TECHNOLOGY TRANSFER AND THE CIVIL SPACE PROGRAM
A Workshop to Address Issues and Strategies

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White House/OSTP Perspective

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Thank you for the opportunity to come talk with you and to learn something from this workshop.

Let me begin by pointing out that what I have to say may not be the view from the White House. Technology transfer -- making the most of our federal R&D investment -- has been and continues to be a great concern to Dr. Bromley as the President's Science Advisor and the head of OSTP. But, in fact, within the Executive Office of the President, on any issue related to civil space technology transfer, you would expect to find considerable interest and slightly different perspectives from OSTP, from OMB, and from the National Space Council. The Council of Economic Advisors, the National Security Council, the Office of Federal Procurement Policy, and the U.S. Trade Representative's Office may also have interests in a particular issue.

I would like to talk to you about two aspects of OSTP's work -- first, efforts to state the overarching technology policy in which technology transfer plays an important part and, second, efforts to coordinate federal R&D programs in several technology areas through the FCCSET process.

The U.S. Technology Policy statement, released by OSTP in September of 1990, for the first time brought together the many facets of technology policy, described what they are, and showed how they fit into a comprehensive framework. It is not a perfect document nor a final statement. It is largely retrospective rather than prospective and, of necessity, it has to describe very complex subjects in broad-brush terms. But it has provided a valuable baseline for continuing dialogue, both inside and outside the government.

A very basic goal of our technology policy is to ensure a quality workforce that is educated, trained and flexible in adapting to technological and competitive change. Without getting ahead of myself, let me mention that the FCCSET crosscut on Math and Science Education takes on this challenge and that of making U.S. students first in the world in math and science by the year 2000. This program proposes to coordinate

education activities, reform the education system, retrain educators, set standards, and pursue new initiatives.

In addition to improving our workforce and preserving our traditional strength in discovery through research, policies must allow and encourage technology to be the engine of economic growth. Policies must encourage investment — reduce the capital gains tax, and make the research and experimentation tax credit permanent. Policies must foster commercialization. This is where technology transfer plays a prominent role. Special emphasis on small business is warranted since 70% of new jobs in the last decade were created in companies with less than 500 employees. Small high-tech firms also innovate more efficiently than larger firms producing 2 to 4 times the number of products and patents per R&D dollar. Policies must mitigate under-investment due to market failure. Much of research produces benefits which are not appropriable and, consequently, the private sector lacks the incentive to invest adequately. Generic, pre-competitive stages of technology development are similar. The government, therefore, has a role to play as do industry consortia. Finally, policies must reward and safeguard innovation. Intellectual property rights must be protected.

The budget proposes to spend $579 million on technology transfer activities in FY 1993. Included are cooperative activities (such as direct technical assistance, personnel exchanges, cooperative R&D agreements), commercialization activities (that is, patenting and licensing of innovations, identifying markets and users, payments of royalties and cash awards to inventors), and information exchange (seminars and dissemination of papers, articles, and reports).

Effective technology transfer must be considerably broader than just that set of activities that have transfer as their primary goal. Aerospace, in many respects, has been a leader in this area. NASA has long had a close link with the aviation industry; it has had authority for cooperative R&D agreements since the Space Act; and the charge to "encourage" commercial space activities was made by the President in 1989. Some of these efforts have worked well and others have not. Today there is a sense of need to improve the effectiveness of technology transfer activities, a desire to evaluate the success of present mechanisms and to consider experiments with new approaches.

With that said about the overarching technology policy, let me spend a few minutes talking to you about the coordination of some technology programs within the federal government through FCCSET. FCCSET is the Federal Coordinating Council for Science, Engineering, and Technology. It is a cabinet-level body headed by Dr. Bromley. Under it are seven interagency committees. This past year, five of these committees, working closely with OSTP and OMB, undertook cross-cutting analyses in specific areas of science and technology and developed coordinated national strategies with long-term goals and priorities. The FCCSET process is a truly cooperative mechanism, resting on the combined efforts of the agencies involved with oversight by the full council. Agencies can mesh their own activities within a broad national strategy while simultaneously increasing their abilities to carry out the critical missions that they have been assigned. It is a positive-sum endeavor in which all gain.

Three of these cross-cutting initiatives are technology-oriented — High Performance Computing and Communications, Advanced Materials and Processing, and Biotechnology. A fourth, Global Climate Change, particularly from NASA's perspective, is technology-intensive. The fifth is Math and Science Education which I have mentioned previously.

The High Performance Computing and Communications initiative is designed to sustain and extend U.S. leadership in all advanced areas of computing and networking. This program is now in its second year and involves nine federal agencies. For FY 1992 Congress appropriated a 27% increase for the program and, for FY 1993, the budget proposes a further increase of 23% to a total of $803 million.

During the past year, major new high performance systems have been delivered, including scalable, massively parallel systems that go much of the way to the five-year goal, established just last year, of creating a teraop system. New software systems have been developed or adapted for such high performance systems. Traffic on the already operational digital communications network has doubled, as has the number of interconnected local and regional networks. And many more people have been trained to develop and use these emerging systems. These four components of the initiative -- hardware, software, networks, and training -- are poised for further major advances.

Advanced Materials and Processing is a one of two new Presidential Initiatives developed from FCCSET cross-cuts this year. It is a coordinated effort to exploit opportunities in materials R&D to meet national goals and extend U.S. leadership in the materials area. Ten federal agencies are involved. The budget proposes $1.8 billion for the program in FY 1993, an increase of over 10% from the levels of FY 1992.

The promise is that of materials with properties and performance tailored for specific applications that can be fabricated by cost-effective and environmentally sound processes. The Advanced Materials and Processing Program will focus additional resources on R&D in synthesis and processing, in particular, in areas that encompass the creation of new materials and processes, applied R&D to transfer the laboratory achievement to pilot plants, and process integration with design and manufacturing requirements. Special attention will be given to the interfaces between universities, government laboratories, and industry.

The second of the new Presidential Initiatives is that in Biotechnology research. This program will maintain the U.S. lead in health-related biotechnology research and will expand research in other critical areas, such as agriculture, energy, and the environment, where applications of biotechnology research promise significant breakthroughs. The National Institutes of Health has been the largest supporter of biotechnology research, but eleven other agencies are also involved in this initiative. The FY 1993 budget proposes that funding for biotechnology research increase by 7% to over $4 billion.

The U.S. Global Change Research Program is the world-leading program seeking to

monitor, understand, and model the entire Earth system to support the needs of policy makers for sound information on the science and economics of global change. The FY 1993 budget proposes a total of $1.37 billion for the eleven agencies involved in this program, an increase of 24%. Major objectives include integration of new scientific discoveries into the Global Circulation Models used to predict world climate changes and improvement of these models so that they can begin to give accurate regional predictions. Technology elements, particularly NASA's Mission to Planet Earth, are major components of the program.

Finally, I want to mention that FCCSET has recently approved Advanced Manufacturing as a candidate initiative for the FY 1994 budget. The focus is on lean and flexible manufacturing techniques. The FY 1993 federal budget includes $321 million for civilian manufacturing R&D and over $1 billion when defense manufacturing R&D is included. The goal of the FCCSET crosscut is to improve the effectiveness of this investment through coordination and enhancement.

These programs aim at accomplishing the missions of the agencies involved. In some cases an agency's mission may be to encourage the development and use of socially-desirable technology by the nation, whereas in other cases technology may be needed to meet internal needs. In all cases, however, the desirability and need of involving the private sector, of technology transfer, is recognized.

Thank you for your time. I hope that this has provided some insight into OSTP's activities.

Technology Policy

- Encourage Investment
  - Capital Gains Differential
  - R&E Tax Credit
- Foster Commercialization
  - Technology Transfer
  - Small Business Programs
- Mitigate Under-Investment
  - Industry - Gov't Consortia
  - Generic Technologies
- Reward and Safeguard Innovation

Table 6–4. THE BUDGET PROPOSES A 23 PERCENT INCREASE FOR ALL ASPECTS OF HIGH PERFORMANCE COMPUTING

(Dollar amounts in millions)

Description	Budget Authority			
	1992 Enacted	1993 Proposed	Dollar Change: 1992 to 1993	Percent Change: 1992 to 1993
Program Components				
High Performance Computing Systems	152	178	+26	+17%
Advanced Software Technology and Algorithms	278	346	+68	+24%
National Research and Education Network	92	123	+30	+33%
Basic Research and Human Resources	132	156	+24	+18%
Agency				
Defense (DARPA)	232	275	+43	+18%
National Science Foundation	201	262	+61	+30%
Energy	92	109	+17	+18%
National Aeronautics and Space Administration	71	89	+18	+25%
Health and Human Services	41	45	+4	+8%
National Oceanic and Atmospheric Administration	10	11	+1	+10%
Environmental Protection Agency	5	8	+3	+60%
National Institute of Standards and Technology	2	4	+2	+95%
Total, All agencies	655	803	+148	+23%

Table 6–5. THE BUDGET PROPOSES A 10 PERCENT INCREASE FOR A NEW INITIATIVE IN ADVANCED MATERIALS AND PROCESSING

(Dollar amounts in millions)

Description	Budget Authority			
	1992 Enacted	1993 Proposed	Dollar Change: 1992 to 1993	Percent Change: 1992 to 1993
Program Component				
Synthesis and Processing	683	748	+65	+9%
Theory, Modeling and Simulation	224	253	+30	+13%
Materials Characterization	474	503	+29	+6%
Education/Human Resources	21	27	+6	+27%
National User Facilities	257	291	+33	+13%
Agency				
Energy	603	678	+75	+12%
Defense	449	432	-17	-4%
National Science Foundation	266	319	+53	+20%
National Aeronautics and Space Administration	125	154	+29	+23%
Health and Human Services	77	82	+5	+7%
Agriculture	57	66	+9	+16%
Commerce	46	48	+2	+4%
Interior	25	24	-1	-4%
Transportation	9	16	+7	+76%
Environmental Protection Agency	3	4	+1	+33%
Total, All agencies	1,659	1,821	+163	+10%

Table 6–6. THE BUDGET PROPOSES A 7 PERCENT INCREASE IN FEDERAL INVESTMENTS IN BIOTECHNOLOGY

(Dollar amounts in millions)

Description	Budget Authority			
	1992 Enacted	1993 Proposed	Dollar Change: 1992 to 1993	Percent Change: 1992 to 1993
Program Component				
Research Areas	3,759	4,030	+271	+7%
Agriculture	191	208	+17	+9%
Energy	80	107	+27	+33%
Environment	69	83	+14	+20%
Manufacturing/Bioprocessing	99	124	+25	+25%
Health	1,594	1,680	+86	+5%
General/Foundations	1,418	1,500	+82	+6%
Social Impact Research	9	9	—	—
Infrastructure	301	320	+19	+6%
Agency				
Health and Human Services	2,963	3,125	+162	+6%
(National Institutes of Health)	(2,801)	(2,944)	(+143)	(+5%)
Agriculture	179	168	-11	-9%
National Science Foundation	174	206	+32	+18%
Energy	182	243	+61	+34%
Veterans Affairs	86	90	+4	+5%
Defense	81	87	+6	+7%
National Aeronautics and Space Administration	37	45	+8	+22%
Agency for International Development	21	31	+10	+48%
Environmental Protection Agency	16	18	+2	+13%
Commerce	13	13	—	—
Interior	5	5	—	—
Justice	2	2	—	—
Total, All agencies	3,759	4,030	+271	+7%

Table 6–12. U.S. GLOBAL CHANGE RESEARCH PROGRAM

(Dollar amounts in millions)

Description	Budget Authority			
	1992 Enacted	1993 Proposed	Dollar Change: 1992 to 1993	Percent Change: 1992 to 1993
Program Component				
Ground-based	733	915	+182	+25%
Oceans	62	85	+23	+37%
Modeling	33	51	+18	+55%
Land Processes	80	92	+12	+15%
Human Dimensions	7	9	+2	+29%
Economics	4	13	+9	+225%
Other	547	665	+118	+22%
Space-based	378	457	+80	+21%
Earth Observing System (NASA)	188	308	+120	+64%
Other Programs (NASA)	190	139	-51	-26%
Energy	—	10	+10	—
Agency				
National Aeronautics and Space Administration	756	891	+135	+18%
National Science Foundation	109	163	+54	+50%
Energy	77	113	+36	+47%
Commerce (NOAA)	47	78	+31	+66%
Agriculture	44	48	+3	+7%
Interior	40	36	-4	-9%
Environmental Protection Agency	24	26	+2	+8%
Smithsonian	6	11	+4	+68%
Defense	6	7	+1	+5%
Health and Human Services	1	1	—	—
Tennessee Valley Authority	*	*	—	—
Total	1,110	1,372	+262	+24%

*Less than $500 thousand.