otherwise, except in the case of willful misconduct. This cross-waiver of liability shall apply only if the person, entity or property causing the damage is involved in activities under this Agreement, and the person, entity or property damage is damage by virtue of its involvement in activities under this Agreement. For purposes of this Agreement, the National Aeronautics and Space Administration is a related entity of [U.S. PI or co-PI].
2. The parties further agree to extend this cross-waiver of liability to their respective related entities by requiring them, by contract or otherwise, to agree to waive all such claims, against the other Party and its related entities for injury, death, damage or loss arising from the activities undertaken pursuant to this Agreement.
3. This cross-waiver of liability shall not be applicable to:
 - claims between a Party and its related entity or between its own related entities;
 - intellectual property claims;
 - claims made by a natural person, his/her estate, survivors, or subrogees for injury or death of such a natural persons, except where a subrogee is one of the Parties; and
 - claims for damage based upon a failure of the Parties or their related entities to flow down the cross-waiver.

[Note: This liability arrangement may be superseded by the liability provisions of a launch license issued under the Commercial Space Launch Act.]

APPENDIX E

CONTENTS OF THE Triana PROJECT LIBRARY

The Triana Project Library includes documents available from a number of internet web sites as well as paper copies. Where the same document is available as paper copy and electronically, proposers are requested to access the document electronically unless internet access is unavailable. Only limited paper copies of documents will be available. Note that not all documents are available in the Triana Project Library, but access information is provided.

Requests for paper copies must be submitted in writing to:

Triana AO
Code Y
400 Virginia Avenue, SW
Suite 700
Washington, DC 20024
or fax request to: 202-554-3024

EARTH SCIENCES REFERENCES:

NASA:

Harriss, R. et al, (1996), NASA Mission to Planet Earth Science Research Plan, NASA Headquarters, Washington, DC 20546
(URL: <http://www.hq.nasa.gov/office/ese/draftsciplan/mtpe-srp.htm>)

Mission to Planet Earth/Earth Observing System Reference Handbook,
(URL: http://espso.gsfc.nasa.gov/eos_reference/TOC.html)

Science Strategy for the Earth Observing System
(URL: http://espso.gsfc.nasa.gov/sci_strategy/contents.html)

Science Plan for Earth Observing System
(URL: http://eospsso.gsfc.nasa.gov/sci_plan/chapters.html)

NASA Earth Sciences Enterprise (Mission to Planet Earth)
general information,
(URL: <http://www.hq.nasa.gov/office/mtpe>)

EXTERNAL:

National Academy of Sciences (1995) A Review of the U.S. Global Change Research Program and NASA's Mission to Planet Earth/Earth Observing System
(URL: <http://www.gcrio.org/online.html>)

Committee on Environment and National Resources (CENR) Research of the National Science and Technology Council (1996) Our Changing Planet: the FY 98 U.S. Global Change Research Program, A Supplement to the President's Fiscal Year 1998 Budget
(URL: <http://www.gcrio.org/ocp98/toc.html>)

LAUNCH SERVICES:

NPD 8610 Launch Services Risk Mitigation Policy for NASA,
NASA-Sponsored Payloads

Delta II Med-Lite Payload Planners Guide

FEDERAL ACQUISITION REGULATIONS (FAR) ELECTRONIC VERSIONS ONLY:

Federal Acquisition Regulations (FAR) General Services Administration
(URL: <http://www.gsa.gov/far/>)

NASA FAR Supplement Regulations
(URL: <http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>)

NASA Financial Management Manual
(URL: <http://www.hq.nasa.gov/fmm/>)

GENERAL REFERENCE INFORMATION:

Management of Major System Programs and Projects (NHB 7120.5)

Earth Science Systems Program Office Library (MTPE Library)
(URL: <http://envnet.gsfc.nasa.gov/MTPELibrary>)

EOSDIS Information
(URL: <http://edhs1.gsfc.nasa.gov/>)

Standard Form SF1448 Proposal Cover Sheet
(URL: <http://www.gsa.gov/forms/one.htm>)

NASA's Mission Operations and Communication Services (SOMO)

RELIABILITY AND QUALITY ASSURANCE, MATERIALS AND EEE PARTS:

Office of Flight Assurance, GSFC
(URL: <http://arioch.gsfc.nasa.gov/>)

NASA Technical Standard NASA-STD-8739.3, Soldered Electrical Connections

NASA Technical Standard NASA-STD-8739.4, Crimping, Interconnecting Cables, Harnesses, and Wiring.

NAS 5300.4(3J-1), Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies

NASA Technical Standard NASA-STD-8739.7, Electrostatic Discharge Control (Excluding Electrically Initiated Explosive Devices)

NHS 5300.4 (3M), Workmanship Standard for Surface Mount Technology.

ANSI/IPC-D-275, Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies, Class 3

IPC 6011 and IPC 6012, Class 3 as the basic specification requirements with GSFC S-312-P-003B, Procurement Specification for Rigid Printed Wiring Boards for Space Applications and other High Reliability Uses as a supplement.

NASA Technical Standard NASA-STD-8739.5, Fiber Optic Terminations, Cable Assemblies, and Installation

SAFETY

NSTS 1700.7B, "Safety Policy and Requirements for Payloads Using the Space Transportation System".

45 SPW S-100/KHB 1700.7B, "Space Shuttle Payload Ground Safety Handbook"

EWR 127-1, "Eastern and Western Range Safety Requirements"

RSM-93, "Range Safety Manual for Goddard Space Flight Center (GSFC)/Wallops Flight Facility (WFF)"

(SSD TD-0005) (currently Rev B). "Pegasus Design Safety Requirements Document"

(SSD TD-0018) (currently Rev A) "Pegasus Safety Requirements Document for Ground Operations"

NPD 8710.3 NASA Policy for Limiting Orbital Debris Generation
(URL: <http://arioch.gsfc.nasa.gov/302>)

NSS 1740.13 Guidelines and Assessment Procedures for Limiting
Orbital Debris

OTHER WEB PAGES

The following internet World-Wide-Web Homepages (URL addresses) may provide additional information of interest:

NASA Office of Earth Science Homepage:
(URL: <http://www.hq.nasa.gov/office/mtpe>)

APPENDIX F

Proposal Cover Sheet

Announcement of Opportunity 98-OES-02
Proposal No. _____ (Leave Blank for NASA Use)

Title: _____

Principal Investigator:: _____

Department: _____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____

Country: _____ E-mail: _____

Telephone: _____ Fax: _____

Co-Investigators: Name	Institution	Telephone
_____	_____	_____
_____	_____	_____
_____	_____	_____

Budget:
1st Year: _____ 2nd Year: _____ 3rd Year: _____ Total: _____

Certification of Compliance with Applicable Executive Orders and U.S. 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) *Certification 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).

Title of Authorizing Institutional Official: _____

Signature: _____ Date: _____

Name of Proposing Institution: _____

Telephone: _____ E-mail: _____ Facsimile: _____

Certification 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 1962 (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 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 recognized 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 below are authorized to sign on behalf of the Applicant.

NASA FORM 1206

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 (1)(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 G

SERVICES AND RESOURCES

SERVICES AVAILABLE FROM CODE IY

The NASA Office of External Relations (HQ Code IY) may be contacted for assistance and information relative to international participation in Triana missions.

The contact information is:

Office of External Relations
Mail Code IY
Ref.: AO-98-OES-01
National Aeronautics and Space Administration
Washington, DC. 20546 USA
Phone: 202-358-0793
Fax Number: 202-358-2798

SERVICES AVAILABLE FROM THE GODDARD SPACE FLIGHT CENTER

Consistent with its mission and subject to the availability of resources, the Goddard Space Flight Center will assist Principal Investigators (PIs) in any or all aspects of mission development, from systems engineering and mission management through on-orbit satellite operation. Upon request, GSFC is prepared to provide access to the Center's institutional capabilities, including facilities, equipment, and expertise in science, engineering, technology, and project management to support and enhance the abilities of the scientific and supporting technical communities to conduct scientific investigations.

These services include:

1) Consultation:

A minimum number of technical and programmatic consulting hours can be provided to answer questions and provide guidance during the proposal preparation phase.

2) Mission Support Services:

Services of a scientific, technical or programmatic nature that commits Center resources to assist, team or partner with Principal Investigators (PIs) in any or all aspects of mission development, and/or provide mission hardware, software or services, are available. GSFC will work with the Principal Investigator to plan and coordinate agreed upon services. These services are made available on a "full cost basis".

The single point-of-contact to coordinate any and all aspects of the use of GSFC resources in response to this Announcement of Opportunity(AO) is:

New Business Office
System Technology and Advanced Concepts Directorate
NASA GSFC
Mail Code 740.1
Greenbelt MD 20771
Phone: (301) 286-6076
Fax: (301) 286-1763

APPENDIX H

CHARTS and TEMPLATES

TECHNOLOGY READINESS LEVEL DEFINITIONS

Technology Definitions

Technology Readiness Levels (TRL), Research vs. Development, Relevant Cross-cutting Processes

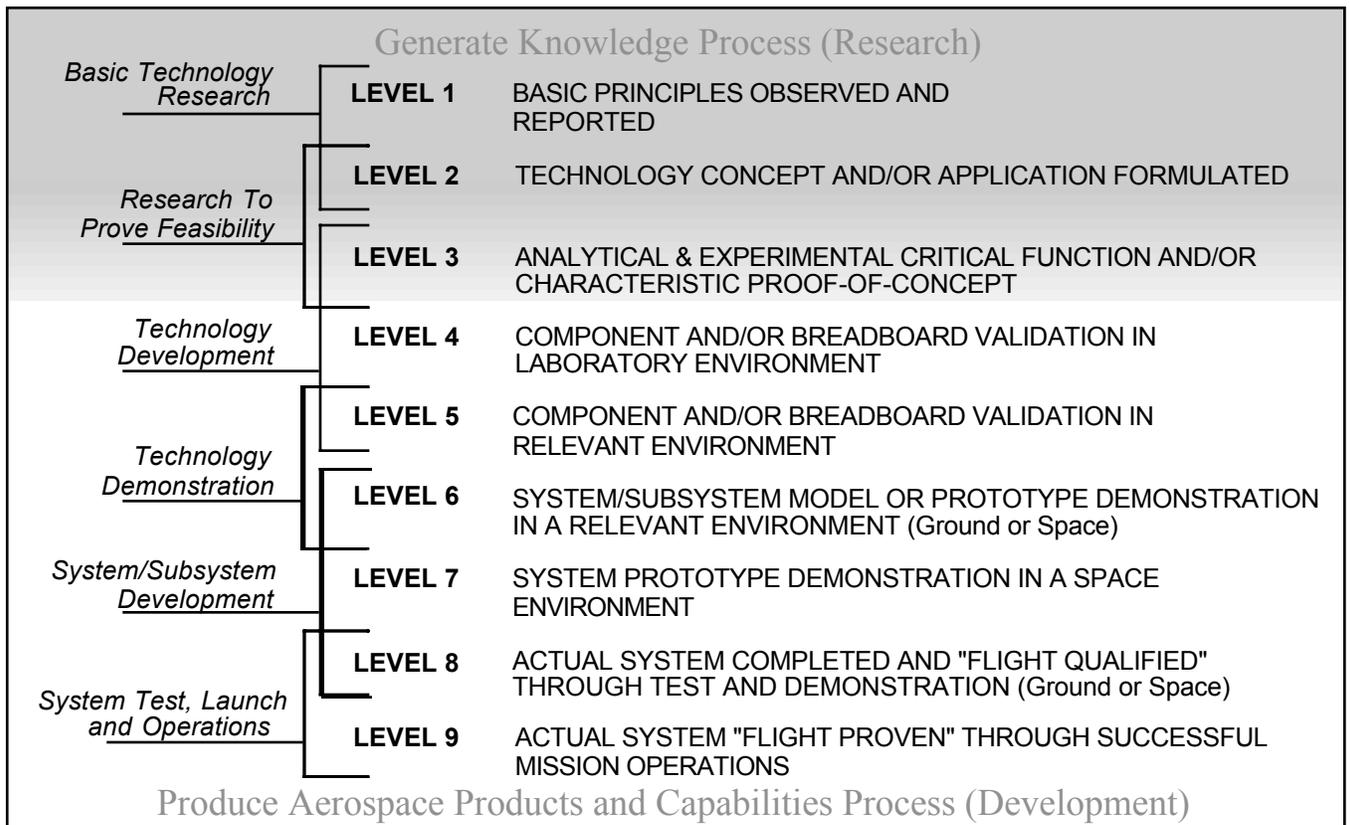


Figure I-1

NASA INFLATION INDEX

FISCAL YEAR	INFLATION RATE
FY 1999	3.8%
FY 2000	4.1%
FY 2001	3.9%
FY 2002	3.9%
FY 2003	3.9%
FY 2004	3.9%
FY 2005	3.9%
FY 2006 and Outyears	3.9%

Figure I-2

SUMMARY OF ELEMENTS OF COST
(BY PHASE, FISCAL YEAR AND WBS LEVEL)

	FY/Quarter Base Rate Cost	PHASE FY/Quarter Base Rate Cost	Total Cost
Direct Labor			
Labor Hours: (by skill categories)			
TOTAL HOURS			
Labor Costs (\$): (by skill categories)			
TOTAL DIRECT LABOR COSTS			
Overhead (% , \$) (by cost centers)			
Subcontracts			
Materials			
Material Burdens (% , \$)			
Travel			
Other Direct Costs			
SUBTOTAL			
G&A Expense (% , \$) (by cost pools)			
SUBTOTAL			
Cost of Money (% , \$) (by indirect pools & overhead centers)			
Profit/Fee (% , \$)			
TOTAL COST PLUS FEE			

* This exhibit can be used for all Phases and WBS levels.

Figure I-3

SAMPLE SIGNATURE PAGE

Mission

Title: _____

Principal Investigator: _____

Project Manager: _____ (signature) _____

Name
Title, Affiliation, Address
Date

Co-Investigator "A": _____ (signature) _____

Name
Title, Affiliation "A", Address
Date

Authorizing Official "A" : _____ (signature) _____

Name
Title, Affiliation "A", Address
Date

Co-Investigator "B": _____ (signature) _____

Name
Title, Affiliation "B", Address
Date

Authorizing Official "B" : _____ (signature) _____

Name
Title, Affiliation "B", Address
Date

Co-Investigator "C": _____ (signature) _____

Name
Title, Affiliation "C", Address
Date

Authorizing Official "C" : _____ (signature) _____

Name
Title, Affiliation "C", Address
Date

Lead Representative "D": _____ (signature) _____

Name
Title, Affiliation "D", Address
Date

Authorizing Official "D" : _____ (signature) _____

Name
Title, Affiliation "D", Address
Date

Lead Representative "E": _____ (signature) _____

Name
Title, Affiliation "E", Address
Date

Authorizing Official "E" : _____ (signature) _____

Name
Title, Affiliation "E", Address
Date

Figure I-5

APPENDIX I

Triana AO ACRONYMS

AO	Announcement of Opportunity
BRDF	Bidirectional Reflectance Distribution Function
CAS	Cost Accounting Standards
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical Design Review
Co-I	Co-Investigator
COM	Cost of Money
COTS	Commercial Off the Shelf
EEO	Equal Employment Opportunity
ELV	Expendable Launch Vehicle
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESE	Earth Science Enterprise
FAR	Federal Acquisition Regulations
FFRDC	Federally Funded Research and Development Center
G&A	General and Administrative
GDS	Ground Data System
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HDTV	High Definition Television
JPL	Jet Propulsion Laboratory
LRR	Launch Readiness Review
MCR	Mission Confirmation Review
MOU	Memorandum of Understanding
MRR	Mission Readiness Review
MTPE	Mission to Planet Earth (now known as Earth Science Enterprise)
NASA	National Aeronautics and Space Administration
NHB	NASA Handbook
NMC	NASA Mission Cost
NPD	NASA Policy Directive
NOI	Notice of Intent
NRA	NASA Research Announcement
NSS	NASA Safety Standard
OES	Office of Earth Science
OLS	Orbital Launch Services
PDR	Preliminary Design Review
PER	Pre-Environmental Review
PI	Principal Investigator
PM	Project Manager
SF	Standard Form

SI	International System of Units
SOMO	Space Operations and Management Office
SOW	Statement of Work
SRR	System Requirements Review
TMLCC	Total Mission Life Cycle Cost
TRL	Technology Readiness Level
WBS	Work Breakdown Structure
WFF	Wallops Flight Facility
WWW	World Wide Web