



National Aeronautics and Space Administration  
Engineering for Complex Systems Program Office

FY 2003 NASA RESEARCH ANNOUNCEMENT (NRA)

**NRA2-38150 (WLT)**

**Research Opportunities In  
Engineering for Complex Systems**

Release Date:	February 14, 2003
Notices of Intent Proposals Due:	March 14, 2003
Proposals Due:	May 30, 2003

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## **Research Opportunities in Engineering for Complex Systems NRA2-38150 (WLT)**

### **INTRODUCTION**

This NASA Research Announcement (NRA) solicits proposals for new and innovative fundamental and applied research, which will reduce risk and achieve ultra high levels of safety and success of future NASA missions through the infusion of advanced information technologies. Participation in this NRA is open to industry, educational institutions, nonprofit organizations (includes not-for-profit organizations), and U.S. Government agencies. Multiple awards are anticipated as a result of this NRA. The range of awards is expected to be from \$100K per year for individual Principal Investigator or small team research to \$1M per year for larger team or collaborative efforts.

Proposals will be evaluated in two steps. Step 1 Notice of Intent (NOI) proposals may be submitted at any time during the period from February 14, 2003, and ending at 5:00 pm, EST, on March 14, 2003. Step 2 proposals will be due no later than May 30, 2003 following notification by NASA on the Step 1 proposal review results and recommendations.

Step 1 Notice of Intent proposals may be up to five (5) pages of text, single-spaced, with type no smaller than 12-pt., and including abstract and references. Step 2 proposals may be up to sixteen pages of text, single-spaced, with type no smaller than 12-pt., and including abstract and references. Detailed information as well as proposal format and content are provided in Appendix A.

Proposals will be subjected to technical review utilizing either mail evaluation, panel evaluation, or both. A NASA management review for program relevance, technical and logistical feasibility and cost analysis will also be conducted. The evaluation criteria to be used are listed in Appendix A. Based on the review, NASA will place each Step 1 proposal in one of three groups: 1) high priority, 2) low priority, and 3) non-responsive.

Proposers will be notified as soon as possible of the categorization of their Step 1 proposals, and will receive summaries of comments from the panel. Proposers will receive specific recommendations concerning the submission of a Step 2 proposal based on the categorization of their proposals (see Appendix A). Step 2 proposals will be reviewed as a group (using both mail and panel review). A proposal that is scientifically and programmatically meritorious, but cannot be accepted during its initial review under an NRA because of funding uncertainties, may be included in subsequent reviews unless the offeror requests otherwise. All or part of a proposal may be selected for negotiations leading to possible award unless the offeror requests otherwise. Selection and award may occur for a period of one-year following the release date of this NRA.

Proposals may request single period or multiple year funding to start no sooner than November 2003. Annual review of progress will be required for renewal of subsequent periods.

## PROPOSAL SCHEDULE

Submit Proposals to: NASA Peer Review Services  
ATTN: NRA2-38150 (WLT)  
500 E. St., SW, Suite 200  
Washington, DC 20024

Copies Required: 20 *plus* signed original, plus an electronic copy on a ZIP disk, CDROM, or floppy

Selecting Official: Dr. Steven F. Zornetzer  
Deputy Center Director  
Ames Research Center

Step 1 Proposals Due: 5:00 pm, EST, March 14, 2003  
Step 2 Proposals Due: 5:00 pm, EST, May 30, 2003  
Announcement of Final Selection: August 2003

Obtain additional information from:

Technical: Dr. Mark Shirley  
NASA-Ames Research Center, MS 213-9  
Moffett Field, CA 94035-1000  
(650) 604-3389  
Mark.H.Shirley@nasa.gov

Contractual: Ms. Wendy Takeguchi, Code JAI  
NASA-Ames Research Center  
Moffett Field, CA 94035-1000  
(650) 604-3008  
wtakeguchi@mail.arc.nasa.gov

Although planned, funds are not currently available for awards under this NRA. The Government's obligation to make award(s) is contingent upon the availability of funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this NRA.

Appendix A provides technical information for the general areas for which research proposals are sought. Appendix B provides basic guidance for preparation of solicited proposals in response to this NRA. Appendix C describes policy on foreign participation. Appendix D provides example forms.

Your interest in participating in this effort is appreciated.

G. Scott Hubbard  
Director, Ames Research Center

## **DESCRIPTION OF PROGRAM AND OPPORTUNITY**

### **BACKGROUND**

Current and future NASA plans include missions with the most difficult, dangerous, and dynamic operations in the history of human kind, ranging from low earth orbit operations to planetary and universe exploration, to revolutionary aerospace systems. These missions, by their nature, push limits of human, technological, and theoretical knowledge boundaries.

The recent problems in some NASA missions, along with similar or related problems in aerospace and general aviation, are symptomatic of the difficulty in synthesizing operational and design parameters. Safety is a system property, encompassing components, subsystems, software, organizations, human behavior, and their interactions. Yet, typically system design and analysis is decoupled, addressing only components and subsystems; analysis of risk factors is usually sporadic, and deferred until integration occurs. Recent major mishaps and various case studies have identified the critical need for NASA and the U.S. aerospace industry to significantly re-tool its engineering processes and capabilities. The Engineering for Complex Systems (ECS) Program was created in response to the urgent concern to develop and establish technical processes that would ensure the safety of human crews and reduce the risk of the Agency's missions.

Assessment of case studies and strategic analyses has identified a current and growing agency capability shortfall. This capability shortfall or technology gap has been broken down into four main problem classes:

1. Limited system and trade space analysis capabilities
2. Poor understanding of system and organizational risk
3. Incomplete knowledge acquisition and communication
4. Inadequate state assessment and brittle control strategies

The case studies have highlighted the need to continuously manage risk throughout the life cycle of a program. The studies also uncovered the fact that risk analysis should not only be conducted linearly but recursively as well. This means that changes in the later phases of a program require revalidation of earlier life cycle phases, such as requirements, design, etc., in order to fully quantify potential risk exposure.

### **PROGRAM GOALS AND OBJECTIVES**

The Engineering for Complex Systems Program vision is to achieve ultra-high levels of safety and mission success by fundamentally advancing NASA's system life-cycle approach through the infusion of advanced information technologies. To successfully achieve these ever increasingly ambitious and complex missions, NASA will have to develop and deploy pioneering and revolutionary technologies that infuse new risk mitigation technologies and processes into standard engineering practices throughout the program lifecycle.

The Engineering for Complex Systems Program is designed specifically to achieve the following objectives:

1. Provide the capability to baseline the Agency's risk exposure during the Mission Concept Development phase.

2. Deliver a suite of prototype engineering tools and resiliency technologies for the Agency that directly assess and mitigate mission risk exposure.

## PROGRAM APPROACH

The program has been divided into three major domain areas as described below.

### 1. System Reasoning & Risk Management (SRRM)

SRRM will address poor System Risk and Multi-objective Trade-off Analysis, by conducting research into system complexity, design, and risk propagation profiles. The products from this research and development activity will include tools that better support risk analysis, design robustness, mishap modeling, and system trade-offs throughout the entire life cycle of the program. Model Based Reasoning will be a key technology to help systemize and automate the risk analysis, and accommodate the growing size and complexity of current and future programs.

### 2. Knowledge Engineering for Safety and Success (KESS)

KESS will address several key issues. First, human and organizational risk factors play a critical role in all systems and their life-cycle phases, yet there is significant under-representation of human and organizational risk factors in current systems engineering tools. Second, to understand the risk that they introduce into a system, it is essential to develop technologies and methodologies to capture and discover the effect of the human and organizational interactions – a knowledge management issue. Third, the lack of adequate knowledge management systems must be addressed.

### 3. Resilient Systems & Operations (RSO)

RSO will address Rigid, Non-adaptive Systems, by developing intelligent software technologies that provide robust and resilient operations, as well as advanced testing, validation, and diagnostic tools for risk reduction of these cutting edge software capabilities.

Through these research areas, the ECS program will focus on technologies for understanding potential accident precursors, addressing currently inadequate methodologies, and capitalizing on critical opportunities.

## ECS Program Work Breakdown Structure

The figure below shows the program work breakdown structure:

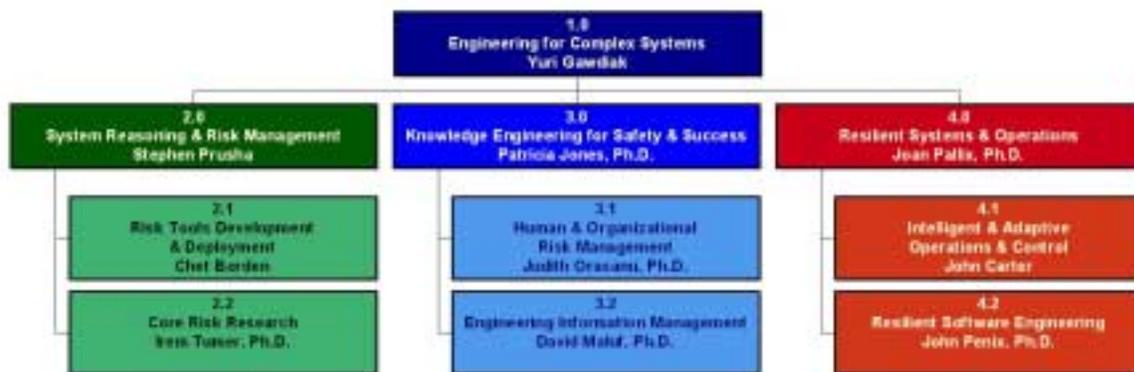


Figure 1-- Work Breakdown Structure

## **NRA TECHNOLOGY RESEARCH AREAS**

This NASA Research Announcement (NRA) solicits research proposals for innovative fundamental and applied research, which will support the NASA vision and mission goals by reducing risk in all phases of the life cycle of aerospace systems and by providing technologies to help build inherently safe and robust systems. Crosscutting proposals across the three following areas are encouraged.

### **Technology Research Area-1:** **System Reasoning & Risk Management (SRRM)**

The goal of SRRM is to improve NASA mission success by developing modeling methods and technologies that identify, characterize, and mitigate risks early and support risk-related decision making across the system lifecycle. Innovative proposals are sought in two broad thrusts: risk-based design or 'using risk as a trade variable' and managing system complexity.

The first area addresses risk management very early in the system lifecycle. It is centered in conceptual and preliminary design and the negotiation that establishes the mission goals and extends earlier into technology development and assessment of readiness and later into the handoff between the conceptual design team and the mission team. The second area focuses tightly on several problems involved in using design models to manage complexity during detailed design and how these models could transition to support operations.

Within these two broad thrusts, innovative proposals are sought in the following areas:

#### **1. Mission Success Risk Precursors**

Effective risk-based design is dependent upon identifying risks to mission success as early in the design process as possible. One approach to doing so is to identify design precursors that are readily available early and that are statistically correlated with schedule, cost and the probability of mission success.

SRRM is interested in projects that seek to develop methodologies to identify and characterize risk precursors or to assess their utility in the context of real projects. Ideally, we are looking to provide the Agency the capability to generate a risk exposure baseline.

Several candidates for such precursors include but are not limited to: (a) system complexity (e.g., number and kinds of design requirements, number, type, and integration of components in the resulting design, degree of coupling), (b) design uncertainty (e.g., variance in predicted system performance or physical test results indicating poorly understood or controlled processes), and (c) heritage (e.g., the number and types of previously flown components and the degree to which the requirements for new mission are unique).

#### **2. Rapid Decision Capture Tools and Methods**

In addition to traditional methods for documenting and representing designs (e.g. engineering drawings, specifications, CAD models), there is increasing evidence that capturing the decisions (including assumptions, constraints, and considerations) leading to design choices is not only important, but may be a more useful representation of the completed design, particularly for far-term missions or systems with high uncertainty.

We are interested in soliciting novel methods and tools for capturing and representing design decisions, particularly those compatible with highly agile real-time design environments and with early phase/far-term design concepts.

### **3. Risk Visualization and Representation**

The traditional representation of risk in the design or planning process does not easily allow it to be actively treated as a design or operations resource. As such, attributes such as risk are treated as a consequence of a design, rather than as a resource to be traded and used to converge designs. In addition, the traditional representation as scalar factors or distributions does little to improve the understanding of risk in an intuitive and creative process such as system design or operations planning.

SRRM is interested in methods, tools, and technologies to characterize and visualize risk and other “soft” design attributes that would enhance or enable the ability to comprehend and trade these values in the design of complex systems. Of particular interest is the ability to represent the temporal aspects of risk (e.g., single phase(s) vs. full project phase/lifecycle), the ability to integrate and overlay (i.e., display simultaneously) risk models and representations onto other, more traditional design representations (e.g. mechanical, thermal), and the means to provide the agility and performance necessary to enable this capability in today’s real-time concurrent design environments.

### **4. Technology Development Cost/Risk Models and Methods**

A variety of models and predictive methods have been developed to assess the likely cost of space missions/projects and aerospace system developments. However, as systems become more complex and the reliance on advanced technology become more significant, the ability to predict the cost and risk of technology developments that future systems are dependent upon will play an increasingly more important role in developing reasonable estimates.

SRRM is interested in soliciting new methods, models, and predictive techniques that rapidly and accurately estimate the cost and risk of successful *technology* development, with particular emphasis on means to provide estimates that apply from proof-of-concept to infusion into flight or ground systems.

### **Technology Research Area-2: Knowledge Engineering for Safety and Success (KESS)**

The Knowledge Engineering for Safety and Success project represents a synergy of human organizational modeling and simulation capabilities with knowledge management approaches that explicitly address issues of mission risk and safety in lifecycle engineering. Innovative proposals that are relevant to NASA missions are sought in the following areas:

1. Computational organizational models of risk management throughout the lifecycle phases of design, manufacture, operations, and maintenance,
2. Model-based simulation of the interactions between organizational decision making and hardware and software systems design and engineering that predict issues related to risk and resiliency,
3. Computational models of human and team performance that include factors such as fatigue, stress, workload, and risk-based decision making in a dynamic environment,
4. Ontologies and architectures for advanced product data management systems that explicitly incorporate the notions of risk, resiliency, and decision-making rationale,
5. Integration and interoperability of knowledge management, knowledge capture, and design rationale management capabilities into a heterogeneous distributed computing environment, and

6. Immersive virtual environments and geospatial navigation approaches for user exploration of engineering facility and vehicle data.

**Technology Research Area-3:**  
**Resilient Systems and Operations (RSO)**

RSO consists of Intelligent and Adaptive Operations and Controls (IAOC) and Resilient Software Engineering (RSE). IAOC will develop technologies that utilize pertinent vehicle health information to assess and predict vehicle dynamic response and capabilities. New technologies will efficiently provide integrated flight, propulsion and structural mode control and recovery in the presence of faults, failures, uncertainty and changing operational/environmental conditions. Capabilities for mission planning and trajectory management, human interfaces, and operations management capabilities will be developed within IOAC. IAOC will focus on real-time control and will mature technologies that enable a vehicle to maintain stability or recover in the presence of vehicle and environmental uncertainties and changes. These technologies will optimize achievable control performance through integration of motion control, power, propulsion, and structural subsystems.

Resilient Software Engineering's emphasis will be on risk management techniques that use well-defined, comprehensible and analyzable specifications of sub-system and software requirements. The current best practices in software development include a range of requirements and design modeling techniques, software process management and extensive software testing. These techniques alone are not effective for providing high-levels of confidence that software will behave safely - that intended or unintended software behavior will not lead to critical system failures. The major limitation of existing methods is that they do not provide adequate support for specifying and managing the wide range of complex constraints placed on critical software. At each phase of software development, teams must apply and reformulate requirements and understand complex interactions between requirements: system requirements determine software requirements, software requirements influence software architecture, architectural constraints impact algorithm selection and implementation and test cases are derived from requirements. This problem is compounded when software development for several interacting sub-systems is performed by different organizations. Without methods and tools to support modeling, application and evolution of these requirements across life-cycle phases and development organizations, there is high risk of introducing undetectable critical errors into the software during the process.

RSO is seeking proposals, which investigate novel approaches to addressing the limitations of current technology in the following areas:

1. Evaluation studies of the application of software engineering methods and tools in the context of complex control systems. The tools should support the management and application of critical design constraints, while minimizing the introduction of unsafe software behavior during requirements specification and design. Also of interest are methods and tools to ensure that requirements and design constraints are applied consistently during verification and testing.
2. Development and application of risk management techniques, which can be used to assess how software engineering methods and tools address technical risks of complex software systems. The potential application of these techniques would range from tools supporting risk-directed software process design to frameworks for dynamically optimizing the performance of software engineering tasks (human or automated) based on input from upstream and downstream tasks.

3. Development and evaluation of novel architectures and interfaces for tools which support collaborative engineering and knowledge management in a distributed software engineering environment. Tools in this area should incorporate an understanding of the human cognitive processes involved in the specific software engineering tasks supported.

All methods and tools developed should be based on specification and modeling languages, which can capture the complexity of real software systems, preferably supporting market-leading commercial modeling tools and programming languages. The tools should also be designed to be human-centered and to be flexible regarding the software engineering processes used with the tools.

### **NRA FUNDING**

The following budget information is provided for planning purposes only. Any award will be subject to the availability of funds.

The Government anticipates multiple awards in each technology area within the available funding. Expected real year funding in millions of dollars, by government fiscal year (FY) will approximate a total of two million dollars (\$2M) per year, all three technology areas inclusive.

The proposals will nominally be for one year with options for two additional years at the discretion of the Government. Please have your cost proposal begin November 1, 2003.

This profile includes funding for all of the following:

1. Funds provided directly to the selected offerors.
2. Funds required paying for charges relating to the performance of Government responsibilities under resulting grants, cooperative agreements or contracts. These may include charges for program support, materials, facility modifications, etc., but do not include salaries or travel for Government personnel. Payment of these charges will be made internal to the Government out of the available program funding. Charges will be consistent with agency wide full-cost accounting practices.

## **APPENDIX A**

### **Supplemental Proposal Submission Instructions**

Proposals shall conform to the guidelines in Appendix B, "Instructions for Responding to NASA Research Announcements." The following supplemental instructions are provided in addition to Appendix B:

#### **PROPOSAL SUBMISSION PROCESS**

##### **Online Submission Instructions**

**Step 1 NOI and Step 2 Proposal Cover Pages** are to be submitted electronically by entering the requested information through the SYS-EYFUS Web site located at:  
<http://proposals.hq.nasa.gov/proposal.cfm> .

SYS-EYFUS is an electronic system (SYS -) used by NASA Headquarters to manage research solicitation activity, plan for the receipt of research proposals, track the receipt and peer evaluation of these proposals, and manage funded research (grants, cooperative agreements, contracts, etc.). SYS-EYFUS also supports the funding and administration of awards pursuant to selection of these research opportunities.

##### ***User Identifications (User ID)***

User ID and passwords are required by NASA security policies in order to access the SYS-EYFUS Web site. Prospective Principal Investigators (PIs) can check if they have a SYS-EYFUS User ID and Password by going to <http://proposals.hq.nasa.gov/proposal.cfm> and performing the following steps:

- Click the hyperlink for NEW USER; this will take the user to the personal information Search Page.
- Enter the user's first and last name. SYS-EYFUS will search for matching record information in the SYS-EYFUS database.
  - If matches are found, select the "correct" record from those displayed and then click on CONTINUE.
  - If no exact match is found, select NONE OF THE ABOVE click on CONTINUE. Then complete the NEW USER form. Follow the on-line instructions for updating and/or entering new data. In addition to adding general contact information, areas of interest and expertise are required.
  - If no match is found, select ADD RECORD. Follow the on-line instructions for updating and/or entering new data. In addition to adding general contact information, areas of interest and expertise are required.

A User ID and password will be emailed to you within minutes.

With the user ID and password, login to the SYS-EYFUS web site and follow the instructions for NEW NOTICE OF INTENT.

***Specific Step 1 Notice of Intent and Step 2 Proposal Cover Pages SYS-EYFUS Instructions***

- Click on link <http://proposals.hq.nasa.gov/proposal.cfm>
- The system will bring you to the “Welcome to Proposal Online Site” page.
- Click on the Login link on the left sidebar.
- Enter your login id and password and click on the Continue button.
- The system will bring you to the “SYS-EYFUS Options Page”.
- Click on the New Notice of Intent button to submit your Notice of Intent or Step 1 Proposal.
- The system will bring you to the “Division Specific Opportunities” page.
- In the dialog box, scroll down to “AeroSpace Technology” and click the Continue button.
- At the List of Existing Opportunities, select the NRA2-38150 (WLT) Research Opportunities in Engineering for Complex Systems opportunity in the window and click the Continue button.
- Begin entering your Step 1 Notice of Intent information.

***The Step 1 Notice of Intent and Step 2 Proposal Cover Pages*** should contain the following information:

- Names, addresses, telephone numbers, FAX number, electronic mail addresses, and affiliations of the Principal Investigator and all Co-Investigators,
- The name of the proposing organization(s),
- A long and short descriptive title for the proposed effort (the long title is to be entered under the “General Information” tab while the short title will be entered under the “Other” tab),
- A brief (200-300) description of the research to be conducted, and
- A total cost estimate by year.
- The Step 1 Notice of Intent Cover Page should be printed (see Appendix D-2 as an example), attached to the 5 pages of text as described in the chart below, and should bear official institutional signatures.

The web site provides the user future use in updating this information for the final Cover Page / Proposal Summary up to the deadline for submission of the Step 2 Proposal.

**Proposal Content, Format and Length**

In addition to paper copies of the proposal, an electronic copy of the proposal shall be submitted in a format readable with Microsoft Word (Office 98 or Office 2000). Text, tables and graphics shall allow for copy and paste into other applications. In addition, supporting cost information shall be provided in Microsoft Excel 98 and Excel 2000– compatible spreadsheets. All electronic information shall be provided on either a Zip (100 MB), CDROM, or floppy for PC and MAC platforms.

The proposal process will involve two stages: All offerors interested in being considered for funding through this NRA must submit a Step 1 Notice of Intent Proposal. Note: If the Government finds sufficient merit from the initial Step 1 abbreviated proposals, the Government reserves the right to request detailed budget information and required certifications and may award off of initial summary submittals.

The proposal should be formatted according to the order listed in the following table and **should not exceed the page limits outlined below including certifications, forms, endorsement letters and appendices**. Each proposal should adhere to the table guidelines for the maximum number of pages for that section.

Proposal Content	Page Guideline	Section and Appendix References
<p><b>Step 1 Notice of Intent (NOI) Proposal</b></p> <p>a. Cover Page (enter the SYS-EYFUS Cover Page online, then print and include in hardcopy proposal)</p> <p>The Step 1 SYS-EYFUS proposal cover page should contain the outlined above. Any additional material submitted with the Step 1 proposal will be discarded. (The electronic proposal submission process located at <a href="http://proposals.hq.nasa.gov/proposal.cfm/">http://proposals.hq.nasa.gov/proposal.cfm/</a> generates this form).</p> <ul style="list-style-type: none"> <li>• <b>SYS-EYFUS Proposal Abstract</b> (200-300 words). Include a description of the research objective and the method of approach. A sample electronic Proposal Abstract page is included in Appendix D-2.</li> <li>• <b>SYS-EYFUS Proposed Cost:</b> The budget section of the electronic proposal cover page should include a budget breakdown for each year of the proposed work (maximum 3 years). The electronic form will provide a total summary for the entire period of the proposal. See Proposed Costs in paragraph (C)-(8) of Appendix B, page B-3.</li> </ul> <p>The length of the electronic proposal cover page (as generated via SYS-EYFUS) may vary depending upon the length of the proposal abstract/summary. <u>However, the total cover-page packet, including the summary and budget figures, will count as only 1 page total.</u> A sample cover page packet is included in Appendix D-2</p> <p><b>To print the Proposal Cover Page</b>, select “View” and then use the “Print” Button on your Internet browser menu. Make sure your printed copy includes the Abstract and the breakdown of Budget Categories. Submit this Proposal Cover Page with your proposal hard copy.</p> <p><b>Certifications Regarding Lobbying, Debarment, Suspension and Other Responsibility Matters and Drug-Free Workplace Requirements Form:</b> The authorizing institutional signature on The Proposal Cover Page automatically certifies that the proposing institution has read and is in compliance with these certifications. No additional form is necessary. For your convenience, the full text is provided in Appendix D.</p> <p>b. Notice of Intent Proposal NOI text should be single-spaced with type no smaller than 12-pt., and including abstract and references. The text should describe concisely the research to be conducted, emphasizing the research objectives, technical approach, and expected results and deliverables, and their relevance to the NASA Strategic Enterprises and to the ECS Program goals and objectives. Information on the goals and objectives of the NASA Strategic Enterprises is contained in the NASA Strategic Plan at <a href="http://www.hq.nasa.gov/office/nsp/cover.html">http://www.hq.nasa.gov/office/nsp/cover.html</a>.</p> <p>Included in this is a copy of the abstract from the cover page.</p> <p>c. Brief Resume for Principal Investigator and other Key Personnel</p>	<p>1</p> <p>5</p> <p>2 (total)</p>	<p>Sample “Certifications Regarding Lobbying...” Located in Appendix D</p>

Proposal Content	Page Guideline	Section and Appendix References
<p>Resume text should be single-spaced with type no smaller than 12-pt. and briefly emphasize the qualifications pertinent to the research being proposed.</p>		
<p><b><u>Step 2 Proposal</u></b></p>		Appendix D
<p>a. <b><u>Cover Letter:</u></b> Each proposal should be prefaced by a cover letter signed by an official of the investigator’s institution who is authorized to legally bind the organization to the proposal and its content (unless the signature appears on the proposal itself). The cover letter should reference solicitation NRA 2-38150 (WLT), Research Opportunity in Engineering for Complex Systems.</p>	1	
<p>b. <b><u>Proposal Cover Page (from SYS-EYFUS):</u></b> Contents outlined above. An example cover page is provided in Appendix D-2.</p>	1	
<p><b><i>Certifications Regarding Lobbying, Debarment, Suspension and Other Responsibility Matters and Drug-Free Workplace Requirements Form:</i></b> The authorizing institutional signature on The Proposal Cover Page automatically certifies that the proposing institution has read and is in compliance with these certifications. No additional form is necessary. For your convenience, the full text is provided in Appendix D.</p>		Sample “Certifications Regarding Lobbying...” Located in Appendix D
<p>c. <b><u>Table of Contents</u></b></p>	1	
<p>d. <b><u>Abstract:</u></b> The abstract should summarize the research proposed in one page or less. It should contain a simple, concise overview of the investigation, its objectives, its scientific approach, its expected results, and its relevance to the NASA Strategic Enterprises and to the ECS Program goals and objectives. It is very important that this abstract is specific and accurately represents the research to be conducted.</p>		
<p>e. <b><u>Technical Plan:</u></b> The technical part of the proposal should be limited to the equivalent of 15 pages of text, single-spaced, with type no smaller than 12 pt., including abstract and references. The cover page, table of contents, management plan, cost plan, and short resumes do not count in this total.</p>	16	
<p>The technical plan should contain a section describing the relevancy of the project to NASA Strategic Enterprise goals and missions (e.g., the International Space Station, the Shuttle, and the design of next-generation launch vehicles, Mars Exploration and Earth Science missions). This is particularly important because Enterprise representatives will review the proposals as part of the overall evaluation. Information on the goals and objectives of the NASA Strategic Enterprises is contained in the NASA Strategic Plan at <a href="http://www.hq.nasa.gov/office/nsp/cover.html">http://www.hq.nasa.gov/office/nsp/cover.html</a>.</p>		
<p><i>A list of references used in the Technical Plan should be provided.</i></p>		
<p>1. <b><u>Management Plan</u></b> (recommended length: 1/2 - 2 pages, depending on complexity). The Management Plan should outline the roles and responsibilities of all investigators and collaborators and indicate the relationships among these roles and responsibilities within the group. The management plan should also identify what contractor and/or non-institutional support is anticipated and who will be providing it.</p>	1/2 - 2	

Proposal Content	Page Guideline	Section and Appendix References
<p>2. <u>Cost Plan for U.S. Proposals Only</u> (recommended length: 1 page per budget year, 1 budget summary page, 1/2 - 2 pages of explanation/justification, 1/2 - 2 pages detailing other funded projects). A detailed cost plan must be provided for each one-year period proposed not to exceed a total of three (3) years. Costs should be broken down into all of the following categories that apply: salaries and wages, including staff-months and rates for all personnel; benefits; supplies; services; equipment purchases; data purchases; computer services; publication costs; communications; travel; overhead; and other direct costs. Contributions from any cost-sharing plan or other support for the proposed research should be detailed. Note: The proposals will nominally be for one year (FY04), with options for two additional years at the discretion of the Government.</p> <p>3. <u>Resumes</u>. Brief resumes (1-2 pages) for all named investigators or key personnel should be appended to the proposal. Current funding from other sources, including the level of funding and the title or brief description of the supported research should be listed.</p> <p>If the proposal requires the use of NASA or other government facilities in performing the research, then appropriate letters or support and/or MOUs should be appended stating that the facilities will be available (see "Government Installation Support" below).</p>	<p>3-8</p> <p>1-2 for PIs / Co-Is</p>	

### Evaluation Process

**Step 1 Proposals** will be reviewed by a technical review panel on the basis of their intrinsic technical merit and innovativeness, relevance to NASA's objectives, qualifications and experience of proposed personnel, and cost. The criteria listed below will be used in evaluating individual Step 1 proposals in the priority order shown:

1. Intrinsic technical merit and innovativeness of the technical approach.
2. The relevance and responsiveness of the proposed research to the goals and objectives of the Engineering for Complex Systems Program and the particular Technology Research Areas, as described in this announcement.

The relevance of the proposed research to the NASA Strategic Enterprise goals and ongoing missions (e.g., the International Space Station, Shuttle, C-17, and space and earth science mission design processes).

3. The qualifications, capabilities, and related experience of the proposed principal investigator and key personnel.
4. The proposed cost in relation to the available funds.

Following the panel review, NASA will place each Step 1 proposal in one of three groups:

- **High priority** (well-conceived proposals of high scientific and technical merit and strongly relevant to the goals of the ECS Program)
- **Low priority** (proposals of lesser relevance, and/or containing major scientific or technical deficiencies, and/or with high costs relative to their projected scientific returns)

- **Non-responsive/unimplementable** (proposals not relevant to the goals of the ECS Program, or proposals so scientifically or technically flawed that they appear to be unimplementable, or proposals with cost estimates exceeding the resource levels available for this NRA)

**Note: If the Government finds sufficient merit from the initial abbreviated proposal, the Government reserves the right to request detailed budget information and certifications, and may award off of the initial summary submittals.**

Proposers will be notified as soon as possible of the categorization of their Step 1 proposal (and will receive summaries of comments from NASA).

- Proposers whose Step 1 proposals were categorized as high priority will receive a specific recommendation encouraging submission of a Step 2 proposal.
- Proposers whose Step 1 proposals were categorized as low priority will receive summaries of comments from NASA and will be discouraged from submitting Step 2 proposals
- Proposers whose Step 1 proposals were categorized as non-responsive/unimplementable will receive notice their proposal was reviewed and considered non-responsive/unimplementable and discouraged from submitting Step 2 proposals.

**Step 2 Proposals** should contain sufficient detail to enable a reviewer to assess the value of the proposed research, its relation to ECS Program objectives, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources and schedule.

The main body of the proposal should contain a full statement of the research to be undertaken and should describe its objectives, technical approach, and expected significance of the work and its relevance to the NASA Strategic Enterprises and to the ECS Program goals and objectives. The key elements of the project should be clearly identified and related to each other. The methods or approaches to be used should be described, and, as appropriate, the advantages of the selected methods or approaches over alternatives should be discussed. The anticipated results and proposed deliverables and schedule should be identified and their relation to the proposal's stated objectives and the objectives of the ECS Program should be discussed. The research should be described in sufficient detail that peer reviewers could adequately assess the scientific methods and quality of the work proposed.

Step 2 Proposals will be reviewed by a technical review panel on the basis of their intrinsic merit, relevance to NASA's objectives, and cost. The criteria listed below will be used in descending order of importance:

1. Evaluation of intrinsic merit includes consideration of the following factors listed in approximate order of decreasing importance:
  - (a) The overall technical merit of the proposal and/or unique and innovative methods, approaches, concepts, or advanced technologies demonstrated by the proposal, and the potential impact of the proposed development in its field;
  - (b) The breadth of applicability of the technology. Applications of the technology development across NASA Enterprises will be considered.
  - (c) The extent to which teaming or other similar relationships are proposed which would ensure or enhance the effective infusion of the technology into NASA missions and systems;

- (d) The qualifications, capabilities, and experience of the proposing Principal Investigator and all other personnel who are proposing to help achieve the proposal's objectives
  - (e) The proposing institution's capabilities, related experience, facilities, techniques, or unique contributions of these that are integral factors for achieving the proposal's objectives; and
  - (f) The overall standing of the proposal against the known state of the art.
2. The relevance and responsiveness of the proposed research to the goals and objectives of the Engineering for Complex Systems Program and the particular Technology Research Areas, as described in this announcement. The relevance of the proposed research to the NASA Strategic Enterprise goals and ongoing missions (e.g., the International Space Station, Shuttle, C-17, and space and earth science mission design).
  3. Evaluation of the cost of a proposed effort shall include the realism and reasonableness of the proposed cost and the comparison of that proposed cost to available funds.

Step 2 Proposals will also be reviewed by NASA to identify any logistical, implementation, cost, and/or management concerns.

NASA may desire to accept only a portion of a proposer's investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance. In cases in which two or more proposals address similar problems and/or adopt complementary approaches to a larger problem, NASA may desire joint participation on the part of two or more proposers in a single project. If such overlap involves more than one funding organization, NASA and those organizations will confer and mutually agree to the disposition of those proposals.

## **GENERAL INFORMATION**

### **Period Of Performance**

The proposal shall specify the period of performance period(s). If more than one year, must provide a separate breakout by each one-year period not to exceed a total of three (3) years. The anticipated start date is November 1, 2003.

### **Number Of Proposals**

Interested responders may propose on any or all of the areas being solicited. Proposals that cut across the three technology areas are encouraged.

### **Government Installation Support**

Government installations may propose to provide non-cash resources (including analysis, design, test, fabrication, facilities, and other resources) within the capabilities and resources of the various field centers to support the proposed activities of non-governmental organizations. The proposal must include documentation of the installation's agreement to provide the planned services in the form of a letter of commitment from the installation's director or designee. This letter of commitment must describe the tasks to be performed, key milestones, assumptions made and a cost summary broken down by civil service labor, support contractor labor, materials and other costs by FY. Offerors should propose the use of only Government installation resources they believe are necessary for the successful completion of the project.

### **Management**

The offeror's proposal shall include support of annual reviews to the Engineering for Complex Systems Program Office and an independent annual NASA review team.

All reports generated under proposed activities shall be submitted electronically to NASA in a format that is accessible by both Macintosh and PC platforms in addition to paper submittals.

### **Teaming**

Teaming between multiple organizations is encouraged.

### **Restrictions On Data Produced**

This activity may produce data to support future NASA solicitations. It is the goal of this NRA to develop technologies in cooperation with U.S. industry for use in the development of Engineering for Complex Systems. Therefore, proposals requiring restrictions on distribution of any aspect of the completed and resulting technology must include a justification for the restriction and the time period for which the restriction would apply. It is anticipated that the data generated will be subject to applicable export control laws.

### **Electronic And Information Technology Accessibility Standards**

Software or information technology developed as a result of work awarded from this NRA must be accessible to persons with disabilities. Awardees must comply with 36 CFR Part 1194, Electronic and Information Technology Accessibility Standards. These standards may be accessed through the Internet at: <http://www.accessboard.gov/sec508/508standards.htm>.

### **Cost**

It is anticipated that award of cost type contracts, Co-operative agreements, and Firm Fixed Price contracts may be utilized as a result of this solicitation.

### **Foreign Participation**

Policy on use of foreign technology is attached in Appendix C. This policy applies to all proposals submitted under this NRA. In general, foreign participation is permitted on a no-cost basis when the foreign company or institution is teamed with a US partner.

### **NRA Access**

A digital copy of this NRA and related documents may be obtained over the Internet. These documents will be in Microsoft Office 2000 format and will reside on a World Wide Web (WWW) server, which may be accessed using a WWW browser application. The WWW address or URL for more information regarding this NRA is <http://prod.nais.nasa.gov/cgi-bin/eps/bizops.cgi?qr=C&pin=21> or <http://research.hq.nasa.gov/research.cfm>.

### **Access to Engineering for Complex Systems (ECS) Program Website:**

Offerors are encouraged to refer to the following URL at <http://ecs.arc.nasa.gov>, "Background", to obtain more detailed technical information of the Engineering for Complex Systems Program.

### **Frequently Asked Questions:**

Please refer to the following URL at <http://research.hq.nasa.gov/research.cfm> for frequently asked questions and for the email address to which additional questions can be directed. Only questions relevant to the NRA will be answered.

## **APPENDIX B**

### **Instructions for Responding to NASA Research Announcements**

#### **Foreword**

- a. These instructions apply to "NASA Research Announcements." The "NASA Research Announcement (NRA)" permits competitive selection of research projects in accordance with statute while preserving the traditional concepts and understandings associated with NASA sponsorship of research.
- b. These instructions incorporate NFS1852.235-72 of the NASA Federal Acquisition Regulation Supplement. <http://www.hq.nasa.gov/office/procurement/regs/5528-41.htm#1852.235-72>

#### **Instructions for Responding to NASA Research Announcements (October 2002)**

- (a) **General.**
  - 1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.
  - 2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.
  - 3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.
  - 4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate award instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).
  - 5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.
  - 6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.
- (b) **NRA-Specific Items.** Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.
- (c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.
  - 1) **Transmittal Letter or Prefatory Material.**
    - (i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;
    - (ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

- (iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;
  - (iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;
  - (v) Identification of other organizations that are currently evaluating a proposal for the same efforts;
  - (vi) Identification of the NRA, by number and title, to which the proposal is responding;
  - (vii) Dollar amount requested, desired starting date, and duration of project;
  - (viii) Date of submission; and
  - (ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).
- 2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

#### **Notice**

##### **Restriction on Use and Disclosure of Proposal Information**

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

- 3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.
- 4) **Project Description.**
- (i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.
  - (ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.
- 5) **Management Approach.** For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.
- 6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other

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

7) **Facilities and Equipment.**

- (i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.
- (ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

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

- (i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.
- (ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.
- (iii) Allowable costs are governed by [FAR Part 31](#) and the [NASA FAR Supplement Part 1831](#) (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).
- (iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

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

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

11) **Special Matters.**

- (i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.
- (ii) Identify and discuss risk factors and issues throughout the proposal where they are relevant, and your approach to managing these risks.
- (iii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals.**

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

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

(f) **Joint Proposals.**

- 1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.
- 2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

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

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

(i) **Evaluation Factors.**

- 1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.
- 2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.
- 3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:
  - (i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.
  - (ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.
  - (iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.
  - (iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.
- 4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

- (j) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.
- (k) **Selection for Award.**
- 1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.
  - 2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.
- (l) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**
- 1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.
  - 2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.
  - 3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.
  - 4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:
    - (i) An exchange of letters between NASA and the foreign sponsor; or
    - (ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).
- (m) **Cancellation of NRA.** NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

**(End of provision)**

## **APPENDIX C**

### **Policy for the Use of Foreign Technology**

The National Space Transportation Policy directs that the U.S. Government will seek to take advantage of foreign components or technologies in developing U.S. next-generation space transportation systems. Such activities will be consistent with U.S. nonproliferation, national security, and foreign policy goals and commitments, as well as the commercial-sector guidelines contained in the National Space Transportation Policy. They will be conducted in a manner consistent with U.S. obligations under the Missile Technology Control Regime and with due consideration given to dependence on foreign sources and national security.

The Engineering for Complex Systems Program may seek to take advantage of all beneficial components and technologies, both foreign and domestic, in developing information systems for U.S. next-generation space transportation systems and other NASA missions. Foreign participation in the Engineering for Complex Systems Program will be undertaken on an institution-to-institution contractual basis with a US partner, and will be conducted consistent with the policy and guidelines in this document.

NASA will make available expertise and resources as appropriate to assist U.S. companies in identifying and analyzing potential foreign participation that could clearly advance the interests of the development and demonstration program.

The National Space Transportation Policy also provides that, for the foreseeable future, U. S. Government payloads will be launched on space launch vehicles manufactured in the United States, unless exempted by the President or his designated representative, or unless foreign launch vehicles are used on a no-exchange-of-funds basis to support the following: flight of scientific instruments on foreign spacecraft, international scientific programs, or other cooperative government-to-government programs. Such use will be subject to interagency coordination procedures.

### **Guidelines**

Any U.S. companies or other organizations that decide to utilize foreign components or technologies in ECS projects should be cognizant that NASA's participation, both as the major provider of research funding and as a major potential customer of future Engineering for Complex Systems, will be subject to the following criteria:

1. Foreign participation must provide clear net benefits to the achievement of the program's technical and business objectives, and further NASA's goal of establishing itself as a world-class developer of information technology.
2. Federal funds may be used for manufacture or acquisition of off-the-shelf foreign component technology, but may not be used for foreign-based development of foreign technology unless specifically exempted by the NASA Administrator.
3. Incorporation of foreign technology must not threaten the successful execution of the program, both in its developmental and operational phases.
4. Due consideration is given to fostering U.S. competitiveness and safeguarding national security interests throughout the life of the program.
5. Close consultation is maintained with NASA and other appropriate U.S. Government agencies on all aspects of foreign participation.

NASA will consult with executive agencies, including the Office of Science and Technology Policy, the National Security Council, and the Office of Management and Budget, to ensure that all national interests are sufficiently reflected in ongoing ECS program activities.

**APPENDIX D-1**

**CERTIFICATIONS, DISCLOSURES, AND ASSURANCES PURSUANT TO LOBBYING,  
DEBARMENT & SUSPENSION, NONDISCRIMINATION AND DRUG FREE WORKPLACE**

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**Certification Regarding Debarment, Suspension, and Other Responsibility Matters  
Primary Covered Transactions**

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This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211). Copies of the regulation may be obtained by contracting the U.S. Department of Education, Grants and Contracts Service, 400 Maryland Avenue, S.W. (Room 3633 GSA Regional Office Building No. 3), Washington, DC. 20202-4725, telephone (202) 732-2505.

- (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 from covered transactions 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 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.

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**Certification Regarding Drug-Free Workplace Requirements Grantees Other Than Individuals**

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This certification is required by the regulations implementing the Drug-Free Workplace Act of 1988, 34 CFR Part 85, and Subpart F. The regulations, published in the January 31, 1989 Federal Register, require certification by grantees, prior to award, that they will maintain a drug-free workplace. The certification set out below is a material representation of fact upon which reliance will be placed when the agency determines to award the grant. False certification or violation of the certification shall be grounds for suspension of payments, suspension or termination of grants, or government wide suspension or debarment (see 34 CFR Part 85, Sections 85.615 and 85.620).

This grantee certifies that it will provide a drug-free workplace by:

- (a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
- (b) Establishing a drug-free awareness program to inform employees about -
  - (1) The dangers of drug abuse in the workplace;

- (2) The grantee's policy of maintaining a drug-free workplace;
  - (3) Any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations in the workplace;
  - (4) The penalties that may be imposed upon employees for drug abuse violations in the workplace;
- (c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will -
- (1) Abide by the terms of the statement; and
  - (2) Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction;
- (e) Notifying the agency within ten days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction;
- (f) Taking one of the following actions, within 30 days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted -
- (1) Taking appropriate personnel action against such an employee, up to and including termination; or
  - (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;
- (g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraph (a), (b), (c), (e), and (f).

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**Certification Regarding Lobbying**

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**Certification for Contracts, Grants, Loans, and Cooperative Agreements.**

The undersigned certifies, to the best of his or her knowledge and belief, 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 any 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 entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal 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 this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit 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.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000 for each such failure.

**APPENDIX D-2**

**SAMPLE PROPOSAL COVER PAGE**

(Date: \_\_\_\_\_ )

**NRA 2-38150 (WLT)**

**Name of Submitting Institution:** \_\_\_\_\_

**Congressional District:** \_\_\_\_\_

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

By signing and submitting the proposal identified in this Cover Sheet / Proposal Summary, the Authorizing Official of the proposing institution, as identified above (or the individual proposer if there is no proposing institution):

1. Certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
2. Agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal;
3. Provides certification to the following that are reproduced in their entirety in this NRA:
  - i. Certification Regarding Debarment, Suspension, and Other Responsibility matters;
  - ii. Certification Regarding Lobbying, and
  - iii. Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs.

**[1] ... Principal Investigator Information**

<b>Name:</b>		<b>Email:</b>	
<b>Organization:</b>		<b>Department</b>	
<b>Telephone:</b>			
<b>Address:</b>		<b>Fax:</b>	
<b>City, State, Zip:</b>		<b>Country:</b>	

Signature and Date: \_\_\_\_\_

**[2] ... Team Members**

<b>Authorizing Official:</b>	
<b>Title:</b>	
<b>Institution:</b>	

Signature and Date: \_\_\_\_\_

**[3] ... Proposal Title (Short and/or Full)**

<b>Short Title:</b>	
<b>Full Title:</b>	

**[4] ... Science Areas - Technology Research Areas (TRAs): Hold down Ctrl-key when selecting more than one area.**

- (1) TRA1: System Reasoning & Risk Management (SRRM)
- (2) TRA2: Knowledge Engineering for Safety and Success (KESS)
- (3) TRA3: Resilient Systems and Operations (RSO)

**[5] ... Summary (Proposal Abstract – 200-300 words)**

**[7] ... Budget**

Type	Year 1	Year 2	Year 3	Total
<b>Direct Labor</b>				
<b>Other Direct Costs - Subcontracts</b>				
- Consultants				
- Equipment				
- Supplies				
- Travel				
- Other				
<b>Indirect Costs</b>				
<b>Other Applicable Costs</b>				
<b>Subtotal – Estimated Costs:</b>				
<b>Less: Proposed Cost Sharing – Cost Sharing:</b>				
<b>Budget Total</b>				

**NASA PROCEDURE FOR HANDLING PROPOSALS**

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