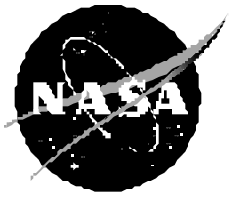

Learning Technologies Project Management Plan FY98

October 1, 1997

Mark León

Learning Technologies Project Manager

Ames Research Center

Moffett Field, CA

Learning Technologies Project Management Plan
Civil Servant Signatures of Agreement
October 1, 1997

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HPCC Program Manager, Bill Feiereisen

_____

LTP Educational Liaison, Rick Smith

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Learning Technologies Project Manager, Mark León

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Learning Technologies DFRC Authorizing Official, Lee Duke

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Learning Technologies JPL Authorizing Official, Robert Ferraro

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Learning Technologies GSFC Regional Outreach Center, Lisa Hamet Bernard

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Learning Technologies JSC Regional Outreach Center, Robert Shelton

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Learning Technologies KSC Regional Outreach Center, Gregg Buckingham

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Learning Technologies LaRC Regional Outreach Center, Jeff Seaton

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Learning Technologies LeRC Regional Outreach Center, Beth Lewandowski

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Learning Technologies MSFC Regional Outreach Center, Bill Anderson

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Learning Technologies SSC Regional Outreach Center, David Powe

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Digital Library Project Manager, Nand Lal

_____

Special Projects Manager, Fritz Hasler

_____

Educational Technology, Eugene Miya

Learning Technologies Project
Management Plan
Support Service Contractor Signatures of Concurrence
December, 1997

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Learning Technologies Deputy Project Coordinator, Tom Dyson

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Regional Outreach Center Coordinator, Jennifer Sellers

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Aeronautics Projects Coordinator, Christiy Budenbender

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Digital Library Technology & Digital Library II Project Manager, Susan Hoban

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Special Projects Deputy Manager, Alan Nelson

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Learning Technologies DFRC Regional Outreach Center Coordinator, Marianne McCarthy

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Learning Technologies JPL Regional Outreach Center Coordinator, Gilbert Clark

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1.0 PREFACE AND GENERAL INFORMATION

The NASA Learning Technologies Project (LTP) will use NASA's inspiring mission, unique facilities, and specialized workforce in conjunction with the best emerging technologies to promote excellence in America's educational system. LTP will work to enhance the public's scientific and technical familiarity, competence, and literacy. LTP will do this by capturing the educational potential of each NASA program and by conducting and facilitating educational projects at all levels of the American educational system.

LTP is a multi-center activity managed by the HPCC LT Project Office at the NASA Ames Research Center (ARC). LTP funds activities that use the National Information Infrastructure (that is, the Internet) and other technologies to foster reform and restructuring in math, science, computing, engineering, and technical education. LTP activities fall under the Educational Technology category of NASA's Education Program.

The NASA HPCC LTP Plan for Education flows from the NASA Strategic Plan. This Plan has been developed for FY98 - FY02. The document was created as a result of intensive collaboration between the NASA Office of Education and the NASA Office of Aeronautics.

LTP will maximize the delivery and impact of our education programs by engaging our research and contractor communities in the use of state-of-the-art educational technologies, and by developing partnerships with the education community. We seek to help the national education system to meet civilian aerospace needs and the broader scientific and technological needs of our nation. Special emphasis will be placed on encouraging historically underrepresented groups to pursue careers in science, mathematics, and engineering.

LTP efforts will be implemented by creating an on-line presence for NASA's missions. Our work will enhance the content knowledge, skills, and experience of teachers, capture the interest of students, and channel that interest into related career paths. Our plan will be achieved through the demonstration of integrated applications of science, mathematics, technology, and related subject matter of interest to the educational community. LTP will focus on life-long learning.

NASA's HPCC Learning Technologies Project is funded through the Educational Technology Division of NASA's Education Program and NASA's High Performance Computing and Communications (HPCC) Program, which has as its hallmark a strong internal management structure with a clear direction for the future. Leadership and coordination with NASA's education program are the responsibility of the HPCC LTP

Manager. HPCC LTP regional outreach offices will coordinate their activities with their respective field center's education program officers.

1.1 The LTP Vision Statement:

NASA's 1997 Strategic Plan states that: "NASA is an investment in America's future. As explorers, pioneers, and innovators, we boldly expand frontiers in air and space to inspire and serve America and to benefit the quality of life on Earth."

The Learning Technologies Project will make a significant contribution to this vision by using leading edge technologies to deliver NASA mission content to classrooms across the nation.

1.2 The LTP Mission Statement:

One of four strategic outcomes from the "Vision, Mission, and Goals" section of the NASA Strategic Plan is to "involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds."

To support the NASA Strategic Plan and NASA's Educational Technology Program Implementation Plan, LTP researches emerging technologies such as the Internet. LTP then develops these technologies into high-quality and affordable learning environments connecting educators with NASA missions. Our intent is to support these educators in their own educational goals, in the goals of the educational systems in which they work, and in their efforts to improve those systems.

1.3 LTP Goals:

The following are broad goals of LTP for the years from FY98 to FY02. These goals support the NASA Education Division goals and objectives, including those of the Educational Technology Program. The goals of the Learning Technologies Project are to:

Promote the enhancement of the knowledge, skills and abilities of educators and students in the areas of science, math, technology and engineering.

- Make NASA missions and content accessible to the educational community.
- Promote large-scale integration of LTP products and services into the classroom.

1.4 LTP Objectives:

The following are specific objectives LTP expects to have in place by FY02.
The objectives in combination will support enhancements for the way educators teach and will significantly contribute to the Agency's Strategic Outcomes in Education:

- Provide access and awareness to LTP products and services based on or derived from NASA missions that relate to math, science, engineering, and technology.
- Deliver classroom-ready current and archived NASA information using innovative technology.
- Facilitate the infusion of LTP-unique technology models into schools across the nation.
- Forge high-leverage partnerships with both commercial and non-profit organizations.

· Provide educator training opportunities and materials for all LTP products and services using emerging technologies so that physical distance is no longer a barrier.

2.0 LTP MANAGEMENT

The execution of the LTP is achieved by a combination of civil servants and support service contractors. Many of these management charts intermix these two job classes. These charts are intended to be functional charts rather than direct reporting charts. In reality no support service contractor can direct a civil servant, but they can convey the project requirements as communicated by the project managers. In addition civil servants cannot direct civil servants at other centers. The LTP manager can dictate project requirements and control fiscal allocations.

In general this project is possible through the joint collaboration of civil servants and support service contractors. The spirit of these charts is to demonstrate the flow of communication for collection of data and dissemination of project requirements.

2.1 LTP Level I Management

NASA's LTP effort is managed through the HPCC Program Office at Ames Research Center (ARC) and reports to the Office of the Director at ARC and to the Director for Aviation Systems Technology Division at NASA Headquarters (HQ), who ultimately reports to the NASA Administrator.

The LTP accomplishes its mission through specific projects conducted by regional NASA centers, grants, cooperative agreements, NASA contracts and NASA sub-contracts. Level I management consists of HQ policy, the Ames Research Center Director, the HPCC Program Management, the HPCC Executive Committee and the Director of the Education Division.

2.2 LTP Level II Management

The LTP Level II Management is conducted via the Project Office located at ARC. The Office is supported by the LTP Manager, the Deputy LTP Manager, a small project support staff, and the Remote Sensing Public Access Center (RSPAC). LTP management is responsible for organizing, planning, staffing and implementing the LTP Management Plan. This includes integrating LTP activities across the Agency. The Project Office is responsible for managing and disseminating the fiscal budget at the seven digit R-TOP level.

2.3 LTP Level III Management

The LTP Level III Management is comprised of a Regional Outreach Center (ROC) Coordinator, an Aeronautics Projects Coordinator, a Digital Library Technology (DLT) & Digital Library Initiative (DLI) Coordinator, a Special Projects (SP) Coordinator, the grants office Contract Officers (CO) and Contracting Officer Technical Representatives (COTR), and Procurement Office Cooperative Agreement COs and COTRs.

The NASA Centers participating in LTP are Ames Research Center, Dryden Flight Research Center, Goddard Space Flight Center, Jet Propulsion Laboratory, Kennedy

Space Center, Johnson Space Center, Langley Research Center, Lewis Research Center, Marshall Space Flight Center, and Stennis Space Center.

Each of these LTP elements has its own Project Manager who is responsible for managing the activity across the agency. The LTP manager will oversee all elements, working groups, and special projects.

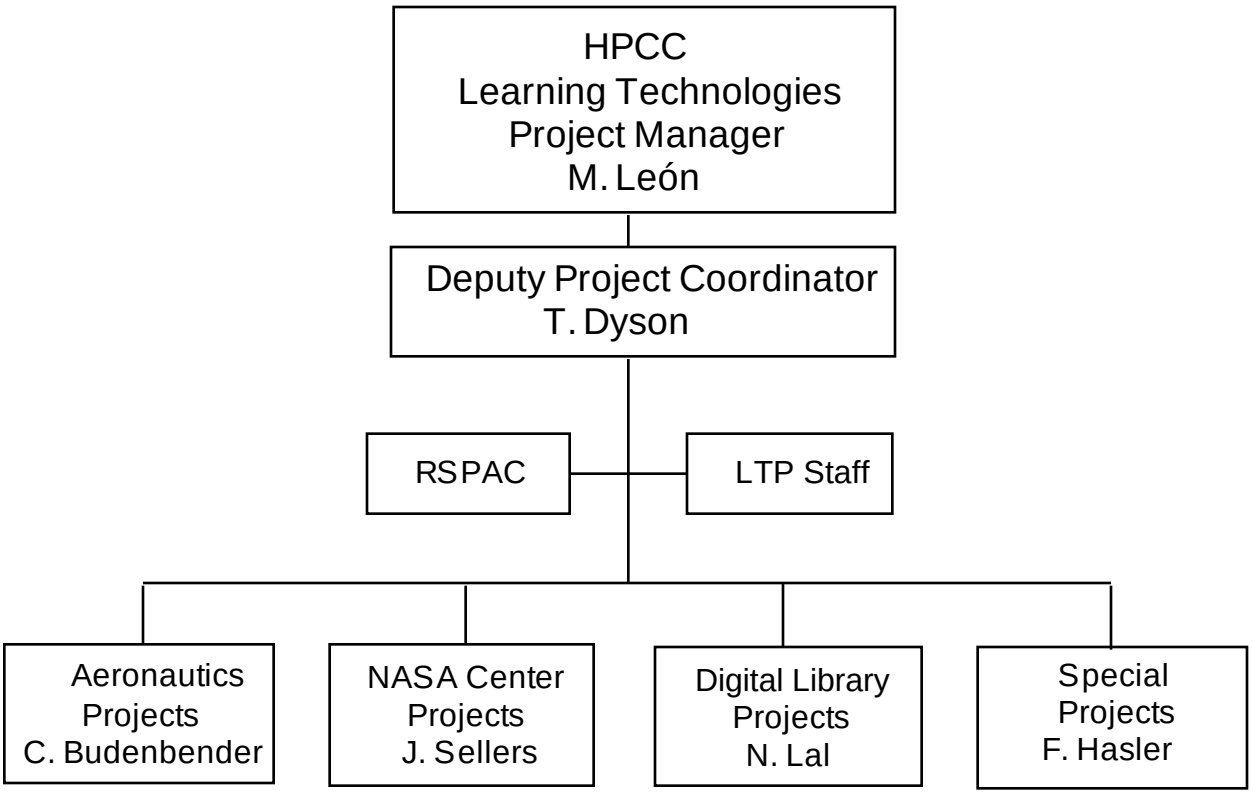
2.4 LTP Level IV Management

Level IV Management consists of the regional outreach center managers, and the Principal Investigators (PI) for the grants and cooperative agreements. The respective organizational structures for each of these levels will be defined in subsequent sections.

3.0 LTP ORGANIZATIONAL STRUCTURE FOR FY98

The support of all levels of management for the cooperative agreements, grants, NASA contracts and the supporting centers is crucial to the success of the LTP. These structures, as well as roles and responsibilities are spelled out below.

Figure 1: LTP Organizational Chart for FY98

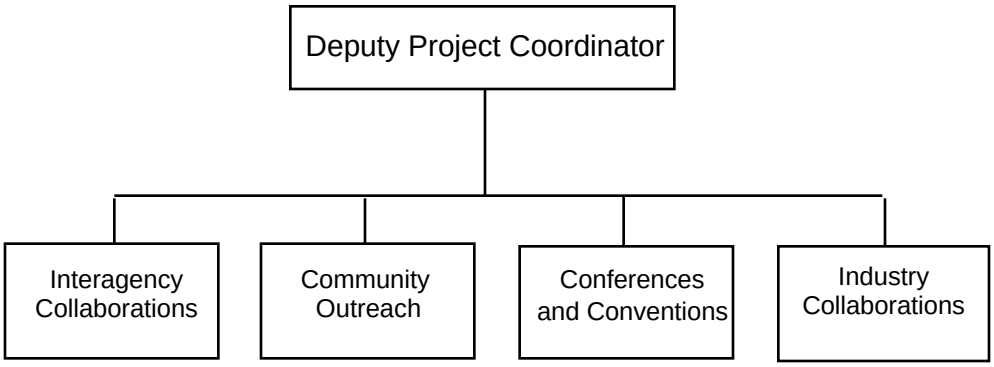


3.1 The Learning Technologies Project Office - Roles and Responsibilities

The LT Project Manager reports to the HPCC Program management located at ARC. The Project Manager is responsible for the overall management of the LTP including: implementation of the research and education programs; maintenance of the financial integrity of the project; constructing and maintaining the technology necessary to manage the project (databases, Web sites and mail lists); preparing, submitting, and presenting reports, reviews and projections to senior management.

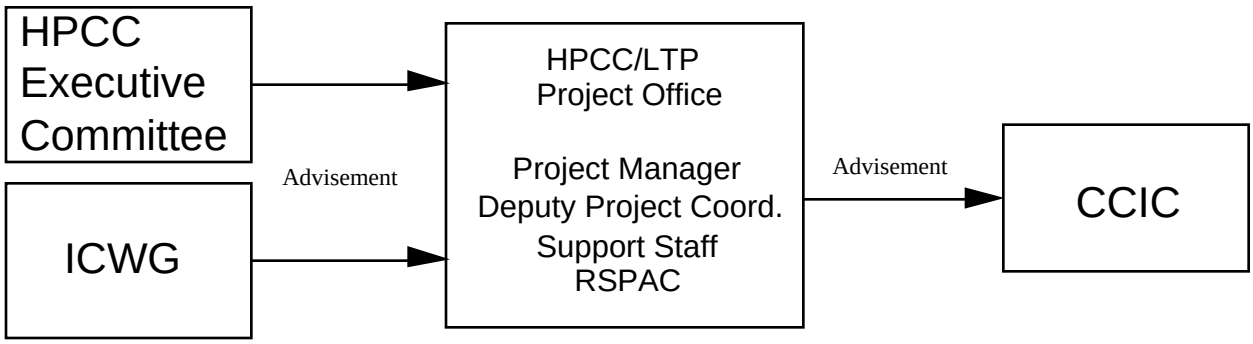
3.2 The LTP Deputy Coordinator - Roles and Responsibilities

Figure 2: The Deputy Project Coordinator



As delegated by the Learning Technologies Project Manager, the Deputy Project Coordinator's responsibilities include, but are not limited to: general support of the Project Office, LTP community outreach, an LTP presence at conferences and conventions, (as well as supporting LTP conferences), and general LTP industry collaborations including LTP product dissemination to these. These responsibilities are discharged by the LTP Deputy Project Coordinator with assistance from the staff and RSPAC Cooperative Agreement as required.

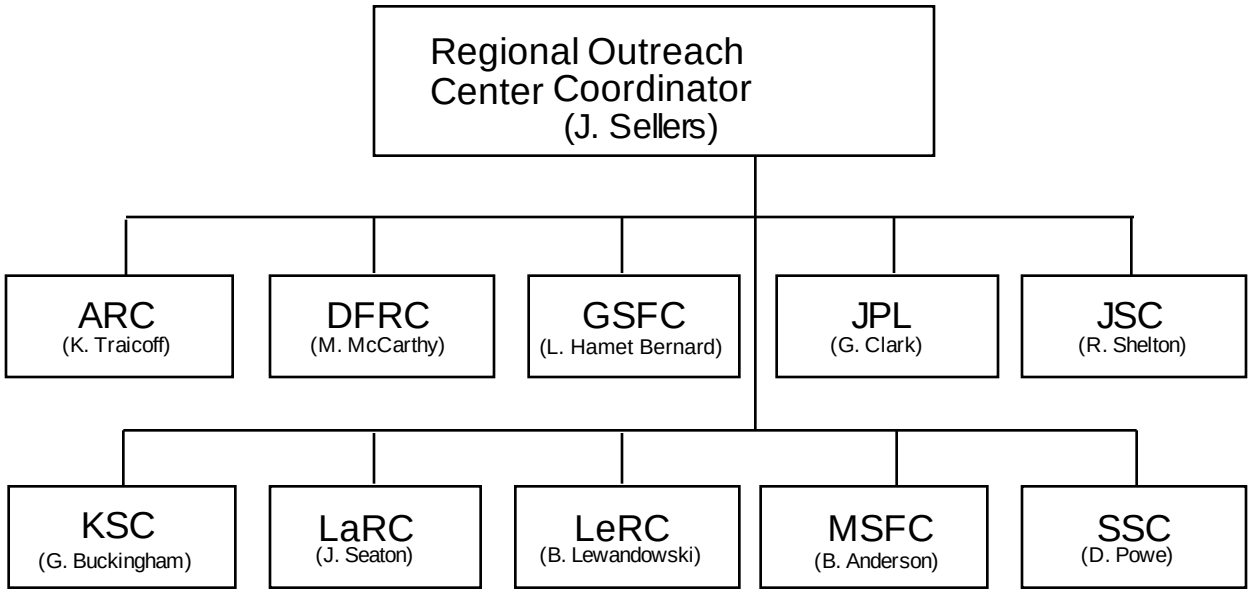
Figure 3: Project Office Advisement



The Learning Technologies Project Office will use the InterCenter Working Group (ICWG) and the HPCC Executive Committee as its steering committee. The voting members of the ICWG are the ten educational program officers from our participating centers, ten LTP outreach center managers, four special projects coordinators, the LTP manager and the LTP deputy coordinator, the LTP educational liaison to code FE, the group leader for Educational Technology for code FE. All together twenty-eight voting members comprise the ICWG. The forum activities are open to anyone interested in the activities of this working group. LTP also holds a seat on the Committee for Computing, Information, and Communication (CCIC) on Educational Training and Human Resources (ETHR) at NASA Headquarters.

3.3 LTP Regional Outreach Center Projects - Roles and Responsibilities

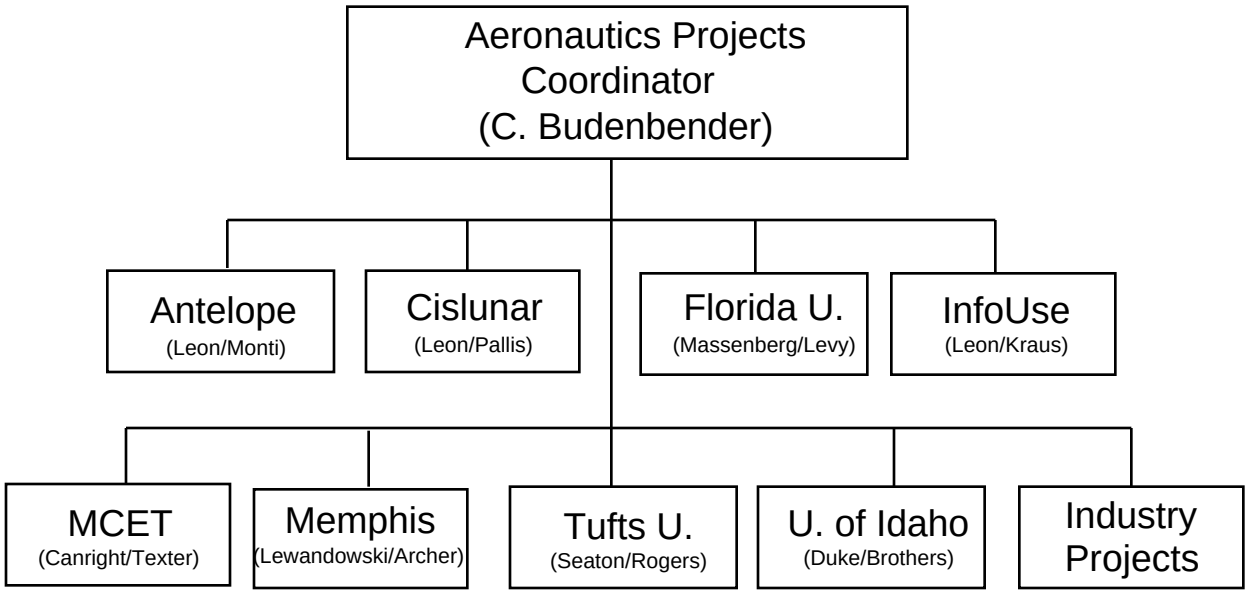
Figure 4: Regional Outreach Center Organizational Chart



The Regional Outreach Center (ROC) Coordinator is responsible for the coordination of activities of the NASA Center Projects within the ten LTP regional NASA centers. The ROC Coordinator will keep in regular communication with the regional centers to assure continued technical progress along with compliance with the financial and technical reporting requirements of the Project Office. The ROC Coordinator will also provide resource advocacy, as necessary, to the Project Office. Supporting NASA Centers will maintain a Regional Outreach Center Project Manager as a point of contact for the ROC Coordinator to prepare reports and briefings on project element implementation, and to oversee project activities at the center. This project manager will have the responsibility of managing the budget allocation from HQ as directed by LTP management.

3.4 LTP Aeronautics Projects - Roles and Responsibilities

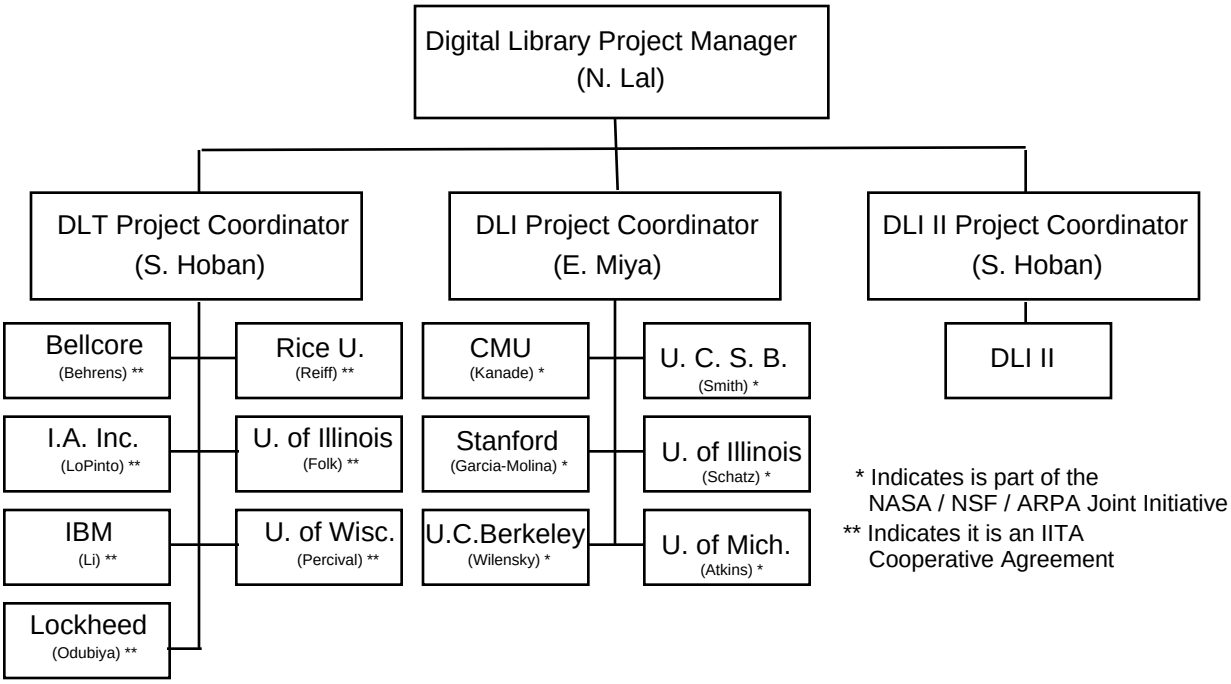
Figure 5: Aeronautics Projects Organizational Chart



The Aeronautics Projects (AP) Coordinator is responsible for the coordination of activities within the six aeronautics grants, two cooperative agreements and additional (Industry Outreach) aeronautics projects. The Aeronautics Projects Coordinator will collect monthly reporting from each of the aeronautics projects. The Aeronautics Projects Principal Investigators will report to the technical liaisons. Technical liaisons will be appointed to each of the cooperative agreements and grants for the purpose of reporting technical progress and milestone status to the Aeronautics Projects Coordinator. The Aeronautics Projects Coordinator will report to the Aeronautics Projects Contracting Technical Representative (COTR). The LTP Manager will assume the role of COTR.

3.5 LTP Digital Library Projects - Roles and Responsibilities

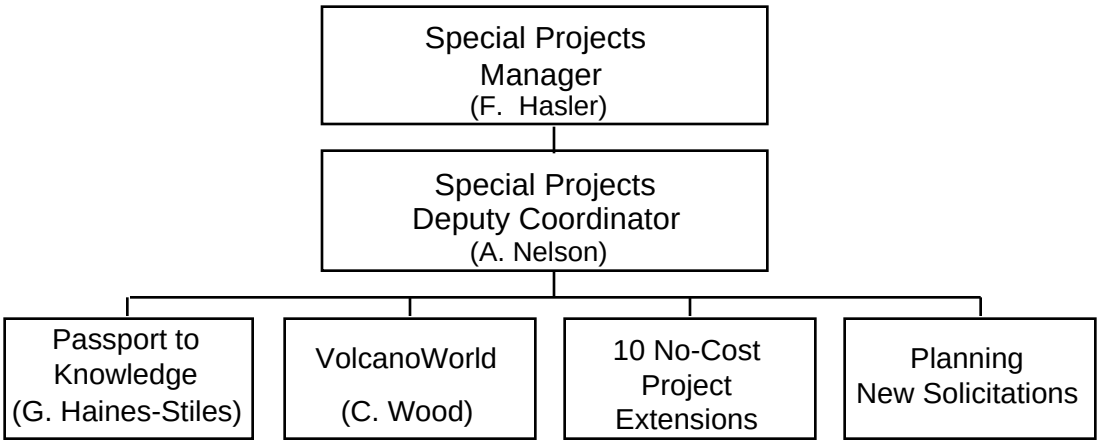
Figure 6: Digital Library Organizational Chart



The Digital Library Project Manager is responsible for the seven Digital Library Technology (DLT) Grants and Cooperative agreements, as well as the six joint NASA/NSF/ARPA cooperative agreements under the Digital Library Initiative (DLI). The Manager will collect monthly reporting from each of the projects for the purpose of reporting technical progress and milestone status to management. NASA will continue collaborations with DLI II. This project will extend until FY02. HPCC will attempt to support DLI II funding.

3.6 LTP Special Projects - Roles and Responsibilities

Figure 7: Special Projects Organizational Chart

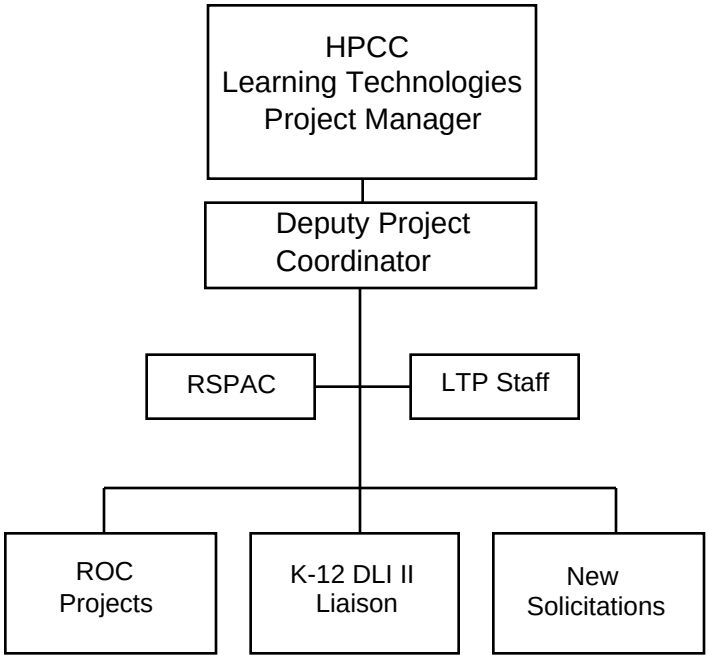


The Special Projects (SP) Coordinator is responsible for the Passport to Knowledge grant, the VolcanoWorld cooperative agreement and ten grants and cooperative agreements that have entered into no-cost extensions. In addition, the SP Coordinator will maintain liaisons with the completed projects and solicit for their participation where appropriate. These no-cost extensions include remnants of the IITA project which terminated at the end of FY97. Projects that terminated at that time, have been either continued under separate commercial or other agency funding, or they have been archived on an LTP server (no funded work has been lost). In some cases, where funding has terminated, RSPAC is supporting the archiving and maintenance of this work. The SP Coordinator will collect monthly reporting from each of the active projects for the purpose of reporting technical progress and milestone status to management.

3.7 LTP in FY99

LTP will continue the Regional Outreach Center work in FY99; however, it will transition away from the current DLT/DLI I projects (which will be terminating) and it will transition toward new DLI II Projects and a new solicitation.

Figure 8: Projected LTP Organizational Chart FY99



The Project Office will remain responsible for the overall management of the LTP including: implementation of the research and education programs; maintenance of the financial integrity of the project; constructing and maintaining the technology necessary to manage the project (databases, Web sites, and mail lists); preparing, submitting, and presenting reports, reviews, and projections to senior management and it would work with the LTP staff and RSPAC to do so. The next Level of LTP management is composed of a Regional Outreach Center (ROC) Coordinator, a New Aeronautics Projects Coordinator, a Digital Library Initiative (DLI) Coordinator and a New Space Projects Coordinator. The word “new” refers to new solicitations.

The ROC Coordinator will continue to be responsible for the coordination of activities within the ten LTP regional NASA centers. The ROC Coordinator will keep in regular communication with the regional centers. Supporting NASA Centers will maintain a Regional Outreach Center Project Manager as a point of contact, to prepare reports and briefings on project element implementation, and to oversee project activities at the center. This project manager will have the responsibility of managing the budget allocation from HQ as directed by LTP management.

The DLI Projects Coordinator will be responsible for collaborating with the Digital Library Initiative II (DLI II). The Coordinator will establish lines of communication between the DLI projects and monitor the development of K-Gray tools and resources

that NASA's educational projects can benefit from. Monthly data will be reported to the LTP Office.

The New Solicitations Project Coordinator will be responsible for the coordination of activities within the new space grants and cooperative agreements and some additional aeronautics projects. The New Solicitations Project Coordinator will collect monthly reporting from each of the new solicitations. Technical liaisons will be appointed to each of the cooperative agreements and grants for the purpose of reporting technical progress and milestone status to the COTR. The New Projects Principal Investigators will report to the technical liaisons. The technical liaisons will report to the New Solicitations Project Coordinator.

4.0 PROJECT AND WORK BREAKDOWN STRUCTURE

The work breakdown structure for the LTP has been defined to have a management component and five major elements: 1) Educational Technology; 2) Teacher Enhancement; 3) Curriculum Improvement; 4) Student Support; 5) Systemic Change/Collaboration. It is anticipated that each field center with K-Gray sub tasks will have activities in several or even all of these areas.

Table 1: K-12 Education Work Breakdown Structure (WBS)

Objective	Center(s) Supporting this Work
· Provide access to LTP products and services based on or derived from NASA missions that relate to math, science, engineering, and technology.	· ARC, DFRC, GSFC, JPL, JSC, KSC, LaRC, LeRC, MSFC, SSC
· Deliver classroom-ready current and archived NASA information using innovative technology.	· ARC, DFRC, GSFC, LaRC, LeRC
· Facilitate the infusion of LTP-unique technology models into schools across the nation.	· ARC, JPL, LaRC, LeRC, SSC
· Forge high-leverage partnerships with both the commercial sector and non-profit organizations.	· ARC, DFRC, GSFC, JPL, JSC, KSC, LaRC, LeRC, MSFC, SSC
· Facilitate access to and awareness of LTP products and services.	· ARC, DFRC, GSFC, JPL, JSC, KSC, LaRC, LeRC, MSFC, SSC
· Provide educator training opportunities and materials for all LTP products and services using emerging technologies so that physical distance is no longer a barrier.	· ARC, DFRC, LaRC, LeRC

4.1 NASA Field Center Responsibilities

Table 2: Field Center Support by NASA Enterprise

NASA Enterprise	Centers Supporting this Work
· Mission to Planet Earth (MTPE)	· GSFC, JPL, JSC, LaRC, MSFC
· Office of Space Science (OSS)	· ARC, JPL, JSC, LaRC
· Human Exploration and Development of Space (HEDS)	· ARC, JPL, JSC, LaRC
· Officed of Aeronautics and Space Transportation Technology (OASTT)	· ARC, DFRC, JSC, KSC, LaRC, LeRC, SSC

4.2 NASA Field Center Responsibilities

Table 3: Field Center Support by NASA Center

Center	MTPE	OSS	HEDS	OASTT
ARC	0%	25%	50%	25%
DFRC	0%	0%	0%	100%
GSFC	100%	0%	0%	0%
JPL	25%	50%	25%	0%
JSC	25%	25%	25%	25%
KSC	0%	0%	0%	100%
LaRC	25%	25%	25%	25%
LeRC	0%	0%	0%	100%
MSFC	100%	0%	0%	0%
SSC	0%	0%	0%	100%

5.0 LTP MILESTONES

The LTP Office shall approve all schedules and schedule modifications. Metrics will be decided at the beginning of the fiscal year and approved in this plan.

5.1 LTP Major Milestones

The schedule of deliverables for the LTP Education Project are shown below in Tables 4 and 5.

Table 4: HPCC LTP Level I Milestones

Distribute Mature K-12 Products over the NII	FY98
Demonstrate Results of Mature DLT Products	FY98

Table 5: LTP Level II Milestones by Element. (ROC, DLT/DLI, DLI II, RSD, AP, SP)

Integration of LTP technology and applications into 10,000 schools.	FY00

HPCC LTP Level III project milestones may be found in the approved Annual Fiscal LTP Proposal Plan. Approximately one Level III milestone is expected for every hundred thousand dollars.

5.2 LTP Level I Metrics

The five measures below have been selected for application to LTP

1) Diversity of Users and Public Interests Supported

An objective of LTP is to reach the broadest possible cross section of the community. Interest groups using LTP information (e.g., students, schools, members of the public) are categorized to determine what fraction of LTP 's efforts serves the disadvantaged and underserved.

2) Number of Accesses to NASA Digital Information

The number of accesses to LTP Web servers ("hits") is used to infer the number of people actively using LTP remote sensing and educational information.

3) Number of Schools, Teachers, and Students Directly and Indirectly Supported

The number of schools, teachers and students that are directly or indirectly impacted by LTP education activities is tabulated to measure the success of education outreach activities.

4) Number of Unique Additional Technology Capabilities Generated

This metric is used to assess the degree to which LTP research and development activities result in advancement of technologies relevant to the National Information Infrastructure. The number of unique new technology capabilities delivered over the evaluation period by LTP is tabulated.

5) Number of Papers Published

The number of papers published is used as one indirect measure of the quality of LTP products.

These metrics will be applied to the LTP milestones. The measures listed above are used to infer the quality, acceptance, and national impact of NASA LTP efforts.

Other characteristics, such as sustainability and scalability, are not measured directly but are assumed to be indirectly captured with the metrics that have been selected. Because individual elements of LTP differ significantly in objectives and scope, metrics drawn from the above list are selectively applied to the Level I milestones as shown below. The metrics will be measured as the accumulation of all LTP over the life of the project

Table 6: LTP Application of Metrics to Milestones for FY98

Milestone	Metric	Application
· #35: Distribute mature K-12 curriculum products over the National Information Infrastructure	· Diversity	· 20% K-12 efforts support the disadvantaged
	· Number of accesses	· 50,000 accesses per day to NASA educational information during peak periods
	· Number of schools supported	· 5,000 schools supported
· #41: Demonstrate results of mature DLT products	· Additional technical capability	· 7 sign. tech monitors
	· Number of papers published	· 20 papers published

5.3 LTP Level II Metrics

Level II Metrics for LTP grow out of the guiding principles, goals, and outcomes discussed earlier. Each LTP metric is directly related to at least one LTP outcome as listed in the table below. All centers report on all metrics in order to group the data on the Learning Technologies Project as a whole. The method for reporting metrics to the Office of Education is Education Division Computer Aided Tracking System (EDCATS). Information from the monthly reports (below) will be summarized by the Project Office and entered into EDCATS.

Table 7: LTP Level II Metrics and Related Outcomes

Metric	Related Outcome(s)
1) Awards and recognition received	· LTP is recognized by the academic and industrial communities
2) On-line: Web statistics (hits, Kb transferred, unique addresses) per month	· LTP is visible and findable · Well-defined technical training path · Large-scale integration of LTP into classrooms
3) Off-line: Number of conferences and other external activities	· LTP is visible and findable
4) Number of "referenceable" papers submitted by LTP and affiliates	· Raised level of math, science, engineering, and technology awareness
5) Number of schools and underserved schools served by LTP projects	· Raised level of math, science, engineering, and technology awareness

Each center must make a reasonable effort to meet these five metrics. The agency is likely to judge the project by its numerical success in these areas.

Metric 1 will be calculated at one major award for every $100K spent on the project rounded to the nearest whole number. If a project budget is $150K, 1.5 prestigious or awards, rounded to two prestigious awards will be required to meet this metric.

Metric 2 will be calculated at a minimum of one hit per dollar. If a center has a budget of $300K, the metric would be at least 300,000 hits for the year. In general most projects far exceed this metric in a single month, however the lower boundary has been set.

Metric 3 will measure one major conference or public activity for every $100K rounded to the nearest whole number. If a project has a budget of $220K per year, it is expected to support 2.2 events, rounded to two events.

Metric 4 will be calculated at one paper for every $100K rounded to the nearest whole number. A center receiving $500K would be expected to produce at least five papers during the year.

Metric 5 will be calculated at three schools for every $10K. A center with $20K would be expected to have data on six schools which it has supported in some fashion. Note this could be as simple as preparing an Internet kit for the school or doing an Internet activity. In general this can be a very low level of personal involvement, but enough for the school to know that NASA is providing it with something.

Table 8: LTP Level II FY98 Target Metrics

Metric	ARC	DFRC	GSFC	KSC	JPL	JSC	LaRC	LeRC	MSFC	SSC
1) awards & recognition	5	2	2	0	3	2	2	2	0	0
2) # of hits	500K	195K	160K	20K	310K	215K	200K	220K	20K	20K
3) #of activities	5	2	2	0	3	2	2	2	0	0
4) # of papers	5	2	2	0	3	2	2	2	0	0
5) # of schools	150	59	48	6	93	65	60	66	6	6

Table 9: LTP Level II Optional Metrics Reported as Necessary

Metric	Related Outcome(s)
· Number of instructional materials based on needs assessment	· Raised level of math, science, engineering, and technology awareness · Partnerships, both for-profit and non-profit · Large-scale integration of LTP into classrooms · Raised level of math, science, engineering, and technology awareness
· Number of teacher training institutions using LTP materials for pre-service teachers	· Raised level of math, science, engineering, and technology awareness
· Number of official school curricula using LTP institutional materials	· Large-scale integration of LTP into classrooms
· Number of students and teachers, and number of underserved students served by LTP projects	· Raised level of math, science, engineering, and technology awareness
· Number of unique technologies piloted in schools	· LTP-unique technology models are in place
· Number of collaborations with NASA-related scientists and engineers	· Partnerships, both for-profit and non-profit
· Number of high-level educational partnerships (universities, museums, national organizations, science centers, state & local education bodies, industry)	· Partnerships, both for-profit and non-profit
· Matching funds & in-kind services generated from outside LTP	· Partnerships, both for-profit and non-profit
· Number of teachers trained nationwide in use of LTP materials (includes demographics and follow-through)	· Well-defined technical training path

5.4 LTP Level II Reports

The Level II reportable metrics selected below represent how well the respective projects are doing toward producing the desired results identified in the table of outcomes listed above. The table below specifies the data collection methodology and responsibility. This information will be recorded at the Project Office level.

The Project Office will also routinely report results or unusually successful (or unusually unsuccessful) efforts to the HPCC Program Office and other senior management. The Learning Technologies Project Office will be responsible for taking any necessary follow-up

action as required. Project contributions and results will be among the criteria used by the Project Office in determining future budget allocations for proposals that are competed between Centers.

Table 10: LTP Metrics and Data Collection for all Levels

Metric	Data To Be Reported Monthly
· Amount of awards or reconition received	· Each project reports new pilots to its respective coordinator
· On-line: Web statistics (hits, Kb transferred, unique addresses) per month	· Each project reports hit and domain statistics to its respective coordinator (alternatively this can be collected by RSPAC)
· Off-line: Number of conferences and other external activities	· Each project reports type of conference participation and demographic make-up to its respective coordinator
· Number of "referenceable" papers submitted by LTP and affiliates	· Each project reports numbers and type of collaboration to its respective coordinator
· Number of schools and underserved schools served by LTP projects	· Each project reports school name, location, and point of contact to its respective coordinator (alternatively this can be collected by RSPAC)

LTP will build a unified infrastructure to address common activities and problems. This will include a Project Office Web presence and database support with a roll-up into EDCATS.

5.5 Project Metrics for Grants and Cooperative Agreements

These milestones represent technical milestones accomplished as represented by financial commitments from this office, coupled with disbursements from the procurement. The metric for success is meeting all milestones on schedule. Note: the financial schedule for specific proposals will be listed in the Approved Annual Fiscal LTP Proposal Plan.

5.6 LTP Financial Metrics

All Learning Technologies Projects will work with an accounting methodology that will allow them to track accruals versus expenses. At a minimum, LTP tasks and subtasks shall maintain metrics that track progress in meeting Office of Aeronautics budget performance requirements. These requirements are that there be 83% accrual of FY funds by the end of Sept. and 100% obligation of funds by the end of the calendar year 1998. Failure to meet these goals shall result in either withdrawal of FY funds or in reduction of the following FY guidelines. Line organizations at each NASA field center are responsible for meeting or exceeding these performance targets.

Funding will be provided by code FE and code R during the next fiscal year. Currently code FE does not have this requirement; however since code R is managing the project all components shall adhere to this metric. It is likely that the whole agency will be migrating toward this metric.

5.7 Management Reviews and Reports

The LTP manager and Deputy Project Coordinator will submit reports on a regular basis and hold reviews periodically to evaluate technical and administrative progress on the LTP.

Comprehensive program reviews are conducted to evaluate the progress of the project and give critical feedback to the project managers. In addition to appropriate NASA personnel, representatives from other federal agencies, academia and industry may be invited to participate. Reviews are conducted in accordance with established policies and procedures.

5.7.1 Reviews

The LTP is responsible for conducting an Annual Review of its activities. Some additional reviews may also be required. Centers with ROC subtasks are required to conduct these reviews when necessary.

The Aeronautics Projects, Special Projects, and Digital Library Projects are responsible for regular review of their agreements by the appointed technical liaisons. This should be handled in the form of regular telecons and at least one site visit per year. The LTP Office will conduct at least one review of each cooperative agreement and grant.

5.7.2 Reports

All elements and projects are responsible for providing monthly and annual project reports. Centers with ROC subtasks are required to provide the information necessary for these reports on time. All projects will be required to provide information for the LTP Annual Report. All types of data may be requested

6.0 LTP RESOURCES

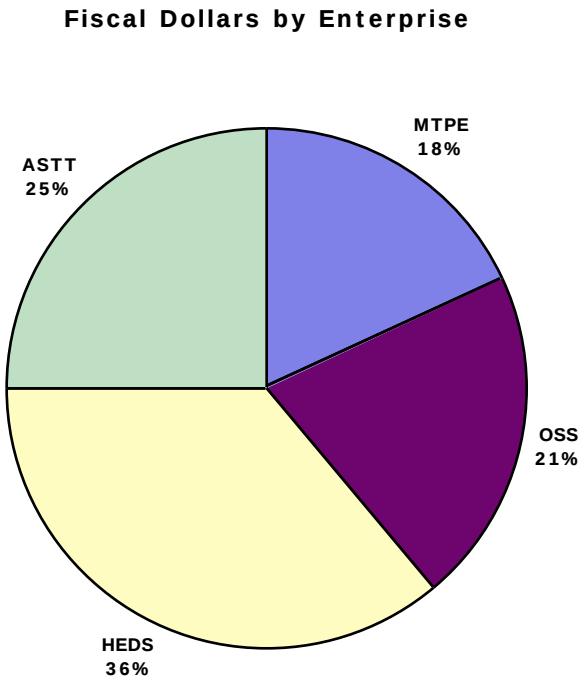
6.1 Financial

Funding and workforce budgets have been coordinated among the various NASA centers participating in the LTP. The LTP budget profiles for the fiscal years FY98 - FY02 are shown in the following table in millions.

Table 11: LTP Multi-Year Budget Plan

FY	Amount	Code FE	Code R
1998	$ 6.7 M	$ 4.2 M	$ 2.5 M
1999	$ 5.0 M	$ 4.0 M	$ 1.0 M
2000	$ 4.0 M	$ 4.0 M	$ 0
2001	$ 4.0 M	$ 4.0 M	$ 0
2002	$ 4.0 M	$ 4.0 M	$ 0
2003	$ 4.0 M	$ 4.0 M	$ 0

Table 12: LTP Budget Plan by NASA Enterprise



NASA Enterprise	FY98
Mission to Planet Earth	$1.2 M
Office of Space Science	$1. 4 M
Human Exploration and Development of Space.	$2.5 M
Aeronautics and Space Transportation Technology	$1.7 M

Note: table rounded to nearest hundred thousand.

Table 13: LTP Budget Plan by Fiscal Year

HPCC Learning Technologies								
Center	Sub Project Category	Completion	FY98	FY99	FY00	FY01	FY02	FY03
ARC	LT Program Office Sterling 625(Leon/Sell	Ongoin	$320,000	$320,000	$280,000	$280,000	$280,000	$280,000
ARC	Code D Tax 2% of	Ongoin	$80,000	$27,000	$7,000	$7,000	$7,000	$7,000
ARC	Head Tax	Ongoin	$14,000	$14,000	$14,000	$14,000	$14,000	$14,000
ARC	Aero K-14/Coop. Agree.Infouse Inc. (Leon)	May-98	$212,799					
ARC	Aero K-14/CA Cislunar Aerospace Inc. (Leon)	Jun-98	$105,376					
ARC	Aero K-14/Grant/Anetlope Valley Sch. (Leon)	Jun-98	$293,849					
ARC	Aero K-14/Grant/Univ. of Idaho (Leon)	May-98	$66,719					
ARC	Aero K-14/Grant/ MCET (Leon)	May-98	$188,933					
ARC	Aero K-14/Grant/Florida Int. Univ. (Leon)	May-98	$409,286					
ARC	Aero K-14/Grant/Tufts Univ. (Leon)	Jun-98	$111,428					
ARC	Aero K-14/Grant/Mephis City Schools (Leon	May-98	$297,744					
ARC	Aero K-14/Grant/Aero. in Sports (Leon)	FY98	$26,000					
ARC	Aero SSC/SP	Ongoin	$70,000	$75,000	$40,000	$40,000	$40,000	$40,000
ARC	LT Technical Support	Ongoin	$42,000	$50,000				
ARC	Minority Student SC,FH&B,HSGEN(Leon/Bu	Ongoin	$17,866	$19,000				
ARC	DLI (Leon/Miya)	FY98	$750,000					
ARC	RSPAC (Griggs/Kakadelis)	FY99	$1,000,000	$750,000				
ARC	Dist. Learning UND (Leon/Dyson) [45K]	Sep-99	$29,000	$100,000				
ARC	LTP Conference	Ongoin	$10,000	$15,000	$10,000	$10,000	$10,000	$10,000
GSFC	LT Special Projects/New Solic. (Hasler/Nelson	FY03		$1,250,000	$1,250,000	$1,250,000	$1,250,000	$1,250,000
GSFC	LT Special Projects (Hasler/Nelson)	Ongoin	$145,000	$145,000	$140,000	$140,000	$140,000	$140,000
GSFC	LT Special Projects/Grant/ VW (Hasler/Nelson	Sep-99	$50,000	$100,000				
GSFC	LT Special Projects/CA/PTK (Hasler/Nelson)	FY98	$100,000					
GSFC	DLT Equipment (Lal/Hoban)	FY98	$30,000					
GSFC	DLT/DLI SSC (Lal/Hoban)	Ongoin	$170,000	$170,000	$160,000	$160,000	$160,000	$160,000
GSFC	DLT Grants (Lal/Hoban)	FY98	$376,000					
ARC	K-Grey (Traicoff)	Ongoin	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000
GSFC	K-Grey (Hamet Bernard)	Ongoin	$160,000	$160,000	$160,000	$160,000	$160,000	$160,000
DFRC	K-Grey (Duke/McCarthy)	Ongoin	$195,000	$150,000	$150,000	$150,000	$150,000	$150,000
JSC	K-Grey (Shelton)	Ongoin	$215,000	$215,000	$215,000	$215,000	$215,000	$215,000
JPL	K-Grey (Ferraro/Clark)	Ongoin	$310,000	$310,000	$310,000	$310,000	$310,000	$310,000
LaRC	K-Grey (Seaton)	Ongoin	$200,000	$230,000	$230,000	$230,000	$230,000	$230,000
LeRC	K-Grey (Lewandowski)	Ongoin	$220,000	$220,000	$220,000	$220,000	$220,000	$220,000
SSC	K-Grey (Powe)	Ongoin	$20,000	$50,000	$50,000	$50,000	$50,000	$50,000
KSC	K-Grey (Buckingham)	Ongoin	$20,000	$50,000	$50,000	$50,000	$50,000	$50,000
MSFC	K-Grey (Anderson)	Ongoin	$20,000	$50,000	$50,000	$50,000	$50,000	$50,000
IVV	K-Grey (Griggs)	Ongoin		$30,000	$164,000	$164,000	$164,000	$164,000
	HPCC Learning Technology		$6,776,000	$5,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000
	* Note that although guideline is 6.7M, 76K of IITA funds is coming back on							

The budget numbers represent totals for the performing centers and cooperative agreements. Unspecified balances represents program reserves, various program taxes, and funds for interagency endeavors, as well as unallocated funds that will be disbursed to the centers for such things as basic research, industry, consortia, and special initiatives.

6.2 Workforce

The direct civil service (CS) and in-house support service contractor (SSC) workforces committed by the NASA centers to the program are shown in the following table in full-time equivalents (FTE).

Table 14: LTP Workforce Plan by Fiscal Year

Center	FY98		FY99		FY00		FY01		FY02		FY03	
	CS	SSC	CS	SSC	CS	SSC	CS	SSC	CS	SSC	CS	SSC
Proj. Office	2	3.5	2	3.5	2	3.5	2	3.5	2	3.5	2	3.5
ARC	.5	5	.5	5	.5	5	.5	5	.5	5	.5	5
DFRC	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2
GSFC	.1	.5	.1	.5	.1	.5	.1	.5	.1	.5	.1	.5
IVV	.1	0	.2	.3	.3	.5	.3	.5	.3	.5	.3	.5
JPL	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2
JSC	.5	2	.5	2	.5	2	.5	2	.5	2	.5	2
KSC	.1	.2	.1	.2	.1	.2	.1	.2	.1	.2	.1	.2
LaRC	1	.5	1	.5	1	.5	1	.5	1	.5	1	.5
LeRC	2	2	2	2	2	2	2	2	2	2	2	2
MSFC	.1	.2	.1	.2	.1	.2	.1	.2	.1	.2	.1	.2
SSC	.1	.2	.1	.2	.1	.2	.1	.2	.1	.2	.1	.2

6.3 Procurement Strategy

Procurement will be in accordance with normal procedures for R&D activities at the procuring centers. Competitive procurements will be used to the maximum extent practicable. When time is a critical factor, innovative procurement practices permitted by any variance to procurement regulations for the Federal High Performance Computing and Communications Program shall be used. Among the procurement vehicles which are expected to be utilized on the HPCC Program are Support Service Contracts, Grants, NASA Research Announcements, Task Order Contracts, Cooperative Agreements, Fixed Price hardware purchases and leases, and cooperation with other Federal agencies.

6.4 Process for Center Proposals - FY98

The procedure below allows for corrective action, enhancing integration, targeting projects, and avoiding duplication.

- Each center proposes for next fiscal year (LTP and Education coordinate)
- Project Office reviews/filters to align with LTP goals
- Centers review: InterCenter Working Group (ICWG) peer review
- Two representatives from each center vote (budget is fixed —"guidelined")

6.5 Proposal Procedure for FY99

The points below refer to regional center proposals for FY99.

The procedure below allows for corrective action, enhancing integration, targeting projects, and avoiding duplication.

- Each center proposes for next fiscal year (LTP and Education coordinate)
- Project Office reviews/filters to align with LTP goals
- InterCenter Working Group (ICWG) conducts peer review
- AECC conducts review of any project containing an Aero Component
- Two representatives from each center vote on proposals (budget is fixed — ”guidelined”)
- Following approval, money will be allocated by either 506 authority from HQ or subauthorization from ARC.

6.6 Principles of Proposal Process FY99

Joint signatures by the NASA Officer of Education and LTP will be required where there is fiscal sharing or in-kind support provided by the Education Office. A concurrence signature by the Education Office is required for all other proposals.

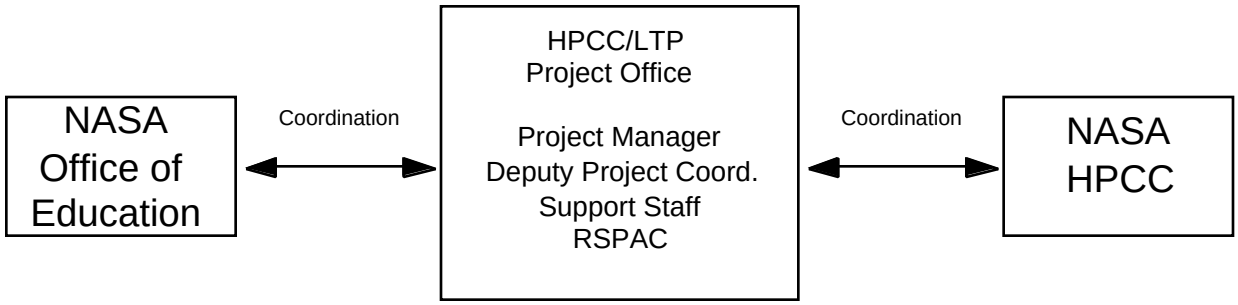
6.7 Risk Assessment

The deliverables in this project will be adjusted to deal with uncertainties in both funding and technical progress as is appropriate for a project pushing the state of the art. The scope of the deliverables will be adjusted in order to deal with unforeseen events. For example the number of LTP applications which are demonstrated, and the extent to which tasks may be undertaken to support these areas, may be executed via modified proposals and adjustments to the cooperative agreements. In all cases, responsible risk assessment must be made of all dissemination of all new technology that is implemented into schools.

7.0 EXTERNAL RELATIONSHIPS

7.1 Cooperation with Other NASA Programs

The LTP maintains a liaison with NASA's other education programs, including the Educational Program Offices residing at NASA field centers and the Educational Program Office at NASA Headquarters. An LTP Educational Liaison position has been created to insure that all Learning Technologies educational products created out of the LTP will be coordinated with NASA’s Educational Programs Office.



7.2 Cooperation with Other Organizations

A key concept of the High Performance Computing and Communications Program is early and continuing interaction with, and involvement of, the domestic academic communities. The LTP will actively foster this relationship through workshops, periodic in-depth reviews, and planning and review activities as appropriate. These workshops and review activities are designed to elicit direct, unfettered feedback from some of the nation's best experts in the field of scientific education in primary, secondary and post-secondary educational environments regarding the goals, objectives, priorities and structuring of the programs planned under LTP.

LTP has established a Joint Planning and Review Team consisting of key individuals in the domestic academic communities. This Planning and Review Team will meet at least annually in coordination with the LTP budgeting and planning process but will be consulted and kept informed regularly. The individuals on the Planning and Review Team will normally be the primary point of contact between the LTP and their respective organizations.

Table 15: Interaction with Other Organizations, Excluding School Partnerships

Center	Major Liaison Activities
Project Office	· Access America Board · ARPA (Advanced Research Projects Agency) · CoSN (Consortium of School Networking) · CUE (Computer Using Educators) · Department of Commerce · Department of Defense · Department of Education · Department of Energy · Eisenhower National Clearinghouse · ISTE (International Society for Technology in Education) · ISOC (Internet SOCiety) · NCTM (National Council for Teachers of Mathematics) · NEA (National Education Association) · NHU (National Hispanic University) · NII (National Information Infrastructure) · NSF (National Science Foundation) · NSTA (National Science Teachers Association) · NetDay Committee
ARC	· California State Teachers Association (CSTA) · Passport to Knowledge · Penn State PBS station WPSX · The Discovery Channel · SpaceNews · San Francisco State University · Institute for Computer Technology · WestEd (formerly FarWest Labs) · The GLOBE Program · Other California state & local education organizations
DFRC	· California State
GSFC	· Maryland State
JSC	· Clear Creek School District · Texas Education Network (TENET) · Other Texas state & local education organizations · Mississippi State University (Research, Rehabilitation, & Training - Center on blindness and low vision)

JPL	· Los Angeles County Office of Education (LACOE) · The California State Department of Education Science Framework Committee · California Museum of Science and Industry, Los Angeles, CA · California State · Mitsubishi · Air Touch · Software Bisque · Mount Wilson Institute · Naval Observatory · Celestron · Mead Instruments · Santa Barbara Instruments Group · Silicon Graphics · Boston Museum of Science · Little Thompson Science Foundation · Hayden Planetarium · Griffith Observatory
KSC	· Florida state and local education organizations · Florida Gulf Coast University · Florida State Commissioner of Education
LaRC	· Virginia state & local education organizations · Elizabeth City State University · US Department of Housing and Urban Development · Virginia Space Grant Consortium · Unified Research Laboratories · WHRO Public TV
LeRC	· Ohio state · Ohio Space Grant Consortium, · WVIZ-TV (Cleveland Public TV)
MSFC	· Alabama state & local education organizations
SSC	· Mississippi state & local education organizations

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- 1996 NASA Communicating Science, A Celebration of Accomplishments (Second Printing).
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- 1996 IITA K-12 Annual Report.
- 1997 IITA Annual Report.
- LTP Five-year Plan for Education.

ACRONYMS

ARC	Ames Research Center
CAN	Cooperative Agreement Notice
CA	Cooperative Agreement
DFRC	Dryden Flight Research Center
FTE	Full Time Equivalents
FY	Fiscal Year
GSFC	Goddard Space Flight Center
HPCC	High Performance Computing and Communications
HQ	Headquarters
LT	Learning Technologies
JPL	Jet Propulsion Laboratory
K-12	Kindergarten through 12th grade
LaRC	Langley Research Center
LeRC	Lewis Research Center
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NII	National Information Infrastructure
OA	Office of Aeronautics
SSC	Support Service Contractors
SSC	Stennis Space Center
UPN	Universal Project Number
U.S.	United States
WBS	Work Breakdown Structure

APPENDIX A: PROJECT PLANS

A1 Learning Technologies Project Office

Proposed Activities for FY98

I. Goals

The two main goals of the Learning Technologies Project Office are to ensure the smooth running of the project and to represent the project to other organizations. The Project Office also manages occasional special projects.

II. Approach

Smooth running of the project occurs through facilitating communication between and among the Regional Outreach Centers and the Project Office; communicating with cooperative agreements and grants via the leads for those activities; organizing and coordinating activities such as product dissemination and metrics gathering, which can be accomplished at least in part through a unified, project-wide infrastructure; preparing and chairing InterCenter Working Group video conferences; and managing the Regional Outreach Center proposal process .

Representation of the project to other organizations includes liaison activities with other NASA projects and missions, other federal agencies, state and local agencies, and private industry. Representation also includes engaging high-leverage partners in working with LTP.

Technical and management support is given to special projects which arise sporadically.

III. Milestone Timeline

- InterCenter Working Group Video Conferences:

  November 5, 1997

  January 9, 1998

  March 4, 1998

  May 8, 1998

  July 10, 1998

  September 11, 1998

  November 5, 1998

- Regional Center Proposals Reviewed and in Place:

  October, 1998

- LTP Advocate Program (Dissemination Strategy) Initiated:

  November, 1998

- LTP Advocate Program Established:

  March, 1998

IV. Deliverables

- Clear communication between centers and the Project Office
- Coordination of LTP-wide activities:

  LTP Advocate Program

  Learning Technologies Channel

  InterCenter Working Group
- Participation of high-leverage partners, with significant cost-savings to LTP

V. Evaluation

Regular conferences will be held with the Project Manager and the leads of each Regional Outreach Center.

VI. Dissemination and Public Relations

The Learning Technologies Project Advocate Program is designed to help put the products and services of all Learning Technologies Projects, both Regional Outreach Centers and Cooperative Agreements/Grants, into schools across the nation. All of the liaison activities of the Project Office are in the nature of Public Relations.

VII. Budget

Labor:	
2.5 SSC=	$275,000
1.0 CS =	n/a
Travel:	
SSC	$20,000
CS	($5,000)
Special Projects:	$20,000
Hardware and Software:	$5,000
Total:	$320,000

A2 Aeronautics Projects

I. Goals : K-14 Aeronautics Projects have the primary goal of increasing math, science and engineering comprehension and understanding in the range of K-14. All projects meet and/or exceed the National Standards. All projects have a diversity component where minorities, physically challenged and women are targeted. All projects will also have an on-line Internet component.

The following projects have subcategories :

a) Lego Data Acquisition Project (LDAPS)

b) Cislunar Aerospace Incorporated (K8AIT)

c) InfoUse Incorporated, Plane Math

d) Aviation Academy

e) SPARK

f) Florida International University (FIU)

g) Mass. Corporation for Education Telecommunications (MCET)

h) SHaring Aeronautics Projects Electronically (SHAPE)

i) Aerodynamics in Sports

Needs assessment

-- Customer involvement

-- Integration with NASA Center Education Office

-- High-level partners

-- Training

II. Approach :

a). LDAPS is cross-disciplined. It uses teacher training in the summers. In the training sessions, teachers learn math and science principles and how to tie them in with the LDAPS curriculum. They are trained on the use of the web and learn how to create and develop web pages. The teacher training is incorporated and reviewed by Langley's Office of Education and K-12 Langley Manager Jeff Seaton.

Collaborative efforts are formed with Lego (in Denmark) and Edu-Tech. Ties are also involved with Tufts University and MIT.

b). Cislunar has a range of target partners ranging from the Hispanics migrant farm workers, to the schools for the hearing impaired to hospitals with bedridden children. NASA ties are with the Program Office at Ames, Tom Clausen and Garth Hull in the Office of Education and the AESP program (Aerospace Encounter). Training is done on-line and through teacher training.

c). InfoUse has a range of collaborative partners. Partners range from Kinkos to San Francisco Airport to ATA (Alliance Technology Association), Ames program office as

well as Ames office of Education (Garth Hull) have provided input on the educational components and the technical support. Julie Pollitt has provided guidance in the area of wind tunnels active lesson plans. Training is done on line. Items are specially designed for the physically challenged.

d) Aviation Academy has collaborative partners with FedEx, FAA, and local Tennessee Colleges. They are actively working with NASA/Lewis HPCC/K-12 manager Beth Lewandowski. Their approach is interesting as an approach as a liaison in engineering. They combined hands on with instructional materials to give a different teaching approach. Training is done in and out of the classroom.

e) University of Idaho works with NASA/Dryden Education Director Lee Duke. They have collaborative partnerships with HP, who provides technical guidance and computer support and usage practices. summer teacher training is done on site for teachers in the k12 program form the Nez Perce and Coeur d'Alene tribe.

f) Florida International University works with Langley Education Director Sam Massenberg. They have on-line training as well as training at Florida International University. As they work with a diverse population, their needs have been catered to those they serve.

g) MCET utilizes a unique approach through satellite broadcast. Some sessions are taped and some are live. Viewers can call in an ask questions. Teachers can tape the sessions or watch them live. Each session has many interactive lesson which can be done in the classroom. They work closely with the NASA/Langley office of education manager Dr. Shelly Canright.

h) SHAPE works closely with the NASA/Ames program office. Training is done on-line through a variety of lesson plans. Two school districts, Antelope Valley and Palm Dale are actively supporting this project.

I) Aerodynamics in Sports utilizes the sport of tennis to draw students into aeronautics.

The engineering process of computational simulation, to wind tunnel testing is used to demonstrate the research and design process.

III. Milestone Timeline

All projects are required to submit an annual report the end of each fiscal year. The requirements were stipulated by NASA/Ames grant office Standard Hand book.

IV. Deliverables

All projects are required to deliver an on-line presentation As a deliverable. All projects must serve under-represented/diverse groups. All projects will meet the national standards for Math and Science. All projects will increase the understating and base knowledge of engineering and aeronautics.. Engineering will assist in the aid and development of a different teaching mechanism, which will in turn increase, math, science, aeronautics, engineering knowledge. Teaching practices will be adjusted to incorporate the new changes.

V. Evaluation

Evaluation is done through a variety of methods. EDCATS is actively used by all projects. Data is distributed through teacher training events and sporadically throughout the year. Projects are also assessed on their compliance with PCA Milestones. Projects will be assessed in deliverance of a changed curriculum and higher testing scores.

VI. Dissemination

All projects will be disseminated on a national and international level. All projects are available via the world wide web. MCET additionally has a satellite component which is broadcast and can be reached on your television cable system. Teacher training and hand out material will be distributed. White papers, MOUs, and collaborations will be made available. All projects will attend national and local conferences and events. Each project has additionally been tied to schools in a variety of geographical locations throughout the country.

VII. Budget

ARC	Aero K-14/Coop. Agree.Infouse Inc. (Leon)	May-98	$212,799
ARC	Aero K-14/CA Cislunar Aerospace Inc. (Leon)	Jun-98	$105,376
ARC	Aero K-14/Grant/Antelope Valley Sch. (Leon)	Jun-98	$293,849
ARC	Aero K-14/Grant/Univ. of Idaho (Leon)	May-98	$66,719
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ARC	Aero K-14/Grant/Florida Int. Univ. (Leon)	May-98	$409,286
ARC	Aero K-14/Grant/Tufts Univ. (Leon)	Jun-98	$111,428
ARC	Aero K-14/Grant/Memphis City Schools (Leon)	May-98	$297,744
ARC	Aero K-14/Grant/Aero. in Sports (Leon)	FY98	$26,000

A3 Aeronautics Projects Coordinator

I. Goals -

A. Successfully integrate developed technology into Year 3 for K-14 projects.

B. Web statistics on a monthly basis

C. Writing early drafts of the Special Projects CAN which will be released in early FY 1999.

II. Approach -

A. 1. Report on a monthly basis to ARC Program Office, Procurement and Grants offices as original periods of performance of K-14 projects.

2. Facilitate Industry collaborations with K-14 Projects.

3. Facilitate Year 3 requirements.

4. Host Year 3 PI meeting/conference for K-14 projects. Event to be held at Langley.

B. 1. RSPAC posts and publicizes web figures.

C. 1. Utilize K-14 Aeronautics CAN as a template plus elements of CAN-OA-94-1 and input from the IC-WG to develop early drafts.

2. Post early drafts online for a month, seeking feedback (to coincide with PI meetings).

3. Incorporate appropriate feedback and release late FY 98 for early FY 99 award.

III. Milestone Timeline

A. Monthly reports submitted to Susan lee on or before the 5th of each month.

IV. Deliverables -

A. Successful Year 3 applications and completions

B. Web statistics posted by RSPAC

C. Special Projects CAN.

V. Evaluation -

The projects will continually be assessed based on their performance in Year 3.

VI. Dissemination and Public Relations

A.1. The Ames Program Office will continue to highlight K-14 projects.

2. K-14 projects will be presented at national and regional educational meetings.

3. AECC Collaborative efforts.

4. Aeronautics External Relations Working Group collaborative efforts.

VII. Budget -

SSC labor	$60,000
SSC Travel	$10,000
Total	$70,000

A4 Learning Technologies Project Technical Support

I. Goals: To provide technical support for the Learning Technology Project.

II. Approach: To utilize Wang Inc. to hire a suitable technician.

III. Milestone:

3/31/98	Design and implement the Distance Learning Facility (DLF).
9/30/98	Design integrated solutions for the Learning Technology Project (LTP) in order to implement distance learning.

IV. Deliverables:

* Design and implement the Distance Learning Facility (DLF).

    -Work with radio frequency & digital equipment to run the DLF.

    -Work with researchers to help prepare NASA courses for the DLF.

    -Manage DLF during production and maintenance periods.

    -Collect DLF data and report.

    -Integrate new DLF components in the N240 Ground station.

    -Utilize new technology models as delivered in the DLF.

* Design integrated solutions for the Learning Technology Project (LTP) in order to implement distance learning.

    -Design video teleconferencing solutions for the ARC video teleconferencing (vits) requirements.

    -Implement vits solutions at Ames Research Center.

    -Research and design effective use of Internet based learning modules.

    -Attend conferences and explore new opportunities for LTP in the domain of Internet

    based learning

* Maintain and service the LTP distance learning cache server.

    -Update cache on UNIX based machine.

    -Take LTP server to small conferences to act as a network emulator.

    -Upgrade systems as required.

    -Develop and acquire superior software modules.

* Support and Implement the LTP dissemination network system.

    -Implement the multiple platform parallel processing network.

    -Interface with 16 machines running 300 node software that can service 4800

    channels.

    -Attend conferences and explore new opportunities for the parallel systems

    processing network.

V. Evaluation: The technical work provided by this resource will be evaluated by Wang Inc. on a quarterly basis.

VI. Dissemination and Public Relations: The resources developed in this project will be a key mechanism for dissemination.

VII. Budget:

Labor

Civil Service	NA
1.0 FTE Support Service Contractor	$42,000
Travel	
Civil Service	NA
Support Service Contractor	$5,000
Hardware & Software	$0

A5 Minority Student Support

I. Goals: To provide opportunity for minority, women, and challenged youth.

II. Approach: To utilize Wang Inc. to employ suitable high school students.

III. Milestone:

* 8/98, HS Student attends Space Camp

* 6/98, Execute and complete 1998 NASA Rocket Club.

IV. Deliverables:

* 3rd Q, Send the winner of the Hispanic Essay contest to Space Camp near MSFC and employ the second place winner for a two week internship.

* 2nd Q - 3rd Q, Hire two high school students to support LTP and work directly with the Ronald McNair Rocket Club on Fridays.

* 4th Q, Return existing students to active duty for summer employment.

V. Evaluation: The technical work provided by this resource will be evaluated by Wang Inc. on a quarterly basis.

VI. Dissemination and Public Relations:

* The Hispanic Essay on the Technology and the Internet will be publicized on the web and in the ARC Astrogram.

* The 1998 Rocket Club will be placed on the ARC Hispanic web site.

VII. Budget:

Labor	
0.5 FTE Support Service Contractor	$16,000
Travel	
Support Service Contractor	$1,500
Total	$17,500

A6 Digital Library Initiative

I. Goal

The Joint NSF/DARPA/NASA Digital Library Initiative (DLI) is basic research to study the problems inherent with large structured data repositories. Existing Internet protocols and facilities have scaling, performance, and other technical issues which were never intended to work with large collections of data/information. The DLI goal is NOT to produce an operational digital library, but rather, the DLI is a series of Projects to produce small working testbeds to study these problems and perhaps find solutions. The post-Initiative disposition of these testbed is left to the individual research unit: some testbeds plan to terminate while other testbeds plan to continue.

The Joint Digital Library Initiative funds six roughly equal-sized Projects:

a) Carnegie Mellon University Informedia Project

b) University of Michigan Digital Library (UMDL) Project

c) University of Illinois, Interspace

d) University of California at Berkeley Electronic Environment Library (elib)

e) Stanford University Infobus Project

f) University of California at Santa Barbara Alexandria Digital Library (ADL) Project

Many other big and small research problems exist when handling large quantities of data depending upon the data's structure, but some those problems may be addressed during a subsequent follow-on Joint Initiative currently under planning.

II. Approach

The existing Internet uses systems and protocols optimized for the bursty test transmission. Unresolved technical issues include indexing, cataloging, clustering, searching, skimming, interface, media format, and payment/royalties to list a few.

The National Science Foundation (NSF) is the agency leading the Joint DLI. With funding from the Defense Advanced Research Projects Agency (DARPA) and NASA for a duration of four-years [FY1995-FY1998], the NSF has awarded six University projects and their research/industrial partners grants totaling slightly more than $24M. The partners include various firms and government agencies (at all levels) from computer, telecommunication, publishing, and other government concerns. This is not the handling dusty old books.

The Carnegie-Mellon University Informedia Project working with industrial partners, most notably Pittsburgh public broadcasting station WQED, is adapting speech recognition technology for use with video as a means to semantically search and skim. Recognition chops the audio and visual streams into video paragraphs and a recognized script which can then be searched. CMU is working with the presumption that video will predominate as an important future medium. CMU is working with a local Pittsburgh school. Additionally, Informedia has a payment research component called NetBill.

The University of Michigan Digital Library (UMDL) Project is exploring the use of software agents and brokers to search and retrieve information. Their collection consists of soft copies of existing science journals (industrial partner: Elsevier Press). SGML (Standard Generalized Markup Language) was chosen by UM and UI (next), because the language offers a document "standard" used increasingly by publishers. The University of Michigan's educational component uses a local high school as well as undergraduates to study the ecology of a local stream.

The University of Illinois, Grainger Library Interspace is focusing on the needs of undergrad engineering education. Engineering education has special requirements like "special" symbols (also known in the publishing industry as "penalty copy") such as mathematical characters and formulae. The University of Illinois is attempting semantic search and clustering techniques under SGML with these requirements. UI is studying their users' needs as they interact with their systems.

The UC Berkeley Electronic Environment Library (elib) is exploring the professional use of digital libraries. Using the State of California's vast hydrologic record system, Berkeley is learning how to deal with legacy documents. Berkeley is taking a relational DBMS query approach for studying user interfaces. They are developing the concept of a "multivalent" document: a document with layers of different semantic meaning from a scanned bit-map, to the textual level of optically recognized characters (OCR), to possibly higher levels of structure and content (e.g., tables, equations, etc.). Their collection is being developed with the California State Dept. of Resources (up to 100 TB).

The Stanford University Infobus seeks to act as a "glue" between various digital library protocols and services. The lack of consistency in I/O syntax and semantics is becoming a problem recognized by the Web community. The problem isn't merely differences in input syntax, but also interpreting output such as ranking queries. The Infobus seeks to unify these differences. It will include services like copy protection (no use another word) and many other tools. Community: The Infobus was originally intended to satisfy the needs of an academic computer science department. It has evolved to try and encompass the need for interoperability among the various other DLI Projects as well as its own Project needs.

The UC Santa Barbara Alexandria Digital Library (ADL) is exploring the differences between conventional Geographic Information Systems (GIS) technology and Internet Web technology. Right now, normal GIS tools such as ARCINFO don't interact with the Web. UCSB has one of the most extensive map collections in the world. Maps are particularly complicated, and searching geospatial data is very different from search for text. Spatial data can easy encompass, point, linear, areas, volumes, and even more abstract spaces. Community: The Alexandria Digital Library is intended to meet the meet the needs of a professional geospatial data community with extensibility to younger educational users.

III. Milestone Timeline

All Projects are required to submit an annual report each fiscal year. Each Project's Web site typically has a pointer to their respective Annual and quarterly reports. The Projects are not held to tight schedules to allow some degree of research freedom.

IV. Deliverables

The funding agencies presume the same standards expected from any academic research institution: new research, ideas, software, etc. These are expected to take the form of conference papers, journal articles, books, but also other media: software (Web pages), Java applets, CDs and other disks, hypertext, and more. We do not specifically expect commercial products as that is not the function of Universities.

V. Evaluation

Evaluation consists these methods:

A yearly site review.

Annual and quarterly reports.

Occasional informal visits (weekly in some cases).

Examination of web and non-web information sources like papers, TRs, and conference proceedings.

In some cases, special access net, demo software and hardware, and other means are used for evaluation.

It is the intent of the funding agencies that evaluation be as minimally intrusive as possible to allow the widest possible freedom.

VI. Dissemination

Digital Library Initiative intellectual property arrangements vary between the public and privately funded universities and their industrial partners. The US government retains certain developed software use rights and content providers (industrial or otherwise) must retain their rights.

The products of the DLI are hoped to disseminate widely. We anticipate that not all products will gain acceptance in the research or business community.

VII. Budget

Approximately $1M NASA dollars are combined with $2M from DARPA and $3M from NSF for a combined initiative totaling just over $24M distributed almost evenly for four-years across the awarded fundees.

a) Carnegie-Mellon University Informedia Project (Dr. H. Wactlar, PI)

$1.3M / year.

b) University of Michigan Digital Library (UMDL) Project (Dr. D. Atkins, PI)

$1.0M / year.

c) University of Illinois, Interspace (Dr. B. Schatz, PI)

$1.0M / year.

d) University of California at Berkeley Electronic Environment Library (elib,

Dr. R. Wilensky, PI)

$1.0M / year.

e) Stanford University Infobus Project (Dr. H. Garcia-Molina, Co-PI)

$0.8M / year.

f) University of California at Santa Barbara Alexandria Digital Library (ADL,

Dr. T. Smith, PI)

$1.0M / year.

A7 Remote Sensing Public Access Center

REMOTE SENSING PUBLIC ACCESS CENTER

I. Goals

LTP Programmatic Support — Provide support for NASA's Learning Technologies Project (LTP) office to manage and promote its activities.

LTP Development Team Support — Provide the LTP-sponsored teams with Internet, outreach, and multimedia assistance.

Public Outreach — Increase the public's access, via the Internet, to space observations of the Earth, our solar system, and the universe beyond.

II. Approach

Participate in LTP management planning activities (weekly teleconferences, InterCenter working group [ICWG], etc.). Provide programmatic support in the form of public outreach and administrative services.

Develop tools, services, and mechanisms for collaboration and communication that benefit LTP projects.

Showcase NASA Earth and space activities via the Observatorium Web site.

III. Milestone Timeline

		1998			
		1st Quarter October - December	2nd Quarter January - March	3rd Quarter April - June	4th Quarter July - September
Observatorium	General	Observatorium Spruce-up			Observatorium Eval
	Promo	Press Kit All Media Mail List PSA Video	Implement Mail List		
	Content	**EARTH:** Continental Drift, El Nino, Groundwater, Urban Heat, Hydrocycle **SPACE:** Cassini, Sunspot **SP FLIGHT:** History **AERO:** New Aircraft **IMAGE:** Search **EDU:** Glossary **FUN:** Crossword, Wordsearch **MISC:** Twice Used Tech	**EARTH:** GIS, Karst, Oceans, Pixel **SPACE:** Meteor, MGS **SP FLIGHT:** Shuttle, X-Planes **AERO:** Wind Tunnel **IMAGE:** MGS, TM Data **EDU:** Weafax	**EARTH:** Atmospheric, Circulation, Hurricanes **SPACE:** Origins **SP FLIGHT:** Launch Vehicles **AERO:** New Aircraft II **IMAGE:** Moon **EDU:** Lab	**EARTH:** Land Use, Weather **SPACE:** Death of Stars, Next Gen Hubble **SP FLIGHT:** Astronauts, Mir **AERO:** Highways in the Sky **EDU:** LEGOs
LTP Support	General	School Database 888 Line -> LTP Help Desk Telecon CA School LTP Web Site LTP Monthlies (3)	Educators' Digest Teacher Resource Guide Bookmarks LTP Monthlies (3)	Educators' Digest LTP Monthlies (3)	Educators' Digest LTP Monthlies (3) Logan County Outreach Review of LTP Site
	Promo &	LTP Press Release	LTP Press Release	LTP Press Release	

	Pubs				
	Conf.	World School WVSTA NSTA Digital Library		NSTA LTP	
Web Wizards		Java Inquisitor			
Systems Admin.		Round Robin Server Open NT			

IV. Deliverables

Milestone deliverables as defined in the RSPAC contract (NCC5-100).

10/31/1997	1/31/1998	4/30/1998	7/31/1998	10/31/1998	1/31/1999	4/30/1999
Milestone #14 Monthly Status Reports Quarterly Meeting	Milestone #15 Monthly Status Reports Quarterly Meeting	Milestone #16 Monthly Status Reports Quarterly Meeting	Milestone #17 Monthly Status Reports Quarterly Meeting	Milestone #18 Monthly Status Reports Quarterly Meeting	Milestone #19 Monthly Status Reports Quarterly Meeting	Milestone #20 Monthly Status Reports Quarterly Meeting

V. Evaluation

RSPAC evaluates its performance through direct feedback from customers.

LTP Office — RSPAC participates in a weekly teleconference with LTP. Through this meeting RSPAC receives new assignments and its performance on previous and current assignments is discussed.

LTP Developers — RSPAC solicits feedback from LTP development teams during and after each collaborative activity is completed.

Observatorium Users — RSPAC tracks the number of Web hits to the Observatorium and how users are accessing its pages. In addition, RSPAC receives and reviews hundreds of e-mails each month from users who comment about the site.

VI. Dissemination and Public Relations

RSPAC's public outreach mission is to increase the visibility of LTP and its development teams to the general public and to people who share a specific interest in NASA's educational opportunities. RSPAC employs two primary forms of outreach — traditional and online.

Traditional Outreach Techniques

Press Releases — RSPAC distributes press releases about LTP and Observatorium activities to a database of e-mail addresses that reaches virtually every US daily and weekly newspaper, as well as Web sites.

Papers — RSPAC submits articles to professional organizations to promote LTP activities.

Promotional Materials — RSPAC has produced brochures, pamphlets, and other promotional materials highlighting LTP and the Observatorium.

Press Kits — To better target selected national media organizations and their Web site critics and columnists, RSPAC has produced press kits touting LTP and the Observatorium.

Direct Media Solicitation — RSPAC contacts members of the media directly to inform them about the activities of LTP and RSPAC.

Conference Display Booth — A staple at trade shows and conferences, RSPAC's display booth allows LTP to be presented to people with similar interests.

Online Outreach Techniques

Hypertext Links — RSPAC solicits hypertext links to the Observatorium and LTP sites.

"Cool" Sites — RSPAC aggressively lobbies cool site indexes for inclusion of LTP sites.

Search Engines — RSPAC monitors its sites' presence on search engines.

News Groups — RSPAC posts information about LTP to several Internet news groups.

A8 Univ. of N. Dakota Distance Learning Grant

I. Goals: To provide university courses over the Internet based on NASA technology. We propose to use funding from this grant for four purposes:

1) teaching one or more short courses similar to TeleRobotics,
2) developing new technologies and methodologies for teaching SPACE.EDU courses,
3) developing a potential software product for teaching via the Internet,
4) informing a broad educational community of our progress via publications and presentations at national and international meetings.

II. Approach: The Department of Space Studies has developed SPACE.EDU (http://www.space.edu), an innovative M.S. program in Space Studies using the Internet and videotapes as the main media for instruction. In the first 18 months of operation ~255 students from 30 states and 10 countries have enrolled in SPACE.EDU courses. The highlight of SPACE.EDU thus far has been the 8 part short course: Live from NASA Ames: TeleRobotics, which explored many different educational technologies using the Internet (Leon, McCurdy and Wood, 1997). Now we propose, in conjunction with NASA Ames, to continue to develop new models of Internet-based distant education programs. An additional goal is to develop the capability and experience to teach short courses similar to TeleRobotics, but to host all of the servers and software here at UND.

III. Milestone:

* Annual report 9/98

IV. Deliverables:

Task 1: We will prepare and teach a course, tentatively titled: Live from NASA Johnson Space Center: Astronaut Training for the Space Station Era. We will work in association with scientists, astronauts, administrators and engineers at Johnson Space Center in developing this project. This course (to be provisionally offered in March 1998) will use those techniques which worked best in the previous TeleRobotics course: audio streaming, web-pages for images, chat software for student questions and online exams. Additionally, we will monitor the improvements in voice-to-text recognition software and, when appropriate, integrate it into the course to compile a reference transcript. Similarly, other commercial software innovations will be tracked and used whenever they would improve the educational experience. We point out, however, that we do not wish to develop educational methodologies which can only be successful in unique circumstances. Rather our goal is to be early adopters of

new technologies that can be utilized by students with computer capabilities only slightly more advanced than the average. In other words, our technologies won't be cutting edge, but we will strive for our applications to education to be.

Other short course are being considered. One is Live from Moscow: The Russian Space Program to which may be offered in fall, 1998. We are coordinating with the Baumann Institute (the MIT of Russia) in Moscow the exploration of possibilities for this course. We would need to send two Space Studies faculty and staff members to Moscow to coordinate this challenging offering. Additional course for development in future years include Live from ...Eros Data Center, Aerospace Industry, Research Organizations, and DOD. This capability can be used for many different types of courses and at various grade levels.

Task 2: SPACE.EDU is currently a very successful set of methodologies and technologies for teaching over the Internet. But as we learn from our experiences, and as new hardware and software capabilities become available, we will evaluate new ways to improve our courses. One important improvement will be to migrate our existing site into one based on a database. We envision that whenever a student logs on to SPACE.EDU the host server will present a menu of options and recommendations personalized to each student's status in the program. For example, if a student has completed 9 credits but has not yet officially applied for admission to UND, the server will remind the student of the requirement to register and lead her/him to the online form for application. Such a database will provide a more personal interaction for the student.

Another important innovation is the development of simulations that improve student scientific understanding by performing interactive experiments. We have already developed such Internet-based lab exercises for impact cratering and volcanic eruptions. In each case a realistic modeling of a geologic process is rendered according to input parameters selected by the student. Comparison of simulation with real volcanoes or cratered surfaces allows inference about the actual parameters. We will also investigate other lab exercises using multi-media experiments delivered over the Internet. This is an effective and fun way to learn.

Task 3: Presentations about SPACE.EDU at meetings in Malaysia, Wyoming, North Dakota and Manitoba, Canada have been very favorably received with many requests for our software. We intend to closely evaluate if our SPACE.EDU software can be generalized as a commercial product. Because the software has to be hosted on a server, it is more complicated to install and implement than most software which simply is loaded onto a desktop PC. We intend to develop a prototype of the various software components and instructions necessary to teach a single course on the Internet: i.e. building class web pages, establishing class list serves, signup forms for enrolling in chat sessions, online testing and grading, etc. NASA funding will be used to test if a feasible product can be developed (can we do it and is there a adequate market); if the answers are yes, other funding will be used to actually develop and market the product.

Task 4: Internet education is inevitable for K-20 education, just-in-time job training and recreational education. We intend to present our experiences, lessons learned

and recommendations to the educational community through published papers and presentations at national and international meetings.

Technical Considerations

Inappropriate use of any educational technology can stifle student interest. We intend to capitalize on the multi-media capability of the web to use color, video, audio, live interactions and simulations to capture student interest. Because we teach the same courses to UND campus and distant students we will be able to quantitatively compare grade distributions and completion rates for the two groups.

We have found that as faculty members experience Internet teaching, they re-cast their teaching styles to encourage more interaction and minds-on and hands-on student projects. Additionally, the faculty members learn new tools that can be used to improve on campus teaching. And by assigning students to prepare homepages, rather than traditional research papers, the students learn valuable skills for use in their professional lives. While SPACE.EDU is specifically aimed at graduate level education, it is applicable to all educational levels. And its reliance upon computers and individual learning is consistent with goals of various national education reform movements.

The development of a complete pedagogical approach incorporating new technology and teaching methodologies provides a tested model for use by other teachers at all grade levels. The proposed commercial product and presentations at meetings will disseminate our innovations to a wide audience.

V. Evaluation: The technical work provided by this resource will be evaluated by the grant COTR.

VI. Dissemination and Public Relations:

* These courses will be made available to at least 150 non-credit students with audio and thousands of participants via the www.

VII. Budget:

NASA AMES BUDGET FOR FY98 and FY 99 (in $)

	FY 1998	FY 1999
Personnel		
Faculty		5000
Staff/Student*	8700	28500
Fringe Benefits (27%)	2349	9045
Total Personnel	**11049**	**42545**
Travel	2600	4800
Communications	55	500
Data Processing**	2000	14000
Office Supplies		
Supplies		748
Total Operating	**4655**	**20048**
Equipment	7800	15500
Indirect Cost/35%	5496	21907
Total	**29000**	**100000**

* Yr 1: Staff 2 mm ($5000); student (15hr/wk = $3700)

* Yr 2: Faculty 1.5 mm ($5000), Staff 12mm ($24,800), Student 15 hr/wk($3,700)

** web software: database, middleware, etc.

*** Equipment: Web workstation, laptop, RAM and hard drive upgrades

	FY 1998	FY 1999
Travel	(Note 1)	(Note 1)
Airfare	1300	2400
Hotel	450	1100
Food	350	600
Registration	100	100
Miscellaneous	100	200
Car Rental	300	400
Total	2600	4800

A9 LTP Conference

Spring LTP Conference, FY 98

I. Goals:

The Learning Technologies Projects (LTP) Conference will provide an opportunity for an exchange of information between projects funded through LTP.

II. Approach:

This conference will provide Principle Investigators and LTP Center Managers the opportunity to present accomplishments and exchange ideas through presentations, demonstrations and workshops. Topics to be addressed include the transition of Digital Library Initiative/Digital Library Technology Projects, the beginning of Digital Library Initiative II's education effort and the final plan of the dissemination effort.

III. Milestone Timeline:

The conference will be held in May or early June at the Gulf of Maine Aquarium in Portland, Maine.

IV. Deliverables:

The conference will produce a document for dissemination of online project information.

V. Evaluation:

Conference attendees will fill out a conference evaluation form and the results will be compiled for management review.

VI. Dissemination and Public Relations:

The LTP Product Guide will be disseminated online and will be linked to the LTP homepage.

VII. Budget:

The total budget for the conference is $10,000. This figure includes facility rental of $5,000, food for attendees at $2,000, computer equipment rental at $2,000, and miscellaneous costs at $1,000.

A10 Special Projects

I. Goals -

A. Continue graceful shutdown/transition of RSD projects.

B. Organization of LTP Principal Investigators Meeting to be held June 1-3, 1998 in Portland. Maine.

C. Writing early drafts of the Special Projects CAN which will be released in early FY 1999.

II. Approach -

A. 1. Maintain milestone-monitoring effort and connections with GSFC Procurement and Grants offices as original periods of performance of RSD projects approach.

2. Facilitate no-cost extensions for those cooperative agreements and grants which would benefit from extensions.

3. Facilitate transfer of final products to RSPAC and/or Eisenhower National Clearing House where appropriate.

B. 1. Utilize Alan Lishness and the personnel at the Gulf of Maine Aquarium in Portland, Maine for local knowledge of facilities and opportunities.

2. Utilize RSPAC for registration, badging, and collecting registration.

3. Convene small committee of NASA staff, support staff and two PIs to help shape the general scope and direction of meetings. The a priori direction of these meetings is to assemble the collective knowledge of online education sites into a formal document and to solicit formal feedback on a draft Special Projects CAN.

4. Invite all PIs from CAN OA-94-1 to attend.

5. Carry out productive, enjoyable meetings with several sessions separated from all forms of electronic communication.

C. 1. Utilize K-14 Aeronautics CAN as a template plus elements of CAN-OA-94-1 and input from the IC-WG to develop early drafts.

2. Post early drafts online for a month, seeking feedback (to coincide with PI meetings).

3. Incorporate appropriate feedback and release late FY 98 for early FY 99 award.

III. Milestone Timeline -

A. Current expiration dates and proposed extensions:

RSD Grants

Grant #	School	Expiration	Extend to:
NAG5-2695	U of Hawaii	8/31/97	8/31/98
NAG5-2696	U of North Dakota	8/31/97	8/31/98
NAG5-2698	U of Minnesota	8/30/97	6/30/98
NAG5-2874	Smithsonian Astrophysical	1/31/98	1/31/99
NAG5-2875	U of California, Berkeley	1/31/98	6/30/98
NAG5-2876	U of Michigan	1/31/98	6/30/98
NAG5-2877	U of Wisconsin	1/31/98	1/31/99
NAG5-2878	U of Washington	1/31/98	7/31/98
NAG5-2905	North Texas University	3/14/97	12/31/98

RSD Cooperative Agreements

Contract #	Institution	Expiration	
NCC5-103	SAIC,	9/30/97	6/30/98
NCC5-104	TASC, The	7/31/97	6/30/98
NCC5-105	ECOlogic, Inc.	9/30/97	no
NCC5-107	Wheeling Jesuit College,	9/21/97	9/30/98
NCC5-109	WRC-TV	8/30/97	6/30/98
NCC5-110	The Childhood Project	8/30/97	8/30/99
NCC5-111	Sentar, Inc.	10/31/96	no
NCC5-113	Gulf of Maine Aquarium	8/30/97	6/30/98
NCC5-114	Prime Technologies	8/15/97	??
NCC5-118	Lockheed Missiles and Space Co.	9/30/98	Not

B. 1. Early announcement of PI meeting - 10/97

2. Schedule with speakers and session titles announced - 4/3/98

3. Final schedule disseminated - 5/5/98

C. 1. First draft of LTP CAN submitted to LTP office and IC-WG - 12/31/97

2. Second draft to NASA HQ - 3/1/98

3. Draft online 5/1/98 - 6/30/98

4. Pre-Final Draft to HQ 8/14/98

5. Final Draft online 10/6/98

6. Proposals Due 12/31/98

7. Announce awards 3/1/99

IV. Deliverables -

A. None.

B. LTP Principal Investigators Meeting, June 1-3, 1998.

C. Special Projects CAN.

V. Evaluation -

A. Keeping track of the products of the RSD projects and their long-term availability.

B. Evaluation forms will be distributed on the last day of the PI meeting soliciting feedback on the utility of the meetings. Results will be tabulated and forwarded to the LTP Project Office for use in future planning.

C. CAN drafts will be reviewed by LTP Project Office, IC-WG and NASA HQ before and after being posted online.

VI. Dissemination and Public Relations

A.1. The RSD server will continue to highlight RSD projects.

2. RSD projects will be presented at national and regional educational meetings.

3. Some RSD projects will continue teacher-training workshops.

4. RSPAC will continue its online and outreach efforts highlighting continuing efforts under the no-cost extensions of RSD projects.

B. 1. The June PI meetings will be advertised via direct email to PIs, through IC-WG and the “Announce” listserve at RSPAC.

C. 1. Early drafts of the Special Projects CAN will NOT be disseminated.

2. Online drafts will be posted at RSPAC, Quest, RSD and DLT servers.

3. Links to the online drafts will be solicited at NASA educational programs.

4. Final version will be posted as earlier drafts.

5. Final version will be accompanied by a postcard mailing and email announcements to NASA educational distribution lists.

VII. Budget -

SSC labor	$127,000
Taxes	13,000
SSC Travel	5,000
Total	$145,000

A11 Special Projects Volcano World

I. Goals - Extend online development of VolcanoWorld online materials and distance-learning efforts.

II. Approach - online materials on the VolcanoWorld Website and online distance-learning activities through the University of North Dakota.

III. Milestone Timeline - No milestones associated with this Grant extension.

IV. Deliverables -

Web statistics for the VolcanoWorld server.
Materials and statistics of student enrollment for online educational activities.

V. Evaluation -

Web materials will be evaluated by GSFC personnel.

Distance learning activities and technologies will be evaluated by GSFC and LTP Project Office personnel for potential use in other LTP activities.

VI. Dissemination and Public Relations -

Web materials will be added to the VolcanoWorld site where they will enjoy an audience approaching 1 million clients annually.

Distance learning activities will be advertised through University of North Dakota and on the VolcanoWorld site.

VII. Budget -

$50,000 extension for grant NAG5-2696.

A12 Special Projects Passport to Knowledge

I. Goals - Partially cover costs associated with Passport to Knowledge (PTK) Spring 1998 project with a working title “Live from the Rainforest”.

II. Approach - Four 1-hour live TV broadcasts on Tuesdays in April, 1998 supported by multi-media activities, online journals, email announcements.

III. Milestone Timeline -

9/30/97	$33,333	Announcement of Live from the Rainforest via mailing lists and online.
11/30/97	$33,333	Completion of first draft of Teacher’s Guide for online and print distribution
4/7/97	$33,334	Live from the Rainforest program 1 airs.

IV. Deliverables -

Teacher's Guide for Live from the Rainforest.
Four live-TV broadcasts.
Videotape copies of the TV broadcasts.

V. Evaluation -

Web materials will be evaluated by GSFC personnel.

Distance learning activities and technologies will be evaluated by GSFC and LTP Project Office personnel for potential use in other LTP activities.

VI. Dissemination and Public Relations -

TV broadcasts are disseminated via Public Television stations, NASA-TV and satellite uplink.

Announcements of broadcasts and resource materials are via online announcements and email notification to the extensive PTK mailing list.

VII. Budget -

$100,000 extension for Cooperative Agreement NCC5-110.

A13 Digital Library Technology Lab

I. Goals

Digital Library Technology Lab

Facilitate deployment of digital library technologies into Earth and space science.

II. Approach

Digital Library Technology Lab

Provide maintenance and system administration support for equipment for the DLT Lab, which includes the DLT Web server and the Framework for Information Technology iNfusion in Earth and Space Sciences (FITNESS), which is attempting to place DLT-developed technologies with users in the Earth and space science communities.

III. Milestone Timeline

Digital Library Technology Lab

PCA Milestone: Demonstrate results of mature DLT projects. 3Q 98

IV. Deliverables

Digital Library Technology Lab

FITNESS plan and activity summary.

V. Evaluation

Framework for Information Technology iNfusion into Earth and Space Science (FITNESS) initiative.

VI. Dissemination

Framework for Information Technology iNfusion into Earth and Space Science (FITNESS) initiative.

VII. Budget

DLT Lab (equipment)	$30k

A14 Digital Library K-12 Project

I. Goals

K-Grey Digital Library

Promote development and deployment of digital library technologies in education and life-long learning.

II. Approach

K-Grey Digital Library Education

Support (salary and travel) for one full-time SSC to serve as Coordinator for the NASA Cooperative Agreement Teams, initial activities in the DLI2 effort, and assistance with FITNESS effort.

III. Milestone Timeline

K-Grey Digital Library

DLT CAT Coordination	1 - 4Q 98
DLI Site visits, planning & PI meeting	1 - 4Q 98
FITNESS activities	1 - 4Q 98

IV. Deliverables

K-Grey Digital Library

Monthly reports for DLT CATs.

Reports, presentations, and support of DLT project manager as required.

V. Evaluation

Framework for Information Technology iNfusion into Earth and Space Science (FITNESS) initiative.

VI. Dissemination

Framework for Information Technology iNfusion into Earth and Space Science (FITNESS) initiative.

VII. Budget

K-Grey DL (salary & travel)	$170k

A15 Digital Library Technology Grants

I. Goals

Research & Development:

Promote development and deployment of digital library technologies using complex NASA datasets as technology drivers.

II. Approach

Research & Development

Administer final year of DLT Cooperative Agreements and grants.

III. Milestone Timeline

Research & Development: Cooperative Agreements & Grants

Milestone Payment Schedule

Project	Payment Date	Payment Amount
Bellcore	11/30/97	$167,540
IBM	12/23/97	$106,233
Lockheed Martin Missile Systems	12/10/97 1/22/89	$50,844 $50,845
UIUC /NCSA	completed	---
Rice University	No cost extension	---
University of Wisconsin	No cost extension	---
CSC	---	---

FY98 Cooperative Agreement & Grant Activities

Bellcore (PI: Behrens)

· Final report.

IBM (PI: Li)

1. New capabilities on the prototype system

· iterative refinement

· shape features

2. Complete Solar Flares scenario

3. Final version prototype system

- session history
- high-dimension indexing (RCSVD)

4. Complete Hantavirus scenario

Lockheed Martin Missile Systems (PI:Das)

1. SAIRE Template

- Investigate the development of a generic version of the SAIRE system (e.g., a SAIRE template) that can be used to build SAIRE like application in a different domain. In this task agent components will be to identified that need to be cast in a "template" and document the process necessary to build such a generic multi-agent tool kit..
- SAIRE project members are currently working with Cynthia Cheung (NASA/GSFC) on the Astrophysics Multispectral Archive Search Engine (AMASE). Although there is interest in SAIRE's User Modeling Agent (UMA) and Concept Search Agent (CSA) capabilities, the immediate interest is in developing a user interface for AMASE so that a novice user can query. Meetings with the AMASE group to understand requirements for the dictionary organization and the free text parsing capabilities. Information on internals of SAIRE's natural language interface and a template for NL-parsing agent are being provided to the AMASE project team.

2. Global Change Master Directory (GCMD) and Distributed Active Archive Center (DAAC) interactions

- Investigate the usability of SAIRE in the GCMD and DAAC community. Receive feedback from this community regarding SAIRE's capabilities and incorporate appropriate changes.

3. User Modeling Agent and Concept Search Agent capabilities

- Investigate learning algorithms and, if possible, develop a framework which will be suitable for inclusion of such learning capabilities.

NCSA (PI: Folk)

1. Atmospheric Sciences

- JAVA Viewer - Prototypes and Demonstration Implementation
- Image Data Browser Framework
- Collaborative Viewer

2. NCSA/HDF

- Java work

  Habanero Port

  Visualization features (prototypes)

- Scientific Data Browser (CGI-bin version)

  Release new version of SDB with features added since last release

  SDB as object prototype

Rice University (PI: Reiff)

FY98 plan is for evaluation, revisions, and expansion. Project activities include:

- Space Update (Six point-and-click Earth and Space Science programs, which can be run separately or as a single linked system).
- Houston Today (Houston's Weather from the local network of AWS weather stations and Houston Environmental Resources - from the Citizen's Environmental Coalition)
- "Ask the Scientist" Cu-SeeMe Videoconferences

  FY98 Ask a Scientist Video Conferences (CY98 dates TBD)

  - October 7, 10 - 10:30 am CST: "Bug-a-Boo"

    Explore the amazing world of insects. Part of the HMNS "Science Quest" series.

  - November 4, 10 - 10:30 am CST: "Before the Dinosaurs".

    Explore the life and times of the creatures who lived before the dinosaurs. Part of the HMNS "Science Quest" series.

  - December 9, 10 - 10:30 am CST: "Coiled to Strike".

    Learn about the amazing world of snakes. Part of the HMNS "Science Quest" series.

University of Wisconsin (PI: Percival)

Build a Web-ready Java version of the ***Progressive Image Transmission*** system.

IV. Deliverables

Research & Development

Cooperative agreements and grants do not have deliverables.

V. Evaluation

Framework for Information Technology iNfusion into Earth and Space Science (FITNESS) initiative.

VI. Dissemination

Framework for Information Technology iNfusion into Earth and Space Science (FITNESS) initiative.

VII. Budget

Research & development (DLT CATs)	$376k

A16 ARC Regional Outreach Center

NASA Ames Quest Team
FY 98 Proposal

Introduction

In Fiscal Year 1998, the NASA Ames LTP team proposes three major activity areas. The activity areas are designed to continue what has been successful in the past, develop and integrate new technologies for education via the Internet, and aggressively seek recognition for the spectrum of products, offerings and information that the Program has already delivered. Our categories are: Sharing NASA, Learning Technologies Channel and Outreach. As the budget figures show, the Sharing NASA activity will take a majority of the resources available.

1. Sharing NASA

Sharing NASA is a suite of projects which use network technology to make NASA programs accessible to students by connecting them in an exciting, interactive way with NASA scientists, engineers and others in math- and science-based careers. As we continue to develop our expertise in conducting these projects, we will also continue to spread the word among NASA organizations about our capabilities of doing educational outreach.

Sharing NASA projects include:

Live From Mars

Year-long project focused on the Mars Global Surveyor and Mars Pathfinder missions. Through December, Live From Mars is being done in partnership with Passport to Knowledge.

Shuttle Team Online

Focused on NASA's human space flight program, including the space shuttle and the International Space Station. We anticipate additional funding from the HEDS outreach office of NASA HQ.

Aero Design Team Online

ADTO is about NASA's diverse aeronautics mission. The project is projected to start in November with a wind tunnel group; we expect that over the school year, other NASA aeronautics personnel will get involved.

Women of NASA

Various NASA women online through chats and biographies to serve as role models, encouraging young girls towards science/technology careers. Also available are resources for teachers who are trying to deal with the issue of gender-equity. Women of NASA is less involved then other Sharing NASA projects; for example, no email Q&A service is provided. Several Women of the World special events will be scheduled to share careers outside of NASA.

NeurOn

Neuron shares the adventure of STS-90, a space shuttle mission dedicated to brain research. We anticipate additional funding from the Space Life Sciences Outreach Program.

Goals

- Use NASA-related topics to enhance teacher's content and pedagogical knowledge in mathematics, science and technology.
- Use NASA-related topics to enhance teachers' capabilities to design and implement more stimulating and engaging lessons and experiences for students.
- Cultivate an awareness of career opportunities in mathematics, science and engineering. Inspire students to pursue technical careers through use of the Internet and by focusing on dynamic and enthusiastic people doing exciting work at NASA
- Connect NASA with public

Approach

Sharing NASA projects focus on the people behind-the-scenes, and most of these projects have consistent project elements such as biographies, field journals, chats, email Q&A, etc. We have learned that short-duration projects present various difficulties for teachers; this year we intend for all of our projects, once started, to last throughout the school year.

In conducting these projects, we intend on using the following implementation strategies:

- Customer Involvement - We rely very heavily on educator input in designing Sharing NASA projects. Input from evaluations of previous projects are incorporated into the planning of future projects. We receive constant feedback throughout a project in the form of email, Webchat comments, surveys, and conference interactions. Evaluations from participants are solicited at the end of each project.

- Integration with NASA Education Office - The Ames K-12 team is very mindful of its relationship with the Education Office and makes every effort to keep them informed of our activities. This summer, we met with the Ames Education Office and their AESPs to brief them on our FY 98 plans and solicit their ideas and feedback.
- High-level partners - We are currently pursuing partnerships with several high-tech companies and with the JASON project.
- Training - Our projects include suggestions for use in the classroom, and forums for teachers to discuss this issue with other educators and with us. The Learning Technologies Channel will also be featuring Sharing NASA projects as part of its "Teaching with the Internet" series.

Milestone Timeline

Sep 97	Continue operating LFM, STO projects throughout school year
Oct 97	Resume operating Women of NASA
Nov 97	Begin operating Aero Design Team Online
Nov 97	Begin operating NeurOn
Jan 98	Survey Shuttle Team Online audience
Jan 98	Begin transitioning Live From Mars to post-PTK project

Deliverables

- Projects that connect students nationwide with real NASA experts
- Projects that assist educators in integrating the Internet into the curriculum

Evaluation

The customers of each project will be periodically surveyed through email and Internet to assess their likes and dislikes and to provide us with feedback on how we can improve the projects. For projects that continue throughout the year, two surveys will be conducted. For the projects which start in November, one survey will be conducted at the end of the school year.

We have begun using survey software that automatically compiles the results. This makes it much less labor intensive to get results. These surveys are conducted via email. The addresses come from both the project's email list and a registration page which is available on the web.

As an example, in the end-of-school-year (June 97) Shuttle Team Online project, we sent surveys to about 2,000 customers. Of these, about 500 people responded. Below are a few of the questions we asked:

3. What is your involvement with, or interest in, Shuttle Team Online?

    a) As a K-12 teacher working in a public or private school actively using it with students.

b) As a K-12 teacher or educator using it for professional development but currently not with K-12 students.

c) As an adult working with students in an informal or after-school setting, etc.

4. If you used this project with students, please indicate how many students were involved:

5. How would you rate the Shuttle Team Online Website in terms of its educational value?

6. We are interested in which parts of Shuttle Team Online you used. Please check all of the resources that you used or read

a) Biographies of NASA people

b) Field Journals

c) WebChats

d) Email Q&A...

etc.

Dissemination and Public Relations

- Delivery over the Internet
- Advertisement via maillists, conferences, speaking engagements, etc.
- Spread the word via the thousands of teachers who have previously utilized our projects

Budget

Labor (SSC)	$335,000
Hardware/Software	$20,000
Travel (SSC)	$20,000
Total	**$375,000**

2. Learning Technologies Channel

During the past two years, we have experimented with hosting various virtual conferences. This year we intend to formalize those infrequent events into a technology infrastructure called the Learning Technologies Channel (LTC). The LTC will provide educators and the general public with a location on the Internet that allows them to participate in online courses and to remotely attend some NASA workshops and seminars. A primary focus of the LTC will be to broaden the uses of the Internet to include in-service teacher training. The LTC will also provide access to the immense field of NASA projects and information.

Goals

- Operationalize the integration of various network technologies to remove the barriers of distance, budgets, etc., allowing educators nationwide to virtually come together to attend various lectures and workshops.
- Conduct meaningful activities that attract large numbers of participants.
- Accommodate low- and high-end users

Approach

Various technologies will be used to broadcast lectures and events over LTC, including web graphics, WebChat, RealAudio, RealVideo, CU-SeeMe, and MBONE.

At a minimum, the Ames group will produce two programs on the channel. One will be an informal series which helps educators make use of the Sharing NASA set of projects. Also, in conjunction with San Francisco State University, we will host a class (for credit) which will expose teachers to a variety of different technology projects available for classroom use.

As well, we will work with other ICWG centers to host programs created by them.

In conducting these projects, we intend on using the following implementation strategies:

- Customer Involvement - Evaluations from participants will be solicited at the end of each event in an effort to continually improve our offerings.
- Integration with NASA Education Office - We will be working with the Ames Education Office to broadcast teacher workshops over the LTC.
- High-level partners - We will continue to work closely with the GLOBE Project on various activities.
- Training - LTC will be a forum for teacher training.

Milestone Timeline

Sep 97	Make various technologies operational
Oct 97	Begin informal Sharing NASA series
Nov 97	Finish development of LTC studio
Jan 98	Begin SFSU course

Deliverables

- Internet access to conferences via email, WebChat, Real Audio, CU-SeeMe, MBONE, and NASA TV

Evaluation

Surveys of various events will be conducted via email.

Dissemination and Public Relations

- Delivery over the Internet
- Advertisement via maillists, conferences, speaking engagements, etc.
- Spread the word via the thousands of teachers who have previously utilized our projects

Budget

Labor (SSC)	$100,000
Hardware/Software	$20,000
Travel (SSC)	$5,000
Total	**$125,000**

A17 GSFC Regional Outreach Center

GSFC FY98 LTP Proposal:

The 1998 GSFC Earth System Science Education Project

I. Goals

- To foster the implementation of NASA/Goddard Earth and space science resources available on the World Wide Web into viable classroom activities.

- To use the Internet as a major communication vehicle for the dissemination of Earth and space science curricular support materials to Earth and space science teachers primarily at the secondary level.

- To develop a resource bank of Earth and space science activities using Internet web sites linked to the resources of the Earth and space science directorates at NASA/Goddard.

- To correlate the instructional resource bank with national standards for Earth and space sciences.

II. Approach

Twenty Earth and environmental science teachers will continue the work begun in FY97 to develop Internet-based Earth system science instructional activities that incorporate NASA data. In FY97, a repository of 43 “investigations” for grades 5-8 and 9-12 was developed during a four-week summer workshop at GSFC, converted to HTML format, and put through a content validation process with MTPE scientists. In FY98, the investigations will be put in a standardized format and made available electronically. Each investigation will be appended with an evaluation form, and this feedback will be used to refine the investigations. Additionally, teachers will expand the repository with a new set of investigations to be developed in an August, 1998 workshop. Particular focus will be on developing investigations to incorporate data available via the EOS Platform to be launched this year. This project will be conducted

in partnership with the GSFC Education Office, NASA Headquarters Code FE, Mission to Planet Earth Education Office, the Maryland State Department of Education, and twenty local Maryland School Systems.

The following implementation strategies of LTP have been incorporated into this project: needs assessment, customer involvement, integration with NASA Center Education office, high level partners, and training. A needs assessment from the Maryland Earth and Environmental Science Teacher Ambassador Program led to the GESSEP concept from the beginning. Teachers trained in the use of the Internet complained of the lack of ready-to-use activities available on the Internet to integrate the Internet into the Earth science classroom. A subset of these same teachers (customer involvement) were consequently empowered to develop such activities, and will receive any feedback on the investigations generated by pilot test teachers. The GESSEP project is a multipartner effort, with LTP and the GSFC Education Office as prime contributors. The local school districts of Maryland are also partners, and participated in the Steering Committee. Finally, in addressing training, one requirement in the design of the investigations was and continues to be that they are all self-explanatory -- any teacher or learner can complete the investigations without additional (external) training. This feature greatly increases the potential customer base and probability for successful use of the investigations.

III. Milestone Timeline

- Evaluation of '97 Investigations completed by scientists, aerospace specialists in workshops, Ambassadors and other Earth science teachers and students in their classrooms, WWW template developed, final revisions, approval, and available on the Internet for all -- 12/31/97
- Funds to Local Maryland School Systems advertised, accepted, evaluated, and awarded for Ambassadors to continue their work in enhancing systemic change in Earth System Science (See Dissemination) -- 10/1/97 - 11/1/97
- Eight regional Earth System Science conferences planned and conducted in cooperation with MSDE (See Dissemination) -- 10/1/97 - 5/31/98
- Steering committee convened, participants selected, preparation and planning of Summer '98 workshop -- 11/1/98 - 5/31/98
- Workshop held at GSFC -- 7/6/98-7/31/98
- Evaluation of '98 investigations, final revisions, approval, and availability on the Internet for all -- 8/1/98 - 9/30/98

IV. Deliverables

Internet-based interactive Earth System Science investigations will be available on a GSFC Web Site for all interested learners. These investigations will meet identified National Science, Math, and Geography Standards, and electronically bring NASA science missions into the classroom. Project reports for both the '97 and '98 projects will be available to all interested parties.

V. Evaluation

Number of accesses to Web site and geographical distribution of accesses will be monitored. Immediate electronic evaluations will be solicited from all users. These will be in addition to evaluations by project staff, participants and their students, aerospace specialists in workshops, pilot testing sites, and any and all who are made aware of them and are willing to help evaluate. Also, teacher evaluation of the GESSEP program itself will be conducted via EDCATS.

VI. Dissemination

Activities distributed via the Web. The educational community will be made aware of them through links to the GSFC Education, ERC and LTP Home Pages as well as those of NASA Headquarters, Spacelink, Mission to Planet Earth, EOS Home Pages and others, and by posting notices to all possible education newsgroups, mailing lists and bulletin boards. The GSFC Education Office will oversee dissemination of information. Further, NASA HQ Code FE has provided funding to allocated to local MD school systems to integrate MTPE activities into the curriculum and to hold regional Earth system science conferences throughout the year to disseminate information.

VII. Budget

Labor: .2 civil servant FTEs, 1 contractor FTE

(Note: manpower from the Education Office is not included. Their support includes ~1 Aerospace Education Specialist and 1+ teachers on loan.)

Teacher stipend ($3.5 K x 20)	$ 70K
Teacher room and board and transportation	$ 30K
Local school system grants ($3.5K x 20)	$ 70K
Regional Earth system science conferences	$ 29K
Contractor Technical Support (.75 FTE)	$ 70K
Misc hardware and software	$ 20K
Administrative support (travel, .25 FTE, etc)	$ 20K
Total funds required	$ 309K
- NASA HQ Code FE funds	$ 99K
- Cecil County surplus funds*	$ 50K
Total FY98 funds requested	$ 160K

* remaining $s from previously funded activities

A18 DFRC Regional Outreach Center

Learning Technologies Project Plan 1997-8

NASA Dryden Flight Research Center

Web-Enhanced Learning Environment Strategies: Development, Implementation, and Evaluation

Goals

The Dryden Learning Technologies Project is a collaboration between Dryden Flight Research Center and the Pennsylvania State University. The multiyear research project began with an analysis and teacher needs assessment relative to the effective use of the Internet and World Wide Web in the classroom. During the summer of 1997, two teacher focus groups were conducted on the use of Web-Enhanced Learning Environment Strategies (WELES); one at Langley Research Center and one at Dryden Flight Research Center. During the focus groups, teachers were asked to evaluate and critique the WELES to improve their design. Two Learning Technologies Conferences were planned to study best practices for delivering instruction via the World Wide Web and to evaluate how effectively NASA sponsored Aeronautics Cooperative Agreements were meeting the needs of their K-14 customers. The latter conferences were attended by the Aeronautics Cooperative Agreement team members, representatives from Headquarters, the four aeronautics centers (Ames, Dryden, Langley, and Lewis), the University of Idaho, and The Pennsylvania State University. The research project will culminate with an impact study of systemic reform of teaching practices in K-12 classrooms as a consequence of Web-based instructional sites. The impact of NASA's Learning Technologies Projects on K-12 instruction and systemic reform of teaching practices will be central to the project.

The DFRC Learning Technologies Project is dedicated to providing a comprehensive examination of the impact of the World Wide Web on classroom instruction. The purpose of the study is to ensure that NASA's Learning Technologies Projects:

- adequately serve the K-12 community,
- are utilized consistently in K-12 classrooms,
- inspire students to study science, mathematics and technology using NASA mission-specific activities,
- assist students in the development of technical competence and literacy, and
- promote excellence in America's educational system.

The Dryden LTP project supports all Enterprises equally. While much of this research has focused on the K-14 Aeronautics Cooperative agreements, there is a component that includes MTPE (remote sensing) and Space Science (digital library technology).

While Dryden's major partner in the LTP Center project is the Pennsylvania State University, the project also includes collaboration with NASA Langley, NASA Ames,

and the Spacelink team at NASA Marshall Space Flight Center. Additionally, Dryden has partnerships in LTP-related activities that include a tribal college (Salish-Kootenai) and a Hispanic-serving Institution (California State University, Los Angeles).

Approach

wConduct an analysis of current teacher needs, school technology infrastructure, and exemplary instructional Web sites - Completed.

wDevelop models of Web enhanced Learning Environment Strategies (WELES) which incorporate sound instruction design, demonstrate methods of integrating the WWW into the classroom, and address access limitations and different teacher and learning styles - Continuing.

wConduct teacher focus groups to identify needs and obtain feedback on models of Web-enhanced Learning Environment Strategies. - Completed.

w Develop instructional plan for producing and pilot testing the Web-enhanced Learning Environment (WELE) materials and put on the World Wide Web.

w Identify three groups of teachers (K-4, 5-8-, 9-12) to participate in pilot study.

wDevelop assessment and reflection tools for data collection during the pilot testing phase.

wOrientation of each team to the pilot materials and teacher development of initial lessons.

wMonthly teacher contact and data collection over a period of three months.

wSummary of feasibility of WELES; Revision of WELES

wRepeat of fall pilot study with revision and new group of 15 teachers during spring semester

wDevelopment of fall impact study

wBegin large group field test

Milestone Timeline

1. Develop instructional plan for producing and pilot testing the Web-enhanced Learning Environment (WELE) materials and put on the WEB.	September-December 1997
2. Identify three teams of teachers (K-4, 5-8, 9-12) of five teachers each.	August/September 1997
3. Develop assessment and reflection tools for data collection during the pilot testing phase.	September 1997
4. Orientation of each team to the pilot materials and teacher development of initial lessons.	October 1997
5. Monthly teacher contact and data collection.	October -December 1997
6. Summary of feasibility of WELES	December 1997
7. Revision of WELES	December 1997
8. Repeat of fall pilot study with revision and new group of 15 teachers	January - June 1998
9. Summary Report	June/July 1998

10. Development of fall impact study	July/August 1998
11. Begin large group field test (impact study)	September 1998
12. Evaluation	Ongoing

Deliverables

Research report summarizing the analysis and recommended design.

Exportable teacher workshop that can be marketed for inservice training in schools.

WWW instruction to accompany the workshop. The electronic tutorial could also be a stand-alone product.

Teacher tools and templates to facilitate developing lesson plans using the WWW in the classroom.

Implementation plan for dissemination of the product into schools.

Impact study report and journal article.

Evaluation

A combination of advisory review, formative evaluation tools (questionnaires asking for feedback in areas such as practicality, user-friendliness and effectiveness) for use in teacher focus groups and summative tools (determining the impact of the WELE instruction on teaching practices and actual diffusion of the WELES into the classroom) for pilot studies and the large group impact study.

Dissemination

The products will be delivered electronically via the World Wide Web and in print. An implementation plan will be developed and submitted as one of the deliverables.

Budget

The Dryden projected workforce for LTP-related projects is

a. FY98-FY02

CS: 1.5 FTE/year

SSC (including performance-based contracts which are

generally not included in such estimates): 2.0 FTE/year

b. each month of FY98 (calculated by dividing the total yearly workforce by the number of months in the year):

CS: 0.125 workyears/month

SSC: 0.167 workyears/month

A19 JSC Regional Outreach Center

JSC FY98 LTP Proposal

I. Goals

• Provide affordable networking technology to a variety of school environments to enrich the K-12 education process.

• Develop and distribute unique network applications that promote the technology and use of the National Information Infrastructure.

• Disseminate NASA information, particularly math and science materials.

II. Approach

During FY98 JSC will accomplish the stated goals through two development efforts. The first few months of FY 98 will be dedicated to technical enhancement and dissemination of SIMON, the School Internet Manager Over Networks. The remainder of the fiscal year will be spent working on the NASA Challenge Quiz Show, a real-time interactive science contest conducted over the Internet.

Technical work on SIMON will include improved access to the SIMON Library, a portable version of SIMON, and advanced data retrieval options. These features were requested by our teacher beta testers and distribution partner, the Texas Education Network (TENET). Beta testing was conducted at various JSC Education Office seminars and workshops over the past 6 months and the enhancements represent the best and most useful requests put forth by the customers. Dissemination and training will be conducted in collaboration with TENET. Additionally, portions of SIMON's automatic lesson generation code will be shared with TENET to facilitate an in-house TENET Web lesson generator.

The main focus of FY98 is the NASA Challenge Quiz Show which will combine advanced Internet network technology and NASA educational resources. This project presents the opportunity to develop interactive web software for Learning Technologies Project customers like "Sharing NASA" and the "Learning Technologies Channel" plus the ultimate customer/consumer, K-12 teachers and students. Schools will compete head to head via a live WebChat question and answer format. The content of the competition will be derived from online NASA literature and categorized by subject and grade level. The lesson categories will be established in collaboration with TENET according to published national and state education standards.

III. Milestone Timeline

Completion of SIMON enhancements -	January 98
Quiz Show infrastructure in place -	March 98
1st functional Q/A databank -	May 98
Quiz Show Beta Release -	June 98
Quiz Show Production Release -	September 98

IV. Deliverables

SIMON enhancements.

Quiz Show software complete with Q/A databank.

V. Evaluation

• SIMON:

To measure project goals, the informal, hands-on process for acquiring user feedback on pre-production versions of SIMON will be automated. A customer database will be developed by requiring each user to submit their email address when downloading the SIMON software. This will quantify how many copies of SIMON have been distributed and create a list of customers we can poll periodically for evaluation data.

• NASA Challenge Quiz Show:

The game software and content will be beta tested through our participation in summer teacher workshops held by JSC Education and Information Services, Clear Creek Independent School District and TENET. The production version will be evaluated by means of questionnaires addressed to participants following each event.

VI. Dissemination

We plan to continue Web-based dissemination of the SIMON software. The customer base will provide evaluation feedback and allow us to keep our users informed regarding new products and services as they become available. TENET will (1) maintain a link to our SIMON distribution site; (2) promote LTP products, services and events through the TENET master trainer program; and (3) collaborate in assembly of standardized lesson modules using our technology and NASA web resources.

VII. Budget

Contractor Technical Support 2 FTE	165K
Texas Education Network Grant	50K

A20 JPL Regional Outreach Center

National Aeronautics and Space Administration
Learning Technologies Project

Jet Propulsion Laboratory

Field Center Proposal

Submitted by

Robert Ferraro, JPL LTP Program Manager

This field center proposal consists of the continuation of two tasks previously funded under IITA - Project SPACE and Project TIE. The FY98 guideline has been allocated equally between Projects SPACE and TIE by JPL Center Management, and each task manager was instructed to prepare a task plan consistent with his funding allocation. Project SPACE has done so. Project TIE has not. JPL's Educational Affairs Office considers both projects to be of equal value to JPL and to LTP. Absent additional funding, JPL will enforce a $155K spending limit on Project TIE by requiring a descope in the proposed FY98 activities.

Project SPACE Program Task Plan
Fiscal Year 1998

Project Leader, Michael A. Garcia

Co-Investigator, Dr. Bruce C. Payne

Educational Affairs Office

Jet Propulsion Laboratory, California Institute of Technology

The Project SPACE (Sun, Planets, Asteroids, Comets Exploration) Program integrates advanced computer technology, complex scientific data sets and a variety of scientific technologies into educational resources, models, simulations and classroom activities that support the national reform efforts in science and mathematics education.

1. Goal: The goal of this project is to create, develop, evaluate and disseminate a new series of interactive Website educational resources and activities, and teacher inservices based on the science, technology, and data derived from the NASA Mission

Strategic Enterprises, specifically: Space Science, Human Exploration and Development of Space, and Mission to Planet Earth.

2. Approach: The general approach of this project will be to: **1)** Create new interactive Website activities and content. This content will be produced and tested to see how evolving Internet technologies and novel aspects of Website interactivity can be utilized in the classroom. Including: new images, movies, animations, and creations to include sound and user-interactivity, live and pre-recorded educational Webcasts, 3D vector-based graphics, and special effects designed to enhance educational content. **2)** Provide an Educator Inservice Program that utilizes LTP products, models, resources and educational methodologies. **3)** Disseminate information and products at national and regional educator conferences. **4)** Involve and work closely with our customers, and our Educational, Industrial and Strategic partners. We will continue to form partnerships with regional educational institutions to leverage LTP resources to assist in the evaluation and dissemination of LTP sponsored products and resources on a national level.

Needs assessment - Customer involvement - Training

Presently, the Internet information system can provide only limited amounts of useful information to our Nation's classrooms. Among these limitations are: 1) scarcity of hardware, 2) current Internet and computer hardware/software capabilities, 3) Internet access factors, 4) appropriateness of available educational content, and 5) the ability of a teacher to integrate this content into a classroom curriculum. Although this is the current situation, many states, school districts and schools are developing programs and resources to address these situations.

In meetings with 17 California school districts superintendents, concerns were expressed about the lack of programs that act as models in which districts could send teachers to learn about new technologies, which include the Internet, curriculum models and the integration of technologies into various curricular disciplines. In response to these expressed needs by educators, we have developed the various components of Project SPACE Program. In addition, in a continued effort to address the expressed needs of school districts, schools and teachers, we initiated a new type of workshop which utilized the Project SPACE products, components and classrooms. The workshops (inservices) received outstanding reviews from teachers participating in the program.

Based on the these reviews of the Project SPACE Program and the expressed needs of educators, this project will incorporate and utilize the Project SPACE Program's curriculum support products, models and resources. In addition, we will develop several new educational classroom activity products which will aid teachers in the process of incorporating new technologies and educational methodologies into the classroom.

Integration with NASA Center Education Office

The products and educational models used in this LTP Program reflect NASA's Strategic Plan for Education, and integrate practices and content of the current

national and state educational reform efforts, such as: the National Science Standards, the 2061 Benchmarks, and the California State Science Framework.

Project SPACE Program High-level partners include:

- The California State Department of Education, Science Framework Committee
- California Museum of Science & Industry, California
- Glendale Unified School District, California
- Pasadena Unified School District, California
- Basset Unified School District, California
- Campbell County School District, Gillette, Wyoming
- The Los Angeles County Office of Education, California
- Industrial: Silicon Graphics Computer Systems, Los Angeles, California

3. Milestone Timeline: 1) Monthly "interactive" Planetary Teacher Resource-Student Activity Products will be delivered to the SPACE Website. 2) Teacher Inservice, and/or Presentations/Demonstrations will be conducted in each of the following months: March, April, May, June, July and August. 3) Presentations/Demonstrations will be conducted at the NSTA, ASCD, ITEA, and NECC Regional and/or National Educator Conferences.

Milestone Timeline Fiscal Year 1998

No.	Description	Timeline
	Internet - Curriculum Support Products	
1	Teacher Curriculum Support Products and Student Activities	Delivered each month: October, '97 through September, '98
	Educator Inservices	
2	Teacher Inservice / Workshop	Conducted each month March, '98 through August, '98
	National / Regional Educator Conferences	
3	NSTA, ASCD, ITEA, and NECC Presentation and Demonstration	Dates to be determined

4. Deliverables: During FY '98 the following resource products, designed to benefit the educational community, will be produced. The Project SPACE Program has developed educational resource products and models which benefit our nation's educators, students, and/or school administrators by promoting and supporting new methods of science and mathematics education, as identified by National Standards, Benchmarks, and State Frameworks. These products demonstrate how data and information from NASA's projects and programs can be integrated into curriculum models.

I) Interactive and reciprocally linked **Internet accessible educator resource products and activities**. These resources (materials and products) will be in the form of classroom activities, and will be housed in the Project SPACE Website. This resource will include new general science activities related to space exploration, astronomy, and the planet, Saturn. The activities will be aligned to the educational themes of state frameworks, benchmarks and standards. In addition, we plan to expand the content of the image library (by adding over 100 image files) and the QuickTime movie library (by adding at least 12 more choices).

II) This project will conduct six **Workshops/Inservices**. The purpose of the inservices will be to inform, educate, and demonstrate to teachers how curriculum support products, materials, resources and methodologies developed by NASA's LTP Program in the Project SPACE Project, relate to and can be integrated into classroom environments, curricula, and disciplines. In these inservices, teachers will receive specific instruction in the use and access of Internet Websites, Project Space Program content (materials and products), and other LTP products such as Project TIE. Classroom teachers will demonstrate products and methods, that have been successfully used in classroom situations. Also, specific activities will be used to demonstrate science content areas, educational pedagogy and instructional methods and strategies. These inservices are centered on educators and this is a primary focus of NASA's Educational Framework "Cube."

III) Attend four **Regional-National Educator Conferences**: One to four hour exhibitions will be presented at national and regional educator conferences. These presentations will provide product demonstrations and LTP Program information. We will utilize pamphlets, single page information sheets and sample materials on disks to distribute information. Four strategic conferences, that will provide the largest base of educators, will be attended.

5. Evaluation: The strategy will be to employ volunteer teachers and students in the initial design, delivery, and evaluation of the various components of the Program. Both summative and formative evaluation techniques will be employed, with goals aimed at both program quality and maximum educational impact. Project Space Program will also become involved in the NASA EDCATS evaluation procedure this year.

6. Dissemination for Public Relations: The dissemination rational is to build from a local base and expand to a regional level and then to the national level. Integral to this dissemination plan is seeking a partnership to reach both regional and national audiences. A partnership would gives us access to states, regions and to other dissemination methods such as the Eisenhower National Clearing House for Science and Mathematics.

1) Local
    a) Workshops & Inservices
    b) Internet
2) Regional
    a) Workshops & Inservices

b) Internet

c) Conferences (Presentations & Demonstrations)

I) Regional NSTA

II) State, Meetings and Conferences

3) National

a) National Conferences (Presentations & Demonstrations)

b) Internet

c) Eisenhower Clearing House

7. Budget: The budget for FY '98 is projected as follows:

Item	**Category**	**Amount**
Labor	Support Service Contractors	$115K
Travel	Support Service Contractors	$20K
Hardware/Software		$20K
	Total:	$155K

TELESCOPES IN EDUCATION (TIE)
TASK IMPLEMENTATION PLAN
LTP PROPOSAL

August 1997
Gilbert A. Clark, TIE Task Manager
Lori L. Paul, TIE Outreach Coordinator

INTRODUCTION

The Telescopes In Education (TIE) Task was conceived in response to a critical need in K-12 schools for hands-on, interactive science programs. The task enables students and educators to operate a research quality telescope and download photos of celestial objects from the convenience of a computer in their classroom. The task also establishes a forum where schools, teachers, and individual students can share images, develop experiments, exchange data, and work together on projects involving the TIE system. The Telescopes In Education task enhances knowledge of astronomy, astrophysics, and mathematics; improves "computer literacy;" demonstrates CCD photography and image processing techniques; and strengthens critical thinking skills. In summary, TIE provides teachers with the appropriate pedagogical tools to bring the new frontiers of science directly into the classroom.

The purpose of this task implementation plan (TIP) is to assure rigor in the project planning process and assist in the development of a successful program.

I. Task Description

The TIE program has continued to provide an exciting and innovative approach to the education of students across the United States during FY `97. Students and educators imaged common objects such as galaxies, star clusters, and nebulae; continued studies of variable stars; and at other times imaged comets, supernovae, and asteroids. Research has become important to some schools, and in response the TIE program is in the process of establishing project SCHOLAR (Students Conducting Hands On Learning in Astronomy Research).

Educators have responded to the TIE program by increasing their knowledge of astronomy, developing approved courses on astronomy for middle and high school students, and improving their facilities for science and technology education. They have done this by applying for, and receiving, numerous grants and donations from both public and private sources. The educators that have reported to the TIE program on their successes in fund raising have brought in over $2,000,000.00 to the classrooms across the United States, based on their affiliation with the Telescopes In Education program.

Colleges and Universities continue to join the TIE program to use the program as an outreach tool to the middle and high schools in their local community. The classes are conducted on Saturday afternoons and are free of charge to participants.

Accomplishments:

1. During the December - January school break, we took the telescope off line and made a number of improvements, including:

   a) Re-aluminized the 24" mirror with high efficient enhanced coating

   b) Modified the Newtonian cage and installed an improved secondary mirror

   c) Several improvements to the Merlin telescope drive system

   d) Added a new hard drive to the computer.

2. Wrote and issued User Manual and Workbook for use by K-12 teachers in their curriculum development.

3. Wrote and published an Operator Manual for use by the volunteer operators.

4. Held workshops for the volunteer operators to improve their performance.

5. Added 80 mm guide telescope with ST 4 camera to provide guidance during long exposures with the ST 6 and ST 8 cameras.

6. Implemented planetary imaging with the 6" GOTO refractor and ST 8 camera.

7. Added a set of UBVRI science filters to support school science projects and to provide color imaging.

8. Evaluated various data reduction software for use by the schools.

9. Assisted schools in planning science projects on the telescope.

10. Worked with Crossroads High School in studying variable stars in the M-5 globular cluster.

11. Presented a paper on the TIE program to the International Meeting of the AAVSO in Sion Switzerland, and conducted teacher work shops for 60 Swiss teachers at the meeting. Set up an information center on the TIE program for attendees.

12. Articles on the TIE program were released by Boys Life, Astronomy Magazine, Sky and Telescope, HPCC Insights, Space Microelectronics, and various newspapers across the United States. TIE was carried on MSNBC, NBC Nightly News, NBC Super Channel, and various others.

13. Hands -on training was provided to educators and students.

The Telescopes In Education project has received several prestigious awards including the 1996 Rolex Award for Enterprise (one of only five laureate awards in the world), the JPL Award for Excellence, two NASA awards (Exceptional Achievement medal and Group Achievement Award), and the Clifford W. Holmes Award. Coverage of award ceremonies and by the local and national media has resulted in numerous inquiries about the program. TIE has been covered by various news and special

interest sources in the media including MSNBC, NBC nightly news, The NBC super station, and the United Airlines inflight entertainment.

I.B. Task Goals

Requirements for the TIE task involve:

1. Disseminate information about the TIE system to the educational community in a way that encourages the widest possible participation of students, teachers, and schools in real-time, remote operation of research caliber telescopes. This includes information made available through the Internet and World Wide Web as home pages, bulletin boards, and electronic mail correspondence.

2. Improve "modules" of hands-on, interactive experiments and research projects that will support existing curricula in astronomy, physics, mathematics, computer science, English, and critical thinking methodologies.

3. Develop the advanced research training program. This program will teach educators how to do photometry, image processing, employment of discovery techniques, and how to report new discoveries.

4. Increase the number of automated telescopes in the TIE system, including instruments located in countries around the world, to improve access by extending remote telescope operation into regular, day time classroom hours. Effort will be made to obtain support for automation of a radio telescope for the TIE network (if funding is available).

5. Implement Internet access to existing and future automated telescopes.

6. Expand access to automated telescopes to physically disabled students.

II.A. Approach

1. The Telescopes in Education task will continue to provide K-14 schools with remote access to the prototype 24" robotic telescope on Mount Wilson.

2. The TIE task will continue to develop a framework for a hands-on, interactive astronomy program for grades K-12 which will promote astronomy experiments and encourage student research.

3. TIE will maintain a training program for educators which will give them the basic skills necessary to bring hands-on astronomy to the classroom.

4. Wherever it is economically feasible, TIE will continue to develop an effective demonstration program which will bring information, workshops, and examples of remote astronomy projects to educators and students.

5. As supplemental funding becomes available, the telescope will be modified to operate at both Cassegrain and Newtonian foci to enable

both deep sky and planetary imaging.

II.B. Inputs to Task

1. Obtain and modify where necessary examples of innovative hands-on, interactive astronomy activities from existing educational resources, including but not limited to:

NASA Space Link, NASA Teaching Resource Centers (TRCs), Astronomical Society of the Pacific Project Astro, the University of California at Santa Barbara (UCSB) Remote Access Astronomy Project, and others.

2. Solicit inputs from other NASA centers.

3. Receive support from the Institutional Computing and Information Services (ICIS) Office at JPL for installation and testing of computer systems, interface boards, and fiber optic (FO) connections and switches to ILAN.

III. and IV. Milestones and Deliverables

1. Monthly reports detailing the progress, accomplishments, and significant events of the TIE task.

2. Final report delivered October 1997 that summarizes TIE task activities for the year.

3. Conduct at least five presentations and demonstrations of the TIE system to the educational community during the next 11 months. Three classes will be in the summer break, and two will be during the holiday breaks.

4. Present beta version of the advanced TIE training package. Presentation will be during the summer of 1998.

V. Evaluation

The Telescopes In Education task will continue to serve K-12 schools with the prototype automated telescope and CCD camera system on Mount Wilson, CA.

Evaluation will be implemented through response to the TIE program. If funding permits, we will develop a tool, distribute it to the users, and compile the results.

VI. Dissemination and Public Relations

TIE is present at many of the science teacher conferences, and we are continuously invited to participate in training programs for educators. We have participated in public information demonstrations in the past, and will continue to do so in the future. The media access to the public has informed millions of people both within the United States, and overseas. Our only limitation is financial support.

VII. Budget

Fiscal Year 1998

Item Description	Estimated Costs
TIE Mount Wilson Costs	
Telescope engineer, part time scheduler, part time accountant, telescope site fees, hardware maintenance	110K
Hands-on Research Module Development Personnel, Materials	60K
Travel:	
Regional and National Educator Conferences:	
Presentations - Demonstrations	20K
Hardware/Software:	
Modification and Improvement	20K
JPL Personnel Costs	160K
Total	**$370K**

Funds allocated from LTP/JPL Guideline for Fiscal Year 1998 $155K

(Obviously, a descope is required. Would LTP management care to provide guidance, or prefer it be handled at the center level? Given a free hand, Gil Clark will eliminate all items except telescope and JPL Personnel, and reduce the funding to each of these remaining items to meet the budget. This would result in less than a full year of telescope availability and approximately .5 FTE of contractor labor)

A21 LaRC Regional Outreach Center

Learning Technologies Project

NASA Langley Research Center

FY 1998 Proposal

I. Distance Learning Research (50%): The continuation and expansion of an existing project, JAVA-based software will be completed to enable an instructor to disseminate class material via the WWW and enable class feedback through the use of any JAVA-enabled web browser at remote sites. Remaining work on the software includes final coding, testing, performance evaluation/improvement, and user interface improvement. LaRC LTP will also begin a research-based investigation into the effectiveness of this type of distance learning model, in collaboration with the LaRC Office of Education and regional university colleges of education. The software will be made available to other NASA LTP personnel for testing and inclusion in projects where appropriate, along with the results of our research.

Goals:

a. Develop software to allow remote class participants to communicate with an instructor using only a standard Internet browser. It is assumed that the communication from the Instructor to the remote sites is achieved through some other mechanism (broadcast television, one-way video link, RealAudio, etc.). The software must run on a variety of computer platforms typically found in K-12 schools.

b. Field test the software in schools in the NASA LaRC 5-state region

c. Develop and disseminate NASA-related lessons which take advantage of the software's capabilities

d. Distribute software to other interested LTP groups

e. Conduct and publish research relating to the effectiveness of this distance learning model

Approach:

a. The contractor who began the work in FY97 will complete the software task in FY98

b. Collaborate with LaRC OEd to identify relevant content for distance learning classes

c. Provide training (printed and online) for participating teachers

d. Research will be a collaboration between LTP, OEd, and University representatives

Milestones/Timeline:

a. November 1997: Software begins beta testing at NASA LaRC

b. January 1998: Software tested by 3 pilot sites in LaRC region

c. February 1998: First class conducted using software for remote site feedback

d. June 1998: Conduct one or more summer sessions/workshops using software

e. July 1998: Release software to all interested LTP groups

f. September 1998: Publish distance learning research

Deliverables:

a. JAVA-based distance learning software (server and client) capable of running on multiple platforms

b. Documentation for server and client software

c. Research paper

Evaluation:

a. Pilot sites will evaluate the initial effectiveness of both the software and the mode of distance learning being tested through focus groups, interviews, and surveys.

b. The LaRC Office of Education will be a partner in developing focus groups of teachers to evaluate the software, as well as to provide ideas for potential topics to be addressed by future distance learning classes

Dissemination & PR:

a. The software will be made available initially to LTP and OEd projects only. Upon successful testing and evaluation, broader distribution is possible through NASA software distribution channels.

b. Opportunities for distance learning classes will be made known in the LaRC region through existing email lists, the Educator Resource Center, and communication with local school division technology and curriculum directors. If testing merits opening up courses to a broader audience, the Quest server will be used to publicize such offerings.

Budget:

a. $45K: Software development

b. $20K: 0.5 FTE IPA

c. $25K: Graduate student support

d. $20K: Hardware/Software

e. $10K: Content development/Teacher support/Teacher Training

II. Langley-based and NASA-wide Interactive Projects (50%): The LaRC LTP will work with NASA scientists and researchers, as well as partner with LTP efforts at other NASA centers to develop online projects which communicate NASA missions to the educational community. LaRC-specific projects under consideration include the upcoming SAGE III mission (a joint US-Russian partnership), NASA's Aviation Safety Program, a remote sensing tutorial, and a weather-based project in collaboration with

the Virginia Air and Space Center. This element also includes LaRC's involvement with LTP projects at other centers such as Aero Design Team Online, and the LTP's support of LaRC Office of Education efforts such as the Journey Into Cyberspace program, Engineer's Week, KidSat, and several other projects in the conceptual design stage. Some projects may be used to augment OEd summer enhancement programs for teachers. The output of these projects will be online resources available to educators and students.

Goals:

a. Create classroom-ready interactive projects which effectively integrate NASA mission content with classroom instruction

b. Create online materials drawing on NASA expertise that will serve as resource information for educators and students

Approach:

a. Work with the LaRC OEd and local groups of teachers

b. Identify curriculum needs which can be addressed by NASA-developed content

c. Create online resources and provide appropriate training (primarily online) for their use

d. The NASA LaRC ERC may host teacher workshops using developed projects

Milestones/Timeline:

a. This project involves the ongoing process of collaborating with local teachers and NASA scientists/engineers to identify matching needs and available resources/knowledge. As such, specific milestones in the development cycle are not listed

b. September 1998: At least 3 online web resources will be available and operational

Deliverables:

a. Online resources addressing specific educational needs

Evaluation

a. Online and printed surveys to evaluate the usefulness and/or effectiveness of online resources

b. Teacher focus groups to assist in the development and evaluation of online resources

c. Involvement of the University community in the use (teacher training programs) and evaluation of specific online resources

Dissemination & PR:

a. Publicity and awareness of available online resources will be achieved through the LaRC, LaRC OEd, and LaRC LTP Websites, as well as the Quest server.

b. The LaRC Educator Resource Center will be used as a gateway to the Educator Resource Network as a mechanism for distribution, as well as hosting teacher workshops using online projects

c. Existing high-level partners such as Elizabeth City State University and the US Department of Housing and Urban Development will be used to publicize resources which fit their missions

Budget:

a. $20K: 0.5 FTE IPA

b. $35K: University grant

c. $10K: Hardware/Software

d. $15K: Content development/Teacher support/Teacher Training

A22 LeRC Regional Outreach Center

1. Goals

The goals of the NASA Lewis LTP are to:

Increase student's interest in and proficiency of math and science through the use of computing and communications technology and by using NASA's mission in aeronautics as a theme.

Assist in creating low cost, efficient network solutions that will enable schools to gain access to the Internet for educational resources.

2. Approach

2.1 Content Development:

The content, developed by the NASA Lewis Learning Technologies Program, focuses on software simulations and NASA research related lessons. Simulations of aeronautics related concepts are created, along with grade appropriate lessons which prompt students to discover basic scientific principles or to engage in problem solving activities. All of the content developed will be reviewed for technical accuracy and for compliance with the national science and math standards. The NASA Lewis Office of Educational Programs will be asked to perform the review on national standard compliance. Following are descriptions of the content which will be developed.

2.1.1 Foil Sim

Foil Sim is a package which simulates the air flowing over an airfoil and over a baseball. Contained within the package are slider bar controls and graphical outputs. The goal for Foil Sim for FY98 is to have it available through the ERC's on a 3 1/2" disk with an accompanying user manual. Additionally, a Foil Sim web page will be created which contains the downloadable software, a Java version of Foil Sim, the user

manual, lessons which incorporate Foil Sim into 9-12 grade science curriculum guidelines, and a feedback mechanism for user evaluation of Foil Sim.

2.1.2 Engine Sim

Engine Sim is a software package that simulates a working aircraft engine. This package also contains slider bar controls and graphical outputs. At the end of the fiscal year a beta version of Engine Sim will be available. The beta version will contain a completed GUI and lessons on how to use Engine Sim and which highlight the features of Engine Sim. Additionally, preliminary testing of Engine Sim by teachers and students will have been conducted.

2.1.3 Aeronauts 2000

Aeronauts 2000 is a series of web pages which takes the user through an aeronautical and space adventure. Contained within the web pages are a series of math and science problems to be solved. The Aeronauts 2000 activities will be field tested in classrooms during the year and a revision of the activities will be completed which incorporate the feedback from the field tests. By the end of the fiscal year, the Aeronauts 2000 web page will be complete, and the revised activities will be available.

2.1.4 NASA Lewis Science Lessons

The NASA Lewis Science Lessons are a series of web pages containing lessons and activities which blend research conducted at the NASA Lewis Research Center with scientific principles that must be taught in K-12 schools. The development of the NASA Lewis Science Lessons will be a collaborative effort between the NASA Lewis LTP and the Ohio Space Grant Consortium. The OSGC will facilitate teachers and researchers working together to create these lessons.

2.2 Access to Content:

The NASA Lewis Learning Technologies Program is committed to researching, prototyping and testing emerging networking technologies which can be used in an educational setting to connect schools to the Internet economically and efficiently. Access to the Internet will allow the schools to use the educational content available on the World Wide Web at the NASA Lewis LTP web site as well as other educational web sites.

2.2.1 Over the Horizon Networking Technology

The OtH Networking Technology project will be a collaborative effort between NASA, Signatron Corp., and an ISP in the Great Lakes region. Over the Horizon networking technology is a wireless network solution. The OtH equipment works by transmitting a data signal from an antenna and bouncing the signal off of the troposphere to the receiving antenna. This method allows there to be a much longer distance between the receiving point and the point of presence than line of sight radio frequency networking technologies. An OtH networking prototype will be implemented in a rural school, which is to be determined. The prototype will be monitored for its ease of use, reliability, bandwidth capabilities, cost effectiveness and

other parameters to determine its effectiveness in providing connectivity to rural schools. A report of findings will be prepared.

2.2.2 Wireless Local Area Network

Typically computer resources are scarce within schools and teachers are forced to share equipment. The NASA Lewis Learning Technologies Program will work with the NASA Lewis Computer Services Division to research and implement a prototype of a wireless local area network within a K-12 school. This wireless local area network will allow teachers to share the equipment used to access the Internet. The prototype will be used to determine whether or not this solution allows a greater number of students to access to the Internet throughout the course of the day than does fixed connections. The wireless local area network prototype will consist of portable or strategically located access points and client antennas for desktop computers. The wireless LAN will be connected to either the school's existing wide area network, if available, or a wireless wide area connection will be deployed at the school selected to receive the prototype. The prototypes will be monitored for their ease of use, reliability, bandwidth capabilities, cost effectiveness and other parameters. A report of findings will be prepared.

3. Milestone Timeline

Foil Sim	10/31	11/30	12/31	1/31	2/28	3/31	4/30	5/31	6/30	7/31	8/31	9/30
Available through ERC's												x
Foil Sim web site on-line						x						
Foil Sim workshop presented at NSTA							x					
Foil Sim workshop presented at SC'97		x										
Foil Sim program broadcast on LTC			x									
Engine Sim												
Beta Version of Engine Sim available												x
K-12 GUI for Engine Sim created					x							
Introductory lessons created						x						
Engine Sim tested by teachers & students									x			
Aeronauts 2000												
Aeronauts 2000 web site created			x									
Aeronauts 2000 field tested in the classroom								x				
Aeronauts 2000 program broadcast on LTC				x								
Revised Aeronauts 2000 available on web site												x
NASA Lewis Science Lessons												
Identify NASA researchers to work with		x										
Conduct workshops				x		x						
Conduct follow up sessions						x		x				
NASA Lewis Science Lessons complete									x			
Over the Horizon Networking Technology												
School and ISP identified			x									
Purchase OtH equipment					x							
Equipment installed in schools							x					
Data collection system in place									x			
Wireless Local Area Network												
Identify schools			x									
Purchase Equipment					x							
Install prototype in schools							x					
Data collection system in place									x			

4. Deliverables

The deliverables of the NASA Lewis LTP will be two educational software packages, two series of educational web pages and two studies of networking solutions for schools. The educational software and of course the web pages will be available to download off of the NASA Lewis LTP web site. The activities within the web sites and software packages will be available to teachers to use as supplements within their classes. These activities encourage students to use problem solving skills and prompt discovery based learning. Additionally, programs on the Learning Technologies Channel and the NASA Educational Channel and presentations at national educational conferences will be used to create awareness of the products. The network solution studies will evaluate new networking solutions and their use within an educational setting. Results of these studies will allow schools to make more informed decisions about the networking solutions they choose for their schools. Results of these studies will be made available on the NASA Lewis LTP web site, through presentations at educational technologies conferences and through publications.

5. Evaluation

5.1 EDCATS

EDCATS will be used to evaluate all of the Learning Technologies Channel programs. A method will be devised to identify which program is being reported on. The short event feedback form will be used to collect the data. An EDCATS program inventory will be developed for the NASA Lewis Educational Channel. Again, a method will be devised to identify which program is being reported on. The short event feedback form will be used to collect the data. EDCATS will be used to evaluate all Classroom of Excellence workshops. The teacher feedback form will be used to collect the data on these events.

Where teachers do not have access to the Internet to complete their evaluations on line, a hard copy of the evaluation form will be sent to the teacher's school. They will be asked to fill it out and return it to NASA Lewis, where it will be entered on-line by one of the LTP staff.

5.2 Customer Feedback

Customer feedback will be gathered on the Foil Sim program and the Aeronauts 2000 activities. Information such as ease of use, usefulness as a science supplement, effectiveness in teaching concepts and other feedback will be sought. The feedback forms will both be in hard copy format, distributed with the software package, and on-line at the web site.

An on-line customer feedback form will be placed on the NASA Lewis LTP web site. Information on quality of information available, ability to find information, content, presentation of material and other feedback will be sought.

A customer feedback form will be sent to all of the schools which have the capability to receive the NASA Lewis Educational Channel. Information on how much

the channel is watched, what programs are viewed the most, other content the teachers would like to have broadcast and other feedback will be sought.

5.3 Data Collection

The networking solutions installed in schools, the Over the Horizon technology and the Wireless Local Area Network, will be monitored for reliability, bandwidth capability, cost effectiveness and other parameters. This data will be collected and a report of findings will be compiled.

6. Dissemination

Various methods will be used to disseminate the content produced.

6.1 Learning Technologies Channel

The NASA Lewis LTP will develop programs for the Learning Technologies Channel, a collaborative effort of the NASA Learning Technologies Program, lead by NASA Ames Research Center. The programs will consist of interactive video conferences to teach teachers how to use Foil Sim and Aeronauts 2000 in their classrooms. Additionally, the NASA Lewis Learning Technologies Program will conduct video conferences from NASA Lewis with schools with compatible video conferencing equipment. Collaborations with state distance learning associations in Ohio and Indiana will be used to identify schools with video conferencing capabilities.

6.2 NASA Lewis Education Channel

The NASA Lewis Learning Technologies Program is partnering with WVIZ TV, the public broadcasting station in Cleveland, OH on the NASA Lewis Educational Channel project. WVIZ TV has a Instructional Television Fixed Services Channel available for educational content. Together with other organizations at NASA Lewis, the Lewis LTP will supply educational content in the form of video tapes of the above video conferences, as well as instructional video tapes produced about the content developed.

6.3 Classroom of Excellence Classes

The NASA Lewis LTP will conduct workshops within the Classroom of Excellence which instruct teachers on how to use the software packages developed and how to integrate them into their curriculum. The teachers will be shown how to access and complete an EDCATS form set up for evaluation of the software package. The teachers will receive the software package to take with them back to their school. They will be asked to use the software in their classes and fill out the EDCATS evaluation form.

6.4 Conferences and Papers

The NASA Lewis LTP staff will attend several educational conferences and deliver hands on workshops or demonstrations of the educational software. Copies of the software will be distributed at the conferences as well. Technical papers about the educational software will be prepared and submitted for publishing. Technical papers on the networking research will also be prepared and submitted for publishing.

7. Budget

Labor	
Support Service Contractors	
GUI development task	10,000
Distance learning task	38,000
Web site development task	55,000
Summer Intern	10,000
Disk duplication	5,000
Sub Total	*118,000*
Grants	
OSGC (web page development)	42,000
Sub Total	*42,000*
Equipment	
Over the Horizon Tech	25,000
Wireless LAN Equipment	20,000
LTC Video Conferencing Equip	15,000
Sub Total	*60,000*
Total	**220,00**

8. Metrics

The NASA Lewis Learning Technologies Program is committed to contributing to the overall metrics for the NASA Learning Technologies Program. The following lists the metrics and the goal the NASA Lewis LTP is striving to achieve during FY98.

Number of unique technologies piloted in schools: 2

Number of hits on the NASA Lewis LTP web site: 850,000

Total number of kbytes transferred from the NASA Lewis LTP web site: 2,500,000 kbytes

Average number of unique IP addresses per month: 5000

Number of presentations given: 5

Number of collaborations with NASA scientists and engineers: 8

Number of high-level partnerships: 4

Amount of funds and in-kind services generated outside of LTP: $50,000

Number of teachers trained by NASA Lewis LTP staff: 500

Number of referenceable papers written: 2

Number of under-served schools served by LTP products: 2

Number of instructional materials created based on needs assessment: 4

A23 SSC Regional Outreach Center

NASA John C. Stennis Space Center Education Programs Office

Learning Technologies Project Proposal

Introduction

We propose the creation of a Website entitled "From a Distance" that will serve as one's first introduction to remote sensing. We recognize that there are quite a few Websites that deal with remote sensing, but they all seem to jump right into image data sets. We envision a Website whose primary patrons will be educators and students in the K-12 community. The Website will include several "Sharpening the Focus" areas:

Let Me See It In Writing. This area will include publications, booklets, overviews, coloring sheets, NASA Fact Sheets, etc., that are downloadable and printable (pdf format is a must). The student or teacher will be able to hold something in their hand as a reward for searching the Web. The content of these publications will focus on getting started in remote sensing.

Show Me the Big Picture (and the Little One). This "Sharpening the Focus" area will serve as a collection of downloadable images as well as a collection of links to other sites. The emphasis of this collection of images will be on demonstrating the obvious. That is, obvious changes over time in selected areas, obvious uses of remotes sensing in archeology, etc. This collection will also include student and educator offered images of their own schoolyards, towns, etc.

I Want To Do It Myself. This area will include ideas and activities that students and teachers can do to collect their own remotely sensed images. Everything from the use of telephoto lenses to flying cameras on kites will be included here. The emphasis will be on practical, inexpensive, and doable projects for the classroom.

What Are You Looking At? This "Sharpening the Focus" area will serve as a clearinghouse of ideas and collaborations among students and schools. It is in this area that classes can collaborate with others in the county or around the world, they can trade images, demographic data, etc.

Goals

The major goals of this project are to put awareness and basic understanding of remote sensing on the caring screens of the K-12 community. These goals will in part be accomplished through the establishment of a Website entitled, *From a Distance*. This Website is intended to be the first (and often returned to) place someone looks when they want to know more about remote sensing. This site will serve as the clearinghouse for information concerning remote sensing and all offerings will be screened for appropriateness for the K-12 visitor. This site will also serve as the place to go for late breaking news as to what is happening in remote sensing, especially as it applies to the average citizen. The information contained at the Website and the

interface used to get at that information will be designed to be user-friendly and non-threatening. Although we do not intend to “dumb-down” the content of the site we will purposefully stay clear of technical jargon and issues. It is our goal to create an exciting Website that will guide educators and students through the mental and sometimes pedagogical barbwire that encrusts any path to deeper understanding.

Approach

Needs Assessment:

In the next ten years, the commercial remote sensing and spatial information industry has the potential to grow from a market value of $1 billion to over $10 billion. With this growth, the application of remote sensing to such concerns as the environment, agriculture, land use management, and infrastructure development will diversify and multiply. New technologies and applications consequently bring the need for new skills and techniques, which translates to additional jobs. The Commercial Remote Sensing Program (CRSP) at NASA's John C. Stennis Space Center has spent the last several years identifying and responding to the needs of the spatial information industry. The CRSP has successfully stimulated the growth and competitiveness of this emerging industry by collaborating with U.S. companies to demonstrate the benefits and utility of remote sensing for their respective markets. The CRSP now foresees a critical need developing within the spatial information industry. In the upcoming decade 10 - 15 commercial satellites are planned for launch, but little is being done to produce and prepare a workforce capable of managing the resulting data and data products. The potential candidates for these jobs are in grade school today!

For K-12 educators the task of introducing remote sensing concepts seems daunting. All the teachers we have interviewed report that getting started in remote sensing is the hardest part. They all expressed a need for an easily accessible central location of material about remote sensing with links to more advanced sites.

Customer Involvement

Opportunities for customer involvement abound in this project and are absolutely critical to its success. The Commercial Remote Sensing Program here at Stennis in conjunction with the Education Programs Office is involved in two initiatives that will provide avenues for customer involvement. The Mississippi Space Commerce Initiative and the National Commercial Remote Sensing Education and Training Program are putting in place the customer involvement infrastructure that is a natural for this proposed project.

Integration with NASA Center Education Office

This proposed project meshes perfectly with the above mentioned initiatives of which the NASA Center Education Programs Office is the guiding force in terms of need assessment, customer involvement, dissemination, etc.

High-Level Partners

This project will certainly benefit from the partnerships that have been forged as a result of the two initiatives already mentioned. The National Science Foundation

sponsored Engineering Research Center at Mississippi State University, one of fifteen in the country, along with the Research Curriculum Unit at Mississippi State University will be providing content and Website interfaces in support of this project.

Private companies such as Geodesy of California will be providing content as well as part of their effort to design curriculum activities for middle school and high school.

Training

The NASA Educator Resource Center under the direction of the Education Programs Office at SSC conducts over one hundred educator workshops each year. Many of the workshops offered are technology-based opportunities such as Introduction to the Internet, Internet II, etc. Additional workshops will be conducted on the fundamentals of remote sensing during which the proposed Website will be the focus of the training.

Milestone Timeline

Form educator advisory team	Oct 97
Search for initial Website content	Oct-Dec 97
Design Website look and interface	Nov-Dec 97
Educator advisory team recommend initial Website content	Jan 98
Select Website field testers	Feb 98
Conduct training workshops	Feb-Apr 98
Analyze evaluations from implementation to date and training workshops	Apr 98
Revise content/approach as indicated by evaluations	June-Sept 98
Reconvene educator advisory team to begin planning for next year	July 98
Periodically update content	Feb-Sept 98

Deliverables

As a result of this project K-12 educators will have the best entry-level site on the Internet. It will be available on the net by March 98.

Evaluation

A web counter counting the number of hits to the site will measure use of the site. More importantly we will also measure the number of file downloads. Use will also be measured by the number of collaborations formed in the “What Are You Looking At?” area. The teacher training workshops will serve as an opportunity to evaluate in a “hands-on” fashion educator’s interaction with the site. Some of the things we seek to know are: Is the Website easy to navigate? Is the content useful? Is the content appropriately age divided? Do the image set offered or linked to illustrate the concepts one is attempting to teach? Are the collaborations useful? Are kids really learning remote sensing?

Dissemination

We will utilize our existing infrastructure and experience in getting the word out to educators concerning the site. We routinely attend and present at several state and national science and math conferences. The demonstration of this Website will certainly be part of our presentation. We will get the word out through our existing workshops. We are also part of a two-way interactive compressed video network that reaches to 92 school districts in Mississippi and will soon be upgraded to be able to connect to virtually any compressed video site in the country. The partnerships formed through the NASA Commercial Remote Sensing Program, the Mississippi Space Commerce Initiative, and the National Commercial Remote Sensing Education and Training Program will serve as high-visibility and valuable avenues of dissemination.

Budget

LaborSupport Services Contractor	12K
TravelSupport Services Contractor	2.5K
Equipment	5.5K

A24 KSC Regional Outreach Center

Learning Technologies Project (LTP)

Kennedy Space Center Proposal

FY98

I. Goals

The Kennedy Space Center's LTP activity will represent the intersection of three distinctive activities: LTP goals, NASA's education framework, and KSC education programs. The LTP has three broad goals: 1) promote the enhancement of the knowledge, skills, and abilities of educators and students in the areas of science, math, technology and engineering, 2) make NASA missions and content accessible to the educational community, and 3) promote large-scale integration of LTP products and services into the classroom. NASA's education office has several goals including increasing the use of educational technology, providing curriculum support to teachers and enhancing faculty and students' capabilities. The Kennedy Space Center has a strong education program and several programs utilizing cutting-edge educational technology. **Combining the goals from these three activities will be the purpose of KSC's involvement in LTP for FY98.**

The overall goal of KSC's involvement is to utilize several of KSC's existing programs, which are local in nature (Florida), and develop education products from those activities that can be distributed and utilized nationally. This will enhance KSC's programs, serve the LTP objectives, and strongly support NASA's education framework.

II. Approach

While KSC is fully staffed to manage its education programs, enlarging the framework of those programs for national distribution would be difficult to undertake with current personnel. The approach we will utilize to achieve our goals is to hire a mature student with necessary skills from a local university. **The Student Technology Assistant is responsible for a) completely familiarizing his/her self with KSC and its education programs, b) identifying targets of opportunity within those programs that could be developed for large-scale distribution, and c) developing those products and distributing them.** The Student Technology Assistant will work with our partners in identifying these target areas.

This person will have office space within the KSC University Programs Office in order to aid in learning about our programs and people. At this time he/she will work fifteen hours per week on these responsibilities.

Two examples of programs that will yield products are the Virtual Science Mentor Program and the Project VISION program. The Virtual Science Mentor Program (VSM) uses desktop video technology to link KSC engineers and scientists with geographically distant middle school science classrooms. The KSC specialized workforce provides information about NASA's mission to the students, provides curriculum materials for the teachers, responds to student questions, judges students science projects and encourages the use of the Internet in the classroom. As we progress in this program, curriculum materials will be developed by the mentors, by the students, and jointly between them. Science Websites developed by students is also a goal These lessons and Websites developed are the material for larger distribution. In addition, the Student Technology Assistant will develop a model for establishing such a program anywhere in the country, using lessons learned from KSC. KSC has strong partnerships in this program including: Florida's Education Commissioner, the State University System of Florida and in particular Florida Gulf Coast University, the Technological Research and Development Authority and the Florida Space Grant. In the coming months we will be including faculty from Florida's universities and industry partners in the program. A Website for the program will be running shortly. These schools involve a substantial number of minorities.

The Project VISION program is a second example of a KSC program offering source material for development. This program is a joint program between Florida International University, KSC, Dade County public schools, industry partners, Del Turabo University in Puerto Rico, and their local school system. It will bring university students and faculty, along with industry mentors and NASA participants into the science classroom of four middle schools. University faculty are required to develop curriculum materials which will be tested in the classroom and if accepted, will be available for distribution. Converting some of this to an Internet-based Website for easy national access will be part of the Student Technology Assistant's job.

Both programs will have Websites with current and historical data available for access. Both programs will have workshops (one already has) to train educators in emerging technologies and how to integrate them in the classroom.

III. Milestones

Broad milestones for this activity include:

October, 1997: locate and hire the Student Technology Assistant

October - December, 1997: establish office space and related activity, completely familiarize themselves with KSC activity and people.

January - March, 1998: begin converting material from local program for national access. Establish Website for that purpose.

April - September, 1998: Continue to develop products and place them on the Website for access, as well as implement other methods of dissemination.

September, 1998: Produce final report.

IV. Deliverables

The deliverables from this activity are difficult to precisely identify since this is the first brush with this type of activity. As a minimum, I would anticipate the following:

1) A developed Website with curriculum material readily useable and available.

2) A model developed for establishing a program like the Virtual Science Mentor Program, including industry and academic involvement.

3) Either ten short (class period length) curriculum activities or five deeper, more lengthy products. I would think that from the two projects mentioned above alone, this would be a minimum. These products would have a “KSC-flavor” thus, enlarging the understanding of KSC and NASA’s mission. They would be “ready-to-use” by other educators. these products, for the most part be middle school level, the time when students are deciding their focus in life.

4) A lessons-learned report suggesting better, alternate, or new ways of developing large-scale curriculum.

V. Evaluation

This activity, as with all other office activity, will be evaluated for its value. The metrics outlined in the LTP Management Plan are directly applicable to this activity: number Website hits, number of teachers and schools using material developed, number of actual products developed, survey information from teachers and students indicating value of the material developed.

VI. Dissemination and Community Outreach

This activity will be highlighted at the 1998 Space Congress held in Florida during a panel session called “New Horizons in Education.” In addition steps will be taken to disseminate the availability of material to the widest possible audience. It is anticipated in the Fall of 1998 Florida will host a NASA-funded research and education conference for grantees to gather and discuss their similar activities.

In addition, our partners in the State of Florida, Florida's Education Commissioner and The Chancellor of the State University System of Florida, will be kept apprised of this activity and its products available.

VII. Budget

A budget sheet is attached. The Student Technology Assistant will be added to an existing grant for payroll purposes. A limited amount is included for travel, more funds would mean a greater number of papers and poster sessions could be attended. The student will be working fifteen hours per week as soon as we are able to hire and continue through September, 1998.

If funds are sent via a 506 to KSC please earmark for "LTP Student Technology Assistant" and identify with my name.

VIII. Conclusion

KSC appreciates the opportunity to be part of the LTP project. We believe we already have several unique and valuable projects underway which can be translated to the LTP required objectives. Since this is our first involvement, guidance on desired products or activities is welcome so that we both may prosper.

The contact for this activity at KSC is:

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A25 MSFC Regional Outreach Center

MSFC FY98 LTP Proposal:

Earth System Science Education Pilot Testing and Dissemination Project

I. Goals

- To pilot test a set of Earth and space science resources developed in support of Mission to Planet Earth and being made available on the World Wide Web as part of the FY98 Goddard Space Flight Center LTP Proposal.
- To utilize a network of teacher training sites established as part of the Alabama Research and Education Network (AREN)

[see **Approach**].

- To use the Internet as a major communication vehicle for the dissemination of Earth and space science curricular support materials to Earth and space science teachers at the middle and secondary level.
- To assist in the development of a resource bank of Earth and space science activities using Internet web sites linked to the resources of the Earth and space science directorates at NASA/Goddard and at the NASA/MSFC Global Hydrology and Climate Center (GHCC).
- To correlate these new Earth and space science resources with the Alabama Course of Study - Science and the objectives of the Stanford Achievement Test, 9th edition, Alabama's benchmark testing standard.

II. Approach

The MSFC Education Programs Office FY98 LTP proposal will be to coordinate the pilot testing of 43 Earth and space science investigations for grades 5-8 and 9-12. These investigations were developed by Maryland teachers at the Goddard Space Flight Center during a four-week summer workshop in FY97. These materials will be placed in a standardized format and made available electronically as part of GSFC FY98 LTP proposal.

The Alabama Supercomputer Authority (ASA) is a state-funded corporation founded in 1989 to operate the Alabama Supercomputer Center (ASC) and the Alabama Research and Education Network (AREN). ASA provides supercomputing time and related resources to Alabama's academic researchers and industry, facilitating research in advanced scientific and engineering disciplines. The ASA network, AREN, provides Internet connectivity to state government, industry, higher education and K-12 systems within the State of Alabama. MSFC will utilize this network to conduct three introductory workshops for pilot teachers at AREN Teacher Training Sites located across Alabama. MSFC will also coordinate videoconference feedback sessions with the NASA MTPE scientists and activity designers located at various NASA centers at the conclusion of the pilot testing period. These sessions will utilize the AREN Teacher Training Sites as well. Grants will be provided to participating schools to facilitate teacher release time. Stipends will be provided to one lead teacher per school to defray participation costs. We are planning for eight pilot testing sites to be selected.

Pilot testing teachers in Alabama will be previous participants in *Project EarthSense*, a week-long MTPE teacher workshop focusing on the concepts of remote sensing and hydrology conducted at the GHCC and funded by the Alabama State Department of Education over the past 5 years. Alabama teachers who have been trained through the GLOBE Program will also be eligible as pilot testers for this effort. Pilot testing teachers will be asked to conduct a web-based MTPE investigation and complete an appended evaluation form. MSFC will collect and provide this feedback to be used to further refine the MTPE investigations.

This MSFC project will be conducted in partnership with the GSFC Space Flight Center, NASA Headquarters Code FE, Mission to Planet Earth Education Office at

NASA Headquarters, the Alabama State Department of Education, and the University of Alabama in Huntsville.

III. Milestone Timeline

- MSFC will assist with the evaluation of '97 GSFC Investigations which is to be completed by scientists, aerospace specialists in workshops, Ambassadors and other Earth science teachers and students in their classrooms; a WWW template will be developed, approved, and made available on the Internet -- 12/31/97
- Selection of pilot testing teachers to participate in introductory workshops-- 10/1/97 - 12/31/97
- Conduct three regional workshops in cooperation with AREN -- 1/1/98 - 4/30/98
- Collect pilot testing evaluation materials and submit to GSFC -- 5/1/98 - 5/31/98
- Assist GSFC staff with the evaluation of '98 investigations, final revisions, approval, and availability on the Internet for all -- 8/1/98 - 9/30/98

IV. Deliverables

MSFC will provide the teacher pilot testing evaluations of Internet interactive Earth System Science investigations to the GSFC LTP team. A project report for the MSFC LTP FY98 project will be available to all interested parties.

V. Evaluation

Electronic evaluations will be solicited from each of the Alabama pilot teachers. The evaluation tool will be designed in cooperation with GSFC and MSFC staff. Summaries of these completed evaluation tools will be made available as a deliverable.

VI. Dissemination

Dissemination of the final forms of these MTPE Investigations will be coordinated by the GSFC Education Office as part of their FY98 LTP proposal. The MSFC Education Office will work in partnership with GSFC to disseminate these activities in Alabama as well as the other states.

VII. MSFC LTP FY 98 Budget Estimate:

Budget Item		Cost Estimate
Regional Workshops (3 @ $1.6K)		$4.8K
Grants to Schools (8 @ $1K)		$8.0K
Lead Teacher Stipends (8 @ $0.5K)		$4.0K
Travel	*Civil Service*	—
(related to workshop and other administrative activities)	*Contractor Support*	$3.2K
Total FY 98 Funds Requested		$20.0K

APPENDIX B The Learning Technologies Project Dissemination Plan

The Learning Technologies Project Dissemination Plan

B1 Introduction

The NASA Learning Technologies Project (LTP) is committed to its goal of communicating NASA to the broadest cross-section of the educational community. The LTP Dissemination Plan is intended to detail how we will convey that NASA offers unique opportunities to the educational community in the areas of math, science, technology and engineering. LTP will accomplish this communication through the use of the Internet and other emerging technologies. The success of this plan will be detailed in a report at the end of FY98.

B2 The need for greater dissemination

The U.S. Department of Education, the National Science Foundation and other public and private organizations have established that there is a significant need for promoting math and science to the American public. The lack of accurate scientific information in education and in everyday situations is among the factors that have caused the Executive Branch of government to call for a National Information Infrastructure (NII). This NII has now evolved into what is commonly known as the Internet, but while the mechanism to provide information has improved significantly over the past few years, the same cannot be said for the content.

LTP personnel frequently hear anecdotal evidence presented by teachers, administrators and other educators that while their general connectivity is improving, they want to know more about what NASA has to offer. The public's interest in NASA is demonstrated by the very recent experience with the tremendous Internet interest in the Pathfinder Mission to Mars. Web sites serving information on the subject were swamped during the July 4 event.

We believe the public wants a NASA that is a technological leader on the cutting edge of scientific exploration. We believe the public wants NASA to succeed, it just needs to know more about what we are up to. Fortunately, currently emerging technologies commingled with the community's curiosity to know create a real opportunity for dialogue. The Learning Technologies Project can affect the educational community's familiarity with NASA projects in a real and profound way. LTP can do this by putting NASA's baseline stakeholders (the American public) directly in touch with its space agency.

NASA depends on the effectiveness of its communications with the public, especially the educational community and the students of our nation, for ongoing support. It is therefore imperative that NASA be available to the community that supports it. LTP can help NASA accomplish this.

B3 LTP Capabilities

It is the established intent of the Learning Technologies Project to reach as many of the educators, schools, and students in the country as possible. To this end, Learning Technologies projects follow the NASA Education and Evaluation Framework which calls for five specific approaches to implementation of NASA's Education Plan:

- [use of] Educational Technology
- Student Support
- Systemic Change
- Curriculum Support
- Teacher / Faculty Preparation and Enhancement

The Learning Technologies Project contains elements that support all aspects of this framework using the latest Internet communications tools. LTP has a core of expertise on the Internet, including experience with Internet hardware, software and networking techniques. LTP has specific experience with Web sites and Web site optimization, chat sessions, audio and video over the Internet, Internet broadcasting, online content development, and general technological advancement. In addition, LTP has many contacts in the historic and currently expanding Internet community. Each of the NASA Centers has an LTP presence focusing on different aspects of this framework. The areas of focus for each are shown in the following table:

Center	Use of Educational Technology	Student Support	Systemic Change	Curriculum Support	Teacher / Faculty Prep
ARC Project Office	x	x	x	x	x
ARC	x	x	x	x	x
DFRC	x		x	x	x
GSFC	x		x		x
JPL	x	x		x	x
JSC	x	x		x	x
LaRC	x		x	x	x
LeRC	x	x	x	x	x
MSFC	x	x		x	

B4 LTP Content Areas

LTP intends to continue to perfect its expertise in offering NASA projects the best in an Internet presence. LTP draws its content from projects within each of the four NASA Enterprises:

Aeronautics and Space Transportation Technology (OASTT)

OASTT intends for NASA to continue to lead the world in flight, in the air as well as in space. OASTT groups its goals into three areas, or "Three Pillars," which are: "Global Civil Aviation," "Revolutionary Technology Leaps," and "Access to Space." LTP will participate in the communication of OASTT to the educational community offering the public participation in its plans and successes.

Space Science

NASA's Space Science Program seeks to discover the mysteries of the universe, explore the solar system, find planets around other stars, and search for life beyond Earth. From “origins to destiny,” SS seeks to chart the evolution of the universe, its galaxies, stars, planets, and life. LTP will participate in the communication of space science to the educational community offering the public participation in its plans and successes.

Human Exploration and Development of Space (HEDS)

HEDS plans to increase human knowledge of nature's processes using the space environment. They intend to explore and settle the Solar System, as well as achieve routine space travel in order to enrich life on Earth through people living and working in Space. LTP will participate in the communication of HEDS to the educational community offering the public participation in its plans and successes.

Mission to Planet Earth (MTPE)

MTPE focuses back on the Earth. NASA and its interagency and international partners are striving to discover patterns in climate that will allow us to predict and respond to environmental events, such as floods and severe winters, well in advance of their occurrence. LTP will participate in the communication of MTPE to the educational community offering the public participation in its plans and successes.

B5 LTP Dissemination Methods

Dissemination must be done aggressively and on a wide scale to have any perceptible impact. The overall plan for disseminating our products is based on the following fundamentals:

- Working with the NASA Enterprises to identify the absolute best from their projects.
- Using emerging technologies as a means for NASA to communicate to the educational community (and the public at large).
- Taking an approach that will reach the greatest segment of the U.S. population possible including the disadvantaged and underserved.
- Using as many existing NASA educational components as possible. This includes those set up by the NASA Office of Education and the Public Affairs Office.
- Using all of our internal resources including the Learning Technolgies Project Office, NASA Center-based LTP activities, and the Learning Technologies Project grants and cooperative agreements.

Our dissemination methods are intended to be cost-effective and diverse. By using more than one method, LTP will have more control and be able to respond to special needs and circumstances. The target is to focus on the educational community, but we must target *all* members of the educational community from students to systemic reformers. Because of this, our dissemination methods will include:

Online Presence - LTP will have as its primary means of dissemination an online presence. Every LT project will have a Web page and most sites are expected to be interactive, providing usable educational content as well as general information. LTP web sites will be optimized to provide the greatest distribution and visibility possible. Because our distribution network is electronic we can enjoy immediate, low-cost, national and international delivery.

Printed Information- Wherever possible electronic information is preferred, however, to increase the awareness of NASA/LTP in the general populace, LTP will produce handouts, brochures, bookmarks, and other printed materials intended to convey its online presence and to reach those who are not on the Internet.

Direct Contact - While the majority of dissemination will be handled online, additional direct contact support from our staff and via historic dissemination methods will also be utilized.

Newsletters - We plan to produce an online newsletter to serve as an informational piece for internal personnel, the technical force, and key contacts. It includes sections covering each major organization within LTP and a message from the management staff. It will also highlight major developments, such as accomplishments, successful applications, uses, installations, dissemination events and LTP product development news.

Public outreach - LTP will participate in public events that draw large groups of people in order to increase the general awareness of NASA online.

Attendance at Conferences, Workshops and Conventions - LTP will use these events to publicize its online presence and to gain feedback from the educational community.

Interviews -Appearances on talk shows and other interviews (in coordination with the respective NASA Public Affairs Office) will expand the public's knowledge of NASA and its online presence.

Databases - All customer contacts will be recorded in LTP databases. Our registration cards and periodic customer surveys will help us understand our customer and measure the success of our dissemination, sales and product activities. Profile overlays or other lists that we buy will fill in our awareness gaps. We plan to develop a customer information system that will help us make sound decisions by providing historical answers to the dissemination questions we pose.

Mail Lists - LTP will develop mail lists from its outreach projects, conference contacts and inquiry responses.

Videos - LTP produces videos to assist in gaining access to emerging technology and applying the power of that technology to the classroom.

Workshops - LTP will conduct internal and external workshops focused on educational technology.

Direct Mail **-** We will be exploring the benefits of incremental, coordinated direct mail programs through the use of Internet Starter Kits. We will provide these kits to educators throughout the United States. All direct mail activities this year will be recorded on our contact database.

Volunteers - Project Office plans include the use of volunteers or advocates. The Learning Technologies Advocates plan will be presented to the Education Division in FY98. LTP has chosen to use a volunteer dissemination force because our products are best applied with some education and familiarity and because of the limited resources we have to take on the entire U.S. education network. Our project warrants a "person-to-person" dissemination strategy, as word of mouth is one of the most effective ways of communicating the value of these products. Additionally, recent voluntary initiatives such as NetDay have encountered considerable success.

B6 LTP Dissemination Partners

The Learning Technologies Project Office plans to disseminate our products through several channels. The determining factors in choosing these channels are:

- The ability to reach large numbers of educators, students and decision makers in a meaningful, motivational and memorable way.
- The extent of our ability to demonstrate or integrate the use of emerging technologies.
- The cost-effectiveness of the effort for the coverage it provides.

When a physical (versus an on-line) presence is required, the proximity of a NASA Center or other NASA activity will also be considered.

A partial list of LTP's internal (within NASA) dissemination partners includes:

The NASA Education Office - The NASA Education Office offers science, mathematics, and technology education programs and activities (elementary, secondary, undergraduate, graduate, and post doctoral) leveraging NASA's inspiring mission, unique facilities, and specialized workforce. It is a parent organization of LTP.

All the NASA Field Centers - Center educational outreach activities seek to stimulate student interest in science, mathematics, and technology; to attract students to career paths in these areas; and to enhance the knowledge and skills of faculty at all levels.

All of the LTP Projects - (See LTP Products, below)

Spacelink - Spacelink is one of NASA's electronic resources specifically developed for use by the educational community. Spacelink is a comprehensive electronic library that contains current information related to NASA's aeronautics and space research.

ERCN - The NASA Educator Resource Center Network is a network of resource libraries and help desks which allow educators to enhance their existing curricula with

information generated by NASA programs, technologies, and discoveries. NASA's educational materials are valuable as curriculum supplements for all subjects.

AESP - The Aerospace Education Services Program is one of NASA's premier outreach programs, reaching millions of students each year with its traveling aerospace education units, which bring the aerospace program into our nation's schools.

CORE - NASA's Central Operation of Resources for Educators (CORE) is an international distribution center for NASA's audiovisual educational materials. For a minimal fee, NASA CORE will provide materials through its mail order service.

NEWEST/NEWMAST - NASA Educational Workshops provide teachers with an opportunity to integrate into their classrooms state-of-the-art research and development through direct interaction with NASA scientists at each of the ten NASA Field Centers.

Other resources as developed.

A partial list of LTP's external (outside NASA) dissemination partners includes:

The Department of Education - The responsibilities of the U.S. Department of Education include providing national leadership and partnerships to address critical issues in American education; serving as a national clearinghouse of good ideas; helping local communities and schools meet the most pressing needs of their students; and preparing students for employment in a changing economy .

The National Science Teachers Association - The National Science Teachers Association (NSTA), is the largest organization in the world committed to science teaching and learning for all. NSTA has a current membership of more than 53,000, including science teachers, science supervisors, administrators, scientists, business and industry representatives, and others involved in science education.

National Council of Teachers of Mathematics - The National Council of Teachers of Mathematics (NCTM) offers vision, leadership, and avenues of communication for those interested in the teaching and learning of mathematics at the elementary school, middle school, high school, college, and university levels. NCTM has more than 117,000 members.

The Eisenhower National Clearinghouse - The Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) is funded through a contract with the U. S. Department of Education to provide K-12 teachers with a central source of information on mathematics and science curriculum materials.

The GLOBE Program - The Global Learning and Observations to Benefit the Environment Program is a worldwide science and education program coordinating the work of students, teachers, and scientists to monitor the global environment.

The American Library Association - The mission of the American Library Association is to provide leadership for the development, promotion, and improvement of library and

information services and the profession of librarianship in order to enhance learning and ensure access to information for all.

The Association of Science-Technology Centers - ASTC is an association of over 400 science and technology museums worldwide.

AskERIC - The Educational Resources Information Center is a federally-funded national information system that provides, through its 16 subject-specific clearinghouses, associated adjunct clearinghouses, and support components, a variety of services and products on a broad range of education-related issues.

CoSN - The Consortium for School Networking considers itself the national voice for advocating access to the emerging National Information Infrastructure in schools.

CUE - Computer Using Educators (CUE) is a California non-profit educational corporation that supports an active membership of 11,000 professionals: 80% within California, 20% worldwide, 95% professional educators in schools, community colleges, colleges, universities and related institutions, and 5% professionals in related fields.

Classroom Connect - Is a multimedia publishing organization for the K-12 market that includes newsletters, books, videos, computer software, seminars and links to online resources.

B7 LTP Dissemination Responsibilities

The Project Office will have the primary responsibility for new product development, including identification, evaluation and funding.

Each Center and LT Project is responsible for its own teledissemination in accordance with NASA policies. LT Projects will plan and implement their own presence at conferences, conventions and other events, but these activities will be coordinated with the Project Office and reflected on the LTP Master Calendar . Optimum use of LTP personnel in the immediate physical proximity to the event can be considered or accomplished. RSPAC will assist in the creation and sharing of online information within and external to LTP, producing online presences and dissemination tools.

LT projects may initiate contact on potential collaboration or matching funds at the local level. High-level contacts will be made by the Project Office at the state and federal level in coordination with the NASA Office of Education. Learning Technologies Projects will comply with NASA graphics standards and logo usage guidelines. Waiver requests or deviations will be presented to the Project Office for response.

B8 LTP Products

The "Quest" World Wide Web server is the home of the NASA Ames Research Center's Quest project, whose mission is to provide support and services for schools, teachers, and students to fully utilize the Internet and its underlying information technologies as a basic tool for learning.

Sharing NASA focuses on the enthusiastic people of NASA who live in the space program every day. Over the Internet, these people come alive for K-12 classrooms.

Students feel like they've not only read about exciting events, but that they've met the people involved.

Virtual Conferences employ Internet technologies that cater to users with both low-end and high-end connections. The idea is to enhance the experience of high-end users without excluding the participation of users with slower connections.

Global Quest: The Internet in the Classroom video is designed to inspire individuals and the community to explore further this exciting resource. The twelve-minute format makes it an excellent tool for Internet advocates to help them convince colleagues to invest effort in the technology.

Connecting to the Future video and handbook were co-produced with the US Department of Education's National Center for Education Statistics. The information in the video and handbook focuses on the idea that connecting to the Internet using a single dial-up connection may not prove too difficult, but connecting your entire school site to the network is a very complex task.

Global Quest II: Teaching with the Internet video features teachers telling teachers about the issues and benefits involved in making this tremendous resource a part of classroom curriculum. The video's twenty-two-minute format allows teachers to tell how the Internet has strengthened their classroom activities.

The Dryden Learning Technologies Project is a collaboration between NASA's Dryden Flight Research Center (DFRC) and Pennsylvania State University. This is a multi-year project which begins with an analysis and needs assessment relative to the Internet in the classroom, and concludes with an impact study of systemic reform of teaching practices in K-12 classrooms as a consequence of Web-based instructional sites.

NASA Goddard Space Flight Center's High Performance Computing and Communications program/ LTP K-12 project has two separate Web sites:

The HPCC/LTP K-12 project's main Web site assists K-12 Earth and space science educators with appropriate classroom links to the Internet and other links of general interest to the K-12 science community.

The Educator Resource Center Web site serves K-12 educators by providing NASA resources for the development of aerospace education programs and projects.

Project SPACE (Sun, Planets, Asteroids, Comets, Exploration) is an educational technology program of NASA's Jet Propulsion Laboratory that has been developed to support the process of systemic change in science and mathematics education currently underway in American classrooms. The goal of the program is to use advanced educational technology and methods to provide educators and students with an enriched environment in which they can learn about how NASA's solar system exploration projects are planned, developed, and carried out.

The Telescopes in Education (TIE) program brings the opportunity to use a remotely controlled telescope and charge-coupled device (CCD) camera in a real-time, hands-on, interactive environment to students around the world. TIE enables students to

increase their knowledge of astronomy, astrophysics, and mathematics, improve their computer literacy, and strengthen their critical thinking skills.

ILIAD is an offline, e-mail Web agent that serves vision-impaired computer users and teachers who have minimal computing resources.

SIMON is an Internet access and management tool that retrieves, organizes, and presents Internet information through an optimized local area network.

Off to a Flying Start, a NASA Langley Learning Technologies Project, is a K-2 online telecommunications project that connects students across the globe with the excitement of aeronautics to provide learning opportunities in math and science. Off to a Flying Start consists of three modules: Introduction to Flight, where students learn basic principles related to airplane design and the theory of flight; Flying the Falcon Flyer, which allows students to build and fly their own gliders; and Experimental Design, which builds on the results obtained with the Falcon Flyer, allowing students to create and test their own unique airplane designs.

The Aeronautical Classroom Activities site contains many ready-made classroom lessons, activities, and experiments which deal with the science of aerodynamics. Use individual lessons for stand-alone labs or activities, or use them together to create a unit or module. The activities contain information on Bernoulli's principle, buoyancy, hydraulics, Newton's laws of motion, velocity, pressure, lift and other forces which act on airplanes.

Basic Aerodynamics Software is educational software designed at the NASA Lewis Research Center to instruct students in the basics of aerodynamics. The software contains two main parts, a baseball pitch and a wing-airflow simulator. The software also includes lessons which prompt students to engage in problem solving and discovery. The software was created to satisfy an objective to cultivate a more thorough understanding of the research being done at the NASA Lewis Research Center, while also filling a critical need for additional intuitive tools that supplement and enhance math and science curricula.

The Classroom of Excellence at the NASA Lewis Research Center, is where computer classes are conducted year-round for K-12 teachers. The classes include introductions to Macintosh, the Internet, and some basic software packages, as well as those designed to show teachers how to incorporate computers into their curricula. Some class titles are "Using the Internet for Science," "Using Interactive Physics in the Classroom," and "Delta Graph Pro for the Educator." The instructional materials can be used for independent learning of computer skills. It can also be used as ready-made lesson plans.

Summer Computer Workshops are held each summer at NASA Lewis. There is a workshop for high school teachers, one for middle school teachers, and one for elementary school teachers. Each is two weeks in duration. The first week the participants receive hands-on computer training in a variety of software applications. The second week participants are required to create a classroom lesson or activity which incorporates the computer applications they learned during the first week.

These lessons are located on the NASA Lewis K-12 Web server. The lessons cover a wide range of topics and grade levels.

NASA's Observatorium Web site is a fascinating Internet window to the best of NASA's Earth and space knowledge. It combines years of NASA exploration and discovery with the latest Web technology. All the NASA favorites are included. Earth and space photos. The space shuttle. The Hubble Space Telescope. Planets. Comets. Black holes. Eclipses...a body of knowledge as vast and varied as the universe itself.

Exploring the Internet with NASA is a CD-ROM produced for NASA to introduce young students or first-time adult users to the Internet. You will discover what the Internet is, what it is used for, and gain hands-on experience navigating the Net and the World Wide Web.

The NASA ALLSTAR Network project is designed to improve the delivery and quality of aeronautics and related instruction to minority students, targeting students in grades 4-14. The laboratory uses NASA, Civil Air Patrol, and private aeronautics information resources to create materials that are accessible through the Internet. The material is also available through stand-alone kiosks at middle schools, junior high schools, high schools, and community colleges across South Florida. It has over 400 Web pages of text, including audio, photo, and video clips.

The Aviation Academy 2000 project provides a multimedia, interactive, electronic medium to encourage high school students to achieve a higher level of practical knowledge and skill in science, mathematics, engineering, and technology subjects. The Aviation Academy will accomplish this goal by providing a diverse curriculum in the field of aeronautics and through the application of data communication and information exchanges. Aviation industry involvement with the program provides realism and will be used to inspire students to seek further education leading to vocational certification, licensing, an associate's degree, a bachelor's degree, or to an advanced degree.

K-8 Aeronautics Internet Textbook is a kid-friendly, interactive textbook that makes understanding basic scientific principles fascinating and fun. Through the magic of the Web and Web video, young students can see a series of experiments that use familiar parts of their everyday world -- a pinwheel, a baseball, a feather -- to entertain and to teach. Instead of intimidating young students with abstract concepts, the K-8 Aeronautics Internet Textbook makes understanding aeronautics as simple as flying a kite.

The (LDAPS) Web site is an interactive, instructional, living document designed and written by teachers, elementary school students, college students, and university faculty. At the site, you can find out why a plane flies, what lift and drag are, learn how to build your own wind tunnel, sample curriculum ideas, and find creative ways teachers have brought engineering into their classrooms. You can also download software drivers for the LEGOs and link to a number of other educational sites.

PlaneMath is a set of online lessons and activities that invites all children to experience the excitement, power, and fun of mathematics and aeronautics. The project targets students in grades 4-7 in schools across the country. The online

lessons and activities are designed for students in special education, as well as those in general education.

"Design of Accessible Web Pages" is published online to provide guidelines to serve as a resource for identifying problems and finding solutions that make Web pages accessible to people with a variety of disabilities, both independent of and in tandem with various types of adaptive hardware and software.

SHAPE uses aeronautics to teach math and science. An aeronautics event is available for all learners. The event requires the integration of math and science concepts for the learner to make the necessary decisions to proceed through the event. The event is written at: Student Pilot level for grade K-4 learners ; Private Pilot level for grade 5-8 learners; Ace Pilot level for grade 9-12 learners.

SPARK develops interactive, Web-based curricula that apply science and mathematics to real research and design problems, and meet local, state, and national standards for grades 9-12. SPARK's interactive activities allow students across the nation to participate in datashare activities and share results to extend learning. SPARK's curricula are designed and implemented by and for Native American, rural, and disadvantaged youth.

Take Off explores the exhilarating world of flight. It is designed to get students excited about math and science through an introduction to lift and drag, aircraft design, ballooning, weather, instrumentation, flight simulators, and navigation. During the seven satellite broadcasts, the course explores both basic science and its practical technology applications, and is intended to inspire students, especially those uninterested in traditional science and math classes, with the possibilities of careers in aviation.

Athena offers online instructional material to K-12 students and teachers. Classroom projects require active participation as students learn; Teacher Talk aids teachers in its use. Using the Web, students access remotely-sensed or real-time data in Space, Weather, Earth and Oceans.

BADGER, the Bay Area Digital Geo Resource project, provides low-cost public access to geographic data over the Internet for non-traditional users such as local governments, utilities, businesses and public organizations.

ESSC, Earth System Science Community, includes educators, students, and scientists. The ESSC is refining an investigation-oriented Earth system science curriculum which enables high school and university students to research the Earth system using Earth observation data and information over the Internet.

Earth System Visualizer (ESV) is a unique Earth science data analysis system over the Web. The purpose of the ESV is to enable analysis and intercomparison of many Earth system parameters using a variety of plot types. The site includes a tutorial and example cases.

The Emergency and Crisis Management project uses remote sensing data for mitigation, preparation, response and recovery from natural and technological hazards. The project is also developing computer-based instruction for emergency

managers and high school students, enabling them to analyze floods on their PCs with remote sensing imagery.

The Everyday Classroom Tools project infuses the Spirit of Inquiry into every school subject, so that students and teachers can approach learning as a lifelong exploration of the world around us. Toward this end, ECT has developed the Threads of Inquiry, an integrated, inquiry-inspiring curriculum framework that brings science and the Internet into the everyday life of the K-6 classroom.

The Exploring the Environment project features interdisciplinary modules that use satellite imagery as a tool, problem-based learning as methodology, and the World Wide Web as a means of delivery. The project provides students with tools to investigate scientific, social, political, and cultural aspects of controversial, authentic, environmental problems. Most problems deal with human activity and its impact upon the environment, such as water quality, habitat destruction, or biodiversity. Standard problem-solving models, on-site resources (including relevant satellite imagery), and recommendations for extended inquiry are made available to students.

ImageView is a World Wide Web-based system that allows users to browse large raster data sets, including Landsat Thematic Mapper (TM) and Advanced Very High Resolution Radiometer (AVHRR) imagery. ImageView provides users who would traditionally have little or no access to such databases with the ability to visualize, manipulate, and download images for a particular area of interest.

MapServer is a software package for bringing interactive maps and associated attribute data to the World Wide Web. MapServer uses Geographic Information System (GIS) databases as the basis for creating maps and reports.

The Internet Weather Explorer (IWE) is a family of products resulting from the FIFE project which allows NASA data and information products derived from NASA-related sources to be combined with educational "context" to support elementary level weather education. Developed by Tasc, Inc., with help from Franconia Elementary School of Alexandria, VA, IWE is a way to create compelling multimedia weather lessons that combine live and stored Internet data and graphics with contextual information such as "What is a weather satellite?"

The Gulf of Maine Aquarium WWW site focuses on K-12 applications of satellite imagery to teach about aquatic environments. Called Space Available: Learning from Satellites, this site includes over sixty classroom-tested activities, complete with learning objectives, background information, and links to relevant imagery. All activities are consistent with national learning standards in mathematics and science.

The Live From Earth and Mars Web site explores atmospheric and space sciences with a special emphasis on K-12 education. Live from Earth and Mars curricula use the power of the Internet to explore and build understanding of standards-based science and engineering concepts. Seven complete modules, representing thirty age-appropriate science lessons and engaging activities for grades 2-12 are currently available. "Live" data captured from Earth-orbiting satellites and planetary spacecraft provide excitement and new perspectives.

Passport to Knowledge is an ongoing series of "electronic field trips to scientific frontiers." Supported by the National Science Foundation, NASA, public television, and other collaborators, it encourages and permits students to interact with... “Real Science, Real Scientists, Real Locations, Real Time.”

Live from Antarctica and Live from Antarctica 2 integrate video, print, and online materials to provide the most comprehensive and exciting interactive multimedia learning experience connecting students to Earth's most remote and mysterious continent.

Live from the Stratosphere gives students their first chance ever to ride -- virtually -- on board NASA's Kuiper Airborne Observatory and observe planets, stars, and galaxies with an infrared telescope.

Live from the Hubble Space Telescope features another educational first: students help select targets for the Hubble Space Telescope, humanity's most powerful eye on the heavens.

Live from Mars tracks NASA's two current missions to the red planet using video, the Internet, and hands-on activities to allow students to simulate the work of the mission team, and bring Mars down to Earth!

Science Education Gate-way (SEGway) - is a K-12 science education resource center for teachers, students, home-schoolers, and all science fans. You'll find learning adventures in Earth and space science from a NASA-sponsored partnership of museums, researchers, and educators. Choose from wide-ranging lessons, tutorials, interactive tools, and activities organized by topic.

TiSDat is a suite of decision support information products for agriculture that merge satellite and meteorological data and forecast models of the atmosphere and land surface. Much of the technology is transferable to other crops and applications, and additional products are now in development.

The Urban Environment Initiative (UEI) provides non-traditional users of Earth science information with technologies that allow them to collect, visualize, and analyze information about the urban environment. This information is then used to answer a wide range of questions important to urban planners and decision makers. UEI works in conjunction with community-based partner organizations to conduct workshops and training sessions about remote sensing information and technologies.

Virtually Hawaii contains a large collection of satellite, aircraft, and ground images of Hawaii. We show near real-time weather satellite images, live video from two islands, and interactive QuickTime VR panoramas and games.

VolcanoWorld brings modern and near real-time volcano information to school kids and other users of the Internet. VolcanoWorld draws extensively on remote sensing images (AVHRR, Landsat TM, Magellan, space shuttle, etc.) and other data collections. We add value to these data by relating each image to geologic processes, and by encouraging users to ask professional volcanologists questions.

WeatherNet4 is a first-of-its-kind project involving NASA and a broadcast television station. The intent is to increase the American people's exposure to Earth and space

science data via the Internet and broadcast TV. It has proven that the television meteorologist/weathercaster is indeed a "Science Ambassador," ready to deliver Earth and space science information daily to those watching television. By using state-of-the-art technology and communications, NBC4 WRC-TV in Washington, DC, has established the most comprehensive local Web site dedicated to weather and Earth and space science.

Windows to the Universe is a user-friendly learning system for the general public. The objective is to develop an innovative and engaging World Wide Web site that presents current information about the Earth and space sciences. To achieve this goal, we are building a site that includes a rich array of documents, images, movies, animations, and data sets that explore scientific knowledge about our solar system, the universe, and the physical sciences. It also highlights the historical and cultural ties between science, exploration, and the human experience. The Windows to the Universe CD-ROM is a product that allows greatly improved access speeds for the Windows to the Universe Web site, especially for users with slow Internet connections.

The Yohkoh Public Outreach Project (YPOP) is an Internet-based project designed to create high-quality public access to Yohkoh/SXT and other solar data. An additional and equally important component of this project is to provide educational products for dissemination to the K-12 community. These products utilize all available technology and comprise interactive lessons aimed at increasing the public's awareness of science with a strong emphasis on astronomy and the space sciences.

The Progressive Image Transmission (PIT) system delivers large digital images over slow networks in a small fraction of the time usually needed. Viewers get a good view in as little as 1/100th of the expected download time, at which point they can interact with the server by outlining rectangular regions of interest, which will be delivered losslessly at a higher priority. The user controls the lossiness of the image, which is not chosen in advance by the server.

"Space Update" is a CD-ROM produced by Rice University and NASA. You get "the best of the Web" safely, without the problems of a Web browser. Students can't reach inappropriate sites or "get lost in cyberspace."

Retrieval of Digital Images by Means of Content is a satellite image database which allows a user to retrieve images based on the characteristics (or content) of the image rather than the location (or metadata) of the image.

Scalable Agent-based Information Retrieval Engine (SAIRE) is a multiagent search engine employing intelligent software agents, natural language (NL) understanding, and conceptual search techniques to support public access to Earth and space science data over the Internet.

The GeoLens project involves the evaluation of new Web/Internet technologies, support of federally mandated information processing standards, and use of public domain software to implement clients and servers. The USDAC's member organizations include Bell Communications Research, Camber Corp., Rutgers Center for Remote Sensing and Spatial Analysis, NASA's National Space Science Data Center, and the California Resource Agency. Recently, USDAC team members have

also collaborated closely with technologists at the National Center for Supercomputing Applications (NCSA), University of Illinois.

B9 LTP Product Pricing

Pass-through pricing is essential to NASA as a government agency, as the community has already provided for most of the costs of development within the NASA budget. Even though these specific products are not available from other sources, LTP products will be made available at no or (in the case of CD-ROMs or other material-based products) very low cost to the customer. When charges are necessary, the prices for our products will be determined first and foremost by our cost of production and any associated costs for storage, shipping and handling (in the case of CORE - represented materials). Materials requested by other NASA entities will be produced on a shared cost basis.

B10 LTP Product Life Cycle

Learning Technologies products should be treated as long-term products as they drive, as well as evolve with, the progress of technology. They create interest which creates refinements to technology that creates more interest and so on. Since LTP is made up of Center-based projects, cooperative agreements, grants and other projects, every effort will be made to retain the knowledge gained by these activities for the benefit of the American public. It is the intent of the Learning Technologies Project that the taxpayers return on investment for LTP be repaid many times over. Our success in disseminating this knowledge and information will be documented at the end of FY98 and will be reported in the 1998 LTP Dissemination Report.