

SCIENCE AERONAUTICS AND TECHNOLOGY

FISCAL YEAR 2000 ESTIMATES

BUDGET SUMMARY

ACADEMIC PROGRAMS

EDUCATION PROGRAM

SUMMARY OF RESOURCES REQUIREMENTS

	FY 1998 OPLAN <u>9/29/98</u>	FY 1999 OPLAN <u>12/22/98</u>	FY 2000 PRES <u>BUDGET</u>	Page <u>Number</u>
	(Thousands of Dollars)			
Student support programs	8,900	8,600	8,600	SAT 6.1-7
Teacher/faculty preparation and enhancement programs.....	12,900	12,800	12,800	SAT 6.1-9
Support for systemic improvement of education.....	29,900	35,300	24,300	SAT 6.1-12
Educational technology.....	24,400	14,200	7,700	SAT 6.1-16
Evaluation.....	<u>700</u>	<u>700</u>	<u>700</u>	SAT 6.1-19
Total.....	<u>76.800</u>	<u>71.600</u>	<u>54.100</u>	

Distribution of Program Amount by Installation

Johnson Space Center.....	1,100	1,300	1,300
Kennedy Space Center.....	600	800	800
Marshall Space Flight Center.....	2,200	2,800	2,800
Stennis Space Center.....	500	900	900
Ames Research Center.....	6,700	3,900	3,900
Langley Research Center.....	1,200	1,200	1,200
Glenn Research Center.....	1,000	1,100	1,100
Dryden Flight Research Center.....	200	500	500
Goddard Space Flight Center.....	52,200	48,300	30,800
Jet Propulsion Laboratory.....	1,500	1,400	1,400
Headquarters.....	<u>9,600</u>	<u>9,400</u>	<u>9,400</u>
Total.....	<u>76.800</u>	<u>71.600</u>	<u>54.100</u>

SCIENCE, AERONAUTICS AND TECHNOLOGY

FISCAL YEAR 2000 ESTIMATES

ACADEMIC PROGRAMS

EDUCATION PROGRAM

PROGRAM GOALS

NASA's direction for education is set forth in the NASA Strategic Plan as one of the Agency's five contributions to the Nation's science and technology goals and priorities:

***Educational Excellence.** We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds.*

This contribution is accomplished through implementation of a full range of NASA education programs and activities that 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. Progress towards this goal is measured in two ways:

- **Excellence:** NASA seeks to be judged by its customer, the education community, as providing excellent and valuable educational programs and services. Therefore we will attempt to maintain an "Excellence" rating ranging between 4.3 and 5.0 (on a 5.0 scale) as rated by our customers.
- **Involvement:** NASA strives to involve the educational community in our endeavors. Therefore, at the proposed funding level, we seek to maintain a current level of participant involvement of approximately 3 million with the education community, including teachers, faculty, and students.

STRATEGY FOR ACHIEVING GOALS

In carrying out its Education Program, 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, teachers, and faculty, and channel this into education endeavors which support local, state, and national educational priorities.

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 educators and students to experience first hand involvement with NASA's scientists and engineers, facilities, and research and development activities. The participants benefit from the opportunity to become involved in research and development endeavors, gain an understanding of the breadth of NASA's activities, and return to the classroom with enhanced knowledge and skills to share with the education community. NASA contributes to promoting excellence in education by providing access to 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 Implementation Plan for Education

The NASA Implementation Plan for Education, one component of the NASA Strategic Management System, provides general guidance for the implementation and continual improvement of the NASA Education Program for fiscal years 1999-2003. Specifically, the plan

- Identifies three leadership strategies to improve and guide the NASA Education Program: (1) contribute to educational excellence; (2) develop alliances; and (3) involve the education community.
- Outlines the education agenda for the next five years through seven improvement initiatives: (1) focus and coordinate state-based efforts; (2) enhance instructional products and dissemination; (3) improve education program integration and coordination; (4) facilitate NASA research in the higher education community; (5) support pre-service education; (6) target informal education; and (7) implement NASA's comprehensive data collection and evaluation system.
- Delineates the operating principles integral to the conduct of all NASA education activities: customer focus; collaboration; diversity; and evaluation.
- Defines the NASA Education Program and Evaluation Framework, the basis from which our agency-wide and center-based programs are organized, implemented, and evaluated.
- Describes the roles and responsibilities of the various organizational entities that carry out the NASA Education Program.

This plan provides guidance for agency-wide education programs as well as programs and activities carried out by the NASA Enterprise Offices, the Office of Equal Opportunity Programs, and the NASA field centers.

SCHEDULES & OUTPUTS

The NASA Education Program and Evaluation Framework was established to serve as a model to guide the implementation and evaluation of NASA's Education Program. The framework was first proposed based on a study conducted by a panel of distinguished experts in education and evaluation. The National Research Council convened this panel in 1994 and produced the report, *NASA's Education Programs: Defining Goals, Assessing Outcomes*, which provided general guidance to NASA on establishing program goals and evaluation indicators. On November 30, 1994, the proposed framework was presented to NASA education personnel, including Center Education Directors, the Director of Minority University Research and Education Programs, the Center University Affairs Officers, the Center Pre-College Officers, and the Center Equal Employment Opportunity Officers at a meeting held at the NASA Johnson Space Center. This meeting resulted in Agency-wide consensus on the framework and the establishment of goals for each implementation approach. From that time until now, the framework has been refined and updated, reflecting direction defined in the NASA Strategic Plan.

This framework integrates NASA's Education Program, which touches the entire range of the education "customer" community, with the programmatic activities of NASA's Enterprises. Each category identifies a goal that reflects its role in relationship to the NASA mission, and is supported by performance measures for evaluation. These categories are:

- Student Support

Goal: To use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, mathematics, technology, and geography.

- Teacher/Faculty Preparation and Enhancement

Goal: To use the NASA mission, facilities, human resources, and programs to provide exposure and experiences to educators and faculty to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, technology, and geography.

- Support for Systemic Improvement of Education

Goal: To use NASA's unique assets to support local, state, regional, and national science, mathematics, technology, engineering, and geography education change efforts through collaboration with internal and external stakeholders.

- Curriculum Support and Dissemination

Goal: To develop, utilize, and disseminate science, mathematics, technology, and geography instructional materials based on NASA's unique mission and results, and to support the development of higher education curricula.

- Educational Technology

Goal: To research and develop products and services that facilitate the application of technology to enhance the educational process for formal and informal education and lifelong learning.

- Research and Development

Goal: To involve the education community, particularly higher education, in NASA programs that contribute to the development of new knowledge in support of the NASA mission, and to utilize the talent and resources of the higher education community.

During FY 1998, NASA has further refined and implemented the framework and the evaluation system that was pilot tested in FY 1996. Three levels of performance measures have been developed. At the top level, all programs have measures that relate to the Program's primary metrics: excellence and involvement. Data showing progress towards these metrics are provided below. At the second level, each implementation approach has specific measures that all programs in that particular category are measured against such as career goals, program value, curriculum integration/use, standards awareness and utilization, overall quality, partnerships/alliances, service quality, and usage. At the third level, each program, in addition to the applicable second level measures, has program specific measures that show progress as well as participant written feedback that provides qualitative evaluation data.

Progress Towards Metrics

In FY 1998, the NASA evaluation system was able to collect data on most of the Agency wide education programs, and many center-specific programs and activities. The data summary below is a roll up of top-level measures that relate to the Education Program's two metrics -- excellence and involvement. The data is for FY 1998, as of 11/18/98. This is still considered preliminary as data roll up continues until January 1999.

- **Excellence**: NASA seeks to be judged by its customer, the education community, as providing excellent and valuable educational programs and services. Therefore we will attempt to maintain an "Excellence" rating ranging between 4.3 and 5.0 (on a 5.0 scale) as rated by our customers.

Progress towards this metric is measured by a quality rating by the educational customer of NASA's performance. The following data were collected:

Participant ratings of excellence (score: 5=excellent to 1=very poor; total participants reporting: 2,200)

- 4.70 Recommend to others
- 4.59 Rate staff
- 4.59 Expect to apply what was learned
- 4.73 Valuable experience
- Overall average for excellence: 4.65

Based on this information, the NASA Education Program is meeting its metric of excellence, as defined by the satisfaction expressed by our customers. As the FY 1998 data collection is completed, it is anticipated that additional participants will report, but we do not expect the ratings to change significantly.

- **Involvement**: NASA strives to involve the educational community in our endeavors. Therefore, at the proposed funding level, we seek to maintain a level of participant involvement of approximately 3 million with the education community, including teachers, faculty, and students.

Progress towards this metric is measured in three ways: (1) total number of students/teachers/faculty involved in NASA education programs; (2) number of partnerships/collaborations; and (3) number of programs using NASA assets and types of assets used. The following data were collected:

Total involvement in NASA Education activities: 21,843,242 (151 programs reporting)

- In person: 3,108,258; electronic: 6,431,900; general public: 13,393,084
- 93% students; 6% teachers/faculty; 1% other
- Students: 2,293,018; 51% K-4; 24% 5-8; 23% 9-12; 2% undergraduate; 0.4% grad
- Educators/faculty: 140,355; 23% K-4; 40% 5-8; 28% 9-12; 1% community college; 2% undergraduate; 6% graduate

Types of K-12 schools represented (2,664 participants reporting)

- 39% urban; 37% suburban; 24% rural

Partnerships/collaborations

- higher education institutions; industry; contractors; other NASA facilities; Educator Resource Center Network; non-profits; local community; school districts

Programs using NASA facilities

- 120 (note, some programs use multiple facilities): aircraft-28; ground trainers-14; laboratories-68; wind tunnels-20; VITS-video-19; computer labs-53; mockup facilities-24; auditoriums-48; classrooms-55

It is clear from the numbers above that the NASA Education Program is meeting the metric of involving 3 million students and educators in our programs and we anticipate continuing to do so in FY 2000.

BASIS OF FY 2000 FUNDING REQUIREMENT

STUDENT SUPPORT PROGRAMS

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
	(Thousands of Dollars)		
Elementary and secondary.....	2,100	2,200	2,200
Higher education.....	<u>8,900</u>	<u>6,400</u>	<u>6,400</u>
Total.....	<u>8,900</u>	<u>8,600</u>	<u>8,600</u>

PROGRAM GOALS

The goal of the Student Support Program is to use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, mathematics, engineering, and technology.

STRATEGY FOR ACHIEVING GOALS

Student support activities (1) provide NASA mission experiences and information that are designed to promote students' interest and achievement in science, mathematics, technology, and geography; (2) provide exposure to NASA research and/or research experiences and activities to promote science, mathematics, technology, engineering, and geography career awareness; (3) provide support to the science and technology workforce pipeline by including greater participation of individuals who are underrepresented in science, mathematics, technology, and geography in NASA student programs; and (4) increase the number of NASA student support opportunities through partnerships and interagency cooperation and collaboration.

Activities such as the NASA Student Involvement Program (NSIP) 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. 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.

SCHEDULE & OUTPUTS

As reported above, in FY 98, 2,293,018 students participated in NASA education activities. Elementary/secondary students comprised almost 98% of that number, in a variety of programs, projects, and activities.

In addition to collecting “excellence” and “involvement” data, second level metrics are also collected for student support programs. These include data on applicant/award ratio; gender, ethnicity, demographics; college major; career goals; interest change; and program value.

For example, 447 students participated in the Summer High School Apprentice Research Program (SHARP/SHARP Plus). This program involves underrepresented minority high school students in intensive research apprenticeships with NASA, 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 involve students from groups traditionally underrepresented in science, mathematics, engineering, and technology in a research environment. The program is very competitive as only 23% of those who apply are accepted into the program. Seventy four percent of these students are juniors in high school when they enter the program; 52% of the participants are female; approximately 30% are African American and 14% are Hispanic. Participants rate the program as being a valuable experience (4.75) and would recommend to others (4.65) (Score: 5=excellent; 1=very poor). At the conclusion of their experience, 47% indicated a career goal being an engineer (level of interest in this discipline area changed for a 3.2 to 4.2 over the course of the experience).

ACCOMPLISHMENTS AND PLANS

General plans for Student Support Programs in FY 1999 and FY 2000 include the development and maintenance of electronically disseminated communication of NASA-sponsored student opportunities and career information to our customers, and better coordination of student program efforts across the NASA system to ensure the progression of students from one program to another.

FY 1998 accomplishments for SHARP/SHARP Plus are cited above. In FY 1999, the two programs will be combined under one procurement vehicle, which will create greater efficiencies in the management of these programs. However, both the residential and center based components will be maintained.

Other agency-wide student programs include the NASA Student Involvement Program, Shuttle Amateur Radio Experiment, and the Graduate Student Researchers Program. In FY 1998 the Space Science Student Involvement Program was redesigned and renamed the NASA Student Involvement Program (NSIP). The program continues to promote literacy in science, mathematics, and technology among students in grades 3-12. More than 10,000 students continued to participate in the program. The redesigned program will insure closer linkages with the NASA Enterprises and provide standards-based, hands-on, inquiry-oriented learning experiences. In FY 1999, the redesigned program will be fully operational.

The Shuttle Amateur Radio Experiment continued in FY 1998 to provide students the opportunity to participate directly in the Shuttle program by communicating directly with astronauts via amateur radio. Again, more than 10,000 students participated in this overall program and SAREX was flown on 2 Shuttle missions with 17 schools and 2,850 students talking directly with astronauts on those missions. In FY 1999, work will continue to integrate SAREX on the International Space Station.

The Graduate Student Researchers Program continued in FY 1998 to provide graduate fellowships to U.S. citizens conducting thesis research in NASA related areas. Approximately 400 students were supported full time, and a similar number is expected in FY 1999. In FY 2000, Student Programs will be maintained at the same funding and participation levels as in FY 1999.

BASIS OF FY 2000 FUNDING REQUIREMENT

TEACHER/FACULTY PREPARATION AND ENHANCEMENT PROGRAMS

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
	(Thousands of Dollars)		
Elementary and secondary.....	4,700	4,200	4,200
Higher education.....	<u>8,200</u>	<u>8,600</u>	<u>8,600</u>
Total.....	<u>12,900</u>	<u>12,800</u>	<u>12,800</u>

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 educators and faculty, to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, technology, engineering, and geography.

STRATEGY FOR ACHIEVING GOALS

At the elementary and secondary level, preparation and enhancement activities are designed to (1) provide NASA mission-based programs that introduce the application of science, mathematics, geography, engineering, and technology for use in student learning activities; (2) provide educators with a wider range of alternatives using scientific inquiry, based on the NASA mission; (3) encourage a “multiplier” effect to expand the benefits of the inservice program beyond participants to include additional educators; (4) provide access to and promote utilization of NASA related materials and information resources; (5) increase the participation of underserved and underutilized individuals and groups; and (6) facilitate collaborations between the faculty of teacher preparation departments and the faculty of scientific and technical departments to develop innovative approaches to teacher preparation. Pre-service programs such as Project NOVA, and in-service programs such as the NASA Education Workshops (NEW) and the 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.

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. 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.

SCHEDULE & OUTPUTS

As reported earlier, in FY 1998, 140,355 educators and faculty participated in NASA education activities. K-12 educators comprised approximately 91% of that number.

In addition to collecting “excellence” and “involvement” data, NASA collects second level metrics for these programs. These include data on applicant/award ratio; gender, ethnicity, demographics; program value; extramural funding; curricula integration/use; and standards awareness.

For example, 382 educators participated in the NASA Education Workshops (NEW). These workshops, held at NASA centers during the summer, provide an opportunity for practicing teachers to update their background and skills in science, mathematics, and technology. The program is competitive – 29% of applicants are accepted. Thirty-eight percent of participants represent suburban schools, 34% urban, and 28% rural. On a rating scale of 5 (5=excellent; 1=very poor), participants rated “expect to apply what learned” at 4.76 and “valuable experience” at 4.73.

ACCOMPLISHMENTS AND PLANS

General plans for teacher/faculty preparation/enhancement programs in FY 1999 and FY 2000 include plans to model inquiry-based science investigations or meaningful mathematics problem solving by engaging educators in the kinds of learning they are expected to practice with their students; expand follow-up and networking opportunities for the alumni of NASA’s teacher enhancement programs; expand the scope of educator enhancement programs to include workshops at each center for institutions in their region that serve informal education and urban/rural systemic efforts; provide education experiences for educators in the effective application of educational technologies; and define and execute activities that target pre-service education programs.

FY 1998 accomplishments for NEW are cited above. In FY 1999, partnerships between NASA and rural and urban education systems will be strengthened through center based workshops. Other agency-wide programs include the following:

Teacher preparation programs such as Project NOVA disseminate nationally an undergraduate pre-service model based on standards and benchmarks for science, mathematics, and technology. NOVA links higher education faculty across several disciplines to create these models. To date, more than 100 colleges and universities have participated. The Urban Community Enrichment Program (UCEP) provides more than 750 urban teachers greater exposure to new NASA knowledge. In FY 1998, UCEP programs were conducted in Kansas, Oklahoma, Texas, Maryland, and Guam. The Teaching from Space Program continues to develop products that are incorporated into enhancement activities, providing tools that can be applied in the classroom and disseminated through the Educator Resource Center Network.

At the higher education level, 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 continues to be supported annually for ten weeks. This program is being combined with the Joint Venture (JOVE) Program, which 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. There are currently approximately 100 academic institutions participating, most

of who had little previous contact with the agency. 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 late FY 1999.

The impact of slightly reduced funding levels in FY 1999 will be evidenced by slightly lower participation rates in workshops or in a reduced number of workshop opportunities at both the pre-college and higher education levels. In FY 2000, Teacher/Faculty programs will be maintained at the same funding and participation levels as in FY 1999.

BASIS OF FY 2000 FUNDING REQUIREMENT

SUPPORT FOR SYSTEMIC IMPROVEMENT OF EDUCATION

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
	(Thousands of Dollars)		
Aerospace Education Services Program (AESP).....	5,600	5,600	5,600
National Space Grant College and Fellowship Program.....	19,100	19,100	13,500
Experimental Program to Stimulate Competitive Research.....	4,600	10,000	4,600
Innovative Reform Initiatives.....	<u>600</u>	<u>600</u>	<u>600</u>
 Total	 <u>29,900</u>	 <u>35,300</u>	 <u>24,300</u>

PROGRAM GOALS

The goal of the Support for Systemic Improvement of Education Program is to use NASA's unique assets to support local, state, regional, and national science, mathematics, technology, engineering, and geography education change efforts through collaboration with internal and external stakeholders.

Systemic improvement encompasses the process whereby an entire system is re-engineered toward achieving a new goal. 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, school system, and/or state. 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

Systemic improvement activities are designed to: (1) coordinate planning among NASA education initiatives to ensure alignment with and support of standards-led systemic improvement initiatives of the states; (2) redirect existing education programs, and ensure new initiatives address state needs and tie unique education and economic development efforts; (3) support standards-based science, mathematics, technology, and geography education change by aligning NASA educational programs and products with the national/state standards; and (4) expand interactions with external stakeholders in the systemic improvement of education change.

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 local, state, regional and national mathematics, science, and technology education efforts through collaboration of internal and external stakeholders in high impact reform activities.

Systemic Improvement 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, authorized by Congress in 1987, increases the understanding, assessment, development, and use of aeronautics and space resources. All 50 states, Puerto Rico, and the District of Columbia have Space Grant Consortium programs in which 703 institutions participate. These consortia form a network of colleges and universities, industry, state/local governments, and nonprofit organizations with interests in aerospace research, training, and education.

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 improvement at both elementary and higher education levels is captured in NASA's Innovative Reform Initiatives program which is supportive of standards-based systemic improvement efforts, and focuses on science, mathematics and technology education. A means of supporting systemic improvement 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).

SCHEDULE & OUTPUTS

Performance in this area is measured in a variety of ways, including partnerships/alliances, supplemental funding, and standards. In FY 1998, NASA education activities documented 6,096 alliances with a variety of partners (note, a program may be involved in multiple alliances). Partners included schools (K-12 and higher education), industry, and non-profit organizations. More than \$80M was secured in supplemental funding, of which 51% came from other Federal agencies, 11% from state agencies, and 10% from industry/business.

Other measures of performance are indicated below:

Aerospace Education Services Program

- 927 schools visited; 1,513 student programs conducted; 278,559 students involved
- 1,853 teacher workshops conducted; 19,236 teachers participated
- Program was a valuable experience – 4.8 (on a scale of 5, 5=excellent; 1=very poor)
- Workshop content matched school's education objectives – 4.6
- Program demonstrated the interdisciplinary nature of NASA's research and development – 4.7
- Experience increased confidence in subject area – 4.7

Space Grant (FY 1997 data)

- 52 University-based Consortia
- Space Grant involves 703 institutions which include:
 - 493 colleges and universities
 - 62 business/industry
 - 34 State and local government agencies
 - 114 other affiliates (science museums, not for profits, etc.)
- \$34.1 M in matching funds (42% university; 21% other Federal, 8% industry; 16% other; 13% local/state government)
- 2,114 fellowships and scholarships (73% undergraduate; 21% underrepresented groups; 43% women)
- 866 education programs/projects/activities
- 331 public service programs/projects/activities

EPSCoR (FY 1997 data)

- Awards to ten states:
 - Alabama, Arkansas, Kentucky, Louisiana, Montana, Puerto Rico – original awardees
 - Kansas, Nebraska, Oklahoma, South Carolina - new in 1996
- Participants:
 - Institutions: 68
 - Research clusters: 47
 - Faculty: 244
 - Post doctoral fellowships: 38
 - Graduate students: 219
 - Undergraduates: 154
- \$25.6M proposals funded
- 152 publications, refereed papers
- 2 patents; 5 patent applications; 1 invention disclosure

ACCOMPLISHMENTS AND PLANS

General plans for Systemic Improvement activities in FY 1999 and FY 2000 include providing professional development on standards-based education initiatives to NASA's internal education community; reviewing existing NASA education initiatives to ensure their alignment with the vision and philosophy for state-based systemic reform; designing new programs or redesigning existing programs to ensure that all NASA efforts align with the science, mathematics, technology, and geography education standards and supporting the needs of those engaged in the implementation of standards-based education at the state and local levels; leveraging the use of NASA programs and resources by expanding NASA interactions and cooperation with all stakeholders involved in national and state systemic initiatives; and implementing a plan through the field centers that supports the needs of individual states.

The AESP specialists are directly involved in supporting state systemic improvement by providing technical linkages to NASA research and development and education programs and services. The AESP delivers educational services on a state-by-state basis. Each education

specialist is assigned one or two states so they might become familiar with their states' science, mathematics, and technology education agenda and the education leaders within these states. This enables them to customize or tailor-make their teacher workshops to fit that particular state's framework. Funding in FY 1999 will continue operation of this program, although projected reductions will result in fewer teacher workshops conducted around the country.

In FY 1998 and FY 1999, funding for Space Grant was increased pursuant to Congressional direction. This funding increase provides for increased basic awards for all Space Grant consortia and supports the award of designation status to up to four additional state consortia. Since there have been no inflationary adjustments over the years, the increases enable the consortia to continue with elements of their program plans that have been deferred due to lack of growth in the program funding levels

FY 1998 marked the fifth year of the NASA EPSCoR program with continued funding for the original six awardees. These six states have been very successful in a short period of time, as evidenced by the metrics previously cited. In addition, four new states were chosen in the second round of awards in late FY 1996 (Kansas, Nebraska, Oklahoma, and South Carolina). They are completing their second year of work, and are expected to be as successful as the first group. Congressional direction in FY 1999 increased the funding for this program to 10.0M. This will enable all eligible NASA EPSCoR states to receive planning grant funding, and a planning process is currently underway. It is expected that planning grants will be awarded to unfunded states, and continuation grants will be awarded to the original six awardees. These awards will help these programs prepare for the next round of awards, scheduled for FY 2001.

NASA's Innovative Reform Initiatives program supports standards-based systemic improvement efforts and priorities, and focuses on science, mathematics, technology, and geography education. To prevent duplication and to strengthen the impact of systemic reform initiatives, NASA confers with other federal agencies and national organizations that are also working with educational systemic reform, including the National Science Foundation, U.S Department of Education, National Research Council, Council of Chief State School Officers, and professional education organizations such as the National Science Teachers Association, National Council for the Teaching of Mathematics, and the International Technology Education Association. 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). These partnerships are each mutually beneficial in creating systemic change by increasing the customer and support bases for both NASA and the partnering stakeholder. Similar opportunities will be explored in FY 1999 and FY 2000.

In FY 2000, the AESP and Innovative Reform programs will be maintained at the same funding and participation levels as in FY 1999. The FY 2000 budgets for Space Grant and EPSCoR (13.5M and 4.6M respectively) represent a return to the base level program support. This will result in a decrease in award amounts for Space Grant consortia and a reduction in the number of NASA EPSCoR states receiving funding.

BASIS OF FY 2000 FUNDING REQUIREMENT

EDUCATIONAL TECHNOLOGY

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
		(Thousands of Dollars)	
Learning tools.....	1,700	1,700	1,700
Demonstrations.....	2,000	2,000	2,000
HPCC.....	4,200	4,000	4,000
Bishop Museum/National Prototype Space Education Curriculum....	2,000	--	--
Alaska Learning Center.....	2,500	--	--
Apple Valley, California Learning Center.....	1,500	--	--
K-12 Telecommunications.....	6,000	--	--
Louisiana Daily Living Center.....	2,000	--	--
Pennsylvania Education Telecommunications Center.....	1,500	--	--
California Discovery Science Center.....	1,000	--	--
Univ. of Maryland, Advanced Info Tech Center	--	2,000	--
Univ. of Redlands, Academic Infrastructure	--	3,500	--
Residential Aerospace Education Center	--	1,000	--
Total	<u>24,400</u>	<u>14,200</u>	<u>7,700</u>

PROGRAM GOALS

The goal of the Educational Technology program is to research and develop products and services that facilitate the application of technology to enhance the educational process for formal and informal education and lifelong learning.

STRATEGY FOR ACHIEVING GOALS

The Educational Technology program (1) produces technology-based teaching tools and strategies that are grounded in or derived from the NASA mission; (2) uses emerging technologies for, and applies existing technologies to, educational programs; (3) utilizes technology to facilitate communication within the educational community; (4) involves educators in NASA missions through innovative uses of technologies; and (5) conducts research into new teaching and learning practices that are made possible through NASA mission-derived technology.

The NASA Classroom of the Future (COTF) 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 that support standards-based education reform.

The Learning Technologies Program, provides demonstration projects and on-line systems dedicated to bringing 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 of technologies within the K-12 education systems. NASA, led by the 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.

SCHEDULE & OUTPUTS

Performance in this area is measured in a variety of ways, including overall quality, type/number of users; standards application; internet hits; data transferred; searchable pages; and unique IP addresses.

- **Educator Resource Center Network:** 142,477 educators used the ERCN (visits, mail, phone, email); 2,018,087 NASA education materials disseminated; teacher ratings of teacher guides – 4.81 (1=lowest; 5=highest); 1,217 site workshops conducted with 27,945 participants.
- **NASA Spacelink, NASA Quest, and Learning Technologies Program:** 199,636,397 internet hits; 28,379 GB data transferred; 6,431,900 unique IP addresses
- **Research and Development: Classroom of the Future.** Two major instructional CD-ROMS, BioBlast and Astronomy Village, were developed and dissemination begun; one web-based Earth science curriculum supplement; one on-line course for Earth science teachers; 25,000 materials disseminated; 15,000 students and 7,000 teachers served.

ACCOMPLISHMENTS AND PLANS

General plans for this program area include providing technology training and support for the persons involved in the operation of the Educator Resource Center Network and the Space Grant program; implementation of a coordinated electronic dissemination system that ensures that all NASA education activities and products are available through appropriate networking technologies; demonstrate NASA's educational technology resources at professional development conferences; develop innovative learning tools and technologies that are integrated with curriculum support and teacher enhancement activities ; develop, implement, and evaluate distance education and virtual mentoring projects; and support distribution of excess NASA equipment to schools and institutions of higher education.

Educational Technology activities support the development of high quality, affordable learning tools and environments (e.g., CD-ROM databases, DVD-ROM, 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. Classroom of the Future continues to be NASA's primary educational technology research and development site.

NASA's Educational Technology program includes the center-based components of the Learning Technologies Program (LTP). 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 ten center-based projects have made extensive amounts of earth, space, and aeronautics information available on the Internet in educational formats. Through this program, collaborations are maintained with and support provided to schools across the country. In FY 1999 LTP will initiate a follow-on grant program funding the use of information technology in educational outreach efforts.

Educational Technology activities in FY 1998 included funding for the following activities directed by Congress in the Conference Report accompanying the FY 1998 VA-HUD-Independent Agencies Appropriation Act: National Prototype Space Education Curriculum in conjunction with the Bishop Museum in Hawaii; Alaska Learning Center; California Learning Center in Apple Valley; K-12 telecommunications in San Bernardino, Louisiana Daily Living Center, Pennsylvania Education Telecommunication Center, and California Discovery Science Center. In FY 1999, additional activities directed by Congress include the University of Maryland Advanced Information Technology Center, University of Redlands Academic Infrastructure, and Residential Aerospace Education Center.

In FY 2000, Educational Technology programs will be maintained at the same funding and participation levels as in FY 1999.

BASIS OF FY 2000 FUNDING REQUIREMENT

EVALUATION

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
			(Thousands of Dollars)
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. A set of standard, Agency wide indicators, metrics, and evaluation instruments has been developed for Agency wide use. The data are collected on-line in a single database capable of providing correlation and report generation capability. External education evaluation experts 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.

SCHEDULE & OUTPUTS

NASA continues to refine a comprehensive system to evaluate its Education Program in order to demonstrate the accomplishment of achievable and measurable goals and objectives. Based on recommendations provided by a study of the NASA Education Program by the National Research Council (NRC), NASA established program goals and defined a comprehensive Education Framework that captures the elements of NASA's Education Program. This framework is detailed in NASA's *Implementation Plan for Education*, and supported by implementation plans developed by the Enterprises and NASA field installations between FY 1995 and the present. NASA utilizes 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 NASA Education Data Collection and Evaluation System (EDCATS) has completed three field test years, each year capturing additional programs and data.

ACCOMPLISHMENTS AND PLANS

NASA's Education Data Collection and Evaluation System (EDCATS), operational in FY 1998, continues to add 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 1999 and FY 2000 will support the continuation and improvement of the system. By FY 2000 the system will be fully operational to track data and evaluation metrics for the entire NASA Education Program.