

**SCIENCE AERONAUTICS AND TECHNOLOGY  
FISCAL YEAR 1998 ESTIMATES  
BUDGET SUMMARY**

**ACADEMIC PROGRAMS EDUCATION PROGRAMS**

**SUMMARY OF RESOURCES REQUIREMENTS**

<b>ACADEMIC PROGRAMS EDUCATION PROGRAMS</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
<a href="#">Student support programs</a>	10,400	10,000	9,400
<a href="#">Teacher/faculty preparation and enhancement programs</a>	14,800	14,000	13,400
<a href="#">Support for system change</a>	26,400	24,800	24,100
<a href="#">Educational technology</a>	9,200	16,100	7,900
<a href="#">Evaluation</a>	700	700	700
<b>Total</b>	<b>61,500</b>	<b>65,600</b>	<b>55,500</b>

<b>Distribution of Program Amount by Installation</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
Johnson Space Center	1,100	1,300	1,300
Kennedy Space Center	400	500	500
Marshall Space Flight Center	2,100	3,300	3,400
Stennis Space Center	1,200	1,200	1,200
Ames Research Center	3,600	3,000	3,100
Langley Research Center	1,000	1,100	1,200
Lewis Research Center	900	1,900	1,000
Dryden Flight Research Center	200	200	300
Goddard Space Flight Center	3,900	42,200	32,500
Jet Propulsion Laboratory	800	900	1,000
Headquarters	46,300	10,000	10,000
<b>Total</b>	<b>61,500</b>	<b>65,600</b>	<b>55,500</b>

**SCIENCE, AERONAUTICS AND TECHNOLOGY  
FISCAL YEAR 1998 ESTIMATES**

**ACADEMIC PROGRAMS  
EDUCATION PROGRAMS**

**PROGRAM GOALS**

- NASA's vision for education is set forth in the NASA Strategic Plan as one of the four strategic outcomes for the Agency:

*To promote the pursuit of educational excellence by involving "the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds."*

This outcome is accomplished through implementation of a full range of NASA education programs which contribute to the various efforts and activities of those involved with and in the education community, and benefit the participants as well as advance the mission of the Agency.

**STRATEGY FOR ACHIEVING GOALS**

In carrying out its education programs, NASA is particularly cognizant of the powerful attraction the NASA mission holds for students and educators. The unique character of NASA's exploration, scientific, and technical activities has the ability to captivate the imagination and excitement of students and teachers, and channel this into education endeavors which support the National Education Goals, specifically to make American students first in the world in science and mathematics achievements.

In fulfilling its role to support excellence in education as set forth in the NASA Strategic Plan, the NASA Education Program brings students and educators into its missions and its research as participants and partners. NASA provides the opportunity for teachers and students to experience first hand involvement with NASA's scientists and engineers, its facilities, and research and development activities. The participants benefit from the opportunity to participate in research and development endeavors, gain an understanding of the breadth of NASA's activities, and return to the classroom with excitement to share with the entire education community. NASA contributes to promoting excellence in education by sharing access and involvement in the NASA mission. Underpinning the entire Education Program is the commitment to involve participants from diverse and underrepresented populations in the science, mathematics and technology pipeline.

NASA remains an involved member of the National Science and Technology Council

(NSTC)/Committee on Education and Training (CET). NASA's education activities are fully supportive of the NSTC Education Strategic Plans and the National Education Goals, three of which relate to mathematics and science education.

## NASA's Strategic Plan for Education

In 1993, NASA issued its first education strategic plan, NASA's Strategic Plan for Education: A Strategy for Change: 1993-1998. This roadmap set forth a comprehensive process to redirect and change the focus of the NASA Education Program. The key goals for NASA's Education Program are:

- To maintain that segment of NASA's current education program -- hereinafter referred to as the base or core program -- that is judged to be effective, based on internal and external customer measures of success. Such maintenance involves individual program revision, expansion, or elimination.
- To implement new education reform initiatives which specifically address NASA mission requirements, national education reform, and NSTC priorities.
- To significantly expand the impact of the NASA education program by developing partnerships with external constituencies.
- To articulate, develop, and implement a NASA education program and evaluation framework.

These goals are supported by enabling activities and management priorities to guide the change process. Since its publication, all NASA field centers and many enterprises have developed center/enterprise-specific strategic plans that are aligned with and support the Agency plan for education.

In 1994, NASA commissioned the National Research Council (NRC) to prepare a comprehensive set of recommendations for the organization and definition of these goals and enabling systems in accord with the management priorities that had been articulated. The NRC report, NASA's Education Programs: Defining Goals and Assessing Outcomes recommended a set of categories for integrating NASA's education goals with the mission of the agency and established the foundation for a solid evaluation program. Working with the NRC recommendations and the principles set forth in the NASA Education Strategic Plan, an agency framework for education programs and evaluation was established in 1994.

This framework integrates NASA's education programs, which touch the entire range of the education "customer" community, with the programmatic activities of NASA's Enterprises. Each category identifies a goal which reflects its role in relationship to the NASA mission, and

is supported by performance measures for evaluation. These categories are:

- Student Support
- Teacher/Faculty Preparation and Enhancement
- Comprehensive/ Systemic Change
- Curriculum Support and Dissemination
- Educational Technology

Evaluation is an integral element of all five categories. The measures to be used to evaluate the performance of NASA's Education Program are based on the goals set out in the NASA Education Framework. Data is being collected to ascertain the levels of actual accomplishment based on the measured outcomes, using data collected from program participants during the programs, from follow-up studies, and from selected in-depth studies. NASA's evaluation system includes measures that:

- 1)Collect and analyze a full range of statistics describing the target population captured.
- 2)Collect and analyze a full range of program performance indicators which include program characteristics, content, processes, and practices.
- 3)Collect and analyze end-of-program and follow-up participant evaluation of programs, covering content; teaching techniques and tools; program value, presentations, processes, and materials; and recommendations and suggestions.
- 4)Collect and analyze a full range of statistics describing supplementary materials, type and distribution.
- 5)Collect and analyze participant description of products and services covering content, value, presentation, processes, use, and recommendations and suggestions.
- 6)Collect and analyze a full range of service performance indicators which include service characteristics, content, processes, and use.

An evaluation program of this scope and complexity cannot be implemented in a single stage. The program starts with NASA-wide programs coordinated from Headquarters and will include center-unique and enterprise-unique programs on an incremental basis, providing for a constant cycle of input, output, evaluation and change aimed at continuous improvement over the entire experience base. A beta test of standard data collection systems and instruments for Agency-wide education programs as well as selected program and center-unique data was conducted in FY 1996. Based on a review of this test, the data gathering instruments will be implemented on agencywide programs in FY 1997; other programs will be brought into the system on a continuing basis.

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## STUDENT SUPPORT PROGRAMS

<b>BASIS OF FY 1998 FUNDING REQUIREMENT (Thousands of Dollars)</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
Elementary and secondary	2,900	2,800	2,600
Higher education	7,500	7,200	6,800
<b>Total</b>	<b>10,400</b>	<b>10,000</b>	<b>9,400</b>

### PROGRAM GOALS

The goals of the Student Support Programs are: to use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for K-12, and undergraduate and graduate students to support the enhancement of knowledge and skills in the areas of science, mathematics, engineering, and technology.

### STRATEGY FOR ACHIEVING GOALS

#### Elementary and Secondary

At the elementary and secondary level, student support activities provide (a) programs which utilize the NASA mission, facilities, and resources; (b) experiences and information that are designed to promote student interest in mathematics, science, engineering and technology; and (c) exposure to research and/or research experiences to promote mathematics, science, engineering and technology awareness. Activities such as the Space Science Student Involvement Program (SSIP) and the Shuttle Amateur Radio Experiment (SAREX) provide general exposure to NASA's mission and stimulate interest in mathematics, science, and technology subject matter. Additional activities such as the Summer High School Apprenticeship Research Program (SHARP and SHARP-PLUS), demonstrate the applications of mathematics, science and technology by providing research experiences for students who traditionally have not been represented in mathematics, science and engineering fields.

#### Higher Education

At the higher education level, student support activities provide undergraduate students exposure to and involvement in research activities; provide experiences that facilitate transition from undergraduate work to graduate studies in NASA-related areas; support students to pursue graduate studies in NASA-related areas; and facilitate continuing professional development and contributions to research in NASA-related disciplines. At the higher

education level, activities such as the Graduate Student Researchers Program (GSRP) provide support to train students in NASA-related disciplines at both the master's and doctoral levels.

**MEASURES OF PERFORMANCE**

<b>Elementary and secondary</b>	<b>FY 1996 Plan</b>	<b>FY 1996 Actual</b>	<b>FY 1997 Plan</b>	<b>FY 1997 Revised</b>	<b>FY 1998 Plan</b>
<b>Space Science Student Involvement Program</b>					
Entries/proposals(student participants)	9,000	8,100	9,000	8,100	7,600
-- Teacher participants	1,200	1,600	1,000	1,600	1,500
-- Schools	N/A	778	N/A	778	725
-- National awards	14	26	14	26	26
<b>SHARP/SHARP-PLUS</b>					
-- Student participants	500	450	500	450	425
<b>SAREX</b>					
-- Student participants	10,000	10,000	10,000	10,000	10,000
<b>Higher education</b>					
<b>Graduate Student Researchers Program</b>					
-- Student participants	510	404	436	400	375
-- Universities	117	108	110	100	95

Currently, program activities in the above categories have a variety of evaluation mechanisms. In FY 1997, a high priority activity will be to further develop and implement key indicators as standards by which all program activities will be measured. These could include such outcomes as change in student interest, career aspirations/awareness, educational aspirations; participation in research activities; persistence to undergraduate or graduate degree; career path; career productivity; participation in other NASA programs and increased participation of underrepresented groups. NASA's education evaluation system (EDCATS) will become fully operational, providing for the collection, analysis, evaluation, and reporting of student support program data and program outcomes throughout the NASA system.

**ACCOMPLISHMENTS AND PLANS**

**Elementary and Secondary**

The student support programs implemented to provide experiences and exposure to NASA's mission are: SHARP/SHARP-PLUS, SSIP and SAREX. These are a series of programs that capture interest in mathematics, science, engineering, and technology, and channel that interest into mathematics, science, engineering, and technology career paths.

In FY 1996, the SHARP/SHARP-PLUS program involved more than 450 underrepresented minority high school students in intensive research apprenticeships with NASA and active industry and university scientists and engineers. SHARP students live within commuting distance of a NASA installation; SHARP-PLUS students have residential research experiences at a participating Historically Black College or University or a Predominately Minority Institution. The goal of both programs is to enhance science, mathematics, engineering, and technology interests and capabilities of students in groups traditionally underrepresented in these fields. In FY 1997, enrichment opportunities will be explored, such as greater involvement in community service projects. In FY 1998, the program will continue, but with fewer student participants due to a projected reduction in the overall budget for student programs.

The Space Science Student Involvement Program (SSIP) is another very effective program managed in collaboration with the National Science Teachers Association, National Council of Teachers of Mathematics, and the International Technology Education Association, that promotes literacy in science, mathematics, and technology among U.S. students in grades 3-12. In FY 1996, more than 1,500 teachers and 8,000 students participated in and entered contests that demonstrated the students' skills in science as well as art, graphics, and writing. By FY 1997, the program will include fourteen competition activities, encompassing all 50 states, Puerto Rico and the District of Columbia through eight geographical regions. In addition, the program will be redesigned to insure closer linkages with the NASA enterprises. In FY 1998, the program will continue in its redesigned state, but with fewer student and teacher participants due to a projected reduction in the overall budget for student programs.

The Shuttle Amateur Radio Experiment (SAREX) provides students the opportunity to participate directly in the Shuttle program through the use of technology. Through actual communication with Shuttle astronauts via amateur radio, and supporting activities, students gain first-hand knowledge of the Shuttle program and its science objectives. SAREX is a mid-deck payload on the Shuttle, and is manifested on 3-5 flights per year, with 3-10 school contacts per flight. This program is accomplished in collaboration with the American Radio Relay League's extensive volunteer network and during FY 1996, involved more than 10,000 students per mission, worldwide. The program is expected to include approximately the same number of students in FY 1997 and FY 1998.

## **Higher Education**

At the higher education level, the GSRP, initiated in 1980, provides graduate fellowships

nationwide to post-baccalaureate U.S. citizens to conduct thesis research. Awards are made to a graduate student for a maximum of three years. On an annual basis, NASA supports approximately 400 graduate students pursuing masters or doctorate degrees in areas compatible with NASA's programs in Earth/space science, aeronautics, and aerospace technology. The request in FY 1997 will maintain the fellowships close to the current level. In addition, linkages will be explored with programs at the precollege level, such as SHARP/SHARP-PLUS, in an effort to broaden the participation of all students in mathematics, science, engineering, and technology fields. The program will continue in FY 1998 but with fewer students supported due to a projected reduction in the overall budget for student programs.

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## **TEACHER/FACULTY PREPARATION AND ENHANCEMENT PROGRAMS**

<b>BASIS OF FY 1998 FUNDING REQUIREMENT (Thousands of Dollars)</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
Elementary and secondary	5,200	5,000	4,700
Higher education	9,600	9,000	8,700
<b>Total</b>	<b>14,800</b>	<b>14,000</b>	<b>13,400</b>

### **PROGRAM GOALS**

The goal of the Teacher/Faculty Preparation and Enhancement Programs is to use the NASA mission, facilities, human resources and programs to provide exposure and experiences to teachers and faculty to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, technology, and engineering.

### **STRATEGY FOR ACHIEVING GOALS**

#### **Elementary and Secondary**

At the elementary and secondary level, preparation and enhancement activities are designed to utilize the NASA strategic enterprises and the process by which new knowledge is discovered to demonstrate the application of mathematics, science and technology in student learning; enhance teachers' capability to design lessons and experiences that use scientific inquiry to affect student learning; encourage a "multiplier" effect to extend the benefits of the in-service program beyond participants to other teachers and students; and provide access to and promote utilization of NASA related materials and information resources. Pre-service programs such as Project NOVA, and in-service programs such as NASA Education Workshops for Elementary School Teachers (NEWEST), NASA Education Workshops for Math, Science,

and Technology Teachers (NEWMAST), and Urban Community Enrichment Program (UCEP) are designed to enhance and improve the teaching of mathematics, science, and technology by demonstrating their applications in aeronautics and space through workshops around the country. The Teaching From Space Program continues to provide instructional products that help support these preparation and enhancement workshops.

### **Higher Education**

At the higher education level, activities are designed to enhance faculty research skills and content knowledge; balance participation so that a cross-section of colleges and universities is represented (i.e., community colleges, four year institutions, institutions that serve significant numbers of underrepresented groups, underfunded institutions); and provide opportunities for curriculum expansion/revision that aligns with the mission needs of NASA and universities. At the higher education level, activities such as the Summer Faculty Fellowship Program (SFFP) and the NASA/University Joint Venture (JOVE) Program provide research experiences for faculty at NASA field centers to further their professional knowledge in the engineering and science disciplines, and to ultimately enhance the undergraduate/graduate curriculum.

### **MEASURES OF PERFORMANCE**

<b>Elementary and secondary</b>	<b>FY 1996 Plan</b>	<b>FY 1996 Actual</b>	<b>FY 1997 Plan</b>	<b>FY 1997 Revised</b>	<b>FY 1998 Plan</b>
<b>Project NOVA</b>					
-- University teams	N/A	33	N/A	33	30
-- Teacher participants	N/A	100	N/A	100	95
<b>NEWEST/NEWMAST</b>					
-- Teacher participants	265	225	250	225	210
<b>STEP</b>					
-- Teacher participants	N/A	300	N/A	300	285
<b>UCEP</b>					
-- Teacher participants	770	958	800	1,243	1,140
-- Schools	N/A	82	N/A	103	95
<b>Teaching from Space</b>					
-- Educational videotapes with resource guides	N/A	3	N/A	3	3
-- Educational videoconferences, reaching 20,000+ teachers	N/A	4	N/A	4	4
-- Other instructional products	N/A	5	N/A	5	5
<b>Higher education</b>					
<b>Summer Faculty Fellowship Program</b>					
-- Faculty participants	314	314	300	275	260
-- Colleges/universities	196	195	180	170	160
<b>JOVE</b>					
-- Faculty participants	178	263	162	263	175
-- Colleges/universities	95	130	89	130	85
<b>Innovative Research</b>					
-- Research grants	22	30	22	30	28

career productivity; participation in other NASA programs; and increased participation of underrepresented groups.

## **ACCOMPLISHMENTS AND PLANS**

### **Elementary and Secondary**

By targeting educators as part of NASA's education strategy, programs such as Project NOVA, NEWEST/NEWMASST, STEP, UCEP, and Teaching from Space, play a significant role in ensuring that students and educators alike are provided today with the tools they will need tomorrow. Teacher preparation programs such as Project NOVA disseminate nationally an undergraduate pre-service model based on standards and benchmarks for science, mathematics, and technology. Teacher enhancement programs provide opportunities for in-service teachers to update their backgrounds and skills in science, mathematics, and technology. NEWEST/NEWMASST provides a leadership opportunity for 225 outstanding teachers; STEP provides actual center laboratory experience for 300 teachers; and UCEP provides more than 900 urban teachers greater exposure to new NASA knowledge. Using multiple formats, Teaching From Space develops products that are incorporated into enhancement activities, providing tools that can be applied in the classroom and disseminated through the Teacher Resource Center Network.

The impact of slightly reduced funding levels in FY 1997 will be evidenced by slightly lower participation rates in workshops or in a reduced number of workshop opportunities. Programs such as NEWEST/NEWMASST will develop an increased emphasis on technology. Other center-based teacher workshops will increase the amount of time spent in a laboratory setting. In an effort to reach a broader population, UCEP programs will be conducted in Tulsa, OK, Wichita, KS, the Territory of Guam, and southern Texas.

In FY 1998, projected budget reductions in teacher preparation and enhancement programs will result in reductions in the number of participants in most programs.

### **Higher Education**

The Summer Faculty Fellowship Program provides highly beneficial opportunities for U.S. citizen engineering and science faculty throughout the Nation to participate in NASA research. This program has contributed significantly to the improvement of both undergraduate and graduate education, and directly benefits NASA, universities, faculty, students and the Nation. Approximately 300 university faculty are supported annually for ten weeks. Evaluations of the program, conducted by the American Society for Engineering Education (ASEE) indicate that approximately 30-40% of the participating faculty subsequently receive NASA research grants or contracts

The Joint Venture (JOVE) Program also provides opportunities for college and university faculty to come to NASA centers to work with NASA data and to enhance research and teaching capabilities. JOVE is managed by the Marshall Space Flight Center, where it was initiated as a pilot program in FY 1989. NASA provides scientific on-line data from space missions, as well as support for electronic work stations and partial faculty and student support. In turn, the universities agree to grant faculty release time, provide student support, and develop an instructional unit on a space science topic. There are currently 130 academic institutions participating, most of whom had little previous contact with the agency.

Since both SFFP and JOVE have similar objectives, i.e., to enhance the research and teaching capabilities of individual faculty members and their institutions, these programs will be reviewed in FY 1997. It is NASA's intent to take the best of both programs -- center research opportunities of SFFP and follow-on opportunities of JOVE -- and create a new program that would begin in FY 1998.

The Innovative Research Program is managed through the Offices of Space Science, Life and Microgravity Sciences and Applications, and Mission to Planet Earth, to support basic and applied research and analysis which is of a highly innovative nature. This program is intended to provide a mechanism for the funding of scientifically sound proposals which might not be funded through normal channels either because of their interdisciplinary nature or because they are speculative or risky. The long-germ goal is to help the new ideas mature to a state of acceptability within a particular science discipline. FY 1996 was the second year of a three year cycle, with 30 grants being funded (out of 612 proposals received). A new group of proposals will be funded in FY 1998, although at slightly reduced levels.

### SUPPORT FOR SYSTEMIC CHANGE

<b><u>BASIS OF FY 1998 FUNDING REQUIREMENT</u></b> <b>(Thousands of Dollars)</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
Aerospace Education Services Program (AESP)	6,200	6,100	5,600
National Space Grant College and Fellowship Program	14,600	13,600	13,300
Experimental Program to Stimulate Competitive Research	4,900	4,500	4,600
Innovative Reform Initiatives	700	600	600
<b>Total</b>	<b>26,400</b>	<b>24,800</b>	<b>24,100</b>

### **PROGRAM GOALS**

The goal of the Support for Systemic Change Program is to support local, state, regional, and

national efforts to enhance the goals of the educational community through individual or collaborative efforts with a range of partners.

Systemic change encompasses the process whereby an entire system is re-engineered toward achieving a new goal. As an example, a superintendent's agenda for change in the public schools might include: school based management; curricula changes to support state standards; increased teacher enhancement support; inclusion of technology access and use by all students; or creation of new student assessment systems. NASA is committed to supporting systemic initiatives in the areas of science and mathematics education, and its activities vary depending on the needs of the institution. Thus, the activities supported by programs included in this category seek to provide a range of support in response to the needs of the customer community

## **STRATEGY FOR ACHIEVING GOALS**

### **Elementary and Secondary**

Support for Systemic Change activities at the elementary and secondary level use NASA personnel and resources to contribute to K-12 mathematics, science, and technology education reform by promoting the involvement of various community sectors; and target a cross-section of schools and organizations which serve a variety of participants, including those from underrepresented groups. A major program at the elementary and secondary education level is the Aerospace Education Services Program (AESP). The AESP's primary focus is teacher enhancement with emphasis on and support for the National Science Foundation's (NSF) and state/local systemic change initiatives.

### **Higher Education**

Support for Systemic Change activities at the higher education level use partnerships, linkages, and collaborations to provide activities and experiences designed to enhance research and educational capabilities, and enhance the collaborative capabilities of a diverse set of academic institutions. Programs such as Space Grant and EPSCoR play a major role in NASA's contribution toward the Nation's systemic educational reform movement.

The Space Grant Program was authorized by Congress in 1987 to increase the understanding, assessment, development, and use of space resources. All 50 states, Puerto Rico, and the District of Columbia have Space Grant Consortium programs in which more than 550 institutions participate. These consortia form a national network of colleges and universities with interests in aerospace research, training, and education. All consortia match their grants at 100% in either dollars and/or cost sharing arrangements (excluding the portion designated for fellowships) to carry out programs of education, public service, and research.

The FY 1993 NASA Authorization Act (P.L. 102-588) directed NASA to initiate a program to strengthen the research capability of states that do not successfully participate in competitive space and aeronautical research activities. The NASA EPSCoR Program, modeled after the National Science Foundation's EPSCoR, provides seed funding that will enable eligible states to develop an academic research enterprise directed toward long-term, self-sustaining, nationally competitive capabilities in space science and applications, aeronautical research and technology, and space research and technology programs. This capability will, in turn, contribute to the state's economic viability.

Systemic change at both elementary and higher education levels is captured in NASA's Innovative Reform Initiatives program which is supportive of standards-based systemic reform efforts and NSTC/CET priorities, and focuses on science, mathematics and technology education. A means of accomplishing systemic reform is through partnerships with professional education associations, national aerospace education associations, industries, other Federal agencies, and state and local groups. When NASA becomes a partner with these groups, its role may be one of leadership, being a participant, or acting as a facilitator to empower and enable wide reaching educational reform that is systemic in nature. An example of these partnerships is NASA's work with the National Alliance of State Science and Math Coalitions (NASSMC).

## MEASURES OF PERFORMANCE

<b>AESP</b>	<b>FY 1996 Plan</b>	<b>FY 1996 Actual</b>	<b>FY 1997 Plan</b>	<b>FY 1997 Revised</b>	<b>FY 1998 Plan</b>
-- Schools visited	2,000	353	1,500	400	365
-- Teacher workshops	2,500	1,914	2,000	2,000	1,850
-- Teacher participants	19,000	20,369	18,500	21,000	19,300
<b>UCEP</b>					
-- Consortia	52	52	52	52	52
-- Institutions	550	550	550	550	550
<b>EPSCoR</b>					
-- Awards	14	6	10	10	10
-- Institutions	N/A	42	N/A	55	55

Currently, program activities in the above categories have a variety of evaluation mechanisms. In FY 1997, a high priority activity will be to further develop and implement key indicators as

standards by which all program activities will be measured. These could include such outcomes as the establishment of partnerships, increased resources, proposals submitted, proposals funded, papers in peer reviewed publications, presentations to professional societies, and new ways of conducting business. NASA's education evaluation system (EDCATS) will become fully operational, providing for the collection, analysis, evaluation, and reporting of comprehensive/support for systemic change program data and program outcomes throughout the NASA system

## **ACCOMPLISHMENTS AND PLANS**

The Systemic Change programs address many different levels within the education community and include AESP, Space Grant, EPSCoR and Innovative Reform Initiatives.

The AESP has been redirected to an emphasis on teacher enhancement, so that specialists are now directly involved in supporting state systemic reform by providing technical linkages to NASA research and development and education programs and services. Funding in FY 1997 and FY 1998 will continue operation of this program, although projected reductions in FY 1998 will result in fewer teacher workshops conducted around the country.

In FY 1997, Space Grant plans will focus on creating effective linkages between components of the Space Grant and EPSCoR Programs, and the NASA Centers. The program will continue in FY 1998, but projected budget reductions will delay planned program enhancements such as increasing the current funding amount for existing consortia, and exploring additional outreach opportunities such as linkages with national extension programs.

FY 1996 marked the third year of the NASA EPSCoR program with continued funding for the original six awardees. These six consortia, in their first 2.5 years of operation, produced 225 refereed papers and were awarded \$62M in successful proposals. The original six awardees were evaluated at the end of FY 1996 to determine their eligibility for an additional two-year award. Five states were evaluated by a panel of NASA officials to be worthy of two additional years of funding. One state will receive at least one additional year, with recommendations for improvement. In addition, 14 proposals were received for the second round of NASA EPSCoR awards, with four new states selected in late FY 1996: Kansas, Nebraska, Oklahoma, and South Carolina. This brings the current number of NASA EPSCoR awardees to 10. Funding levels for FY 1997 and FY 1998 will maintain the current program with no new solicitations planned.

NASA's Innovative Reform Initiatives program supports standards-based systemic reform efforts and priorities, and focuses on science, mathematics and technology education. To prevent duplication and to strengthen the impact of systemic reform initiatives, NASA confers with other Federal agencies and national organizations who are also working with educational systemic reform, including the National Science Foundation, Education Department, National

Research Council, National Science Teachers Association, National Council of Teachers of Mathematics, International Technology Education Association, Council of Chief State School Officers, and the Smithsonian Institution. Systemic reform initiatives are accomplished through partnerships with local, state, and national stakeholders including professional education associations, national aerospace education associations, industries, education agencies, and other interest groups. When NASA becomes a partner with these groups, its role varies between providing supportive leadership, being a complementary participant, or acting as a facilitator to empower and enable wide reaching educational reform that is systemic in nature. Examples of these partnerships are the National Alliance of State Science and Math Coalitions (NASSMC), the Council of State Science Supervisors (CS3), the NASA Industry Education Initiative (NIEI), the Tri-State Education Initiative (TSEI), and the Aerospace Education Alliance. These partnerships are each mutually beneficial in creating systemic change by increasing the customer and support bases for both NASA and the partnering stakeholder.

NASA's Education Division held a workshop in late calendar year 1996, in partnership with NASSMC, entitled "Linking Leaders for Systemic Reform." This workshop brought together NASA principal investigators, education, science and mathematics coalition leaders from the states of Ohio, Mississippi, and Colorado to focus on systemic change in those states. The Division is also supporting a week-long training workshop for the Council of State Science Supervisors (CS3) at NASA's Classroom of the Future to enhance participants' understanding of NASA discoveries and to provide training in the effective utilization of technology in the learning process. This workshop was requested by CS3. Similar opportunities will be explored in FY 1997 and FY 1998.

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## **EDUCATIONAL TECHNOLOGY**

<b>BASIS OF FY 1998 FUNDING REQUIREMENT (Thousands of Dollars)</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
Learning tools	2,000	2,000	1,900
Demonstrations	2,000	2,000	1,800
HPCC	2,200	1,400	4,200
South Dakota Discovery Center	1,500	--	--
Montana State University Teacher Resource Center	1,000	--	--
Network for Education and Research in Oregon (NERO)	500	--	--
National Prototype Space Education Curriculum	--	1,600	--
Museum Initiative/American Museum of Natural History	--	8,000	--
Upgrades to Mobile Aeronautics Education Lab	--	300	--
Feasibility Study, National Residential High School, LeRC	--	250	--
Replication of Science, Engineering, Mathematics and Engineering Academy (SEMMA)	--	250	--
Classroom of the Future, Astronomy Village	--	300	--
<b>Total</b>	<b>9,200</b>	<b>16,100</b>	<b>7,900</b>

## **PROGRAM GOALS**

The goal of the Educational Technology program is to use the unique assets of NASA to provide products and services that facilitate the application of technology to enhance the educational process for formal education and lifelong learning.

- 1) *Astronomy Village*, a multimedia program for 9-12 grade science;
- 2) *BioBLAST*, a multimedia/network program for high school biology;
- 3) *Tools of Aeronautical research*, a high school physical science program;
- 4) *Liftoff to Learning*, a series of videotapes featuring onboard sequences videotaped on the Space Shuttle; and
- 5) *Virtual Exploration of Mars*, a learning tool based on virtual reality technology.

NASA Spacelink, an interactive network system for educators, and the videoconference series, On the Cutting Edge, address the second pillar. Additionally, all learning tools are designed to include a teacher training component.

The NASA Classroom of the Future continues to be the major component of the educational technology program. The role of the COTF is to translate NASA technologies and research results into learning tools, demonstrations, and teacher enhancement programs which support standards-based education reform.

The Center-based K-12 Internet Initiative, which is part of the HPCC program, provides demonstration projects and on-line systems dedicated to bringing real NASA science to teachers and students in the classroom, using examples from NASA's unique missions. The goal of this program is to accelerate the implementation of a national information infrastructure through NASA science, engineering, and technology contributions and facilitate the use and technologies of the infrastructure within the K-12 education systems. NASA, led by Ames Research Center, organizes various interactive on-line projects that connect classrooms with ongoing science and engineering work. The projects provide real and relevant content to enhance classroom curriculums. For example, Live from the Hubble Space Telescope provided students the opportunity to interact with scientists using the HST to make new astronomical discoveries.

## **MEASURES OF PERFORMANCE**

Teacher Resource Center Network	200,000 + users at 73 locations in 47 states
NASA Spacelink	1,363,000 total sessions; 208,000 sessions averaging 20 minutes/session from 1,800 registered educator accounts
HPCC/IITA	25 World Wide Web sites ("Quest", Passport to Knowledge - Live From..." series 2000 schools involved in K-12 aeronautics cooperative agreements

## ACCOMPLISHMENTS AND PLANS

Educational Technology activities support the development of high quality, affordable learning tools and environments (e.g., CD-ROM databases, live or taped video, computer software, multimedia systems, virtual reality) and supplementary instructional materials. These tools use existing technology as well as emerging technologies to facilitate education programs.

Demonstrations of innovative, efficient, and effective technology and networking applications are also supported. For example, NASA Spacelink recorded 1,363,000 total sessions with 208,000 sessions averaging 20 minutes/session from over 1,800 registered educator accounts and several affordable networking technology projects have been demonstrated. Classroom of the Future continues to be NASA's major educational technology program.

NASA's Educational Technology program includes the center-based components of the High Performance Computing and Communications/Information Infrastructure Technology and Applications (HPCC/IITA) program. One of the goals of this program is to demonstrate how newly emerging communication technologies can be used to bring NASA's science and engineering data to schools and the public. The seven center-based projects have made extensive amounts of Earth, space, and aeronautics information available on the Internet. Several of our Internet sites have received a top score from one or more independent rating services. These sites include: "Quest -- K-12 Internet Initiative" and "Passport to Knowledge". Through this program, collaborations are maintained with and support provided to 2,600 schools across the country.

In FY 1997, the Educational Technology program will begin the development of a virtual education server, incorporating services such as Spacelink and the HPCC/IITA sites, as well as

Funding is included in FY 1996 to support three activities directed by Congress in the Conference Report accompanying H.R. 2099: Science/Discovery Center in South Dakota, Teacher Resource Center at Montana State University, and additional funding for the Network for Engineering and Research in Oregon (NERO). Funding is included in FY 1997 for the following activities directed by Congress in the Conference Report accompanying the FY 1997 VA-HUD-Independent Agencies Appropriation Act (P.L. 104-204): National Prototype Space Education Curriculum in conjunction with the Bishop Museum in Hawaii; further development of the American Museum of Natural History/national center for science, literacy, education and technology; Upgrades to Mobile Aeronautics Education Lab.; feasibility study to create a national residential high school at the Lewis Research Center; Replication of the Science, Engineering, Mathematics, and Aeronautics Academy (SEMMA) Program at Cuyahoga Community College; and increase learning effectiveness of the Classroom of the Future, by assessing and improving student scientific inquiry abilities using the Astronomy Village Program.

### EVALUATION

<b>BASIS OF FY 1998 FUNDING REQUIREMENT (Thousands of Dollars)</b>	<b>FY 1996</b>	<b>FY 1997</b>	<b>FY 1998</b>
Evaluation	700	700	700

### **PROGRAM GOALS**

The goal of the evaluation program is: to provide documented evidence of the degree to which NASA's educational program, with its associated projects and activities, has accomplished its goals; and to develop a systematic strategy for collecting, aggregating, and reporting evaluation indicator data.

### **STRATEGY FOR ACHIEVING GOALS**

NASA has undertaken a comprehensive effort to evaluate its education programs in order to demonstrate the accomplishment of achievable and measurable goals and objectives. Although every NASA education program currently has an evaluation component, a set of standard, agencywide indicators, metrics, and evaluation instruments is being developed for agencywide use. The data will be collected on-line in a single database capable of providing correlation and report generation capability. External education evaluation experts have also been engaged to provide guidelines and criteria for the analysis of qualitative and quantitative data to facilitate an in-depth survey of various programs offering recommendations and suggestions about the instruments in development.

## **MEASURES OF PERFORMANCE**

NASA is currently developing and testing a comprehensive system to evaluate its education programs in order to demonstrate the accomplishment of achievable and measurable goals and objectives. Based on recommendations provided by a study of NASA Education Program by the National Research Council (NRC), NASA has established program goals, defined a comprehensive Education Framework which captures the elements of NASA's Education Program. This framework is detailed in NASA's *Strategic Plan for Education*, and supported by strategic plans developed by the Enterprises and NASA Field Installations. NASA will utilize an Internet-based system, for the collection, analysis, evaluation and reporting of standard and program unique data and program outcomes for all NASA education programs. This system, the Education Computer-Aided Tracking System (EDCATS), is currently in the test phase, using data from a selected group of national programs. This system will provide overall data and some in-depth data for FY 1997.

## **ACCOMPLISHMENTS AND PLANS**

NASA's education evaluation system (EDCATS) will become fully operational in FY 1997, adding programs incrementally until all NASA education programs are included. As programs compile a firm set of baseline data, selected annual program targets will be established, as needed or required. Funding included in FY 1997 and FY 1998 will support the gradual expansion of the EDCATS data base to encompass all of NASA's Education programs.