

**REPORT OF THE
REVIEW COMMITTEE**

**The Performance and Potential of
The Center for Innovative Technology**

**TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA**



SENATE DOCUMENT NO. 16

**COMMONWEALTH OF VIRGINIA
RICHMOND
1993**

CENTER FOR INNOVATIVE TECHNOLOGY REVIEW COMMITTEE

December 1, 1992

Dear Governor Wilder and General Assembly Members:

We are pleased to transmit to you the Review Committee's *Report on the Performance and Potential of the Center for Innovative Technology*. This report was mandated by Item 267 of the 1992 Appropriation Act. The act directed that a review be conducted by a committee comprised of members from the Office of the Governor, the Senate, the House of Delegates, and the Center for Innovative Technology (CIT) Board of Directors. Representatives from business and industry were appointed by the chairman as industrial advisors. The Committee was jointly staffed by the Department of Planning and Budget and staff of the Joint Legislative Audit and Review Commission.

Specific recommendations and draft legislation are included in the enclosed report. The Review Committee has concluded that CIT has basically implemented the original legislative intent, despite problems in the areas of mission, governance, administration, and accountability. The Review Committee recommends that CIT be continued with substantial changes and refinement in these areas. State funding is appropriate for CIT to ensure that the economic development objectives of the Commonwealth are emphasized. The committee recommends that the current funding level of \$8.7 million annually be maintained until the Commonwealth's economic development strategies are more fully formulated.

Finally, the Review Committee has concluded that science and technology efforts should be an integral part of an overall economic development plan for the Commonwealth and has recommended means to accomplish this objective. CIT should play an important role in these planning efforts.

The committee would like to thank Governor Holton and his staff, the CIT Board, the higher education institutions, and the business and technology communities for their cooperation and assistance during this review. Finally, we would like to compliment the staff for soliciting broad input, conducting extensive research, and preparing an objective and balanced report for your consideration.



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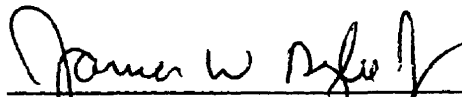
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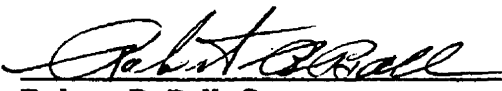
**CENTER FOR INNOVATIVE TECHNOLOGY
REVIEW COMMITTEE**

December 1, 1992


We, the undersigned, accept and approve this report for transmittal to the Governor and General Assembly for their consideration in accordance with Item 267 of the 1992 Appropriation Act.

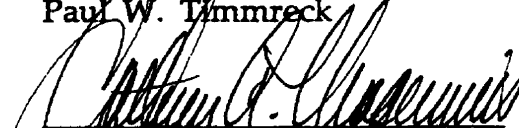

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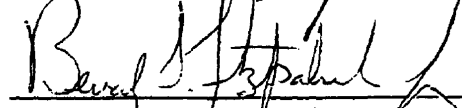

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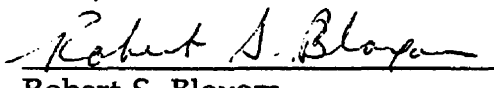

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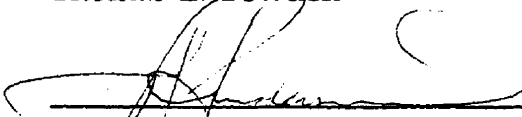

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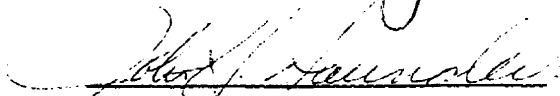

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EXECUTIVE SUMMARY

The Center for Innovative Technology (CIT) has basically implemented original legislative intent, despite problems in the areas of mission, governance, administration, and accountability.

CIT Background Information. The General Assembly established the Innovative Technology Authority (ITA) based on recommendations from the 1983 Governor's Task Force on Science and Technology. CIT is a private, non-profit corporation that serves as the operating arm of the ITA. CIT was formally incorporated on July 1, 1984. The first executive director was officially appointed in January 1985. Since its inception, CIT has had five directors, including one acting director.

CIT's mission is to promote economic growth by enhancing the ability of Virginia universities to develop and transfer technology to industry. It implements this mission primarily by co-sponsoring research projects with industry. Over the past seven years, CIT reports that it has funded more than 600 projects involving more than 550 companies, 460 university professors, and 1,000 students. In addition, CIT markets and licenses intellectual property developed at the universities. Finally, some of CIT's programs provide direct services to business and industry across the Commonwealth.

For fiscal years 1985 through 1992, the Commonwealth provided \$80.7 million for the programs and operation of CIT and \$21.2 million for the construction of the CIT Building. CIT received \$8.7 million in State funding for fiscal year 1993. CIT estimates that it will also collect \$1.9 million in nonstate revenue. Therefore, total revenue available to CIT is approximately \$10.6 million for fiscal year 1993.

Study Mandate. Item 267 of the 1992 Appropriation Act mandated that a study be conducted by an independent review committee. This is the first comprehensive external review of CIT since its inception. The Review Committee was appointed by the Governor, the General Assembly, and the CIT Board Chairman. Four industry advisors were appointed by the Review Committee Chairman from business and high technology communities. Staff of the Joint Legislative Audit and Review Commission and the Department of Planning and Budget jointly provided support to the committee.

State Vision for Economic Development. The Review Committee concluded that science and technology efforts should be an integral part of the economic development strategy of the Commonwealth. However, it found that current State strategic plans for economic development and for science and technology are insufficient and do not allow CIT to be an effective team player in meeting the objectives of the Commonwealth.

The Review Committee recommends that the 1993 General Assembly consider adopting a resolution requesting the Secretary of Economic Development to prepare a strategic plan for economic development in the Commonwealth. It also recommends adopting a resolution creating a task force to coordinate the development of a statewide strategic plan for science and technology. CIT should play an important role in these planning efforts.

CIT Mission. CIT was intended by its founders to be an engine of long-term economic growth. The Review Committee recommends that CIT expand its mission to include three strategies to promote economic growth in the Commonwealth: maintaining its current efforts to develop and transfer university-based technology; increasing emphasis on efforts to support high technology industry; and aggressively pursuing research and development facilities and contracts in the federal government and private sector.

Programs and Outcomes. CIT's programs reflect legislative intent, emphasizing the development and transfer of university-based technology to the private sector. Businesses sponsoring individual projects with CIT are generally satisfied with relationships and outcomes. CIT also appears to have leveraged substantial funds from industry and the federal government. However, quantitative outcome measures, such as the number of jobs created and retained, are limited. The Review Committee recommends that CIT continue to develop its evaluation system and that the CIT Board of Directors approve an evaluation process.

CIT's mission, strategies, and successes are complex and often not understood. This has resulted in diverse and inflated expectations of CIT's role. Research and technology development are risky and long-term investments. Decision-makers should not evaluate the success of university research and technology development solely on quantitative outcome measures, particularly in the short-term. The Commonwealth can reasonably expect, however, substantial long-term benefits from CIT in the next five to 10 years.

Over time, CIT has tried to be more responsive to the needs of industry by solving short-term technical problems and by providing assistance in commercializing new technologies. However, the Review Committee found that the scale and scope of CIT programs that serve high technology industries and the current industrial base in the Commonwealth are not sufficient. The Review Committee recommends that the Secretary of Economic Development, in collaboration with other appropriate entities, conduct a comprehensive review of needs and resources for industrial extension services.

Governance and Accountability. Substantial changes are recommended in CIT's governance, administration, and accountability. The CIT Board should have greater industry representation and include the Secretaries of Education and Economic Development. The proposed board composition would ensure the articulation and coordination of industrial and State interests. The CIT Board should be more involved in setting policies, providing direction, and establishing strategic priorities. It should also actively seek the involvement of key industry and technology leaders through advisory boards and other mechanisms. The CIT President should make substantial changes in the organization, structure, and management of administrative functions.

CIT should be maintained as a private non-profit corporation. It should also be retained in the Education Secretariat to emphasize the long-term outcomes to be expected from the Commonwealth's investment in CIT. This placement should be periodically reassessed to ensure consistency with CIT's mission.

Finance. Finally, the Review Committee concluded that State funding for CIT is appropriate to ensure that the economic development objectives of the Commonwealth are emphasized. CIT should pursue funding from other sources to supplement State funds. In addition, the Review Committee found that the present level of State funding is sufficient for CIT to maintain its current programs. However, substantial changes in CIT's mission and programs would result in either the need for additional funding, or the redistribution of current funds among programs, or both.

As an independent entity receiving substantial State general funds, CIT must be more accountable for how tax dollars are spent. CIT needs to develop a "culture of accountability" to State government and the public. Periodic external evaluations should be conducted and CIT should provide non-proprietary information as requested by the Commonwealth.

Conclusion. After an unsettled early history, CIT has achieved stability and is beginning to develop a record of accomplishment. Its mission needs to be focused more directly, however, on stimulating economic growth through a balance of university-based and industry-based strategies.

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I. INTRODUCTION

STUDY MANDATE

The 1992 Appropriation Act directed that a "review of the performance of the Center for Innovative Technology and future funding levels and sources shall be conducted by a Review Committee. The Committee shall also develop a plan to provide guidance for maximizing the Center's potential." The full text of the mandate is included in Appendix A.

The Review Committee was comprised of three Secretaries from the Office of the Governor, two members of the Senate, three members of the House of Delegates, and three members of the Board of Directors for the Center for Innovative Technology (CIT). Four representatives from business and high technology industries across the Commonwealth were appointed by the chairman as advisors to the committee. The act assigned joint responsibility for staffing the committee to the Department of Planning and Budget and the staff of the Joint Legislative Audit and Review Commission.

CIT BACKGROUND INFORMATION

The Center for Innovative Technology was one of 44 recommendations from the 1983 Governor's Task Force on Science and Technology in Virginia. Two major factors led to the creation of CIT in the early 1980's. First, the Microelectronic Technology and Computer Consortium (MCC) located its private research institution in Texas, rather than Virginia. The primary reason MCC selected this location was the significant investments Texas had made in its university research and educational facilities.

The second factor leading to the creation of CIT was the success of areas such as the Research Triangle Park in North Carolina, the Route 128 corridor in Massachusetts, and the Silicon Valley in California. Forty-eight states were creating or expanding programs to attract or develop high technology industries. Most of these programs focused on developing or exploiting the strengths of universities.

CIT is a private, non-profit corporation that serves as the operating arm of the Innovative Technology Authority (ITA). The authority serves as the mechanism to transfer State funding to CIT and to issue bonds. Thus, CIT has a greater degree of independence than a State agency.

The ITA was established in statute by the 1984 General Assembly. CIT was formally incorporated on July 1, 1984. The first executive director was officially appointed in January 1985.

The ITA reports to the Secretary of Education in the Governor's Office and is governed by a 15-member board of directors. All members of the ITA Board also serve on the CIT Board, which by statute has five additional members. The CIT Board

employs an executive director, who is given the title of president and serves at the pleasure of the board. The director exercises the powers and duties delegated by the board and directs the day-to-day operations and activities. Since its inception, CIT has had five executive directors, including one acting director.

The current CIT President, the Honorable A. Linwood Holton, has brought stability to CIT. He describes its mission as promoting economic growth through technology. CIT implements this mission primarily by co-sponsoring research projects with industry. This funding enhances the ability of Virginia universities to develop and transfer new technologies to industry. Over the past seven years, CIT reports that it has funded more than 600 projects involving more than 550 companies, 460 university professors, and 1,000 students. In addition, CIT has developed a marketing staff to license and sell intellectual property developed in Virginia universities.

Over the course of its existence, CIT has expanded its range of programs to include direct services to business and industry. These services include management support for high technology entrepreneurs, near-term engineering services for product development and process improvement, and technology information and referral assistance.

CIT moved its headquarters to Herndon, Virginia in April 1989. Its distinctive building is located near the Washington-Dulles International Airport. Twenty-nine staff are housed at the CIT Building. However, CIT's programs are distributed across the Commonwealth in Virginia's universities and community colleges. The Software Productivity Consortium (SPC) also occupies one wing in the CIT Building. This consortium of aerospace and communications firms works on software design and development. Space in the CIT wing is also leased to George Mason University, the Virginia Department of Economic Development, International Microspace, and C&P Telephone Company. Approximately seven percent of the CIT wing is unoccupied at this time.

CIT received \$8.7 million in State funding for fiscal year 1993. For fiscal years 1985 through 1992, the Commonwealth provided \$80.7 million for the programs and operation of CIT and \$21.2 million for the construction of the CIT Building. The State also pays the debt service payments on the \$13.3 million bond that was issued by the ITA to construct the SPC wing. These payments are partially offset by revenue income received from the SPC.

BROAD ISSUES ADDRESSED

In general, committee members agreed that there is a role for State government in promoting, developing, and transferring technology to enhance economic growth. However, they identified several broad issues to be addressed during the review. These issues included:

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- ❑ Has the State integrated CIT into its economic development strategy for the Commonwealth?
 - ❑ What is the current mission of CIT, and in today's rapidly changing world, is it optimal for meeting the State's needs in high technology?
 - ❑ What programs and services are provided by CIT and are these optimal for meeting Virginia's future high technology needs?
 - ❑ What have been the outcomes of CIT programs and how should the Commonwealth evaluate results and benefits in the future?
 - ❑ What is an effective balance of independence and accountability for CIT?
 - ❑ What is CIT's decision-making process for allocating and monitoring resources and are there opportunities for improvement?
 - ❑ What is the appropriate structure and staffing for CIT to serve high technology needs? What is the appropriate organizational placement of CIT in State government?
 - ❑ What are the current funding levels and sources for CIT? How can the State optimize future funding to more effectively promote, develop, and transfer high technology?

STUDY APPROACH

Committee Activities. The committee stressed that the review should be future-oriented and constructive, focusing on how the Commonwealth can optimize its efforts to promote high technology. Within this forward looking context, the committee evaluated the past performance of CIT and identified opportunities for improvements.

During the review, the committee met seven times. The first meeting on May 11, 1992 was an organizational meeting. CIT President, Governor Holton, presented background information on CIT. Committee members identified broad issues to be addressed during the review.

At the second meeting on June 10, 1992, the committee adopted a staff study plan which detailed research methods and activities. The committee also heard from invited guests representing high technology industry, academia, and State government and 30 other speakers in a public forum at CIT Headquarters in Herndon, Virginia.

The third meeting was held on August 6, 1992. The committee heard from Mr. Hays T. Watkins, Chairman Emeritus of the CSX Corporation, on the impetus and original vision for CIT. Mr. Watkins was a member of the 1983 Governor's Task Force on Science and Technology which recommended the creation of CIT. Mr. Peter Fitzpatrick, Executive Vice President of CIT, then presented an internal review of CIT, entitled *1991 Report to the President and the Board of Directors of CIT*.

The next two meetings occurred in October 1992. On October 5th, the committee visited the Ben Franklin Technology Center in Southeastern Pennsylvania. On October 6th, a workshop was held with national experts on the approaches used by various states for technology development. The speakers included:

- Dr. Walter Plosila, President of the Suburban Maryland and Montgomery County High Technology Councils and former Director of the Ben Franklin Partnership Program in Pennsylvania.
- Mr. Brian Bosworth, consultant in the area of industrial modernization and former Director of the Indiana Economic Development Council.
- Mr. Chris Coburn, Director of Public Technology Programs at Battelle Memorial Institute, former Director of the Edison Program in Ohio, and Staff Director of the Carnegie Commission on Science, Technology and Government.
- Dr. Irwin Feller, Director of the Graduate School of Public Policy and Administration and Professor of Economics at Pennsylvania State University.

On November 10, 1992, the staff reported its findings and recommendations to the Review Committee. The report reflected the information provided during committee meetings, as well as extensive research conducted by the staff. A unified course of action was developed by staff with input from the chairman and vice-chairman. The committee unanimously approved the staff report.

This final report and proposed legislative package were unanimously adopted at the last meeting on December 1, 1992. The committee requested that this report be submitted to the Governor and General Assembly as mandated by the 1992 Appropriation Act.

Additional Research Activities. Throughout the review, input was solicited from the business and academic community, as well as from other individuals with knowledge of or interest in the activities of CIT. The staff interviewed over 100 people directly involved in the creation or implementation of CIT programs. They interviewed the chairman and members of the CIT Board, the president and staff of CIT at Herndon, the directors and staff of all CIT programs across the State, and individuals involved in crafting the original vision for CIT.

In addition, the staff conducted 34 case studies of randomly selected CIT research projects. For these cases, they interviewed both the business sponsors and the university researchers. They also interviewed 78 business clients of randomly selected projects conducted by technology transfer directors at the community colleges.

The industry advisors to the Review Committee were instrumental in organizing and hosting four focus groups across the Commonwealth with business representatives. These meetings were held in Northern Virginia, the Tidewater area, Central Virginia, and the Southwest/Western region. Through the public forum, case studies, and focus groups, comments were solicited on CIT's performance and potential from over 100 individuals representing business and industry.

The staff visited all of CIT's programs located at six universities and 10 community colleges. Telephone interviews were conducted with selected states and information was collected on the science and technology programs of all 50 states. The staff also conducted extensive document and literature reviews.

II. FINDINGS AND CONCLUSIONS

The findings and conclusions of the Review Committee are described below by issue. First, the State vision for economic development and CIT's mission are discussed. These sections are followed by CIT's current programs and services and by the benefits and outcomes of these programs. Findings and conclusions in the areas of accountability, governance, and finance are addressed in the next two sections. Finally, various strategies for optimizing the future funding of CIT and for promoting economic growth in Virginia are presented.

STATE VISION

A recurring theme throughout the review was that science and technology should play an important role in the Commonwealth's economic development efforts. Specifically, the committee addressed the issue of whether the Commonwealth has sufficiently integrated CIT into an overall economic development strategy.

Economic Development Blueprint. In 1991, the Joint Legislative Audit and Review Commission (JLARC) reported in its *Review of Economic Development in Virginia* that a process was needed to establish objectives and priorities for the Commonwealth in the area of economic development. JLARC recommended the development of a comprehensive policy and strategic planning process. Based on these recommendations, the *Code of Virginia* (§ 2.1-51.39) now requires a written comprehensive economic development policy for the Commonwealth.

The Secretary of Economic Development issued a new policy statement in June 1992. While this statement recommended the development of strategic plans, current plans are not sufficient. Without a blueprint, CIT cannot articulate a vision that effectively meets State objectives and that complements other State actions.

Science and Technology Plan. The Review Committee heard repeatedly that science and technology efforts should be an integral part of the overall economic development plan for the Commonwealth. In an era of growing international competition, the future vitality of Virginia's industrial base depends in part on the successful development and exploitation of scientific and technological advances. An assessment of Virginia's strengths and needs in technology and industry was recommended by CIT in its 1987 strategic plan and by the panel of national experts. The last comprehensive action plan for science and technology was developed by the 1983 Governor's Task Force on Science and Technology.

The 1992 Carnegie Commission on Science, Technology and Government recommended that every state establish a permanent science and technology advisory body. This body would advise the governor and legislature on pertinent issues. It would also develop and periodically update a science and technology plan to meet state

strategic economic development goals. This recommendation was also included in the 1989 report from the Southern Technology Council of the Southern Growth Policies Board entitled *Turning to Technology: A Strategic Plan for the Nineties*.

Conclusions. The Review Committee concluded that State strategic planning for economic development is insufficient and does not allow CIT to be an effective team player in meeting the objectives of the Commonwealth. Virginia needs an economic development plan and a mechanism for establishing and refining strategic goals in the areas of science and technology. CIT should play an important role in these planning efforts.

CIT MISSION

The Review Committee explored several issues regarding the mission of CIT. What was the original legislative intent? What ambiguities and conflicts, if any, exist in interpreting the current mission of CIT? Finally, is there a need to more clearly articulate or change the mission of CIT in the *Code of Virginia*, given current economic development and industry needs across the Commonwealth?

Original Intent. The *Code of Virginia* (§ 9-252) provides a "declaration of public purpose" for the Innovative Technology Authority. The ITA was designated as a political subdivision of the Commonwealth; CIT was created as a private non-stock corporation that serves as the operating arm of the ITA. The declaration of purpose includes four objectives. These objectives are:

- "(i) to enhance and expand the scientific and technological research and development capabilities of the institutions of higher education in the Commonwealth and coordinate such capabilities with the scientific and technological research and development activities and requirements of the public and private sectors;
- "(ii) to expand knowledge pertaining to scientific and technological research and development among public and private entities, including, but not limited to, knowledge in the areas of information technology, biotechnology, computer-assisted engineering and materials science and engineering;
- "(iii) to encourage and provide for specialized graduate education programs in science and technology; and
- "(iv) to promote the industrial and economic development of the Commonwealth."

Interviews with the original crafters of CIT revealed that these four objectives were not placed in priority order. Rather, they reflected a logical sequence of the research and educational process that eventually leads to economic development. The strategy was to strengthen university research and development capabilities, thereby creating scientific and technological advances for potential commercialization. The goal was to create high wage jobs and expand the tax base by attracting or developing high technology industries. Therefore, the first three objectives were intended to be the means for accomplishing the ultimate goal of economic growth stated in the fourth objective.

Balancing Constituent Goals. The first three objectives in the statutory language address CIT's higher education constituency. CIT's other two constituents, industry and the Commonwealth, are not mentioned until the last objective.

These three constituent groups have different goals and place different demands on CIT. Higher education's goal is to enhance knowledge and expand research capabilities to improve education, research, and service programs. Industry strives to increase competitiveness through the application of innovative technologies that improve productivity and efficiency. Finally, one of the major goals of the Commonwealth is to promote economic growth through attracting and retaining jobs and businesses in Virginia.

The goal of the Commonwealth can be met through both university-based and industry-based strategies. The leadership in Virginia must determine the balance it wants to achieve between developing knowledge and technologies in higher education and meeting specific industry needs to increase competitiveness.

Conclusions. CIT's strategies have consistently reflected the mission articulated in the *Code of Virginia*. This mission is primarily a university-based strategy to achieve long-term economic growth. However, the mission does not adequately balance the goals of its three major constituencies and needs to be refined to reflect an appropriate balance. While there is consensus that CIT's ultimate purpose is to promote economic growth, there are diverse views on how to accomplish it. The Commonwealth needs to determine the strategies CIT should pursue in order to maximize its effectiveness.

CURRENT PROGRAMS AND SERVICES

The Review Committee addressed several issues related to CIT's current programs and services. These issues included how CIT has implemented its mission through its strategies, programs, and services. The Review Committee also explored the outcomes of CIT's major research programs and industry services. It also addressed how the Commonwealth should evaluate program results and benefits in the future. Finally, the Review Committee assessed how effectively CIT is marketing its programs and services to businesses.

Program Evolution. While statute often provides a broad framework for an organization's mission, the leadership of an organization must formulate strategies for accomplishing that mission. Programs and services can then be designed to implement strategies that reflect a changing environment. This flexibility allows organizations to respond to evolving needs over time.

The leadership of CIT has altered its strategies based on the changing environment. Basically, four factors have led CIT to reassess its university-based strategy and to expand into other areas.

First, CIT faced the national issue of how to translate research advances and technology from the lab into marketable goods or improved processes. Second, CIT recognized that individual companies have different needs based on industry size, type, and stage of development. CIT also realized that technology development is a long-term investment and does not produce significant economic results in the short-term. At the same time, there were increased expectations and pressure on CIT from State government and industry to create jobs and companies.

University Strategies. These four factors caused CIT to define its university strategies more clearly. Today, CIT focuses on developing applied technology at universities and transferring those advances to the private sector.

CIT accomplishes this goal primarily by co-sponsoring research projects that have the potential to stimulate economic growth. CIT will spend approximately \$2.9 million, or 28 percent of its total budget for fiscal year 1993, on co-sponsored research. Most of this research will be for Virginia business and funded through four CIT Institutes. These institutes are located at the University of Virginia (UVA); Virginia Polytechnic Institute and State University (VPI&SU); and Virginia Commonwealth University (VCU).

In addition, CIT has allocated \$2.5 million, or 24 percent of its 1993 budget, to fund the existing 10 Technology Development Centers (TDCs) and two new centers. Five of the current centers are located at VPI&SU, four centers are housed at UVA, and one center is located at George Mason University (GMU). These centers are focused areas of research, development, and technology transfer. Approximately one-fourth of the funding supports co-sponsored research projects with businesses in these centers.

Generally, CIT commits annual funding to the Technology Development Centers for a maximum of five years, decreasing funding each year. The centers are expected to match CIT's funding level with support from industrial sponsors. This external support is expected to increase substantially over the years. CIT funds equipment, researchers, and engineers to develop and transfer technology, build expertise, and enhance the reputation of the centers.

Finally, CIT assists in transferring the research and technological advances from the universities to the private sector through its Intellectual Property Program. In this program, CIT reviews voluntary disclosures of university inventions for technical merit, commercial potential, and "patentability." CIT files for patent protection and markets selected inventions.

Industry Strategies. In addition to focusing its university strategies, CIT expanded its mission by pursuing three strategies to assist businesses more directly in commercializing new technologies and solving technical problems.

First, CIT assists entrepreneurs and start-up companies with business, financial, and management services through the Innovation Center Program. CIT funds university-based centers to provide support for small technology-based firms and entrepreneurs. In fiscal year 1993, CIT will provide approximately \$250,000 for Innovation Centers at George Mason University, Old Dominion University, and Virginia State University.

The second strategy CIT has incorporated is providing formal and ad hoc assistance to Virginia high technology industries. The Space Industry Development Program supports the commercial aerospace industry in Virginia through several activities. These activities include providing access to university resources through matching grants, networking among industry leaders to work on common problems, and supporting marketing and educational activities. CIT also provides ad hoc support for regional high technology industry efforts. This support has included funds and staff resources for defense conversion efforts.

The Technology Transfer and Assistance Program provides technology information, assistance, and referral services to small and medium-sized businesses. This program is budgeted at \$1.18 million in fiscal year 1993, excluding CIT staff salaries. A key service of this program is provided by the Virginia Tech Information Center. This center provides on-line access to hundreds of technical, scientific, and business information data bases.

The third industry-based strategy involves two programs that solve short-term problems for existing industries. The Technology Application Center (TAC) is located at Old Dominion University and is funded at \$200,000 annually. This program offers near-term engineering services, including manufacturing process improvement, product development, fabrication and demonstration of prototypes, and product testing. Similarly, the Manufacturing Action Program (MAP) provides access to specialized engineering resources for small and medium-sized enterprises. This program is funded at \$35,000. Specific projects may include improving work flows, reducing operating costs, and streamlining operations.

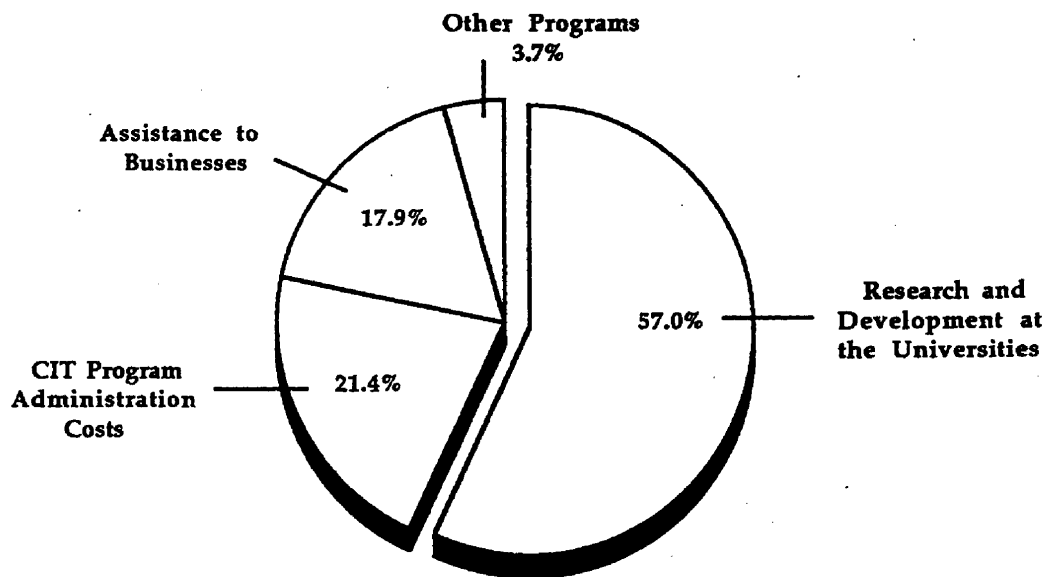
CIT's Emphasis. The national speakers who appeared before the Review Committee on October 6, 1992 stated that CIT's efforts appear to be diffused across several strategies and multiple programs. In fact, CIT offers a range of programs similar to those

of other states. The speakers maintained, however, that CIT has not focused its resources on developing a "critical mass" in those select areas where the Commonwealth has a competitive edge or overriding need.

In fiscal year 1993, CIT continues to place funding emphasis on the university-based strategy articulated in the *Code of Virginia*. Fifty-seven percent of all CIT program funds go to research and development activities in the universities. In contrast, approximately 18 percent of these funds go to assist businesses. Figure 1 shows the fiscal year 1993 budget for CIT programs. Appendix B provides detailed information on CIT's total budget for this fiscal year.

FIGURE 1

CIT Program Budget for FY 1993*



TOTAL - Program Budget = \$9,423,000

NOTE: *Includes salaries and benefits of CIT program staff.

SOURCE: Staff analysis.

The Review Committee found that many states are shifting their science and technology strategies to focus more directly on the needs of industry. For example, literature reviews suggest that small industrial enterprises require intensive support to implement best-practice technologies and processes. Information referral, one of CIT's principal services to these businesses, is only one element of an effective manufacturing modernization program. In addition, smaller companies often lack the resources to track and effectively use the developments at the universities. During the review, a number of executives of small high technology firms noted a need for more accessible information on private and public sector technology resources.

Conclusions. CIT's programs and services primarily implement the original mission and strategy articulated in the *Code of Virginia*. However, CIT has expanded its strategies to include programs designed to solve specific industry problems.

While CIT has tried to be responsive to the needs of industry by expanding its services, supporting industrial sectors to improve competitiveness requires a comprehensive approach. The scale and scope of CIT's programs are not sufficient to serve high technology industries and the current industrial base in the Commonwealth. A comprehensive review of needs and resources for industrial services is required.

PROGRAM BENEFITS AND OUTCOMES

Benefits and Barriers in Research Programs. In interviews, both businesses and university faculty identified significant, but often intangible, benefits in working together on co-sponsored research projects. Businesses emphasized that the outcomes they desired are long-term in nature. They often want to develop relationships with highly reputable researchers and gain access to state-of-the-art technology. These businesses maintain that such access could potentially increase their competitiveness through improved quality or reduced costs.

University researchers stressed that they benefit from these joint ventures by being exposed to "real world" problems and by providing funding and research opportunities for their graduate students, among other benefits. Without CIT funding, faculty repeatedly stated they would not conduct the applied research and technology development that actually solves problems for industries.

Businesses and faculty both stressed, however, that there are significant barriers to bridging the different cultures of industry and universities. Some businesses emphasized that they would not go to universities on critical projects such as near-term product development. Some businesses also stated that university policies regarding the transfer of intellectual property rights favor the universities and create barriers to effective working relationships.

Faculty stressed that the current incentive structure in the universities makes it difficult for young researchers to work on applied research. This structure tends to reward basic research and teaching. Many university researchers are flexible about delaying publication of proprietary solutions to industrial problems until patents are secured. However, the current tenure system makes such delays in publications difficult for new faculty members.

Program Outcomes. Business sponsors and university faculty generally expressed high satisfaction with working relationships and outcomes of co-sponsored research projects and the Technology Application Center projects. Clients are also generally satisfied with the services received from the technology transfer directors. However, the types and levels of services provided in the technology transfer program vary according to the skills of individual directors and the needs of local industries.

While it is too soon to evaluate the Manufacturing Action Program, it appears to be a productive strategy for leveraging public and private engineering resources to support small and medium-sized businesses.

Two quantitative measures are frequently used to evaluate state technology programs. These performance measures include the leveraging of federal and industry funds and the numbers of jobs created and retained.

The willingness to commit funds is one way to determine the economic value a sponsor places on a project. CIT has played a significant role in leveraging funds. Since its inception, CIT has spent a total of \$55 million on university research. These same programs received \$28 million in federal grants and \$46 million in cash grants from industry and nonstate sponsors.

For every State dollar CIT has spent, Virginia universities received 51 cents of federal funding and 84 cents from industry and other sources. CIT staff report that the ratio of sponsor dollars to CIT dollars has increased from around 50 cents per dollar in fiscal year 1985 to over \$3.50 per dollar in fiscal year 1992.

In some cases, business sponsors said CIT matching funds were not necessary to conduct their research. However, they stated that CIT provided introductions and often served as the catalyst in the institute projects for building relationships with university researchers. Some businesses said they probably would not have worked with Virginia universities without CIT involvement. In addition, several high government officials stated that federal matching funds for large projects would not be considered without the commitment of State or local funds.

While CIT is developing an evaluation process to monitor the effects of its research projects, outcome measures are not routinely collected and analyzed. Quantitative outcomes, such as the number of jobs created and retained, are limited for several other reasons as well. First, the time frame for evaluating results of completed projects is

currently too short to document long-term impacts. In addition, reported increases in sales, jobs created, and costs saved are difficult to verify. Finally, the impacts of CIT programs are difficult to discern from those of other factors, such as economic recessions or changes in interest rates.

Research and technology development are widely recognized as long-term and high risk ventures. The Small Business Innovation Research (SBIR) program is a federal program that designates a portion of agency research budgets to aid small businesses in developing and commercializing new technology. A 1991 report of the SBIR program estimated the rate of commercialization among its Phase II projects. These projects are generally defined as more advanced and more likely to result in commercialization than are Phase I projects. Four years after receiving a Phase II award, 12 percent of companies reported that commercialization had occurred. It was projected that in five or six years after the award, 23 percent of the projects would result in commercialization. The remaining 77 percent of projects could potentially result in commercializable products at some point in the future, though many may not.

Generalizing the national results of the SBIR program to Virginia, it appears that the Commonwealth can expect substantial long-term benefits from CIT's projects. In the past, most of CIT's projects appear to be comparable to SBIR Phase I projects. In fact, some of CIT projects have received SBIR Phase II funding.

Overemphasis on short-term outcomes could negatively affect the long-term research and development process. In fact, short-term results are often not produced from such long-term investments. The business sector in the United States has been criticized for emphasizing short-term performance measures and missing important opportunities for long-term growth.

Marketing. CIT devotes substantial staff resources to marketing and the Department of Economic Development is now featuring CIT in its advertisements. In addition, most CIT programs, such as the Technology Development Centers, have active marketing efforts targeted at users of their technologies. However, sponsors of TDC projects often do not realize the role that CIT has played in funding the centers.

CIT's mission and strategies are complex and not understood by many key opinion leaders in the Commonwealth. CIT seems reluctant or unable to involve many technology and industry leaders. These factors have led to diverse and inflated expectations of CIT's role by its potential client base. Recognizing that improvements are needed in marketing its programs across the Commonwealth, CIT has hired a new marketing director.

Conclusions. The Review Committee found that businesses and faculty involved in CIT-funded projects are generally satisfied with relationships and outcomes. CIT funding provides businesses long-term benefits in accessing technology and expertise. It

provides incentives for university faculty to focus on economic development objectives of the Commonwealth.

CIT appears to have leveraged substantial funds from industry and the federal government. However, research and technology development are risky and long-term investments. Decision-makers should not evaluate the success of university research and technology development solely on quantitative outcome measures, particularly in the short-term. The Commonwealth can reasonably expect substantial long-term benefits from CIT in the next five to 10 years.

CIT has a mixed record on marketing. While there is confusion about CIT's mission and services, CIT reaches a significant portion of its potential client base. CIT's mission, strategies, and successes are complex and often not understood. This has resulted in diverse and inflated expectations of CIT's role.

ACCOUNTABILITY AND GOVERNANCE

The Review Committee explored a number of issues in the areas of accountability and governance. These issues included:

- Is the board adequately involved in providing strategic direction and oversight to CIT? If not, what strategies would enhance involvement?
- Are the processes and procedures for making decisions adequate to ensure efficient allocation and effective utilization of resources?
- Should CIT report to the Secretary of Education, the Secretary of Economic Development, or should it be an independent agency?
- Is the CIT office in Herndon appropriately staffed and organized?
- What is an effective balance of independence and accountability for CIT?

CIT Board of Directors. The *Code of Virginia* (Title 9, Chapter 29) specifies the composition of both the Innovative Technology Authority and CIT Boards. The ITA Board is comprised of 15 members, including the presidents of the University of Virginia, Virginia Commonwealth University, and Virginia Polytechnic Institute and State University. In addition, there must be two representatives from the other institutions of higher education and one representative from each of the 10 congressional districts.

The CIT Board consists of 20 members. By statute, all members of the ITA Board serve on the CIT Board. In addition, the Chairman of the Joint Legislative Audit and Review Commission and four additional members from the public at large must serve.

The current CIT Board is unevenly balanced with seven university presidents and no industry representatives of CIT technology program areas. These areas include biotechnology, materials science, information technology, manufacturing, environmental science, and computer-assisted engineering.

Interviews with CIT Board members and CIT staff revealed that the CIT Board has not developed a unified strategic vision and set of priorities to guide the organization. Many board members stated that CIT's internal planning efforts have not sufficiently involved state policy-makers, business leaders, or technology experts. In fact, there was almost unanimous agreement among CIT Board members and staff that the board is not sufficiently utilized. While members stressed that the board should not be involved in day-to-day management of CIT's activities, they felt it should be more involved in setting policies, providing direction, and establishing strategic priorities. Despite some recent improvements, most members report that they do not receive adequate information.

Placement. The placement of CIT in any secretariat has advantages and disadvantages. The committee explored three options for placement: the Secretariat of Education; the Secretariat of Economic Development; and an independent authority.

The placement of CIT in the Education Secretariat recognizes the uniqueness of the university culture, focuses attention on knowledge-based industries, and enhances access to university resources. Moving CIT to the Secretariat of Economic Development would facilitate integrating CIT into the overall economic development strategy, as well as linking it with industry.

Several states have independent science and technology advisors to the governor. The advantages of CIT being an independent authority are its potential for increased visibility and its ability to cross all secretarial areas. However, the effectiveness of such advisors can be subject to gubernatorial interest or lack thereof.

Organization. Governor Holton has brought stability to CIT, which previously had four executive directors in less than four years (including the first acting director). His public commitment was to serve a minimum of five years. A search committee to find his successor has been formed.

The CIT organization in Herndon has two program units: the Technology Development and Commercialization Unit; and the Technology Transfer and Space Unit. An organizational chart of CIT is shown in Appendix C. The general manager of one unit supervises 80 percent (8 staff) of the program personnel. In contrast, the other general manager supervises two professionals.

The Technology Development and Commercialization Unit primarily implements the university-based strategy. This unit is effectively managed. Responsibilities are clearly delineated. Authority is appropriately delegated in most situations.

Management expectations are communicated and understood. Finally, evaluations are conducted on a periodic basis.

The Technology Transfer and Space Unit mainly assists business and industry. This unit has effectively implemented an industry-based strategy in its space program. This program provides support to the commercial aerospace industry by bringing together industry leaders to identify opportunities and solutions to common problems. This unit also includes the technology transfer program.

Technology Transfer Program. There appear to be significant structural and overlap problems in the Technology Transfer and Assistance Program. These problems have created conflicts in role definition and have impacted CIT's ability to control service effectiveness and quality.

First, there are dual reporting problems with the technology transfer directors reporting to both the CIT program director in Herndon and to the presidents of the community colleges where they are housed. While CIT has instituted an extensive reporting process to overcome this problem, directors do not adequately implement it.

There is also a lack of definition of the types of services to be provided to clients. This absence of clarity has resulted in the provision of both technical and non-technical services by the technology transfer directors. This finding was identified in the 1991 JLARC *Review of Economic Development in Virginia*. It continues to be an issue in the program today. These non-technical services may overlap those provided by the small business development centers operated by the Department of Economic Development.

While several directors have received outstanding endorsements from clients, other directors have not met standard expectations. Finally, the average director salary is 29 percent higher than professional faculty positions at the 10 community colleges, causing some resentment in the colleges.

Program Support and Administration. An analysis of staffing patterns at CIT in Herndon revealed that only 40 percent (11.5 FTE) of the 29 staff provide direct services to universities, businesses, or industries. The remaining 60 percent (17.5 FTE) provide administrative or program support. In addition, CIT staff reported that most administrative functions are scattered across several staff. They also stated that responsibilities are not clearly defined and authority to make decisions is often not specified. Several staff reported that these problems negatively effect morale and effectiveness. In addition, formal policies and procedures on procurement, personnel management, and fiscal practices are neither sufficient nor clearly understood by CIT staff.

Many CIT staff reported insufficient work load to justify the number of administrative positions. Several administrative positions have highly overqualified staff for the level of duties, responsibilities, and authority. A small non-profit company, such as CIT, does not require positions at some of these levels.

Conflicting Independence and Accountability Needs. A balance is required between CIT's need for independence to effectively carry out its mission and the Commonwealth's need for accountability to ensure that tax dollars are appropriately spent. To achieve independence, the statute exempts CIT from State personnel, procurement, freedom of information, conflict of interest, investments, and privacy protection requirements. CIT needs to maintain confidentiality of proprietary information provided by individual companies.

To provide accountability, the Governor appoints the CIT Board of Directors, the Auditor of Public Accounts conducts an annual audit, and the Chairman of JLARC serves on the CIT Board. Accountability also requires that State officials receive sufficient information to determine if expenditures are consistent with legislative intent and to make informed budget decisions. In the past, financial data submitted by CIT to the State has not been sufficient. CIT has also used different formats each year, making it difficult to track expenditures over time. In this area, however, CIT's grant policies are well documented and the processing and disbursement of funds to the universities appears to be functioning well.

Conclusions. The current composition of the CIT Board of Directors reflects an emphasis on the university-based strategy. Regional representation by congressional district does not necessarily provide industrial expertise. The CIT Board should reflect CIT's mission through an appropriate balance of State government, industry, and higher education representatives. In addition, the board should be more active in setting policies, approving priorities, providing oversight, and directing allocation decisions.

Regarding the organizational placement of CIT in State government, the Review Committee concluded that CIT should be retained in the Education Secretariat. CIT should receive sufficient guidance on its role through an overall economic development plan for the Commonwealth and through a strategic assessment in the areas of science and technology. Further, the recommended changes in the composition of the CIT Board and the proposed technology advisory committee should provide sufficient industry involvement in guiding the policies of CIT.

Placement in the Education Secretariat reinforces an important emphasis on the long-term outcomes to be expected from the Commonwealth's investment in CIT. Retaining CIT in this secretariat offers important continuity while a number of other changes are implemented. This placement should be periodically reassessed to ensure consistency with CIT's mission, constituent groups, and strategies.

Two problems are evident regarding the organization and structure of CIT. Significant improvements are needed in the structure and oversight provided in the technology transfer program. In addition, the administrative work load of CIT does not appear to justify the number of administrative staff nor the level of qualifications in some cases. Effectiveness in this area is also limited by the structure of functions. The overall staffing, structure, and management of administrative staff need to be reorganized.

Finally, CIT and State decision-makers need to balance the conflicting needs for accountability and independence. Since CIT is primarily funded with State general fund dollars, CIT must be accountable for how tax dollars are spent. CIT needs to develop a "culture of accountability" with State government and the public. Recommendations contained in this report, if implemented by CIT, should substantially increase accountability to the Commonwealth.

FINANCE

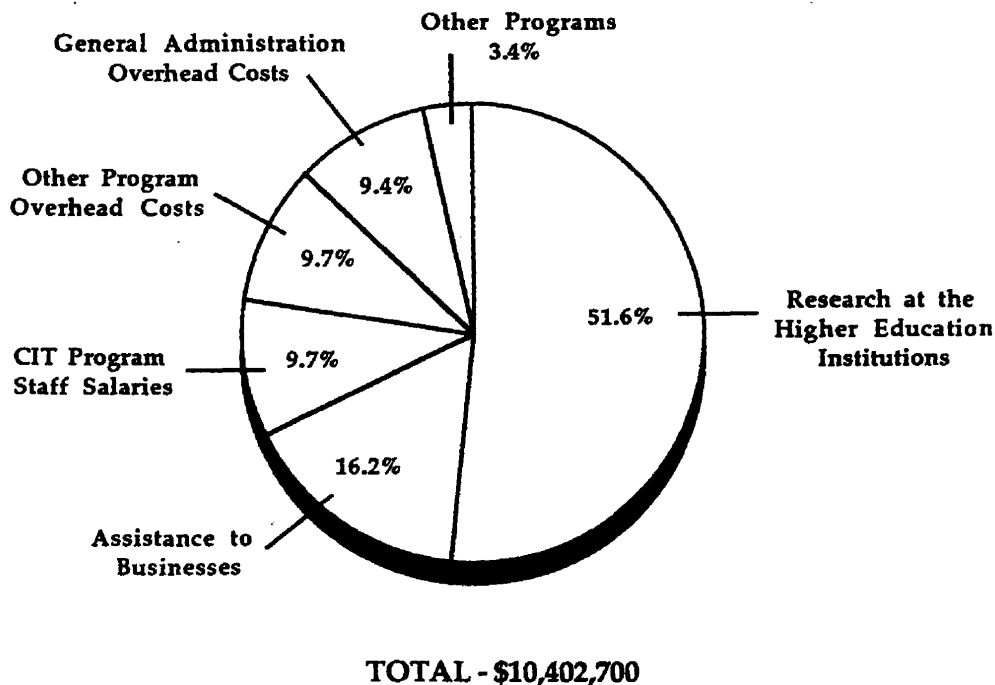
The 1992 Appropriation Act includes \$17.3 million for the 1992-94 biennium for CIT programs and operating costs. CIT received \$8.7 million in State funding for fiscal year 1993. To fully fund its \$10.4 million operating budget, CIT uses revenue from nonstate sources and fund balances from prior years. Figure 2 on the next page shows CIT's operating budget for fiscal year 1993.

For fiscal years 1985 through 1992, the Commonwealth provided \$80.7 million for the programs and operation of CIT and \$21.2 million for the construction of the CIT Building. State appropriations since fiscal year 1985 are shown in Appendix B. The State also pays the debt service payments on the \$13.3 million bond that was issued by the ITA to construct the Software Productivity Consortium (SPC) wing. These payments are partially offset by revenue income received from the SPC.

The Review Committee addressed three issues in the area of finance. First, can or should CIT become self-sufficient? Are alternative sources of funding available to support CIT programs? Finally, is the current level of funding appropriate for CIT to implement its current mission and level of activities?

Level of Funding. The amount of funding provided by the Commonwealth to CIT is comparable to funding provided by other states for similar entities. The national speakers agreed that funding for CIT is in line with other state technology programs relative to Virginia's size. Of the 38 states responding to the survey of the Carnegie Commission on Science, Technology and Government, Virginia ranks eleventh in general fund appropriation for its State technology programs. This is comparable to Virginia's national ranking in population and per capita personal income.

FIGURE 2
CIT Operating Budget for FY 1993



SOURCE: Staff analysis.

Support from the general fund for this type of program is common. Of the 48 states that have designated funding for science and technology programs, 33 states support the programs entirely with general funds, 13 states provide general funds for a portion of the costs, and two states do not provide general fund support.

Other Revenue. CIT receives revenue from sources other than the Commonwealth. In fiscal year 1992, \$1.8 million or 15.7 percent of the revenue collected by CIT was from other sources. In fiscal year 1993, CIT estimates that it will collect other revenue of \$1.9 million, or 18.3 percent of its total revenue of \$10.6 million. However, \$1.1 million of this revenue is used to offset the cost of operating the facility.

In fiscal year 1993, other revenue sources include interest earned, patent royalty and licensing fees retained to offset costs, and administrative overhead allowances on two nonstate grants administered by CIT. Although the CIT Foundation has been established, no funding has been raised to support CIT activities.

In the past, CIT has not spent all of its revenue. At the end of fiscal year 1992, unspent fund balances at CIT totaled \$6.4 million, with an increase of \$1.0 million from fiscal year 1991.

Administrative Costs. Administrative costs at CIT account for over one-quarter of its expenditures. For fiscal year 1993, general administration costs are 9.4 percent of the total CIT budget and program overhead costs are 19.4 percent.

General administration salaries are high in comparison to other State supported positions. The average salary for the professional program support staff of \$60,305 exceeds the level of comparable positions in State agencies. For example, the authorized average salary for administrative faculty at George Mason University, also in Northern Virginia, is \$51,444.

Conclusions. CIT performs legitimate State functions. Therefore, State funding is appropriate and ensures that the Commonwealth's needs are emphasized. Although CIT should begin to aggressively pursue other sources, it is unlikely that other revenue will replace the need for continued State funding.

In fiscal year 1993, CIT estimates that total revenue available for program and administrative costs is \$9.5 million. CIT expended \$9.8 million on these activities in fiscal year 1992. Therefore, CIT can maintain current programs at 1992 levels by supplementing its State appropriation of \$8.7 million with revenue from other sources and by reducing administrative costs. However, substantial changes in CIT's mission and programs would result in either the need for additional funding, or the redistribution of current funds among programs, or both.

STRATEGIC OPTIONS

To maximize CIT's benefit to the Commonwealth, the Review Committee explored various strategies CIT could pursue for promoting economic growth in Virginia.

Potential Strategies. The Review Committee considered four potential strategies for accomplishing CIT's mission of promoting economic growth. Each strategy is briefly described below.

- Enhancing university-based technology;
- Supporting high technology industry;

-
- ❑ Attracting research and development facilities and contracts; or
 - ❑ Providing industrial extension services.

University-Based Technology. This strategy involves supporting the development of technology in the universities and transferring these advances to the private sector. CIT primarily uses this strategy.

In this strategy, CIT would continue to build relationships between universities and industries. It would selectively invest in key technology areas. In addition, CIT would support commercialization of university discoveries through licensing and patenting activities. CIT staff would continue to market the resources available at the universities. Finally, it would provide policy support for industry-related issues at the universities.

High Technology Industry. A second strategy CIT could pursue would be an expansion of its current services to high technology business and industry. CIT would mobilize support for high technology industries to commercialize new products and processes.

CIT would expand its space industry development concept to include other high technology sectors. It would also organize assistance for small companies. This assistance could include leveraging seed and venture capital funds with State contributions, sparking the creation and organization of private financial and management resources, and evaluating selected technology for private venture funds. This assistance could also include direct grants to businesses for commercialization efforts.

CIT could also provide formal support to select industry sectors, such as assisting the defense industry in converting technologies to commercial applications. It could seed and support regional high technology efforts. Finally, CIT staff could assist companies in understanding the federal regulatory process, particularly companies seeking approval for the first time.

Attracting Research and Development Facilities. A third possible strategy CIT could pursue would be to organize State efforts to compete for research and development (R&D) facilities and contracts from the federal government and private sector.

This strategy could involve coordinating efforts to identify and aggressively compete for large facilities and contracts. This coordination would include bringing together Congressional representatives, the Governor's Office, the General Assembly, and industry and higher education leaders.

This strategy could also include tracking federal technology initiatives and recommending State actions. A key component would be orchestrating a statewide university strategy to compete for large R&D contracts. CIT could assist in identifying

strategic investments to build world-class research capabilities. It could also assist in targeted marketing efforts to attract key high technology industries.

Industrial Extension. The last strategy CIT could pursue is an industrial extension program to improve the competitiveness of the existing industrial base. This strategy would involve CIT assisting industry to select and implement best-practice technologies. It would also involve disseminating technical information and providing referrals to technical resources. In addition, CIT staff would organize resources to analyze and solve critical technical problems. They could also provide work force training and general business support. Finally, CIT could organize and support manufacturing networks across Virginia.

Analysis of Options. Substantial economic development benefits can result from well orchestrated efforts in each of these strategies. The first three strategies – developing university-based technology, supporting high technology industry, and attracting R&D facilities and contracts – build on CIT's current strengths. These strategies complement CIT's current role as a catalyst, broker, and marketer of high technology resources.

The fourth strategy – a comprehensive industrial extension program – involves providing services to a wider client base. In addition, this strategy involves the direct provision of services to clients. This would require substantially different resources at CIT. Other states use various structures to deliver industrial extension services. However, they are typically organized independently of high technology efforts.

Conclusions. The Commonwealth can expect significant benefits from building on CIT's strengths and expanding its mission. CIT's mission should be expanded from its current university-based strategy to include two additional strategies: increasing emphasis on supporting high technology industry across the Commonwealth; and attracting research and development facilities and contracts in the federal government and private sector. Figure 3 on the next page provides an overview of the proposed strategies. The most appropriate structure and design for delivering industrial extension services need to be determined.

FIGURE 3

Alternative Strategies for Promoting Economic Growth

ATTRACT R&D	UNIVERSITY TECHNOLOGY	TECHNOLOGY INDUSTRY	INDUSTRIAL EXTENSION
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Proposed Areas of CIT Focus </div>			Requires Further Study
<ul style="list-style-type: none"> * Federal Labs * R&D Contracts * World-Class Facilities * High Tech Marketing 	<ul style="list-style-type: none"> * Technology Development Centers * Co-Sponsored Research * Licensing * Technology Application Center 	<ul style="list-style-type: none"> * Innovation Centers * Industry Networks * Direct Grants * Regional Efforts * Venture Capital * Electronic Access 	<ul style="list-style-type: none"> * Technology Demonstration * Technology Implementation Assistance * Technology Information * Engineering Assistance * Manufacturing Networks

SOURCE: Staff analysis.

III. RECOMMENDATIONS

Science and technology efforts should be an integral part of an overall economic development strategy for the Commonwealth. CIT should play an important role in these efforts. CIT programs currently reflect greater emphasis on university-based technology, and basically implement original legislative intent. Businesses sponsoring CIT projects generally report satisfaction with outcomes, and the Commonwealth can reasonably expect to begin seeing substantial long-term benefits in the next five to 10 years.

The Review Committee recommends substantial changes in CIT's governance, administration, and accountability. It also recommends that CIT's mission be expanded to balance three strategies: maintaining its current strategy of developing university-based technology; increasing emphasis on supporting high technology industry; and aggressively pursuing research and development facilities and contracts in the federal government and private sector. Specific recommendations of the Review Committee are listed below by issue area.

STATE VISION

RECOMMENDATION 1: The 1993 General Assembly should consider adopting resolutions requesting:

- The Secretary of Economic Development, in collaboration with key government, industry, business, education, and community leaders, to establish a strategic planning process and prepare a strategic plan for economic development prior to the 1994 General Assembly Session; and
- The Governor and the General Assembly to appoint a science and technology task force to report on the status of the 1983 task force recommendations and to coordinate the development of a statewide strategic plan for science and technology. The task force should submit a preliminary report to the Governor and 1994 General Assembly Session. A final report should be prepared for consideration by the Governor and the 1995 Session of the General Assembly. Among the issues examined should be the creation of a permanent council on science and technology and its role in the strategic planning process for economic development of the Commonwealth.

MISSION

RECOMMENDATION 2: The General Assembly should consider amending the statement of public purpose in the *Code of Virginia* to reflect an appropriate balance among the goals of CIT's three constituent groups: the Commonwealth, industry,

and higher education. It should also consider expanding the original university-based strategy to include two additional strategies for promoting economic growth in the Commonwealth. This mission should include:

- ❑ Promoting economic growth by attracting and retaining high technology jobs and businesses in Virginia.
- ❑ Increasing industry competitiveness through the application of innovative technology that improves productivity and efficiency.
- ❑ Mobilizing support for high technology industries to commercialize new products and processes, including organizing assistance for small businesses and supporting select industry sectors and regional high technology efforts.
- ❑ Enhancing scientific and technological knowledge and expanding research and development capabilities in the institutions of higher education, including transferring technological advances to the private sector.
- ❑ Identifying, competing for, and attracting research and development facilities and contracts in the federal government and private sector. Tracking federal technology initiatives and recommending State actions.

PROGRAMS AND OUTCOMES

RECOMMENDATION 3: The Secretary of Economic Development, in collaboration with the Secretary of Education, the institutions of higher education, and other appropriate agencies, should analyze the needs and resources in the Commonwealth for enhancing the competitiveness of the current industrial base.

RECOMMENDATION 4: The CIT Board should approve an evaluation process. This process should include establishing goals, milestones, time frames, and quantitative outcome measures for research projects, when appropriate. CIT should incorporate these factors into the evaluation system under development. CIT should also analyze projects by industry, business size, technology, and other factors.

RECOMMENDATION 5: CIT should serve in a catalyst role to bring together the institutions of higher education, the State Council of Higher Education for Virginia, and the Secretary of Education to discuss broad policy issues. These issues should include flexible approaches to intellectual property negotiations and tenure

guidelines for faculty working in the area of applied research and technology transfer. The Review Committee recognizes that these policy issues are within the purview of the universities.

RECOMMENDATION 6: CIT should increase the advice and counsel of key industry and technology leaders through advisory boards and similar mechanisms, whenever feasible.

RECOMMENDATION 7: CIT should continue to refine and improve current marketing efforts, including analyses of markets to identify and target key businesses and technologies. It should also evaluate the effectiveness of marketing efforts through surveys, focus groups, and comment from key decision-makers in the public and private sectors.

CIT BOARD

RECOMMENDATION 8: The General Assembly should amend Virginia statute to establish a 15-member board of directors, appointed by the Governor and confirmed by the General Assembly, for the Innovative Technology Authority. The ITA Board and CIT Board should have the same membership. In practice, this board should be ultimately accountable to CIT's three constituent groups. The board should be comprised of:

- Nine industry members: representatives include a variety of different companies and industries by types, sizes, location, and stages of development; recommendations made by industry groups and technology councils.
- Three higher education members: two representatives of the major research universities; one representative of the other colleges and universities.

The Secretary of Economic Development, the Secretary of Education, and the Director of the State Council of Higher Education for Virginia should serve as ex-officio members.

RECOMMENDATION 9: CIT should develop long-range and annual planning processes that involve key industry, technology, and government officials and that set broad resource allocation goals.

RECOMMENDATION 10: The board should establish standing committees to address administrative oversight, strategic planning, and program needs. Additional persons with specific expertise should be included on these committees when appropriate.

RECOMMENDATION 11: The board should establish a technical advisory committee, with representatives recommended by technology councils, industry and business associations, and college and university presidents. The committee should include:

- Ten members with knowledge, skills, or expertise in the specific needs of industry; and
- Ten members with the same qualifications in technology areas.

The CIT chief technical officer and the Director of the Department of Minority Business Enterprise should serve as *ex-officio* members.

RECOMMENDATION 12: The CIT Board Chairman should take actions to increase information and staff support provided to the board. Such actions should include: improving orientation for new members; meeting more frequently across the Commonwealth; visiting CIT programs; encouraging input from clients and the public; providing substantive committee reports with recommended actions; distributing background materials and agendas prior to meetings; preparing issue and action-oriented agendas; and assigning staff to each committee.

PLACEMENT, ORGANIZATION, AND STRUCTURE

RECOMMENDATION 13: CIT should be retained in the Secretariat of Education, with consultation by the Secretary of Economic Development. This placement should be periodically reassessed to ensure consistency with CIT's mission.

RECOMMENDATION 14: The need for and placement of the Technology Transfer and Assistance Program should be evaluated by the Secretary of Economic Development in the comprehensive review of industrial extension services. Structural, oversight, and evaluation issues should be addressed as necessary. Alternative solutions should be evaluated for this program, including locating the program in the Department of Economic Development and consolidating it with the small business program or abolishing the program and redirecting funds to meet other program needs.

RECOMMENDATION 15: The CIT President should distribute responsibilities more equitably across the two program managers. He should consider hiring a program director to assist the manager of the Technology Development and Commercialization Unit. He should also consider assigning the strategic planning process and expanding the industry-based programs under the manager of the Technology Transfer and Space Unit.

RECOMMENDATION 16: The CIT President should evaluate the organization, structure, and management of administrative functions. The president should:

- ❑ Request assistance from the Virginia Department of Personnel and Training to determine appropriate qualifications and compensation levels for administrative staff. The president should contract out some services, reduce the number of administrative staff, reallocate positions downward as necessary, and redirect administrative savings to program needs.
- ❑ The president should also organize administrative functions to improve oversight. He should consolidate duties and define responsibilities to improve staff effectiveness and morale.
- ❑ Finally, the president should improve formal policies and procedures on procurement, personnel, and fiscal practices. These documents should be distributed to all staff.

ACCOUNTABILITY AND INDEPENDENCE

RECOMMENDATION 17: The Commonwealth should maintain CIT as a private, non-profit corporation.

RECOMMENDATION 18: The Governor and General Assembly should include language in the Appropriation Act directing CIT to submit operating budgets and year-end expenditure reports annually in a format developed with and approved by the Department of Planning and Budget.

RECOMMENDATION 19: As an entity receiving State funds, CIT should be externally reviewed every four years as part of a normal oversight function. CIT should not resist regular and prudent monitoring of State funds, nor should such stewardship be perceived by CIT clients as a threat to the continuity or survival of the organization.

FINANCE

RECOMMENDATION 20: CIT should continue to receive State funding. It should, however, begin to raise funds through its foundation and continue to pursue federal and private contracts that fall within its mission.

RECOMMENDATION 21: The CIT Board should consider using the fund balances to start "seed" or "venture" capital funds to provide financial assistance for new companies, among other options.

RECOMMENDATION 22: The State appropriation for CIT should be reassessed when a strategic plan has been approved by the CIT Board, incorporating the recommendations of the Review Committee.

STRATEGIES

RECOMMENDATION 23: The CIT Board should develop a preliminary plan for implementing CIT's expanded mission, if adopted by the 1993 General Assembly. This strategic plan should be submitted to the Governor and General Assembly prior to the 1994 General Assembly Session. The plan should address the following strategies:

- Expanding services and assistance to high technology industries to support commercialization of new products and processes. As part of this strategy, the board should evaluate and consider leveraging private sector resources by providing direct grants to small firms and organizing seed and venture capital funds for new companies. In addition, CIT should seed, organize, and support regional groups, as well as establish electronic access to CIT information resources for small companies.
- Achieving better balance with the current university-based strategy.
- Increasing resources and marketing efforts directed at attracting major research and development funds and facilities in the federal government and private sector.

RECOMMENDATION 24: The Secretary of Economic Development, in collaboration with the Secretary of Education, the institutions of higher education, and other appropriate agencies, should analyze the needs and resources in the Commonwealth for enhancing the competitiveness of the current industrial base. This comprehensive review of industrial extension services should include issues of scope, organization, level of resources, and placement.

APPENDICES

APPENDIX A: STUDY MANDATE LANGUAGE

APPENDIX B: CIT BUDGET INFORMATION

APPENDIX C: CIT ORGANIZATIONAL CHART

APPENDIX D: PROPOSED LEGISLATION

1992 Appropriation Act

Item 267

"A review of the performance of the Center for Innovative Technology and future funding levels and sources shall be conducted by a Review Committee. The Committee shall also develop a plan to provide guidance for maximizing the Center's potential. The Review Committee shall be comprised of three members appointed by the Governor; two members of the Senate appointed by the Senate Committee on Privileges and Elections; three members of the House of Delegates, appointed by the Speaker; and three members of the board of the Center for Innovative Technology, including one university president, appointed by the board chairman.

"The study shall be jointly staffed by the Department of Planning and Budget and staff of the Joint Legislative Audit and Review Commission, which will prepare a plan and methodology for the study, and a final report with findings and recommendations, both for the committee's review. Throughout the course of the review, input will be solicited from the business and academic communities, as well as other individuals with a knowledge of or interest in the activities of the Center for Innovative Technology.

"The Review Committee shall report its findings and recommendations to the Governor and the General Assembly by November 1, 1992. The Innovative Technology Authority, the Center for Innovative Technology and all state agencies shall fully cooperate in the review."

APPENDIX B

CIT Operating Budget FY 1993

PROGRAMS	<u>Totals</u>	<u>% of Total Budget</u>
Research Activities at the Institutions	\$5,370,000	51.62%
Technology Development Centers	\$2,500,000	
Institutes	2,120,000	
Research Administered by CIT	400,000	
Space Industry Support	350,000	
Assistance to Businesses	1,685,000	16.20
Technology Transfer Program	1,175,000	
Innovation Centers	250,000	
Technology Application Center	200,000	
Manufacturing Action Program	35,000	
Training and Economic Bridges	25,000	
Patenting and Licensing (Legal Fees)	300,000	2.88
Outreach	50,000	0.48
CIT Staff Salaries and Benefits	1,009,572	9.71
Other Program Overhead Costs	<u>1,009,328</u>	<u>9.70</u>
SUBTOTAL - Program Costs	9,423,900	90.59
GENERAL ADMINISTRATION	<u>978,800</u>	<u>9.41</u>
Salaries	659,700	
Other General Administration Costs	309,100	
Assets	10,000	
TOTAL BUDGET	\$10,402,700	100.00%

SOURCE: Staff analysis.

**State Appropriations
FY 1985 - FY 1994
(\$ in Millions)**

<u>Fiscal Year</u>	<u>Operating</u>	<u>Capital</u>	<u>Total</u>
1984-85	\$9.99	\$1.75	\$11.74
1985-86*	8.22	9.95	18.17
1986-87**	6.86	2.50	9.36
1987-88	9.49		9.49
1988-89	12.16	7.00	19.16
1989-90***	13.01		13.01
1990-91	11.00		11.00
1991-92	9.98		9.98
1992-93	8.67		8.67
1993-94	8.67		8.67
TOTAL	\$98.05	\$21.20	\$119.25

NOTES: * The CIT Board redirected \$2.45 million of its \$10.67 million operating appropriation for capital construction costs.

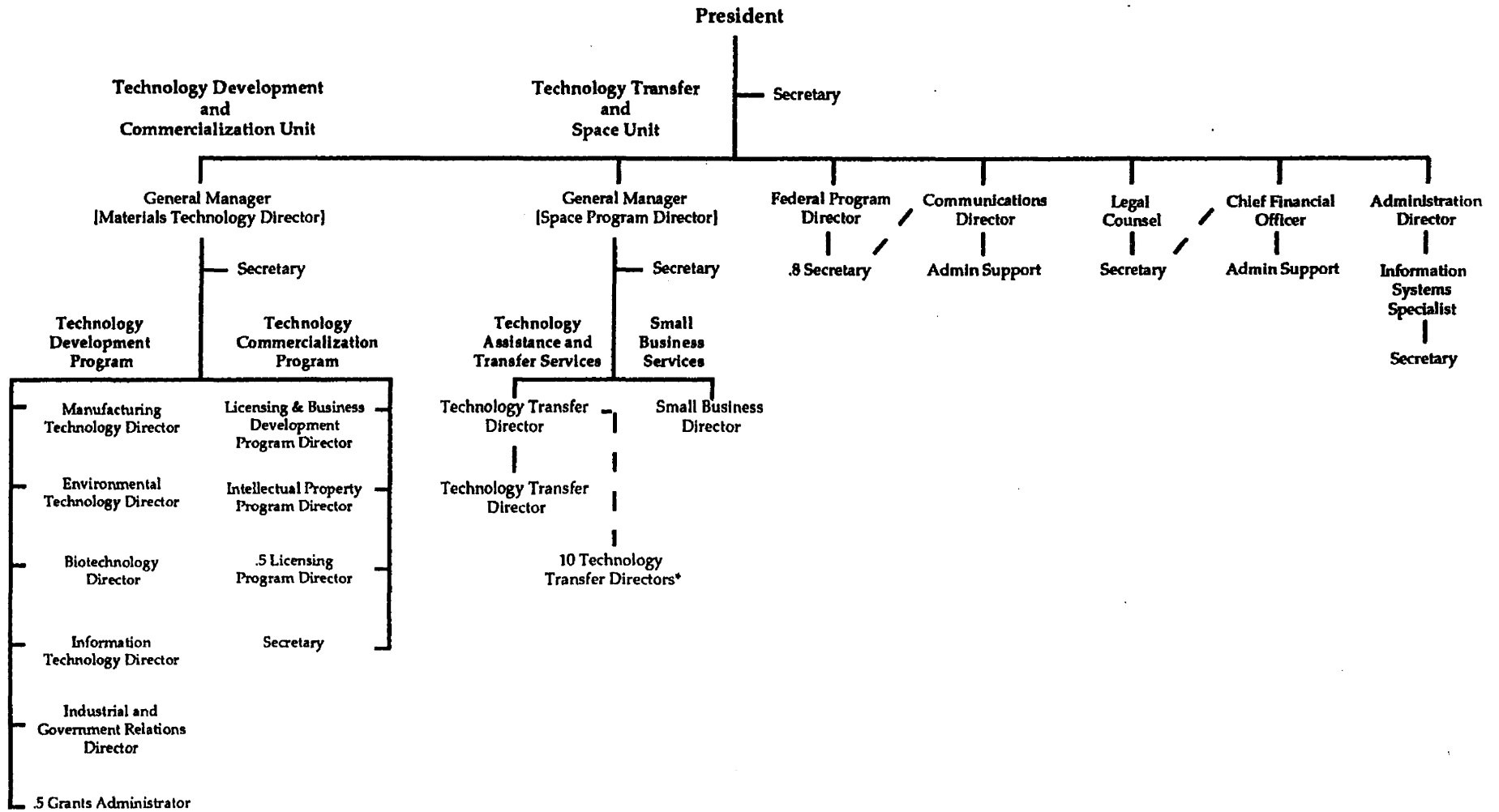
** The board redirected \$2.50 million of its \$9.36 million operating appropriation for capital construction costs.

*** The General Assembly appropriated an additional \$3.7 million for expansion of the technology development centers and other research programs and increased funding for intellectual property services.

SOURCE: Staff analysis.

APPENDIX C

CIT ORGANIZATIONAL CHART



APPENDIX C 1

NOTE: * Housed in community colleges and report to college presidents.

SOURCE: Staff analysis.

**Proposed Legislation
House Joint Resolution**

Requesting the Secretary of Economic Development to establish a strategic planning process and prepare a strategic plan for economic development in the Commonwealth.

WHEREAS, in 1990, the Joint Legislative Audit and Review Commission recommended the development of a comprehensive policy and strategic planning process for economic development in the Commonwealth; and

WHEREAS, in 1991, the General Assembly enacted § 2.1-51.39 of the Code of Virginia which requires the Secretary of Economic Development to develop and implement a written comprehensive economic development policy for the Commonwealth; and

WHEREAS, in June 1992, the Secretary of Economic Development issued a new policy statement; and

WHEREAS, this policy statement recommended the development of strategic plans as the next step towards economic growth and prosperity for the Commonwealth; and

WHEREAS, the special Review Committee mandated by Item 267 of the 1992 Appropriation Act concluded that current strategic plans are not sufficient; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Secretary of Economic Development, in collaboration with key government, industry, business, education, and community leaders, be requested to establish a strategic planning process and prepare a strategic plan for economic development in the Commonwealth.

The Secretary shall complete the plan in time to submit it to the Governor and the 1994 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

Proposed Legislation
House Joint Resolution

Establishing a science and technology task force to coordinate the development of a statewide strategic plan for science and technology.

WHEREAS, the Commonwealth desires to promote economic growth by attracting high technology industries to Virginia, creating high wage jobs and expanding the tax base; and

WHEREAS, in an era of growing international competition, the future vitality of the Commonwealth's industrial base depends in part on the successful development and exploitation of scientific and technological advances; and

WHEREAS, the Commonwealth has invested in a wide array of science and technology resources; and

WHEREAS, the last comprehensive action plan for science and technology in the Commonwealth was developed in 1983 by a task force appointed by the Governor; and

WHEREAS, the special Review Committee mandated by Item 267 of the 1992 Appropriation Act concluded that current strategic plans for science and technology are insufficient; and

WHEREAS, the Southern Growth Policies Board and the 1992 Carnegie Commission on Science, Technology and Government recommended that every state establish a permanent science and technology advisory body; and

WHEREAS, science and technology should be an integral part of the overall economic development strategy for the Commonwealth; and

WHEREAS, the Review Committee concluded that the Center for Innovative Technology should be an integral part of the overall economic development strategy of the Commonwealth; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That a science and technology task force be established to report on the status of the 1983 task force recommendations and to coordinate the development of a statewide strategic plan for science and technology. The task force shall be composed of twenty-three members representing the Virginia General Assembly and state and local government, research, university and business leaders in the fields of technology and science. The members shall be selected as follows: three members to be appointed by the Senate Committee on Privileges and Elections; six members to be appointed by the Speaker of the House of Delegates; and fourteen members, to be appointed by the Governor, who are citizens of the Commonwealth having knowledge and expertise in the fields of science and technology.

Among the issues to be examined shall be the creation of a permanent council on science and technology and its role in the strategic planning process for the economic development of the Commonwealth. The Division of Legislative Services, the Center for Innovative Technology, the Department of Economic Development, and the State Council of Higher Education shall provide staff support to the task force as requested. All agencies of the Commonwealth shall cooperate with the task force and, upon request, assist the task force in the performance of its duties and responsibilities.

The task force shall submit a preliminary report of its findings and recommendations to the Governor and the 1994 Session of the General Assembly. A final report shall be prepared for consideration by the Governor and the 1995 Session of the General Assembly. Both reports shall be submitted in accordance with the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

**Proposed Legislation
Senate Bill**

A Bill to amend and reenact §§ 9-252, 9-253 and 9-263 of the Code of Virginia, relating to the Innovative Technology Authority Act.

Be it enacted by the General Assembly of Virginia:

1. That §§ 9-252, 9-253 and 9-263 of the Code of Virginia are amended and reenacted as follows:

§ 9-252. Declaration of public purpose; Authority created.— A. It is hereby found and determined by the General Assembly that there exists in the Commonwealth of Virginia a need to (i) ~~to~~ *promote the economic development of the Commonwealth by attracting and retaining high technology jobs and businesses in Virginia;* (ii) *increase industry competitiveness by supporting the application of innovative technologies that improve productivity and efficiency;* (iii) *mobilize support for high technology industries to commercialize new products and processes, including organizing assistance for small business and supporting select industry sectors and regional high technology efforts;* (iv) *enhance and expand the scientific and technological research and development capabilities of the institutions of higher education in the Commonwealth and coordinate such capabilities with the scientific and technological research and development activities and requirements of the public and private sectors , including transferring technological advances to the private sector;* ~~(ii) to~~ (v) *expand knowledge pertaining to scientific and technological research and development among public and private entities , including, but not limited to, knowledge in the areas of information technology, biotechnology, computer assisted engineering and materials science and engineering;* ~~(iii) to encourage and provide for specialized graduate education programs in science and technology; and (iv) to promote the industrial and economic development of the Commonwealth. In order to;~~ (vi) *attract research and development*

(R&D) facilities and contracts from the federal government and private sector, including coordinating efforts to identify and compete for large federal and private sector R&D facilities, tracking federal technology initiatives and recommending state actions, and developing a statewide strategy to compete for large R&D contracts; and (vii) facilitate and coordinate the marketing, organization, utilization and development of scientific and technological research and development in the Commonwealth, the advancement of knowledge therein and the growth of scientific and technological research and graduate education in science and technology in the Commonwealth and to meet the needs and demands of public institutions and private industry therefor, and to promote the industrial and economic development of the Commonwealth, which purposes are hereby declared and determined to be public purposes.

B. To achieve the objectives of subsection A of this section, there is hereby created and constituted a political subdivision of the Commonwealth to be known as "The Innovative Technology Authority." The exercise by the Authority of the powers conferred by this chapter shall be deemed and held to be the performance of an essential governmental function.

§ 9-253. Board of directors.— *A. The Authority shall be governed by a board of directors consisting of fifteen members appointed by the Governor, three-two of whom shall be the Presidents of the University of Virginia, Virginia Commonwealth University and Virginia Polytechnic Institute and State University who shall serve as directors during their terms in those offices-major research universities and one of whom shall represent the other state colleges or universities. Of the presidents to be appointed in 1993, one shall be appointed for a three-year term, one shall be appointed for a four-year term and one shall be appointed for a five-year term. Thereafter, all appointments of presidents shall be for terms of five years, except that appointments to fill vacancies shall be for the unexpired terms. No president shall be eligible to serve for*

*more than two successive five-year terms; however, after the expiration of a term of four years or less, or after the expiration of the remainder of a term to which appointed to fill a vacancy, two additional terms may be served by such member if appointed thereto. The Secretary of Education, the Secretary of Economic Development and the Director of the State Council of Higher Education shall serve on the board for terms coincident with their terms of office. The Governor shall appoint the ~~twelve-nine~~ other directors as follows: ~~two representatives from other institutions of higher learning in the Commonwealth of Virginia and ten representatives from the public at large consisting of one representative from each congressional district.~~ who shall be nominated by established industry groups and technology councils within the Commonwealth. These appointees shall include representatives of a variety of businesses, industries and corporations of different types, sizes, locations and stages of development. All members of the board of directors appointed by the Governor shall be confirmed by each house of the General Assembly. ~~Four-Three~~ of the ~~twelve-nine~~ directors appointed by the Governor shall be appointed for terms of three years, ~~four~~ *three* for terms of four years, and ~~four-three~~ for terms of five years, from the effective date of their appointment; and thereafter the members of the board shall be appointed for terms of five years. Vacancies in the membership of the board shall be filled by appointment of the Governor for the unexpired portion of the term. No director shall be eligible to serve for more than two successive five-year terms; however, after the expiration of a term of four years or less, or after the expiration of the remainder of a term to which appointed to fill a vacancy, two additional terms may be served by such member if appointed thereto. Members of the board shall be subject to removal from office in like manner as are state, county, town and district officers under the provisions of §§ 24.1-79.1 through 24.1-79.10 of the Code of Virginia. The Circuit Court of the City of Richmond shall have exclusive jurisdiction of all proceedings for such removal.*

Immediately after such appointment, the directors shall enter upon the performance of their duties. The ~~Governor~~ *members of the board* shall ~~appoint annually~~ *elect* one of the members of the board to be chairman ~~who shall serve as chairman for such term of office as shall be designated by the Governor~~. The board shall annually elect one of its members as vice-chairman, and shall also elect annually a secretary, who may or may not be a member of the board, and may also elect such other subordinate officers who may or may not be members of the board, as it shall deem proper. The chairman, or in his absence, the vice-chairman, shall preside at all meetings of the board. In the absence of both the chairman and vice-chairman, the board shall appoint a chairman pro tempore, who shall preside at such meetings. ~~Eight directors shall constitute a quorum for the transaction of the business of the Authority, and no vacancy in the membership of the board shall impair the right of a quorum to exercise all the rights and perform all the duties of the Authority. The members of the board shall be entitled to reimbursement for their expenses incurred in attending the meetings of the board or while otherwise engaged in the discharge of their duties. Such expenses shall be paid out of the treasury of the Authority upon vouchers signed by the chairman of the board or by such other person or persons as may be designated by the board for this purpose.~~ The board ~~may~~ *shall* employ an ~~Executive Director~~ *a President* of the Authority, who shall serve at the pleasure of the board, to direct the day-to-day operations and activities of the Authority and carry out such of the powers and duties conferred upon him as may be delegated to him by the board. The ~~Executive Director~~ *President* and employees of the Authority shall be compensated in the manner provided by the board and shall not be subject to the provisions of Chapter 10 (§ 2.1-110 et seq.) of Title 2.1 of the Code of Virginia. *The terms of all current board members shall expire on the effective date of this act.*

B. The board shall establish a twenty-two member technical advisory committee with representatives recommended by technology councils, industry and business associations, and college and university Presidents. Ten members shall have knowledge, skills and expertise in the needs of industry, and ten shall have knowledge, skills and expertise in specific technology areas. The chief technical officer of the Center for Innovative Technology and the Director of the Department of Minority Business Enterprise shall also serve on this committee.

§ 9-263. Auxiliaries.— A. The Governor is hereby authorized to provide for the formation of a nonstock corporation to carry out the purpose of this chapter. The board of directors of the nonstock corporation shall consist of the fifteen members of the board of directors of the Authority ~~, the Chairman of the Joint Legislative Audit and Review Commission and four additional members appointed by the Governor~~. The articles of incorporation of the nonstock corporation shall provide that upon dissolution the net assets of the corporation shall be transferred to the Commonwealth of Virginia. The nonstock corporation shall insure that the economic benefits attributable to the income and property rights arising from any transactions in which the nonstock corporation is involved are allocated on a basis which is equitable in the reasonable business judgment of the board of directors, with due account being given to the interest of the citizens of the Commonwealth and the needs of the nonstock corporation. Any such nonstock corporation shall not be deemed to be a state or governmental agency, advisory agency, public body or agency or instrumentality for purposes of Chapters 10 (§ 2.1-110 et seq.), 13 (§ 2.1-153 et seq.), 14 (§ 2.1-173 et seq.), 18 (§ 2.1-327 et seq.), 21 (§ 2.1-340 et seq.), 23 (§ 2.1-359 et seq.), 26 (§ 2.1-377 et seq.) and 40.1 (§ 2.1-639.1 et seq.) of Title 2.1, Chapter 7 (§ 11-35 et seq.) of Title 11 and Chapter 1 (§ 51.1-100 et seq.) of Title 51.1, nor shall any director, officer or employee of any such nonstock corporation or entity be deemed to be an officer or employee for purposes of Chapter 40.1 (§ 2.1-639.1 et seq.) of Title 2.1.

Notwithstanding the foregoing, the Auditor of Public Accounts, or his legally authorized representatives, shall annually audit the financial accounts of the Authority and any such nonstock corporation entity, provided that the working papers and files of the Auditor of Public Accounts relating to such audits shall not be subject to the provisions of Chapter 21 (§ 2.1-340 et seq.) of Title 2.1.

B. Notwithstanding the provisions of subsection A of this section, as an entity receiving state funds, any such nonstock corporation shall be subject to periodic external review either (i) under the provisions of the Legislative Program Review and Evaluation Act (§ 30-64 et seq.) or (ii) by an entity appointed for that purpose by the Governor. Any such nonstock corporation shall be deemed to be an institution of higher education within the meaning of §§ 15.1-22 and 23-9.2, but only for the limited purposes therein stated.