NASA/CR-96-205955

FINAL REPORT

Technology Education Professional Enhancement Project
NASA Grant No. NCCW-0064
October 1, 1994 to September 30, 1996

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PROJECT SUMMARY

The International Technology Education Association (ITEA) received NASA grant NCCW-0064, Technology Education Professional Enhancement Project, for a period of approximately twenty-four (24) months beginning October 1, 1994. A project extension was allowed through November 30, 1996 without extending the amount of approved funding. The intent of this work was to continue a cooperative endeavor between NASA and ITEA that strengthens an integrative curriculum of mathematics, science, and technology and increases the effectiveness of educators to empower students to understand, apply, and assess technology. Two goals guided this project:

GOAL I. INTEGRATIVE AEROSPACE MATERIALS
Use the integrative field of aerospace technology to enhance the content and instruction delivered by math, science, and technology teachers through the development of a new publication entitled *NASA Technology Today*.

GOAL II. RATIONALE AND STRUCTURE FOR TECHNOLOGY EDUCATION
Research and develop a rationale and structure for the study of technology, which establishes the foundation for developing technology education standards and programs of the future.

GOAL I. INTEGRATIVE AEROSPACE MATERIALS

The project initiated a publication through an agreement between ITEA, Association Business Publications (ABP) (publishers of *NASA Tech Briefs*) and in cooperation with NASA, to share the excitement, adventure, and knowledge of NASA's work with educators for use in their classrooms and with parents for use at home. *NASA Technology Today* was designed to help educators stay abreast of the latest happenings in the aerospace industry,

scientific, and technological developments (communicated in layperson's terms) and the wealth of resources available for the school classroom and laboratory.

Two editions of *NASA Technology Today* were prepared by ITEA and transmitted to ABP to produce copy for the Government Printing Office, which printed and returned to ABP for dissemination with *NASA Tech Briefs* to 210,000 subscribers September, 1995 and March, 1996. Copies were also disseminated through the national conferences of the National Science Teachers Association, the National Council of Teachers of Mathematics, and ITEA.

The inaugural issue, September, 1995, featured 16-pages of content with six articles: (1) Hubble Space Telescope, (2) International Space Station, (3) Dante II, (4) NASA's Mission to Planet Earth, (5) Spacelink, and (6) miscellaneous technical information.

The second issue, March, 1996, included the following feature articles: (1) The Next Generation of Supersonic Airliners, (2) Traveling in the Information Highway's Fast Lane, (3) Learning On-Line: Information at Your Fingertips, (4) GAS Gets Schoolwork Off the Ground, (5) Becoming an Astronaut, (6) They Came From Space: Down-to-Earth Products of NASA R&D, (7) What's The Reason for . . ., and (8) Techbits.

Response to *NASA Technology Today* has been very positive. Requests for additional copies of each issue overwhelmed the supply. Assorted readers, including teachers, administrators of various NASA Centers, NASA contractors, and the general public, responded with commendations for the content and presentation. Receiving information about highly technical and sophisticated developments so that teachers could draw relationships between school studies and the sophistication of NASA technology appeared to be valued and appreciated.

ABP and ITEA believe this new resource was a success and will be valued by educators in the future. Thus, an agreement has been formed between them to produce the publication as a business venture henceforth. Consequently, the third issue was prepared on this basis and released as the Fall, 1996 edition (September, 1996). Content is being prepared so that a production schedule can be sustained with six issues per year. Subscribers, advertisers, and subscription underwriters are currently being sought.

GOAL II. RATIONALE AND STRUCTURE FOR TECHNOLOGY EDUCATION

We are surrounded by the concepts, processes and products of technological innovation. Technological literacy is considered critical to the future of our country's businesses, government and quality of life. The need for a technologically literate citizenry grows stronger each year.

To meet this need, the National Aeronautics and Space Administration and the National Science Foundation funded Goal II to develop a rationale and structure for technology education. This effort was spearheaded by ITEA and is entitled "Technology for All Americans." The ultimate goal was to offer those who are interested in technology education as an essential core subject, a clear vision for what it means to be technologically literate, how this literacy can be achieved at a national level, and why it is important for our nation.

The Technology for All Americans Project set out to achieve this goal by establishing a National Commission to serve in a advisory capacity to the project staff. The 22-member Commission functioned independently of both the project and ITEA. The Commission was composed of persons who were especially aware of the need for a technologically literate society. Members represented the fields of engineering, science, mathematics, the humanities, education, government, professional associations, and industry. They served as a vital resource of experts who were knowledgeable in technology and its interface with science, mathematics, engineering, and education.

A six member writing team was formed from the National Commission. The writing team represented a wealth of knowledge, extensive background, and a unique diversity that played an important role in the *Technology for All Americans: A Rationale and Structure for the Study of Technology* (the R&S Document), the Project's final product.

The R&S Document, in draft form, went through a dynamic process as a result of a very structured consensus process. It underwent the scrutiny of over 500 reviewers inside and outside the profession of technology education. During the initial review process, that took place during the month of August 1995, the draft document was mailed to numerous professionals. These professionals were selected via a nomination process. Each state supervisor for technology education and president of state associations for technology education were asked to nominate mathematics, science, and technology educators from elementary through high school levels to participate in a series of consensus building workshops. These workshops were hosted by the following NASA field centers:

Consensus Building Workshops at NASA Centers on First Draft Conducted by the Technology for All Americans Project (August, 1995)

NASA Center	Location
Ames Research Center	Moffett Field, California
Goddard Space Flight Center	Greenbelt, Maryland
Jet Propulsion Laboratory	Pasadena, California
Johnson Space Center	Houston, Texas
Langley Research Center	Hampton, Virginia
Lewis Research Center	Cleveland, Ohio
Kennedy Space Center	Cape Canaveral, Florida

The draft document was disseminated to the participants prior to the consensus building workshop. They were asked to review the draft document and respond to several prepared questions, as well as provide comments directly on their copy of the draft. At the workshops, participants were divided into heterogeneous groups that represented the interest groups of those involved (i.e., elementary, middle school, high school, mathematics, science, technology). These small groups were then asked to respond to prepared questions as a group and come to consensus on the content of the draft document. Generating input and reactions from the field were very valuable during the consensus process. Perspectives were shared that had not been discussed in prior writing team meetings. Ideas for improving the draft document were generated from the group synergism, and regional philosophies or viewpoints were acknowledged.

This input was analyzed to determine the needed changes for its content. Changes were made to reflect the data from the summer workshops. In addition, these changes were "tried out" with groups throughout the fall at state and regional conferences. The project staff found that by focusing on major input identified from the summer review process, they could concentrate on changes made in subsequent versions of the draft document.

Changes and revisions go hand-in-hand with the consensus process. This process continued throughout the fall until a second version of the draft document was disseminated for review in October-December, 1995. This draft of the document was disseminated to over 250 people. This group contained a large number of administrators. It was felt that an important part of the consensus process includes a "buy-in" component. In other words, if technology education is to become a core subject in our schools, then those who hold the power to enable this vision to become real must be involved in the front end of this process.

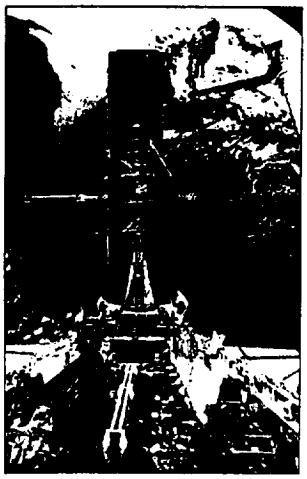
Additional efforts were made to expand the audience that reviewed this document by making it available to anyone having access to the Internet. Throughout this project, an Internet home page was maintained in an effort to disseminate timely material generated by the project. Access to the draft document became part of our home page in December 1995, and reviewers were invited to fill out a comment and review form on-line and submit it to the project for consideration prior to the final revision. The final version of this document represents the broad support and input that was provided throughout this consensus process. The final R&S Document was disseminated to 8,500 educators and key decision makers in September, 1996.

Attached is a final evaluation of Phase I of the Technology for All Americans Project and the final R&S Document.

After developing a consensus-based rationale and structure for the study of technology, the ultimate goal for the Technology for All Americans Project is to develop standards for technology education. This will include Kindergarten through twelfth grade curriculum content standards with benchmarks at 4th, 8th and 12th grade, teacher enhancement and teacher preparation standards, student assessment standards, and program standards. When these standards are developed and implemented, they should improve the quality of technology education programs in the schools in the future.

TECHNOLOGY TODAY

A RESOURCE FOR TECHNOLOGY, SCIENCE, & MATH TEACHERS



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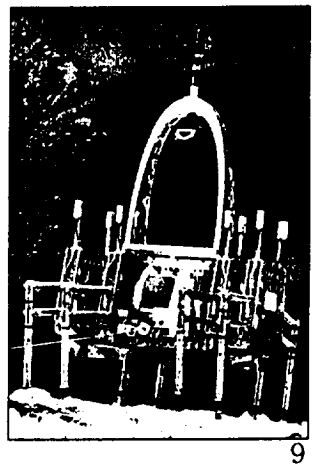

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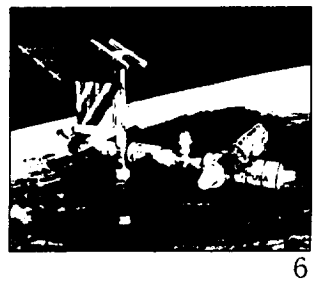

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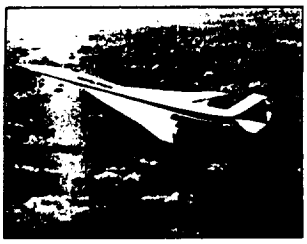

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On the cover: Illustration shows several Get Away Special (GAS) experiment canisters in the shuttle cargo bay and attached to the craft's robotic arm. Turn to page 10 to learn more about the GAS program.

NASA Technology Today is produced by Associated Business Publications and the International Technology Education Association, in cooperation with NASA, to share the excitement, adventure, and knowledge of NASA's work with educators and parents. Send your comments and suggestions to: NTT Editor, Associated Business Publications, 317 Madison Avenue, New York, NY 10017; E-mail: ntb_edit@interramp.com.

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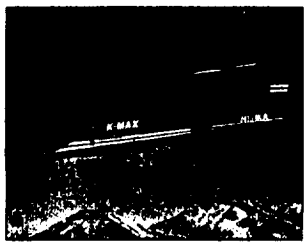

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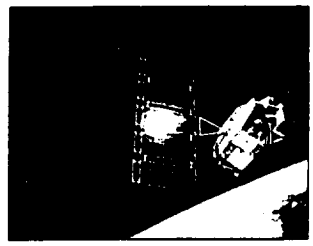

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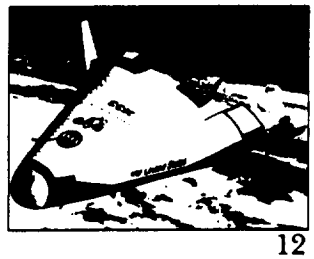

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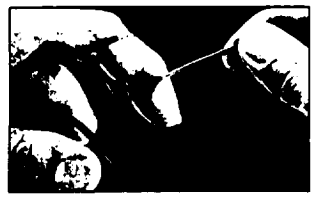

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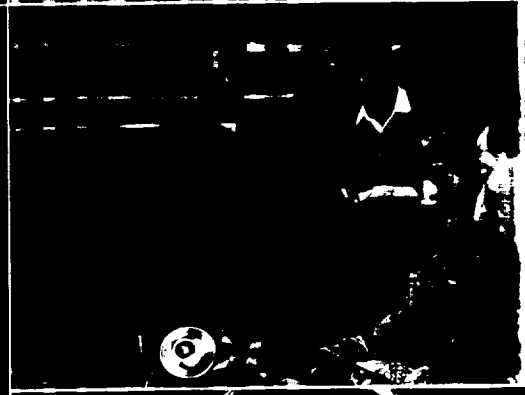
Technology for All Americans



A Rationale and Structure for the Study of Technology