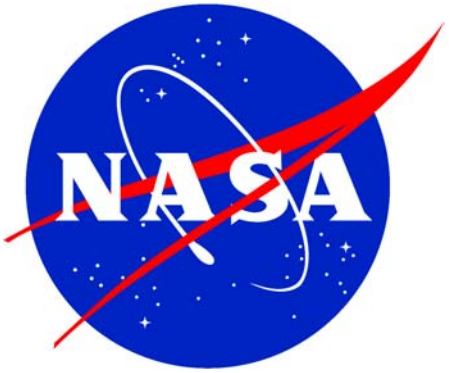
OMB Approval Number 2700-0087



National Aeronautics and Space Administration
Office of Equal Opportunity Programs
Minority University Research and Education Division

FY 2002 NASA RESEARCH ANNOUNCEMENT (NRA)

(NRA 02-OEOP-05)

Faculty Awards for Research (FAR)

Release Date:	December 21, 2001
Notice of Intent Due:	February 1, 2002
Proposals Due:	March 22, 2002
Selection Announcement:	June 2002

Code EU, NASA Headquarters
Washington DC 20546-0001

SUMMARY AND SUPPLEMENTAL INFORMATION

NRA 02-OEOP-05 **Faculty Awards for Research (FAR)**

Senior-Career Level
(Received Ph.D. degree prior to 1989)

Mid-Career Level
(Received Ph.D. degree between 1989 and 1999)

Early-Career Level
(Received Ph.D. degree after 1999)

The selection official for this NRA is the Associate Administrator for the Office of Equal Opportunity Programs at NASA Headquarters.

Inquiries

General questions about this NASA Research Announcement (NRA) must be submitted via e-mail to muredsupport@mail.nasaprs.com or directed to the NASA Minority University Research and Education Division (MURED) staff listed below. Technical and scientific questions about research opportunities in this NRA may be directed to the appropriate contact from the contact list in Appendix I.

Mr. John Malone
Solicitation Manager / FAR Program Manager
Telephone: (202) 358-0948
Fax: (202) 358-3745
Email: jmalone@hq.nasa.gov

Contracting Officer

The contracting point of contact will be specified in the selection notification letters.

Funds Availability

Funds are not currently available past the first year commitment for awards under this NRA. The Government's obligation to make awards for the second and third year are contingent upon the availability of appropriated funds from which payments can be made and the receipt of annual progress reports that NASA determines are acceptable to continue the award.

Safety

Safety is the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. NASA's safety priority is to protect: (1) the public, (2) astronauts and pilots, (3) the NASA workforce (including employees working under NASA instruments), and (4) high-value equipment and property.

Solicitation Availability: http://research.hq.nasa.gov
Click on Office of Equal Opportunity Programs (Code E)

Proposal Submission

Each eligible faculty member may submit only one proposal in response to this program announcement. The original and 5 copies of the proposal must be received **no later than 4:30 p.m. Eastern Standard Time, March 22, 2002**. All proposals should be addressed to the appropriate NASA Center / Jet Propulsion from the mailing list in Appendix I and should indicate Senior-Career, Mid-Career or Early-Career Level.

In addition two copies of the proposals must be sent to:

NASA Peer Review Services
Attention: Faculty Research Awards (NRA 02 OEOP-05)
(Indicate Senior-Career, Mid-Career or Early-Career Level)
500 E Street, S.W., Suite 200
Washington, DC 20024-2760

This NRA is sponsored by the NASA Office of Equal Opportunity Programs, Minority University Research and Education Division and solicits proposals for the Faculty Awards for Research (FAR) program. Proposals can be submitted at three different career levels: Senior, Mid or Early-Career level.

The FAR announcements provide an opportunity for Historically Black Colleges and Universities (HBCUs) and Other Minority Universities (OMUs), which include Hispanic Serving Institutions (HSIs) and Tribal Colleges and Universities (TCUs), to propose basic and applied research and analysis that is relevant to one or more of the five NASA Strategic Enterprises described in the NASA Strategic Plan and the associated research opportunities at the NASA Centers and/or Jet Propulsion Laboratory (JPL). The Strategic Enterprises are Earth Science; Aerospace Technology; Human Exploration and Development of Space; Biological and Physical Research; and Space Science. These Strategic Enterprises encompass a broad range of traditional science and engineering disciplines to meet NASA's mission needs.

Participation in this announcement as principal investigator is open to tenure and tenure-track faculty of HBCU's and OMU's, (or full-time faculty of TCU's) that offer baccalaureate degrees in mathematics, science, engineering, or technology (MSET) disciplines. We anticipate making 20 Senior and/or Mid-Career level awards and 20 Early-Career level awards based on merit reviews.

We appreciate your interest and participation in NASA programs.

George E. Reese
Associate Administrator
Office of Equal Opportunity Programs

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FACULTY AWARDS FOR RESEARCH
NRA 02-OEOP-05

I. INTRODUCTION

In response to a congressional mandate to increase diversity in the pool of Agency researchers, NASA's Office of Equal Opportunity Programs invites proposals for the NASA Faculty Awards for Research (FAR) Program. Institutions should encourage eligible doctoral faculty to submit a proposal.

Proposals are solicited from HBCUs and OMUs on behalf of senior- and mid-career level faculty members who have received less than $250,000 in NASA funding during the last five years. Early-career faculty members who have never received a NASA research award are eligible to participate.

II. TECHNICAL DESCRIPTION

FACULTY AWARDS FOR RESEARCH

During Fiscal Year (FY) 2002, approximately 40 proposals indicating research areas relevant to the NASA Strategic Enterprises will be selected from HBCU's and OMU's (which include HSI's and TCU's) in mathematics, science, engineering, or technology (MSET) research fields.

Approximately 20 proposals from senior-career and mid-career level faculty who have received less then $250,000 in NASA funding during the last five years will be selected. Approximately 20 proposals from early-career level faculty who have never received NASA funding will be selected.

The estimated fund available for this NRA is $2.2M for year one and $2.0M each for years two and three.

Goal

The goal of this program is to expand NASA's research base at HBCUs and OMUs by involving faculty and students in the Agency's sponsored research community.

Objectives

Program objectives to accomplish this goal are as follows:

1. Conduct research that contributes to the Agency's research.

2. Provide research experiences in NASA-related fields to undergraduate and graduate students, who are US citizens and underrepresented in MSET fields, thereby increasing the pool from which NASA and the aerospace industry can draw (**NOTE: The proposed NASA cost must include at least 25% direct support to students).**

Expected Outcomes

Based on the proposed NASA research to be conducted, the following outcomes are expected:

1. Submission of at least one technical paper to a refereed journal.
2. Respond to at least one non-MURED NASA research announcement of opportunity
3. Each student supported will submit at least one paper during each year of the award.

Program Structure

Faculty Awards for Research are offered in the following categories:

1. Senior-Career Level (Received Ph.D degrees prior to 1989);
2. Mid-Career Level (Received PhD degrees between 1989 and 1999); and
3. Early-Career Level (Received Ph.D degrees after 1999).

Award Size and Duration

Each senior and mid-level award will consist of a grant, cooperative agreement or contract of no more than $100,000 per year for up to 3 years. Continuation of funding for years two and three is predicated on documented progress reported annually, including the submission of annual outcomes and student tracking reports, and the availability of funds. Failure to make adequate progress in any one year will result in termination of the grant, cooperative agreement or contract and continuation funding will not be provided. Continuation funding may be reduced if cost reporting indicates a significant level of unexpended funding.

Early-career awards are one-year grants of no more than $10,000 to strengthen faculty knowledge of NASA-related research and to increase understanding of NASA competitive peer review and merit selection of scientific research. Early career faculty grantee must design a plan that will assist in matching their research interest and capability with the mission and research goals of a NASA Center/JPL. Recipients must plan and budget a visit to the identified Center/JPL.

Supplemental Funding for the Inclusion of Individuals with Targeted Disabilities

NASA is fully committed to implementing all Federal laws, regulations and guidelines related to the development of affirmative employment plans and inclusion of persons with disabilities. Therefore, we strongly encourage the participation of persons with disabilities in FAR. To facilitate the participation of individuals with targeted disabilities, NASA MURED will provide up to $5,000 in supplemental funding for special assistance and/or equipment necessary to enable the principal investigator (PI) to perform the work under the award. Proposals denoting request for supplemental funding must include a detailed one-page description of the request, as well as the budget and budget justification narrative, and Form 256 (See Appendix K), completed by the individual for whom the request is being made. (See Appendix G for the legal definition of targeted disabled.)

III. GENERAL ELIGIBILITY REQUIREMENTS

Institutions

All proposals must originate from a U. S. college or university designated by the Department of Education as a minority institution in 2002. Proposing institutions must:

1. Offer baccalaureate degrees in engineering, mathematics or science disciplines **and**
2. Meet at least one of the following criteria:

a. Must be an accredited minority college or university with enrollment of a single underrepresented minority group or the combination of underrepresented minority groups that exceeds 50 percent of the total student enrollment as defined in the Higher Education Act as amended (see 20 USC 1135d and 34 CFR 637.4b);

b. Must be a Hispanic-Serving Institution under Title III of the *Higher Education Act of 1965*, as amended [See 20 USC 1059 ©; Public Law 102-325, Section 306, July 22, 1992]; and/or

c. Must be a Historically Black College or University under Title III of the *Higher Education Act of 1965*, as amended (see 34 CFR 608.2); and/or

d. Tribal colleges and universities must be cited in Section 532 of the Equity in Educational Land Grant Status October of 1994; Tribally Controlled Community College Assistance Act of 1978; or the Navajo Community College Assistance Act of 1978, Public Law 95-471

A list of the Department of Education minority institutions can be accessed at the web address, http://www.ed.gov/offices/OCR/minorityinst.html.

Any arrangements and/or agreements to have the administration of the award performed by a third party is between the awardee and the third party and does not require NASA's involvement. However, the recipient of the award shall be the submitting minority institution.

Principal Investigators

Note: Principal investigators must meet all of the following criteria at the time the proposal is submitted:

1. Must be a tenure or tenure-track faculty member of an eligible HBCU or OMU except TCU, which must be a full time faculty member.

2. Must have a Ph.D. in an engineering, mathematics or science discipline applicable to NASA research needs; and

3. Must not be a former and/or current FAR recipient; and

4. Must not have received more than $250,000 in NASA research awards during the last 5 years for mid and senior-career level faculty; and must not have received any NASA funding for early-career level faculty. (Applicants who are current/former principal investigators or co-investigators on NASA research awards must identify the amount of funding from such awards which support or have supported their part of the research.)

IV. PROPOSAL GUIDELINES AND NOI SUBMISSION INSTRUCTIONS

Notice of Intent (NOI)

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are strongly encouraged by the date given in this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through the SYS-EYFUS web site located at http://proposals.hq.nasa.gov/.

User Identifications (User ID)

User identifications (User ID) and passwords are required by NASA security policies in order to access the SYS-EYFUS web site. Prospective PI's can check if they have a SYS-EYFUS user ID and password by going to http://proposals.hq.nasa.gov/ and performing the following steps:

1. Click the hyperlink for new user, which will take the user to the Personal Information Search page.

2. Enter the user's first and last name. SYS-EYFUS will search for matching record information in the SYS-EYFUS database.

3. If matches are found, select the correct record displayed or None of the Above.

4. If no match is found, select Add Record

5. Select continue, and a user ID and password will be emailed to you.

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. With the user ID and password, login to the SYS-EYFUS web site and follow the instructions for New Notice of Intent.

As a minimum, the following information will be requested:

- NRA number, alpha-numeric identifier, (Note: this may be included on the Web site template);
- The Principal Investigator's name, mailing address, phone number, and email address;
- A descriptive title of the intended investigation; and,
- A brief (200-300 word) description of the investigation to be proposed.

A separate NOI must be submitted for each intended proposal. Note that this NOI may also be the preliminary version of the proposal *Cover Page/Proposal Summary*; if so, the web site provides the user future use in updating this information for the final *Cover Page/Proposal Summary* as the deadline for submission of the final proposal approaches.

Refer to the NRA Cover Page for NOI deadlines.

Proposal Guidelines

General guidelines for proposal preparation are given in Appendix A, Instructions for Responding to NASA Research Announcements. However, certain sections listed in Appendix A must be appropriately modified to meet the intent of this announcement. For convenience, the information that follows augments the descriptions in Appendix A.

- Submit the original and seven copies, numbered one through seven, by the deadline specified. A submitted proposal should be no more than 25 pages in length, using standard-sized paper (8.5x11), one-inch margins (top, bottom, left and right), and 12-point font. Certifications, appendices, forms, and figures, e.g., depicting research schedule, are desired but must fit within the 25-page limit. Only the first 25 pages will be reviewed. To facilitate the recycling of proposals after review, proposals should be submitted on plain, white paper only. The use of cardboard stock, plastic covers, colored paper, etc., is prohibited.

Budget Guidelines

The "Proposed Costs" discussed in Section C. 8. NRA-Specific Items of Appendix A is supplemented by the following information concerning proposal cost detail.

1. The proposal must contain sufficient cost detail and supporting information to facilitate a speedy evaluation and award. The proposed costing information should be sufficiently detailed to allow the Government to identify cost elements for evaluation purposes. (See Page 17 and Appendix A) Generally, the Government will evaluate costs in terms of their reasonableness and acceptability. Each category should be explained. Offerors should exercise prudent judgment since the amount of detail necessary varies with the complexity of the proposal.

2. Direct labor costs should be separated by titles or disciplines such as Principal Investigator, clerical support, with percent of time. Please note, it is OEOP policy to not fund direct labor cost in excess of twenty-five percent of the total NASA cost. Estimates should include a basis of estimates such as, currently paid rates or outstanding offers to prospective employees. Indirect costs should be explained to the extent that allows the Government to understand the basis of the estimates.

3. With regard to other costs, each significant category should be detailed, explained, and substantiated. For example, proposed equipment purchases should specify the type of equipment, number of units, and unit cost. Requested travel allowances should include the number of trips, duration of each trip, per diem, rental car expenses, etc.

4. Twenty-five percent of the total NASA funds must directly support undergraduate and/or graduate students who are U. S. citizens.

5. Indirect costs are included in the award amounts.

V. PROPOSAL FORMAT, CONTENT, AND SUBMISSION

Formatting and Content

The proposal should be formatted according to the order listed in the following table and **should not exceed 25 pages 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
1. Proposal Cover Page: The proposal cover sheet must be signed by an institutional official who is authorized to certify institutional support and sponsorship of the investigation and of the management of the proposal. (The electronic proposal submission process located at http://proposals.hq.nasa.gov/ generates this form). The Proposal Cover Page includes the following items: ***Proposal Abstract (200-300 words):*** Include a description of the project's objectives, number of participants in the project, method of approach, and the measurable outcomes. A sample electronic Proposal Abstract page is included in Appendix B. ***Proposed Cost:*** The budget section of the electronic proposal cover page should include a budget breakdown for each year of the proposed work (3 years). The electronic form will provide a total summary for the entire period of the proposal. Student support should be categorized under the "Other" section of the Budget Form. **Undergraduate and/or graduate student direct support must account for 25 percent of the NASA funds**. Students must be U. S. citizens and no student may receive more than $15,000 per student per year. See Budget Guidelines on Page 17, Appendix B. The research funding may include support of research assistants, undergraduate and graduate student researchers, professional travel, research supplies and equipment, PI summary salary, and release time for conducting research. NOTE: Co-Investigators are not permitted. The length of the electronic proposal cover page (as generated via SYS-EYFUS) may vary depending upon the length of the proposal abstract/summary. However, the total cover-page packet, including the summary and budget figures, will count as only 1 page total. A sample cover page packet is included in Appendix B. **To print the Proposal Cover Page**, 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.	1	Appendix B Use the SYS-EYFUS Cover Page

Proposal Content	Page Guideline	Section and Appendix References
2. Budget Narrative: Include explanatory notes for each line item in the budget. Funding limitation **includes** indirect costs. The research funding may include support of research assistants, undergraduate and graduate student researchers, professional travel, research supplies and equipment, PI summer salary, and release time for conducting research.	4-5	
3. Table of Contents	1	
4. Certification of Principal Investigator Eligibility Form	1	Appendix C
5. Certifications Regarding Lobbying, Debarment, Suspension and Other Responsibility Matters and Drug-Free Workplace Requirements Form. (This form does not have to be submitted with the proposal. The authorizing institutional signature on the Proposal Cover Page certifies that the proposing institution has read and is in compliance with these certifications.)		Appendix D
6. Proposal Data	1	Appendix E
7. Proposal Equipment List	1	Appendix F
8. Relevance to NASA: Include how the proposal relates to NASA interests.	2	Section VI (Evaluation Criteria)
9. Project Description: Narrative should include objectives that are specific, measurable, achievable, and realistic within a stated time period. **The proposal should identify methods to accomplish a NASA objective through stimulating or supporting the acquisition of knowledge or understanding of the subject or phenomena under study, or attempting to determine and exploit the potential of scientific discoveries or improvements in technology, materials, processes, methods, devices, or techniques and advance the state of the art.** In addition, a plan to recruit, select and involve students in the research should be clearly described.	6-9	Section VI (Evaluation Criteria)

Proposal Content	Page Guideline	Section and Appendix References
10. Personnel: Submit principal investigator's vitae, including academic record and listing of relevant publications. A single-page bibliography including no more than five publications relevant to the proposed research may be included as an appendix.	2	Section VI (Evaluation Criteria)

Proposal Submission

To assist in expediting the evaluation, selection and award processes, please submit the following forms electronically: Proposal Cover Page (Appendix B), which includes sections for the Proposal Abstract and Budget figures. The forms can be accessed online at http://proposals.hq.nasa.gov/.

The original and 5 copies of the proposal package must be received at the appropriate NASA Center / Jet Propulsion that is responsible for the proposed topic area no later than 4:30 p.m. Eastern Standard Time, March 22, 2002 to be considered for FY 2002 awards. **See Appendix I for NASA Center / JPL mailing addresses.** Proposals received after this time are ineligible for consideration. This supersedes Section (g) of the Instructions for Responding to NASA Research Announcements listed in Appendix A. The proposal may be delivered by regular mail, certified mail, or commercial delivery. Avoid using registered mail as this may delay the log-in time of arrival. To ensure identification of proposals by the mailroom for proposals sent through regular mail, please mark your proposal in an appropriate place with the following identifier in large bold letters: **FAR PROPOSAL NRA 02 OEOP-5 (Indicate Career Level).** Receipt acknowledgement of proposals will be e-mailed within 14 calendar days of the proposal due date.

In addition to the five proposal copies mentioned above, two more copies of the proposals must be sent to:

NASA Peer Review Services
Attention: Faculty Research Awards (NRA 02 OEOP-5)
(Indicate Senior-Career, Mid-Career or Early-Career Level)
500 E Street, S.W., Suite 200
Washington, DC 20024-2760

VI. PROPOSAL COMPLIANCE, EVALUATION, AND AWARDS PROCESS

Proposal Compliance

All proposals must comply with the general requirements of the NRA. Upon receipt, proposals will be reviewed for compliance. Proposals that do not meet the items below will be returned to the proposer without further review.

1. Submission of complete proposals on or before the due date specified on the cover page of this NRA.

2. Submission of a proposal from an eligible minority institution, specified in the General Eligibility Requirements (Section III).

3. Submission of all forms as required by this NRA.

Evaluation Criteria

This section supercedes the evaluation factors in Section (q) of Appendix A. Proposals will be evaluated based on the following criteria: Relevance, Intrinsic Merit, Principal Investigator Qualifications, Student Research Experience, Institutional Resources and Cost. The criteria are listed in descending order of importance. For example, Relevance is more important than Intrinsic Merit.
NOTE: Early-career level proposals will be evaluated on the appropriate elements of the first three criteria and criteria #6, Cost, only.

1. **Relevance:** Relevance to the NASA Center or JPL research topic and to the potential contribution to the Strategic Enterprises and the NASA missions.

2. **Intrinsic Merit:** Technical merit of the proposed research, its overall project design, and the methods, approaches thoroughness and continuation plan of the research.

3. **Principal Investigator Qualifications:** Qualifications of faculty principal investigator. Evidence of the researcher's skills, experience, and past accomplishments, and plan for participating in NASA mainstream research program.

4. **Student Research Experience:** Degree to which the proposed research will meet the NASA objective to develop a pool of bachelors and graduate degree recipients, who are US citizens, with research experience in NASA-related fields.

5. **Institutional Resources:** Evidence of adequacy and commitment of institutional resources including laboratory equipment and facilities, administrative, and cost sharing.

6. **Cost:** Appropriateness of the budget, including reasonableness of proposed cost and cost elements, PI salary and/or release time, equipment, and 25 percent of the total budget allocated to students (no more than $15,000 per student per year).

Evaluation Techniques and Award Process

Proposals will be evaluated on the basis of merit review. Reviews may include mail reviews and/or panel reviews. The reviewer will assess the proposals based on the six criteria outlined in Evaluation Criteria.

NASA will assign the following ratings for use by the reviewer in evaluating each of the six criteria:

ADJECTIVE	DEFINITION
Excellent	A comprehensive and thorough proposal of exceptional merit, with numerous strengths and no major weaknesses.
Very Good	A proposal that demonstrates overall competence and is worthy of support. However, the proposal has a few minor correctable weaknesses.
Good	Proposals with a reasonable sound response. There are more strengths than weaknesses.

Fair	Proposals with strengths and weaknesses approximately equal. However, as a whole weaknesses are not offset by strengths.
Poor	Proposals with serious deficiencies and should not be supported. There are numerous weaknesses and few strengths.

Notification

Selection notification will be made in writing to the institution President. Principal Investigators will be notified by email. The selection official for this requirement is NASA's Associate Administrator for the Office of Equal Opportunity Programs.

APPENDIX A

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS
NASA FAR Supplement 1852.235-72 (JANUARY 2000)

(a) General.

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

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

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

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

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

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

(b) NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

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

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

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

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

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

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

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

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

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

(viii) Date of submission; and

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

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

Notice
Restriction on Use and Disclosure of Proposal Information

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

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

(4) **Project Description.**

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

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

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

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items, which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

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

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

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

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

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

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

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

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

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

(11) **Special Matters.**

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

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

(d) Renewal Proposals.

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

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

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

(f) Joint Proposals.

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

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

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

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

(i) Evaluation Factors.

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

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

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

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

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

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

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

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

(j) Evaluation Techniques. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal that 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, the procurement office in the funding installation will handle negotiation and award. 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.

APPENDIX B **PROPOSAL COVER PAGE**
(Date: _____)

NRA 02 OEOP-05

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] … PI Information

Name:		**Email:**	
Organization:		**Department**	
Telephone:			
Address:		**Fax:**	
City, State, Zip:		**Country:**	

Signature and Date: _____

[2] … Team Member

Authorizing Official:	
Title:	
Institution:	

Signature and Date: _____

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

Short Title:	
Full Title:	

[4] … Science Areas (Designated Center of Excellence Area of Responsibility)

[5] … Themes (Strategic Enterprise)

(1)	Earth Science
(2)	Space Science
(3)	Aeronautics and Space Transportation Technology
(4)	Human Exploration and Development of Space
(5)	Biological and Physical Research

[6] … Summary (Proposal Abstract – 200-300 words)

[6] … BUDGET

Type	Year 1	Year 2	Year 3	Year 4	Total
Direct Labor					
Other Direct Costs - Subcontracts					
- Consultants					
- Equipment					
- Supplies					
- Travel					
- Other					
Indirect Costs					
Other Applicable Costs					
Subtotal – Estimated Costs:					
Less: Proposed Cost Sharing – Cost Sharing:					
Budget Total					

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.

GENERAL BUDGET INSTRUCTIONS

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list number and titles of personnel, amount of time to be devoted to the grant, and rates of pa.
2. Other Direct Costs:
   - (i) Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
   - (ii) Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay.
   - (iii) Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General-purpose equipment is not allowable as a direct cost unless specifically approved by the grant officer. Any equipment purchase requested to be made as a direct charge under this grant must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
   - (iv) Supplies: Provide general categories of needed supplies, the method of acquisition, estimated cost.
   - (v) Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
   - (vi) Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate. Enter the student stipends (number of students x amount of stipend for each).
3. Indirect Costs: Identify indirect cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency and official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
4. Other Applicable Costs: Enter total of other applicable costs with an itemized list explaining the need for each item and basis for the estimate.
5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.
6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
7. Carryover Funds (if any): Enter the dollar amount of any funds that are expected to be available for carryover from the prior budget period. Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget. Not applicable to 2nd-year and subsequent-year budgets submitted for the award of a multiple year grants.
8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

APPENDIX C

FY2002 FACULTY AWARDS FOR RESEARCH (FAR)

CERTIFICATION OF PRINCIPAL INVESTIGATOR ELIGIBILITY

Completion of this form is required

I. Principal Investigator Eligibility Certification

1. Last Name First Name MI

2. Verification of Employment:

Employed by (institution):

School/Department (specify):

Check type of position
☐ Tenured ☐ Tenured-track ☐ Full Time Contractual (For TCU's only)

3. Year Ph.D. Received _____

II. Previous NASA Funding

List all NASA awards, NASA contracts; NASA consulting from which the proposed PI received funding as PI during the past 5 years, including active awards.

Column A	Column B	Column C	Column D	Column E
Award	**PI or CO-I**	**Title of Award**	**Period (from - to)**	**Amount**
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			TOTAL FUNDING:	

Instructions:

Column A: Identify whether award was a research grant (R), education grant (E), contract (C), or consulting agreement (A).

Column B: For each award indicate whether applicant was a PI or CO-I.

Column C: List title of award.

Column D: List the period of performance**.**

Column E: List amount of award. For awards on which the proposed PI was a CO-I, show only that portion of the award, which supported the proposed PI's personal research, and attach an explanation of how this was determined. For awards on which the proposed PI was the PI, show the total award amount.

Certification Authority
The person authorized to sign below certifies that the information provided is accurate.

Authorized Institutional Official (typed): _____
Title: _____
Signature: _____

APPENDIX D

FY2002 FACULTY AWARDS FOR RESEARCH (FAR)

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

A. LOBBYING

As required by Section 1352, Title 30 of the US 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.

B. 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.

C. NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

The institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called Applicant, HEREBY AGREES THAT it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250)(hereinafter called NASA) issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives Federal financial assistance from NASA; and HEREBY GIVES 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, and transferee, for the period during which the real property or structure is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the Federal financial assistance is extended to it by NASA. THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other Federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for Federal financial assistance which were approved before such date. The applicant recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

APPENDIX E

FY2002 FACULTY AWARDS FOR RESEARCH (FAR)

PROPOSAL DATA

1. NASA Center individual who has expressed specific interest in this proposal (optional)

   (a) Name _____

   (b) Center _____

   (c) Telephone _____

Check One:

☐ Level 1: Senior-Career Level ☐ Level 2: Mid-Career Level ☐ Level 3: Early-Career Level

2. Budget Summary by Federal Government Fiscal Year

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Requested NASA Funding					
Cost-Sharing (if applicable)					
Total Project Resources					

3. (a) Enter the Center research opportunity number next to the relevant Center/JPL from Appendix J and (b) select the Strategic Enterprise.

(a) NASA Center/JPL

Goddard Space Flight Center		Johnson Space Center	
Langley Research Center		Kennedy Space Center	
Glenn Research Center		Marshall Space Flight Center	
Ames Research Center			
Dryden Flight Research Center			
Jet Propulsion Laboratory			

(b) Strategic Enterprise

Earth Science	
Space Science	
Aeronautics and Space Transportation Technology	
Human Exploration and Development of Space	
Biological and Physical Research	

See NASA Center/JPL Center of Excellence Area of Responsibility from Appendix H.

APPENDIX F
FY2002 FACULTY AWARDS FOR RESEARCH (FAR)

EQUIPMENT LIST

ITEM (Descriptive name, probable brand, and model)	**QUANTITY**	**UNIT PRICE**	**BASIS**	**TOTAL COST**	**JUSTIFICATION**

Total Equipment _____

Non-NASA Contribution _____

Cost to NASA _____

APPENDIX G-- GLOSSARY OF ACRONYMS AND DEFINITIONS

FACS	Financial and Contractual Status Report
HBCU	Historically Black Colleges and Universities
HSI	Hispanic Serving Institutions
JPL	Jet Propulsion Laboratory
MSET	Mathematics, Science, Engineering and Technology
MURED	Minority University Research and Education Division
NRA	NASA Research Announcement
OEOP	Office of Equal Opportunity Programs
OMU	Other Minority Universities (refers collectively to HSI, TCU, and other minority institutions)
PI	Principal Investigator
TCU	Tribal Colleges and Universities

Black, not of Hispanic origin: A person having origins in any of the black racial groups of Africa.

American Indian or Alaskan Native: A person having origins in any of the original peoples of North America, and who maintains cultural identification through tribal affiliation or community recognition.

Hispanic: A person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish Culture.

Pacific Islander: A person having origins in any of the original peoples of Hawaii; the US Pacific Territories of Guam, American Samoa, and the North American Marianas; the U.W. Trust Territory of Palau; the islands of Micronesia and Melanesia; and the Philippines.

White, not of Hispanic origin: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

Targeted Disabilities: A person having a physical or mental impairment that substantially limits one or more major life activities, such as walking, seeing, hearing, etc. (REF: EEOC Regulation 1630 http"//www.eeoc.gov/regs/index.html).

Underrepresented minority students: Refers to students from racial and ethnic groups whose enrollment in MSET education or participation in MSET professions are much smaller than that group's representation in the general population. African Americans, Hispanics, and Native Americans currently fit this definition.

APPENDIX H

WORLD WIDE WEB ADDRESSES

1. NASA Strategic Plan World Wide Web address: http://hq.nasa.gov/office/codez/new/
2. Minority University Research and Education Division World Wide Web address: http://mured.nasaprs.com
3. NASA Center/JPL Center of Excellence and Mission Areas

Center	Designated Center of Excellence Area of Responsibility	Mission Area
Ames Research Center http://www.arc.nasa.gov/	Information Technology	Aviation Operations Systems and Astrobiology
Dryden Flight Research Center http://www.dfrc.nasa.gov	Atmospheric Flight Operations	Flight Research
Goddard Space Flight Center http://www.gsfc.nasa.gov/	Scientific Research	Earth Science and Physics and Astronomy
Jet Propulsion Laboratory http://www.jpl.nasa.gov/	Deep Space Systems	Planetary Science and Exploration
Johnson Space Center http://www.jsc.nasa.gov/	Human Operations in Space	Human Exploration and Astro Materials
Kennedy Space Center http://www.ksc.nasa.gov/	Launch and Payload Processing Systems	Space Launch
Langley Research Center http://www.larc.nasa.gov/	Structure and Materials	Airframe Systems and Atmospheric Science
Glenn Research Center http://www.grc.nasa.gov/	Turbomachinery	Aeropropulsion
Marshall Space Flight Center http://www.msfc.nasa.gov/	Space Propulsion	Transportation Systems Development and Microgravity
Stennis Space Center http://www.ssc.nasa.gov/	Rocket Propulsion Testing Earth Science Applications	Propulsion Test

APPENDIX I NASA CENTERS / JPL Mailing Addresses and Contacts

Discussions of proposed research with appropriate NASA Center or JPL personnel before submission of a proposal to that Center or JPL is strongly encouraged. A list of appropriate initial NASA Center and JPL contacts is given below.

Ames Research Center Attn.: Ms. Adriana Cardenas Ames Research Center NRA 02 OEOP-05 (Career Level) Mail Stop 19-5 Moffett Field, CA 94035-1000 **Contact for technical and scientific inquiries:** Ms. Adriana Cardenas (650) 604-6510 Fax: (650) 604-2720 acardenas@mail.arc.nasa.gov	**Kennedy Space Center** Attn.: Mr. Kenny Aguilar Kennedy Space Center NRA 02 OEOP-05 (Career Level) Mail Code AJ Kennedy Space Center, FL 32899 **Contact for technical and scientific inquiries:** Mr. Kenny Aguilar (321) 867-9165 Fax: (321) 867-1066 Kenny.aguilar-1@ksc.nasa.gov
Dryden Flight Research Center Attn.: Ms. Erma Cox Dryden Flight Research Center NRA 02 OEOP-05 (Career Level) 4876 Lily Drive Edwards, CA 93523-00273 **Contact for technical and scientific inquiries:** Ms. Erma Cox (661) 276-3033 Fax: (661) 276-2800 erma.cox@mail.dfrc.nasa.gov	**Langley Research Center** Attn.: Ms. Vivian Merritt Langley Research Center NRA 02 OEOP-05 (Career Level) Mail Code 478 Hampton, VA 23681 **Contact for technical and scientific inquiries:** Ms. Vivian Merritt (757) 864-3290 Fax: (757) 864-8832 v.b.merritt@larc.nasa.gov
Goddard Space Flight Center Attn.: Mr. Dillard Menchan Goddard Space Flight Center NRA 02 OEOP-05 (Career Level) Mail Code 120 Greenbelt, MD 20771 **Contact for technical and scientific inquiries:** Mr. Dillard Menchan (301) 286-7348 Fax: (301) 286-0298 dmenchan@pop100.gsfc.nasa.gov	**Glenn Research Center** Attn.: Mr. Robert Romero Glenn Research Center NRA 02 OEOP-05 (Career Level) 21000 Brookpark Road Cleveland, OH 44135-3191 **Contact for technical and scientific inquiries:** Mr. Robert Romero (216) 433-5538 Fax: (216) 433-8285 Robert.Romero@grc.nasa.gov

APPENDIX I: NASA CENTERS / JPL Mailing Addresses and Contacts (Continued)

Jet Propulsion Laboratory

Attn.: Mr. Ozell Grissom
Administrator, Minority Science
& Engineering Initiatives Office
Jet Propulsion Laboratory
NRA 02 OEOP-05 (Career Level)
4800 Oak Grove Drive
Pasadena, CA 91109-8099

Contact for technical and scientific inquiries:
Mr. Ozell Grissom
(818) 354-6605
Fax: (818) 354-6663
ogrissom@pop.jpl.nasa.gov

Marshall Space Flight Center

Attn.: Mr. Charles Scales, Director
Equal Opportunity Office
Marshall Space Flight Center
NRA 02 OEOP-05 (Career Level)
Mail Code OS01
Marshall Space Flight Center, AL 35812

Contact for technical and scientific inquiries:
Mr. Willie Love
(256) 544-0088
Fax: (256) 544-2411
Willie.Love@msfc.nasa.gov

Johnson Space Center

Attn.: Ms. Estella Gillette
Johnson Space Center
NRA 02 OEOP-05 (Career Level)
2101 NASA Road One
Mail Code AJ
Houston, TX 77058-3696

Contact for technical and scientific inquiries:
Ms. Estella Gillette
(281) 483-0603
Fax: (281) 483-0609
egillett@ems.jsc.nasa.gov

Stennis Space Center

Attn.: Ms. Jean Rhodes
NASA Equal Opportunity Office
Stennis Space Center
NRA 02 OEOP-05 (Career Level)
Mail Stop AA00, Bldg. 1100, Room 333
Stennis Space Center, MS 39529-6000

Contact for technical and scientific inquiries:
Dr. Ramona E. Pelletier Travis
(228) 688-3832
Fax: (228) 688-7499
Ramona.Travis@ssc.nasa.gov

APPENDIX J

Description of FAR Research Opportunities

Ames Research Center (ARC)

Aerophysics **AR01**

Aerodynamics: applied aerodynamics, advanced aerodynamic concepts, aerodynamic facilities and operations. Computer systems and research: systems integration. Fluid Dynamics: computational aerosciences, computational algorithms and applications, turbulence and transition, modeling and experimental validation, fluid mechanics. Numerical Aerodynamic simulation Systems: applied research, systems development, and computational programs.

Aerospace Systems **AR02**

Full-Scale Aerodynamics Research: fixed wing aerodynamics; rotorcraft mechanics; National Full-Scale Aerodynamics Complex (NFAC), the world's largest wind tunnel; data acquisition, systems and research operations. Information Sciences: artificial intelligence, computational systems, and spacecraft data systems. Human Factor Research: computational human engineering; full-mission simulation, human interface research, rotorcraft human factors, flight human factors. Flight Systems and Simulation: air traffic control, field systems, flight dynamics and control; simulation experiments, aircraft systems, aircraft guidance and navigation, simulation systems.

Astrobiology and Space Research **AR03**

Interdisciplinary research is conducted to understand life's origins, its distribution in the universe, and its destiny. Specific area of focus are: *Life Sciences:* role and influence of gravity on living systems, flight equipment engineering, science operations, payload operations. *Earth System Science:* ecosystem science and technology, atmospheric chemistry and dynamics, atmospheric physics. *Space Science:* astrobiology, computational astrobiology, observational astrophysics, laboratory astrophysics, planetary science, exobiology, star and planet formation, search for other planetary systems, planetary exploration. *Advanced Space Technology:* Advanced technologies are developed for biomedical research, biotechnology, bioinformatics, biocomputation, visualization, regenerative life support systems, infrared detectors cryo-optics, systems evaluation and integration. *Space Projects:* Spaceflight and Earth Atmospheric projects in the research areas noted above are regularly proposed and conducted. Current major projects are: Space Station Biological Research Project (SSBRP) and the Stratospheric Observatory for Infrared Astronomy Project (SOFIA).

Information Technology **AR04**

Accelerate the research and infusion of new technologies and capabilities into NASA's future missions by performing research and testing conceptual designs and technologies in the following areas: high end computing and large scale networking, high dependability software, intelligent and autonomous systems, robotics, collaborative and assistant systems, aviation surface technologies, automated software engineering and data analysis, human/machine systems and operations, advanced displays and spatial perception, flight human factors, cockpit displays, vision science, human-automation reliability, situational awareness and prediction, human-centered design in complex systems, information and knowledge management, advanced safety and design, multicast and quality of service technology, multi-protocol technology for real-time data links, fatigue countermeasures, distributed computing environments, cognitive/physiological tools for evaluating human performance, and next generation neural flight control research.

Dryden Flight Research Center (DFRC)

Flight Operations **DF01**

High speed/performance mission support, shuttle landing support, avionics, flight crew, aircraft life support, operations engineering, aircraft quality inspection, aircraft maintenance and modification, flight data acquisition systems, and mission control.

Research Engineering **DF02**

Fluid and flight mechanics, aerostructures, thermostructures, propulsion and performance, flight instrumentation, flight dynamics, flight controls and systems, structural dynamics, thermal and mechanical load control systems, ground test data acquisition systems, and sensor evaluations.

Research Facilities **DF03**

Information systems, range systems, flight simulation systems, integrated test systems, systems development, system integration and facilities engineering.

Goddard Space Flight Center (GSFC)

Space Sciences **GS01**

High energy astrophysics; X-ray and gamma-ray spectroscopy, cosmic ray physics; solar, stellar, galactic and metagalactic high energy processes; UV, optical, and infrared astronomy; theoretical astrophysics; cosmic background radiation; solar physics; radio galaxies; chemical history of solar system; solar wind; comets; planetary atmospheres, magnetospheres, meteoritic asteroids, radio wave and ion plasma of planetary satellites; galactic, stellar, and planetary infrared spectroscopy; molecular aeronomy; extreme UV spectroscopy, planetary electric and magnetic fields.

Earth Sciences **GS02**

Earth system sciences integrates the search for understanding the way the Earth System works including interactions among the atmosphere, hydrosphere, biosphere, and the solid Earth. This involves numerical modeling of the atmosphere, ocean, and terrestrial systems; supporting observational studies on radiation, vegetation, tropospheric and stratospheric chemistry, ocean surface dynamics, sea ice, oceanic productivity, regional and micro-scale dynamics, cloud convection, cloud modeling and radiation balance, solar radiation studies, geophysics, plate tectonics, geomagnetism, gravity, celestial dynamics, and planetary atmospheres. Tools used to provide observations supporting these studies include remote-sensing, passive and active instruments including laser and radar altimetry, scatterometry and microwave sensors. Data interpretation methods include data assimilation into models. Field studies are also carried out, involving in-situ sensors, aircraft and satellite sensors.

Engineering Development **GS03**

Optical analysis, optical material research and optical metrology equipment development; thermal analysis including two-phase heat transfer, contamination effects and contamination transport mechanisms applied to advanced spacecraft and instrument systems for STS and free-flying spacecraft; cryogenic cooling development for space instruments; very large-scale integrated circuits using NMOS and CMOS; multi-chip module radiation-hardened processors, high density solid state memories, and fiber optic data networks, advanced electronic and photonic materials and microelectronic device fabrication; ultra-low noise microwave amplifier and mixer design and testing; correlated double sampling of infrared detector array data; advanced sensors and instruments for observation of x-ray, gamma-ray and ultraviolet radiation, images, and spectroscopy; electromechanical subsystem control, interactions, system modeling, and developing control laws for small self-contained instruments; vibration cancellation and isolation; analysis of the dynamics of large structures in orbit, flexible space structures, thermal effects, excitation by mechanisms

or spacecraft control system; attitude dynamics and control of spinning/non-spinning flexible spacecraft and, dynamics and precision-pointing of instruments from zero momentum 3-axis controlled spacecraft.

Communications & Data Systems Development **GS04**

Expert systems/neural networks/model-based systems/agent-based systems for automated mission operations, resource scheduling, and system and network modeling and fault isolation; distributed systems for payload control and data handling; VLSI and gate array design for real-time telemetry processing; software engineering technology for decentralized development of large scale systems and development of a reusable software base; data management technology for distributed systems and data flow architectures for telemetry processing; human factors technology and rapid prototyping techniques for interactive spacecraft, network, data system control workstation design, and RF communications, modulation/coding, antennas, receivers, demodulators, and propagation effects.

Computational Sciences and Information Systems **GS05**

Simulations and modeling of Earth and space phenomena; high performance computing; global optimization algorithms and applications; simulated analogs; genetic algorithms; neural networks; intelligent data management systems; mass data storage systems, access and retrieval; scientific visualization and animation; voice recognition, data compression, optical systems characterization, image restoration, and on-board high performance data recorders.

Earth Sciences **GS06**

Earth system sciences integrates the search for understanding the way the Earth System works including interactions among the atmosphere, hydrosphere, biosphere, and the solid Earth. This involves numerical modeling of the atmosphere, ocean, and terrestrial systems; supporting observational studies on vegetation, tropospheric and stratospheric chemistry, ocean surface dynamics, sea ice, oceanic productivity, regional and micro-scale dynamics, cloud convection, cloud modeling and radiation balance, solar radiation studies, geophysics, plate tectonics, geomagnetism, gravity, celestial dynamics, and planetary atmospheres. Tools used to provide observations supporting these studies include remote-sensing passive and active instruments including laser instruments including laser and radar altimetry, scatterometry, and microwave sensors. Data interpretation methods include data assimilation into models. Field studies are also carried out, involving in-situ sensors, aircraft and satellite sensors.

Research Opportunities at Wallops Flight Facility **GS07**

Physical oceanography, laser remote-sensing applications, atmospheric chemistry, remote-sensing of atmospheric ozone, development of remote sensors, thin film material research, balloon membrane structural analysis, launch vehicle aero-ballistics, reentry, aero-thermal analysis, development of improved attitude control system(s), network and data systems control, thermodynamic modeling of large balloon structures, environmental impact of range operations.

Research Opportunities At Goddard Institute for Space Studies **GS08**

The Goddard Institute for Space Studies (GISS), located on the Columbia University campus in New York City, conducts comprehensive, theoretical and experimental research in: climate change, Earth observations, paleoclimatology, cloud climatology, radiation studies, hydrological studies, stratospheric dynamics biogeochemical cycles and planetary atmospheres including the dynamical meteorology of Mars. GISS is the Global Processing Center for the International Satellite Cloud Climatology project.

Jet Propulsion Laboratory (JPL)

Systems **JP01**

Systems analysis; policy analysis and operations research; design of space missions; spacecraft system design and concurrent engineering, integration; assembly, test and launch operations, navigation; spacecraft sequence design including robotics and artificial intelligence applications; mission operations systems; distributed real time information systems.

Earth and Space Sciences **JP02**

Emphasis on remote-sensing along with extensive efforts in data analysis and theoretical modeling, field measurements and laboratory research in related disciplines. Fields of interest are planetary atmospheres, planetary geology, planetary and interstellar astronomy, astrophysics, relativity and cosmology, interplanetary space physics, comet and asteroid studies, Earth atmosphere, atmospheric chemistry, global weather and climate, oceanography, geosciences, air-sea interaction, and air-land interaction.

Telecommunications Science and Engineering **JP03**

Emphasis on deep space and Earth satellite communications, radiometric tracking and active remote-sensing along with related science, technology, and engineering. Areas of current interest include: spacecraft communications systems, highly stable microwave transponders, low noise amplifiers, efficient antennas, source and channel coding, noise processes, signal processing, communication networks, ultra-precision frequency standard systems, satellite-based mobile communication systems, high power Earth-based radar, spaceborne synthetic aperture radar, altimeters, meteorological radars, scatterometers, radar radiometrics, VLBI and GPS-based systems for navigation and tracking, geodynamics science and instrumentation, radio and optical interferometry.

Avionic Systems and Technology **JP04**

Advanced microelectronics including sensors, micromagnetic and superconducting devices, and microelectronic materials; in-situ microinstruments; analog processing devices, fuzzy logic, and neural networks; guidance and control analysis for advanced spacecraft including special topics information flight and tethered systems; sensor, actuator, and control development for spacecraft, a microspacecraft, and space structures; space interferometer technology; robotics, telerobotics, autonomous vehicles, and microrovers; telepresence and virtual reality; machine vision, photonics, including optical processing and electro-optics; machine intelligence and autonomous intelligent spacecraft, ground system, and mission operations technology; energy conversion, storage and management, including fuel cells, batteries, solar arrays, and thermal-to-electric converters, for spacecraft and terrestrial power systems; integrated microavionics technology and applications including concurrent, distributed processing, integrated power electronics, and advanced packaging; spacecraft data system technology including computer architecture, flight computers, data storage, and software.

Mechanical Systems Engineering and Research **JP05**

Active cooling of sensors, vibrational isolation of substructures, precision deployable space structures, precision inflatable structures, opto-electronic materials, dimensionally stable structures, smart structures and materials, active optics devices, electric propulsion, advanced chemical propulsion, cold electronics, advanced electronic packaging, low temperature physics, advanced chemical systems, miniaturized components, advanced instrumentation, environmental simulation.

Observational Systems **JP06**

Development of instrumentation systems employing X-ray, ultraviolet, visible and infrared imaging; infrared and visible spectroscopy; passive microwave radiometry; and analytical techniques. Development of calibration science technology to enable quantitative remote-sensing. Technology development and characterization of advanced sensors and focal plane arrays. Development of optical systems,

interferometry, electro-optical systems, and optics technology. Development of science data processing systems including algorithms and systems architectures, image processing and science data analysis and visualization. Development of science data management systems and analyzing systems.

Information Systems Development and Operations **JP07**

Development, planning and operations related to ground-based information systems for spacecraft missions. Research areas include: advanced automation for spacecraft diagnosis; simulation and graphics for knowledge fusion, data understanding, and training; high-rate, high-capacity information systems; software productivity and reliability; intelligent access to large, interactive hypermedia data bases; high-performance computing and networking; numerical analysis and computational software libraries; and low-cost mission operations.

Space Microelectronics Technology **JP08**

This Center focuses upon the design and development of microelectronics and advanced computing unique to space applications. One focus involves the development of sensors for those portions on the electromagnetic spectrum that are not accessible from Earth because of atmospheric absorption. Another focus is the development of microinstruments and microelectronics systems for miniature spacecraft. This Center also develops high performance computing for mission data analysis and visualization.

Space Interferometry **JP09**

This Center focuses upon the development of leading edge capabilities in optical interferometric imaging and astrometric technology. This Center will also enable the development of lightweight space telescopes, interferometers, and advanced detectors for the next generation of Astrophysics missions. By so doing, this Center will enable JPL to conduct advanced science experiments in Extra-Solar System Exploration and in Astrophysics.

In-situ Exploration and Sample Return **JP10**

This Center intends to develop leading edge capabilities in domains central to in-situ and sample return missions to bodies within our solar system. Current emphasis is on experimental development of scientific instruments associated with sample acquisition and instrument deployment. These instruments will be used to explore atmospheres, surfaces and subsurfaces of solar bodies. The Center's work will enable JPL to carry out sample return missions to Mars and comet nuclei. This work will also enable in-situ missions to Europa, Titan, Venus and to the outer planets.

Integrated Space Microsystems **JP11**

The focus of this Center is the development of system architecture, core technology development, system level integration, and validation of breakthrough technologies for a complete avionics-on-a-chip that will integrate key spacecraft subsystems into a single unit. These subsystems include computers, telecommunications, navigation, power management, and sensor technologies.

Deep Space Communications and Navigation Systems **JP12**

Center is to develop concepts and technologies for communication and navigation associated with the next generation space exploration missions. Included in these concepts are communications between spacecraft, and with surface and subsurface platforms (e.g. rovers penetrators, hydrobots). Emphasis is placed upon the development of innovative concepts that involve instruments with low mass operating with low power while under extreme environmental conditions. This Center is also taking the lead for the development of the optical communication with, and navigation of, spacecraft and space instruments.

Space Mission Architecture and Design **JP13**

The focus of the Center is to develop the architectural concepts that will be used for the development of future mission. This involves modeling and simulations.

Johnson Space Center (JSC)

Engineering Directorate

Crew and Thermal Systems Division **JS01**

Research and technology development in the areas of biological and physical/chemical regenerative life support systems and active thermal control systems for crewed spacecraft and surface bases; extravehicular individual life support systems; space suit systems, and protective system concepts for dust exclusion from extravehicular system hardware components.

Tracking and Communications Division **JS02**

Design and analysis of space communication and tracking systems. Topics of interest include: infrared, laser/optical millimeter wave, microstrip patch antennas, multibeam arrays, multi-access, packetization, interference tolerance, channel coding, video compression, secure data, voice control, automated control and monitoring, and digital and Fourier optics vision.

Navigation, Control, and Aeronautics **JS03**

Design, development, integration, and testing of guidance, navigation, and control hardware and software systems for atmospheric and orbital flight; aerosciences engineering in the disciplines of flight dynamics, computational fluid dynamics, aerodynamics, and aerothermodynamics; application of Total Quality Management Tools to projects.

Flight Data Systems **JS04**

Study of flight data systems hardware and software that provides spacecraft computation and information processing, onboard check-out, instrumentation, data storage, and displays and controls. Includes applied technology studies for spacecraft data systems, instrumentation, signal conditioning, data recording, and advanced displays and controls.

Propulsion and Power **JS05**

Study of propellant chemistry and physics of combustion venting; fluid system leakage detection; cryo-coolers for long-term storage; high temperature rocket combustion chamber materials; propulsion/fluid system health monitoring; electric motors and controllers; zero/low gravity fluid management for Earth storable and cryogenic fluids; chemical reaction kinetics of pyro initiator explosions; evaluation of fuel cell polymer and intercalation-type electrodes; development of software system designs for distribution, control, and management of electrical power for space systems.

Automation and Robotics **JS06**

The study of the application of Artificial Intelligence (AI) and advanced automation technologies to the areas of: system and subsystem monitoring, control and diagnosis; automated assistance for systems operations; process planning and scheduling; advanced systems analysis and control; computer-aided engineering; concurrent engineering and intelligent integration of information; massively parallel and distributed computer processing; automated knowledge acquisition and machine learning; object-oriented data bases and data mining; graph theory and knowledge representation; human-computer interaction; engineering methods for intelligent systems; teleoperator, telerobotic, and autonomous robotics control system development; robotic sensing, perception, and world model updating; real-time simulation of manipulators; engineering and integration of manipulators and end-effectors into laboratory robots.

Structures and Mechanics **JS07**

Study of microcracking of composite materials; study of spacecraft re-entry thermal protection and on-orbit thermal control techniques modal, vibration, and acoustic testing; and methods for micro-g isolation of on-orbit experiments, advanced methods for use in structural response analysis, and advanced computational computer-aided engineering graphics techniques for structural and thermal analysis.

Systems Engineering **JS08**

Research and development in the area of flight mechanics; conceptual design and analysis of evolutionary and future systems for transportation; Earth orbit activities.

Information Systems Office

Advanced Information Systems Technology **JS09**

Opportunities exist for developing and evaluating advanced information systems technology in support of NASA institutional and mission operations. Current areas include research into heterogeneous digital libraries, virtual reality technologies, general purpose intelligent training systems, expert assistants, neural networks for machine learning, applications of pattern recognition and signal processing to system monitoring and process control, software development tools and methods, network technology, genetic algorithms, distributed computing technology, and knowledge/process capture technology.

Safety, Reliability, and Quality Assurance Office **JS10**

Develop strategies for expanding the current methodologies in risk assessment. Investigation, assessment, evaluation and initial feasibility development of automated failure tolerance analysis program, FMEA programs, fault-tree generation programs, and system safety analysis programs. Develop software product assurance methodologies for very large scale systems, expert systems and certified intelligence systems, including verification and compliance with product assurance requirements. Develop on-orbit systems maintainability technology such as calibration and pressure systems recertification. Develop application of existing nondestructive evaluation (NDE) technology for on-orbit systems including leak detection, composite materials, stress distribution, and surface impact detection. Develop technology and methodology for early detection of system failures, contamination, fires, and leaks.

Space and Life Sciences Directorate

Life Sciences Project Division **JS11**

Investigation, assessment, evaluation and initial feasibility development of biomedical instrumentation devices, systems, and supporting equipment for human experiments. Development of flight experiment hardware and supporting ground test equipment including definition, systems engineering and analysis, hardware fabrication and acceptance testing. Systems include sensing instruments, control, and data in support of in-flight biomedical monitoring of human status and performance. Areas of interest include flight experiment microcomputers; non-invasive physiological monitoring, respiratory gas analysis via mass spectrometry; data storage and recording; biomedical telemetry; auto test and checkout systems; ground support facility development and specialized support equipment.

Flight Crew Support Division **JS12**

Human-machine interface requirements definition, systems engineering, analyses and integration for development and operation of human-systems for space flight and planetary habitats. Areas of interest include Advanced Food Technology, flight crew equipment development and provisioning including clothing, restraints, mobility aids, personal hygiene, emergency survival techniques, housekeeping in reduced and microgravity, long mission systems development for clothes washing, personal hygiene, modified integrated logistics support techniques for small critical systems, advanced technologies for microgravity and 1-g human-machine interfaces; computerized dynamic, anthropometrically accurate, human-modeling; control of remote operations/human interfaces to automated systems; human-computer interaction research; system information management; habitability subsystems and protocols; biomechanics data collection and human

modeling advanced ADP technologies and applications, and high resolution digital image acquisition/storage/transmission/reproduction.

Medical Sciences Division **JS13**

Evaluation of bone demineralization, muscle atrophy, and cardiovascular deconditioning resulting from space flight; astronaut radiological health assessment; prevention of decompression sickness following pressure changes, biotechnology and cell culture in space; hormonal regulation of fluid and electrolyte balance; pharmacokinetics in space; nutritional biochemistry; muscle cell physiology; toxicological assessment of spacecraft environment; microbiological capability in space; physiological correlates of space adaptation syndrome; clinical characterization of space motion sickness (SMS); vestibulomotor and vestibulocular mechanism in SMS; behavioral, physiological and pharmacological countermeasures; development of capabilities for in-flight health care, physical exercise, and spacecraft environmental monitoring.

Earth Science and Solar Exploration Division **JS14**

Fundamental research on the composition, origin, and evolution of terrestrial planets, meteorites, and interplanetary dust through chemical, mineralogical, and isotopic analysis of extraterrestrial materials utilizing state-of-the art analytical instrumentation and through laboratory simulation of natural melting and impact processes using high-pressure, high-temperature furnaces and hypervelocity impact facility. Cooperative studies of energy expenditures in humans using mass spectrometers. Lunar base science and lunar and Mars resource utilization studies. Definition of future human planetary missions. Applied research into the characteristics of the near-Earth space environment, including measuring and modeling the distribution, rate of growth, hazards, and mitigation of debris in Earth orbit; hydrocode modeling of debris impact; experimental and hydrocode modeling studies of hypervelocity impacts onto spacecraft components; analysis of impacts on space-exposed surfaces; and measurement and modeling of the space radiation environment. Engineering analysis of photography and television of Shuttle and Space Station. Study of environmental, geological, oceanographic, meteorological processes as revealed in photography from Shuttle.

Space Station Program Office

Vehicle Office **JS15**

The EEE Parts Information Management System (EPIMS) is no longer the data base of choice since NASA HQ stopped development funds and the EPIMS Administrator is now supporting GSFC-funded data base developments and priorities. After coordinating with the EPIMS Administrator, it was agreed that the ISS Program Office should develop its own parts management system. GSFC is now developing a new Parts-Web data base which currently does not have all the capabilities to support the ISS EEE Parts need.

With the aid of the Summer Faculty Fellowship Program and support from the University of Houston, the Parts Control Board has developed a prototype data base in Microsoft Access which has been dubbed Polaris. This system will be used in the short term to complete the launch package assessments. In addition, the EEE parts organization is working with the Engineering Data Management personnel to determine if VMBD capabilities can be developed to support long-term goals.

Kennedy Space Center (KSC)

Launch Vehicle Processing Systems **KS01**

Perform research in the identification and control of hazards, probabilistic risk assessment, fault-tree analysis and applications, interactive hazard information tracking and closure systems, and reliability engineering.

Research and development of hardware/software used in real-time control systems from embedded applications to critical large scale distributed systems. Applications under study or development include: control system for real-time digital video distribution system; control system for a checkout of space vehicles

payloads; real-time voice communications systems; real-time monitor and analysis system for flight hardware technology demonstrator; development of rough logic algorithm for training of neural nets; development of RF collision detect wireless data network; and development of knowledge-based systems for a variety of ground processing and management functions. Specific interest exists in real-time control and monitoring, automated test procedure development, imbedded diagnostics, fault isolation, and management planning and scheduling applications.

Numerous advanced technology projects include hydrazine sensing, mass spectrometry contamination monitors, personnel dosimeters, gas monitors and warning equipment for trace levels of several toxic elements. Other instrumentation projects involve level and flow measurement of cryogenic propellants, new transducers, and state-of-the-art fire detectors.

The application of current and advanced robotics technology to time critical, hazardous or repetitive labor-intensive operations will be considered. Specific interest exists in high-speed vision, precise positioning, force-torque tracking, counter balancing, adaptive control software, and redundancy. Applications under study or development include: remotely controlled umbilicals; inspection and re-waterproofing of orbiter tiles; inspection of orbiter radiator panels; inspection of payloads; and cleaning of payload canisters.

Command, Control, Monitoring & Range Technologies **KS02**

Continued work with multi and single mode optical fibers exists as well as development activities in optical multiplexing, switching, repeaters, and various fiber optic instrumentation techniques. Applications for research also include high-speed base band and broadband communications in the integrated networking environment and high reliability/redundant dedicated circuits.

Research and development includes real-time systems for control and monitoring of complex checkout and launch procedures. Distributed database and computer networking techniques and various microprocessor applications in work and human-computer interface techniques are under investigation. Major efforts include the development processing systems specifically designed for use at KSC.

Research, development, and evaluation of leading edge network architectures, network operating systems, and network protocols. These would be for local area networks (LAN), metropolitan area networks (MAN), wide area networks (WAN) and the Internet. Focus study or analysis would include reduction of implementation and operating costs of existing systems, system expansions, and new systems. This is to be accomplished through the application of new technology, new techniques and consolidation of systems.

KSC is interested in predicting severe weather and thunderstorms. Instrumentation is in place and under development to track thunderstorms based on electromagnetic and electrostatic characteristics. Opportunities exist in studying the physics of lightning processes, in characterization of electromagnetic emission associated with lightning, and in the development and implementation of improved lightning protection techniques. Opportunities also exist for the development of operationally viable techniques for measuring (not merely inferring) charge and/or electric fields in and around clouds. Remote sensing techniques are preferred for operational reasons, but cost-effective in situ measurements, which do not interfere with or pose a hazard to launch operations, would also be acceptable.

Fluid System Technologies **KS03**

Tasks underway involve cryogenic vacuum-jacketed storage, perlite compaction, hypergolic vapor dispersion down draft elimination, low-cost cryogenic transfer pipelines**,** high efficiency cryogenic insulation, cryogenic helium storage and transfer systems, slush hydrogen transfer pipelines, magnetic refrigeration for air conditioning, two-phase fluid flow meters, self-contained atmospheric protection ensemble breathing air management systems, hypergolic discharge elimination, Computation Fluid Dynamics (CFD) of rocket exhaust into flame/exhaust ducts, and hypergolic vapor scrubber improvement.

Process Engineering **KS04**

Development of analytical and graphic techniques to improve engineering tasks associated with modeling and reporting results from analysis and laboratory tests dealing with dynamic loads, cryogenic two-phase flow and heat transfer, and structural, mechanical and electronic systems.

Perform research in the application of statistical process control, methods and analysis, automated assessment techniques and evaluation of inspection methods.

Industrial engineering technologies will be developed to improve the effectiveness and efficiency of spacecraft processing. Areas of interest include: operations research, process simulation modeling, statistical process control, data mining, experimental design, advanced scheduling systems, project management risk analysis, cost benefit analysis, decision modeling, systems engineering, methods engineering, work measurement, human factors, ergonomics, facility layout/design, performance metrics, management information systems, and bench marking.

Spaceport Structures & Materials **KS05**

A number of tasks are underway investigating environmentally compliant corrosion preventive coatings to include electrically conductive polymers, accelerated corrosion test techniques, thermal protective coatings, material ignitability in high pressure oxygen, and chlorofluorocarbon replacement chemicals and mechanical cleaning techniques.

Plant & Microbiological Sciences **KS06**

Activities would involve verification testing of space flight hardware in support of life sciences research in space. The hardware will be evaluated to provide an appropriate environment for the experimental organism within the mass, size and power constraints of a Space Shuttle mid-deck locker. The tasks involve ground-based biological verification of the appropriateness of the hardware as a research tool.

The development of an evaluation tool is required to discover the efficiency and effectiveness of Life Sciences Educational Programs. An evaluation instrument and a means for compiling data needs to be developed using the Concerns-Based Adoption Model as an example, in which participants (students, teachers and the public) can respond on the impact and effectiveness of the programs. The Concerns-Based Adoption Model is an example of a model to measure the efficiency of teacher training. Creation of this evaluation tool will include the development of instruments such as surveys, questionnaires, interview guidelines, and tests. The instruments must also be pilot-tested and evaluated as to their content validity and situational usefulness. Other tasks to be considered: development of curriculum enhancements to the current programs and improved means for coordinating and implementing existing programs.

Continuation of a project to demonstrate the feasibility of using bio-regenerative systems to recycle critical elements of human life support. Initial tasks employ a closed chamber to verify varieties of plants in communities for the production of edible biomass and respirable oxygen, and to recover water; and bioreactors to recover plant and human waste solids, fluids, and metabolic gases. Application of AI/Expert systems, robotics and instrumentation to this project is appropriate. Other allied research tasks deal with chemical and microbial contaminate characterization, removal, and control for habitable structures in the space environment; the influence that gravity may have on plant growth, metabolism, and production; and in the preservation of human health for long-duration missions.

Research at Kennedy Space Center in the ecological sciences includes use of remote sensing/geographic information system evaluation of land use land cover changes associated with the understanding and modeling of ecosystem processes associated with long term sustainability of biological diversity. Specific studies include the role of wildfire in ecosystem dynamics and the development of remote sensing tools and predictive models for evaluating risk and management of these natural hazards, in situ evaluation of the effects of elevated atmospheric carbon dioxide on Florida scrub oak ecosystem processes and the ecological dynamics of the estuarine/coastal upland interface as affected by land cover land use change (areas of investigation include coastal wetland management effects on land cover dynamics, biogeochemical cycling, fisheries and wildlife habitat dynamics).

Proposed research on the effects of Kennedy Space Center operations on barrier island ecosystems. Studies should include monitoring and assessment of habitat management programs on vegetation, federally listed threatened and endangered species, and other protected species found on Kennedy Space Center's wildlife refuge. Studies on use of geographic information systems (GIS) as decision support for environmental monitoring, remediation, pollution prevention and management.

Langley Research Center (LaRC)

Atmospheric Sciences Program **LA01**

Apply LaRC's capabilities to expand the scientific understanding of the Earth's stratosphere and troposphere and develop the ability to assess potential threats to the atmosphere.

Climate Research Program **LA02**

Theoretical, laboratory, and field investigations of the chemical and radiative properties of natural and human-made aerosols and assessment of their impact on regional and global climate. Remote and in-situ observations of the cloud properties and radiation balance components and theoretical studies.

Communication Technology **LA03**

Dissemination tools for promoting the expedient transfer of technologies over Internet (World Wide Web) and commercial object-oriented electronic distribution models and methodologies.

Computer Science **LA04**

Concurrent processing, highly reliable computing, information and data base management, software engineering, software safety, and application of formal methods to systems design and analysis.

Controls and Guidance **LA05**

Fault tolerant systems, aerospace vehicle dynamics and applied control concepts.

Design for Competitive Advantage **LA06**

A major problem facing the aerospace industry is how to become more competitive. Decreased cost and increased quality characterize the increased value necessary to improve competitive advantage. This task is to concurrently examine, in the context of competitive advantage, (1) an aerospace product and (2) the system by which we bring forth, sustain, and retire that aerospace product.

Electromagnetic Systems **LA07**

Electromagnetic analysis methods, far-field and near-field antenna measurements and analysis, High Intensity Radiated Fields, compact range applications, aircraft and spacecraft antenna systems, and computational electromagnetics.

Electronics and Information Systems **LA08**

Microwave-sensing technology, laser-sensing technology, optical data processing, and very high speed information processing.

Engineering Lab Team **LA09**

Physical and chemical analytical testing services needed for the operation of facilities at LaRC. Development of analytical instrumentation that will advance services at LaRC or will advance technology in aeronautics and space projects. Current projects include instrumentation for environmental control, X-ray fluorescent spectroscopy for wear metal, agriculture and geological analysis, flow field and temperature visualization for wind tunnel models and high temperature superconductive materials for magnetic levitation.

Facility Assurance **LA10**

Systems safety and risk management techniques applied to unique wind tunnel facilities and operations.

Facility Engineering **LA11**

Engineering and design of research facilities and equipment for aeronautical and space research, including wind-tunnel structures and systems, test selections, model support, environmental chambers, heaters, coolers, mechanical drives, electrical drive machinery, and electrical distribution systems.

Flight Electronics Technology **LA12**

Research covering flight electronic system sensing, computing, and display for aerospace applications. Flight system sensing includes laser sensing, microwave remote sensing technology including electromagnetic analysis methods, far-field and near-field antenna measurements, compact range technology, and aircraft and spacecraft antenna technology. Computer technology and data processing research areas include optical data processing, solid-state memory technology, very-high-speed information processing, concurrent processing, and highly reliable and fault-tolerant systems.

Gas Dynamics **LA13**

Opportunities for research in both focused and basic research and technology development in the areas of aerothermodynamics and hypersonic airbreathing propulsion. Develop, validate, and perform analytical, computational and experimental aerodynamic, aerothermodynamic and fluid physics research to develop, optimize, and evaluate future experimental flight demonstration vehicles and aerospace vehicles.

Flight Deck System **LA14**

Flight deck design, flight management technology, systems management concepts, flight deck automation/integration, and aviation safety.

Fluid Physics **LA15**

Subsonic aerodynamics, transonic aerodynamics, high speed aerodynamics, computational fluid dynamics, turbulent drag and noise reduction, airfoil aerodynamics, advanced test instrumentation, full scale Reynolds number test technology, applied mathematics and computer science.

General Aviation **LA16**

Aerodynamics, crash dynamics, integrated design and manufacturing, propeller noise reduction, avionics, single pilot IFR systems, systems interaction, and AGATE-related research.

High Speed Aircraft **LA17**

Flight dynamics, advanced military aircraft and missiles, high speed transportation, supersonic laminar flow and single-stage-to-orbit vehicles.

Hypersonic Fluid Physics **LA18**

Launch vehicle and spacecraft aerothermodynamics and configuration technology; and aerodynamic and aerothermodynamic flight data analysis.

Low Speed Aircraft **LA19**

Rotorcraft structures, vibrations, aeroelasticity and acoustics, natural laminar flow, and landing dynamics.

Materials and Structure **LA20**

Structural composites and adhesives, materials for advanced aircraft and spacecraft structures, loads, aeroelasticity and structural dynamics, high temperature aerospace structures and thermal protection system materials, advanced space structures, design methods, and space vehicle dynamics, nondestructive evaluation, computational structural mechanics, and fatigue and fracture mechanics.

Propulsion **LA21**

Noise research, propulsion integration, hypersonic airbreathing propulsion research, advanced turboprops.

Spacecraft Systems and Transportation Systems Technology **LA22**

Space structures systems technology, File II flight experiment, semiconductor materials growth in low G environment, computer-aided design, future space vehicle concept development, operations research, integrated systems design, and advanced launch systems.

Systems Engineering and Systems Analysis **LA23**

Mathematical modeling, optimization, parametric studies and cost estimation of various aeronautics and space engineering systems.

System Genopersistation Technology **LA24**

Develop technology for the genopersistation of systems, that is, technology for accomplishing the functions: conceptually design; develop; test and evaluate; produce; deploy; operate; support; evolve; retire; and manage. Emphasis is to be placed on how NASA and its support community can accomplish these functions faster, better, and with less resource utilization.

Technology Transfer/ Commercialization **LA25**

Transfer of LaRC-developed technologies to American companies/industries, with emphasis on non-aerospace applications, but team members will also help researchers transfer technologies that only have aerospace applications.

Transport Aircraft **LA26**

Wake vortex minimization, laminar flow control, high Reynolds number research, configuration aerodynamics, advanced guidance and control, flight management research, noise reduction, and automation of air traffic surface operations.

Transportation Systems **LA27**

Future space vehicle concept development, operations, research, and computer-aided design.

Glenn Research Center (GRC)

Aeronautical Propulsion **LE01**

Rotorcraft, subsonic, supersonic, and hypersonic propulsion systems and components; aerodynamics and acoustics of turbomachinery; aerodynamics of inlets and nozzles; fundamentals of internal combustion; small engine propulsion technology; aircraft icing.

Propulsion Systems Analysis **LE02**

Propulsion system and aircraft modeling, integration analysis, novel concepts, mission studies, configuration studies, and environmental/economic assessments.

Computer Science **LE03**

Numerical analyses including nonlinear regression, acceleration of series or sequences of scalars and vectors, symbolic manipulation, modularized algorithms, client/server architectures, graphical user interface design and development.

Data Management **LE04**

Acquisition of experimental data, data base structure and searching, management information systems.

Instrumentation and Control **LE05**

Advanced instrumentation for propulsion research including thin-film sensors and remote-sensing optical-based systems, advanced propulsion and flight controls emphasizing integrated and fault-tolerant controls and fiber optic-based control systems, high temperature integrated electronics and sensors based on SiC technology.

Internal Fluid Mechanics and Heat Transfer **LE06**

Advanced numerical methods, multiblock grid and zonal approaches, 3-D geometry and mesh-generation techniques, prediction of 3-D turbulent flow fields, application of advanced computer concepts and expert systems, fluid mechanics of inlets and nozzles, aerothermodynamics of combustors and augmentors, fan and compressor aerodynamics, flow and heat transfer in turbines, unsteady aerodynamics.

Materials **LE07**

Metallic materials and advanced processing methods, ceramic and ceramic matrix composites, polymer and metal matrix composites, fundamental studies in tribology.

Microgravity Experiments **LE08**

Combustion, materials processing, crystal growth, fluid physics, theoretical modeling.

Space Communication **LE09**

Microwave amplifiers, solid-state devices, circuit technology, RF systems, digital systems, advanced antenna technology.

Space Power **LE10**

Photovoltaics, electrochemical energy storage, solar dynamic power systems, power electronic systems and devices, electrophysics, power management and distribution systems, power systems dynamics and control, environmental interactions.

Space Propulsion **LE11**

Primary and auxiliary chemical rockets; ion, resistojet and arcjet electronic propulsion; rocket engine health management, expendable launch vehicle upgrades.

Space Systems Engineering **LE12**

Space Station power system, advanced communication satellite (ACTS).

Structures **LE13**

Analysis and design methodology of metallic and composite engine structures, advanced structural mechanics, nondestructive evaluation, fatigue, fracture and life prediction, aeroelasticity and structural dynamics, rotor dynamics.

Marshall Space Flight Center (MSFC)

Space Sciences **MA01**

Gamma ray, x-ray astronomy, cosmic ray, low temperature, solar, atomic, magnetospheric, and space plasma physics; aeronomy, superconductivity.

Earth Science **MA02**

Storm physics; geophysical fluid dynamics; atmospheric processes, dynamics and composition; remote-sensing including laser Doppler and visible/infrared devices.

Computer Science **MA03**

Supercomputer systems optimization; distributed data management, Management Information Systems (MIS).

Microgravity Science **MA04**

Containerless processing, crystal growth, solidification phenomena, separation techniques, fluid modeling, protein crystal growth, optical techniques, solid-state structure and property characterization.

Materials and Processes **MA05**

Engineering physics, advanced NDE techniques, atomic oxygen effects, turbopump bearings, space lubricants, metallic materials, non-metallic materials, composites, propellants, processes engineering, robotics welding, welding process, vacuum plasma spray technology.

Structures **MA06**

Structural design optimization of isotropic and anisotropic space structures and elements, orbital (debris/meteoroid) protection systems, stress analyses, fracture mechanics, fatigue, durability, structural test methods.

Dynamics **MA07**

Rotordynamics, pointing and vehicular control systems design, large flexible space structures dynamics, vibroacoustics response, loads analyses, design criteria and verification methods, computational fluid dynamics, rarefied gas dynamics, fluid-elastic instabilities.

Propulsion **MA08**

Propulsion concepts for advanced space exploration, propulsion systems analysis, zero and low gravity fluid management, solid rocket motor technology development, hybrid propulsion technology development, combustion stability analysis, health management, reliability, turbo-machinery performance, cryogenic bearing design, engine ignition and transient analysis, combustion analysis, spray combustion experiments, combustion diagnostics, automated control systems, rocket engine testing, and digital/analog data acquisition systems.

Thermal Control and Life Support **MA09**

Closed loop life support analysis/integration/testing, heat pipes/two-phase flow analysis and modeling, avionics cooling, low temperature control/refrigeration development, passive thermal protection concepts and thermal vacuum testing techniques.

Information and Electronic Systems/Avionics **MA10**

Electrical systems, electrical power systems and components, solar power, high-rate and high-density data acquisition, audio and video systems, radio frequency and laser communication, lidar, antenna systems, flight computers and related ground support equipment, flight electronic packaging, life-cycle software engineering, math models, system and subsystem flight simulations, software development and management, fault tolerant logic systems, electronic device failure analysis techniques, optical instruments and systems, optical metrology, optical fabrication, and photographic processes.

Automation and Robotics **MA11**

Automation techniques (all Avionics disciplines), knowledge-based AI/Expert Systems development and implementation, robotics, telerobotics, and robotics system simulations.

System Analysis and Integration **MA12**

Systems engineering, systems analysis, systems design, integration/verification, orbital mechanics, optimization, trajectory optimization, mission design, guidance schemes, navigation methods, EMC/EMI analyses and modeling, Space Station support for lunar base/Mars mission, and configuration management techniques.

Systems Safety Engineering **MA13**

Hazard identification and control, probabilistic risk assessment, fault-tree analysis, interactive hazard information tracking. Automated assessment techniques, reliability engineering, statistical modeling, failure mode analysis.

Quality Engineering **MA14**

Application of quality function deployment, design of experiments for process characterization, program quality cost studies, application of statistical process control methods.

Testing and Experimentation **MA15**

Non-destructive evaluation of structures under dynamic loads, holographic and optical techniques, experimental astrophysics, vacuum system design.

Advanced Mission Studies **MA16**

Conceptual design of advanced launch and orbital vehicles, large optical systems, laser power beaming, geostationary facilities, crewed lunar and Mars missions, and scientific spacecraft.

Mission Operations **MA17**

Resource analysis, operations planning and integration, flight systems operations, data management, crew procedures, human/systems integration, mission design, ground control systems design, development and operation, communications systems, training systems design, development and operations, flight and ground crew training, human-systems development and development of analytical tools such as virtual reality.

Stennis Space Center (ST)

Earth Science Research Applications **ST01**

Among the activities that will be conducted in this program as NASA's lead center for Earth Science Research Applications is the selection of relevant research and the validation and verification of remote sensing data acquired from a range of sensors that may lead to successful applications in four theme areas: (1) Environmental Quality which covers both air and water quality, and the effect of natural and man-made changes in the landscape on the environment. (2) Resource Management including natural resource as well as renewable economic resources such as agriculture, forestry, and fisheries. (3) Community Development focusing on land use, transportation, infrastructure, cultural and recreational resources, and issues of quality of life in our communities. (4) Disaster Management which encompasses natural disasters, such as volcanic eruptions, earthquakes, severe weather and floods, as well as ecological issues related to the health of human, plant and animal communities.

Propulsion Test Research in Thermal and Acoustic Environment – Prediction and Control **ST02**

Testing of large rocket engines produces damaging thermal and acoustic environments on facilities and the test articles. Advanced prediction and mitigation technologies for these environments are needed. Test programs for rocket propulsion systems employ very large flame deflectors and diffusers to control, deflect, cool, condition, and reduce the sound level of the plume. Innovative thermal protection tiles, coatings, materials, and insulation systems could result in significant savings.

Propulsion Systems Testing Techniques **ST03**

A flexible, dynamic fluid flow simulation tool is desired for rocket engine ground testing programs. An effort is ongoing to develop an engine testing facility model that can be run real-time prior to testing of an engine or engine component to predict facility response. Integration of data acquisition and control to provide closed loop, real time simulation of the control system during a test is also needed.

Instrumentation and Control **ST04**

Research to develop new instrumentation technologies and techniques for test facility monitoring and control during propulsion testing.

Rocket Engine Health Monitoring **ST05**

Research opportunities are available to quantify failure and wear of rocket engines through exhaust plume diagnostics experimentation. Theoretical and experimental studies are being conducted with emission and absorption spectroscopy, laser induced florescence and other non-intrusive methods.

Self-pumping Supersonic Diffusers **ST06**

Design methodologies, design tools, innovative designs, and/or operational techniques for self-pumping, supersonic diffusers for altitude testing of rocket engines are needed to reduce ground testing costs and test stand activation times.

APPENDIX K

SELF-IDENTIFICATION OF HANDICAP

(See instructions and Privacy Act information on reverse)

Last Name, First Name, Middle Initial	Birth Date *(Mo./Yr.)*	Social Security Number	ENTER CODE HERE →

DEFINITION OF A HANDICAP: A person is handicapped if he or she has a physical or mental impairment which substantially limits one or more major life activities; has a record of such impairment; or is regarded as having such impairment. Those handicaps that are to be reported are listed below (codes in bold numbers 13 through 94). In the case of multiple impairments, choose the code which describes the impairment that would result in the most substantial limitation.

TO THE EMPLOYEE: Self-identification of handicap status is essential for effective data collection and analysis. The information you provide will be used for statistical purposes only and will not in any way affect you individually. While self-identification is voluntary, your cooperation in providing accurate information is critical.

01 I do not wish to identify my handicap status. *(Please read the employee note above and the reverse side of this form before using this code.)* (Note: Your personnel officer may use this code if, in his or her judgment, you used an incorrect code.)

05 I do not have a handicap.

06 I have a handicap but it is not listed below.

SPEECH IMPAIRMENTS

13 Severe speech malfunction or inability to speak; hearing is normal *(Examples: defects of articulation [unclear language sounds]; stuttering; aphasia [impaired language function]; laryngectomy [removal of the "voice box"])*

HEARING IMPAIRMENTS

15 Hard of hearing *(Total deafness in one ear or inability to hear ordinary conversation, correctable with a hearing aid)*

16 Total deafness in both ears, with understandable speech

17 Total deafness in both ears, and unable to speak clearly

VISION IMPAIRMENTS

22 Ability to read ordinary size print with glasses, but with loss of peripheral (side) vision *(Restriction of the visual field to the extent that mobility is affected—"Tunnel vision")*

23 Inability to read ordinary size print, not correctable by glasses *(Can read oversized print or use assisting devices such as glass or projector modifier)*

24 Blind in one eye

25 Blind in both eyes *(No usable vision, but may have some light perception)*

MISSING EXTREMITIES

27 One hand
28 One arm
29 One foot
32 One leg
33 Both hands or arms
34 Both feet or legs
35 One hand or arm *and* one foot or leg
36 One hand or arm *and* both feet or legs
37 Both hands or arms *and* one foot or leg
38 Both hands or arms *and* both feet or legs

NONPARALYTIC ORTHOPEDIC IMPAIRMENTS

(Because of chronic pain, stiffness, or weakness in bones or joints, there is some loss of ability to move or use a part or parts of the body.)

44 One or both hands
45 One or both feet
46 One or both arms
47 One or both legs
48 Hip or pelvis
49 Back
57 Any combination of two or more parts of the body

PARTIAL PARALYSIS

(Because of a brain, nerve, or muscle problem, including palsy and cerebral palsy, there is some loss of ability to move or use a part of the body, including legs, arms, and/or trunk.)

61 One hand
62 One arm, any part
63 One leg, any part
64 Both hands
65 Both legs, any part
66 Both arms, any part
67 One side of body, including one arm and one leg
68 Three or more major parts of the body *(arms and legs)*

COMPLETE PARALYSIS

(Because of a brain, nerve, or muscle problem, including palsy and cerebral palsy, there is a complete loss of ability to move or use a part of the body, including legs, arms, and/or trunk.)

70 One hand
71 Both hands
72 One arm
73 Both arms
74 One leg
75 Both legs
76 Lower half of body, including legs
77 One side of body, including one arm and one leg
78 Three or more major parts of the body *(arms and legs)*

OTHER IMPAIRMENTS

80 Heart disease with no restriction or limitation of activity *(History of heart problems with complete recovery)*

81 Heart disease with restriction or limitation of activity

82 Convulsive disorder *(e.g., epilepsy)*

83 Blood diseases *(e.g., sickle cell anemia, leukemia, hemophilia)*

84 Diabetes

86 Pulmonary or respiratory disorders *(e.g., tuberculosis, emphysema, asthma)*

87 Kidney dysfunctioning *(e.g., if dialysis [Use of an artificial kidney machine] is required)*

88 Cancer—a history of cancer with complete recovery

89 Cancer—undergoing surgical and/or medical treatment

90 Mental retardation *(A chronic and lifelong condition involving a limited ability to learn, to be educated, and to be trained for useful productive employment as certified by a State Vocational Rehabilitation agency under section 213.3102(t) of Schedule A)*

91 Mental or emotional illness *(A history of treatment for mental or emotional problems)*

92 Severe distortion of limbs and/or spine *(e.g., dwarfism, kyphosis [severe distortion of back])*

93 Disfigurement of face, hands, or feet *(e.g., distortion of features on skin, such as those caused by burns, gunshot injuries, and birth defects [gross facial birthmarks, club feet, etc.])*

94 Learning disability *(A disorder in one or more of the processes involved in understanding, perceiving, or using language or concepts [spoken or written]; e.g., dyslexia)*

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Standard Form 256 (Rev. 8/87)
U.S. Office of Personnel Management
FPM Supplement 296-1

The Rehabilitation Act of 1973 (P.L. 93-112) requires each agency in the Executive branch of the Federal Government to establish definite programs that will facilitate the hiring, placement, and advancement of handicapped individuals. The best means of determining agency progress in this respect is through the production of reports at certain intervals showing such things as the number of handicapped employees hired, promoted, trained, or reassigned over a given time period; the percentage of handicapped employees in the work force and in various grades and occupations; etc. Such reports bring to the attention of agency top management, the Office of Personnel Management (OPM), and the Congress deficiencies within specific agencies or the Federal Government as a whole in the hiring, placement, and advancement of handicapped individuals and, therefore, are the essential first step in improving these conditions and consequently meeting the requirements of the Rehabilitation Act.

The handicap data collected on employees will be used only in the production of reports such as those previously mentioned and not for any purpose that will affect them individually. The only exception to this rule is that the records may be used for selective placement purposes and selecting special populations for mailing of voluntary personnel research surveys. In addition, every precaution will be taken to ensure that the information provided by each employee is kept in the strictest confidence and is known only to the one or two individuals in the agency Personnel Office who obtain and record the information for entry into the agency's and OPM's personnel systems. You should also be aware that participation in the handicap reporting system is entirely voluntary, **with the exception of employees appointed under Schedule A, section 213.3102(t) (Mental Retardation); Schedule A, section 213.3102(u) (Severely Physically Handicapped); and Schedule B, section 213.3202(k) (Mentally Restored).** These employees will be requested to identify their handicap status and if they decline to do so, their correct handicap code will be obtained from medical documentation used to support their appointment. No other employees will be required to identify their handicap status if they feel for any reason it is not in their best interest to have this information officially recorded outside of medical records. We request only that anyone not wishing to have this information entered in the agency's and OPM's personnel systems indicate this to their Personnel Office, rather than intentionally miscoding themselves, since false responses will seriously damage the statistical value of the reporting system.

[In those instances where the employee is or was hired under Schedule A, section 213.3102(t) (Mental Retardation), the Personnel Director or his/her designee (a Vocational Rehabilitation Counselor may also be helpful) **will assist the individual in completing this form and ensure that the employee fully understands the meaning of the form and the options available to him/her, as noted above.**]

Employees will be given every opportunity to ensure that the handicap code carried in their agency's and OPM's personnel systems is accurate and is kept current. They may exercise this opportunity by asking their Personnel Officer to see a printout of the code and definition from their record, by notifying Personnel any time their handicap status changes, and by initiating action in either of these cases to have the necessary changes made to their records. The code carried on employees in their agency's system will be identical to that carried in OPM's system, and any change to the agency records will result in the same change being made to OPM's records.

Your cooperation and assistance in establishing and maintaining an accurate and up-to-date handicap report system is sincerely appreciated.

PRIVACY ACT STATEMENT

Collection of the requested information is authorized by the Rehabilitation Act of 1973 (P.L. 93-112). The information you furnish will be used for the purpose of producing statistical reports to show agency progress in hiring, placement, and advancement of handicapped individuals and to locate individuals for voluntary participation in surveys. The reports will be used to inform agency top management, the Office of Personnel Management (OPM), the Congress, and the public of the status of programs for employment of the handicapped. All such reports will be in the form of aggregate totals and will not identify you in any way as an individual.

Solicitation of your Social Security Number (SSN) is authorized by Executive Order 9397, which requires agencies to use the SSN as the means for identifying individuals in personnel information systems. Your SSN will only be used to ensure that your correct handicap code is recorded along with the other employee information that your agency and OPM maintain on you. Furnishing your SSN or any other of the requested data for this collection effort is voluntary and failure to do so will have no effect on you. It should be noted, however, that where individuals decline to furnish their SSN, the SSN will be obtained from other records in order to ensure accurate and complete data.

Employees appointed under Schedule A, section 213.3102(t) (Mental Retardation), Schedule A, section 213.3102(u) (Severely Physically Handicapped), or Schedule B, section 213.3202(k) (Mentally Restored) are requested to furnish an accurate handicap code, but failure to do so will have no effect on them. Where employees hired under one of these appointments fail to disclose their handicap, however, the appropriate code will be determined from the employee's existing records or medical documentation submitted to justify the appointment.

Standard Form 256 *BACK*
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