

FLC History

Establishing a National Presence

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Acknowledgments

The concept of the FLC began in 1971—more than 20 years ago, when several technology transfer champions explored the potential of applying the concepts of the Naval Weapons Center's (NWC) China Lake, CA technology transfer endeavors to other Department of Defense laboratories for the purpose of assisting civilian Federal agencies and state and local governments. George F. Linsteadt, who headed NWC's Industrial and Government Liaison Office at the time, was determined to "make this concept a reality". His determination was instrumental to launching the fledgling Federal Laboratory Consortium for Technology Transfer in 1974, and his perseverance was influential in creating the organization as we know it today. Linsteadt's continuing tenacity provided the impetus to document the historical development and the accomplishments of the FLC.

Leroy L. Doig, a writer and historian employed by the Naval Air Warfare Center Weapons Division (formerly NWC), and the author of this manuscript, literally combed through Linsteadt's files—"twenty-odd boxes" containing several thousand items of information—to compose this chronology of the development of the Federal Laboratory Consortium and the simultaneous development of the technology transfer movement across a portion of the country. Doig credits colleagues Dorothy Victor and Janice Kasperson, for their top-notch copy editing and for invaluable resource-consolidation and formatting assistance.

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We also recognize some of the original entrepreneur—the champions akin to the cultivation and the growth of the Federal Laboratory Consortium. The FLC extends a sincere appreciation to them for their instrumental achievements as well as their review of this document: George Linsteadt, Leroy Marquardt, Harold Metcalf, Fred Nathan, J. Richard Perrin, and RAdm. Gordon H. Smith, USN (Ret.).

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Preface

*"I believe imagination is stronger than knowledge,
that hope always triumphs over experience and
dreams are more powerful than fact."*

by Robert Fulghum

It is amazing to me how the vision and motivation of a few people in 1971 have brought the Federal Laboratory Consortium for Technology Transfer to this place and this time. I believe the Consortium was formed on three operating principles that still guide its efforts some twenty plus years later. These are:

- ▶ A need to make broader use of the technologies and expertise developed in Federal laboratories,
- ▶ A focus on communications and interagency and inter-laboratory interactions, and
- ▶ An emphasis on technology transfer through person-to-person mechanisms.

Although we are not organized as an R&D consortium, the FLC has characteristics that have been identified for successful R&D consortia. The FLC always has had inspired leaders, unified and well-defined goals and, since 1987, relatively stable funding.

The transition of the FLC from a small organization of 12 laboratories to a well-organized and nationally recognized body of more than 600 R&D laboratories and centers representing 16 departments and agencies has been an outstanding feat. The FLC owes its origins and concept to the pioneers at the Naval Air Warfare Center (formerly Naval Weapons Center) and continues to be grateful for their leadership to this day.

The history of this endeavor has been remarkably captured by one of the Navy's prominent writers and historians, Mr. Leroy Doig from the Naval Air Warfare Center at China Lake, CA. A few more details have been added by others.

This history is more than a commemorative piece about the FLC. It reflects a portion of the early technology transfer movement in the United States and substantiates the difficulties of transferring technology—both then and now. The history weaves a tale of phenomenal persistence, hard work, and risk taking by various players to hurdle the barriers—e.g., administration changes,

organizational policies, management behaviors, and lack of staffing and funding. Twenty years later technology transfer still requires phenomenal persistence and risk taking to overcome some of the same barriers.

I find it interesting that the FLC started as a Department of Defense Consortium. And now, more than twenty years later, the FLC is in a position to return some of the knowledge and expertise gained through the years by applying it to defense conversion efforts.

Dr. Loren C. Schmid, Chairman
Federal Laboratory Consortium

Chapter 1

TECHNOLOGICAL POWERHOUSES

The Laboratories of the Federal Government and their Role in Technology Transfer

The Federal Government has, through its various departments and agencies, either conducted or stimulated research and development (R&D) in almost every conceivable realm of science and technology. The R&D activities of the Federal Government have helped the United States to attain and maintain technological leadership in numerous areas.

New and advanced technologies are the products of research programs, and along with that, the evolution and application of new technologies to solving practical problems—before the actual "problem-solving" is accomplished—are major areas of effort for R&D activities. R&D work in Government and in private industry now represents a significant portion of the productive efforts of the nation.¹

Directed R&D effort in the U.S. was practically negligible until World War II, when urgent national needs brought together the phenomenal (and previously untapped on a national scale) scientific and industrial resources of the entire country in a directed program of technological advancement, development, application, and production. Much of the wartime R&D effort was conducted by activities operated by academic and industrial concerns under contract to the Federal Government. Many of these activities (including the in-house development and testing activities that had existed before the war) survived the post-war drawdown and became permanent Government R&D activities

The products of research and development (R&D) and the applications of new technologies

The U.S. Government's contribution to the national growth of R&D since World War II

manned and operated by civil-service employees. R&D statistics, first compiled in 1953-1954 by the National Science Foundation, show that the greatest direct R&D outlays over the years since the war have been by private industry. However, the biggest contributor to R&D growth was the Federal Government, because much of industry's R&D effort was carried out under Government auspices and control.²

The Federal Government technology-development and -application program begun during the war has continued to the present. Although its direction and nature have changed significantly over the years with shifting national priorities, technological advances, and the rise and fall of the defense industry, the Federal R&D establishment remains a major factor in national R&D efforts.

Most Federal departments and agencies maintain R&D activities to support individual missions, and each R&D laboratory, center, and activity has its own mission. The laboratories of the Federal Government conduct more than basic and applied research in the physical sciences. Fundamental studies in physics, chemistry, biology, mathematics, and engineering sciences are major aspects of the laboratories' R&D programs, but the Federal laboratories also conduct programs in a variety of other "practical" areas, including, for example,

- ▶ Agriculture and forestry, from plant genetics and post-harvest technology to the construction of timber bridges;
- ▶ Construction and civil engineering, from materials research and stress analysis to modular building techniques and flood control;
- ▶ Energy production and energy alternatives, from advanced synthetic fuels synthesis to hybrid solar/wind systems to electric vehicles;
- ▶ Manufacturing and production technology, from advanced materials synthesis and soldering technology to automated manufacturing machinery/methods and low-cost production disciplines;
- ▶ Atmospheric and oceanographic sciences, from weather prediction, marine biology and pollution control to weather- and seawater-proof coatings and advanced propellers;

*Some practical applications of
federally sponsored R&D*

- ▶ Medical technology and medicines, from new diagnostic procedures and devices to materials-exposure research and treatment, and prosthetic materials;
- ▶ Materials and structures for "high" and "low"-technology applications, from road surfaces and advanced composite airframes to semiconductor substrates; and
- ▶ Computing and information systems, from shared databases and extended communication systems to advanced computer languages.

The Federal laboratories have developed and exploited technologies in every area, and their contributions to scientific and technological advancement have had a major influence in both basic knowledge and application.

Laboratories Conduct Mission-Related Research

Each Federal Government agency has a specific mission, and each Federal laboratory, too, has an individual mission appropriate to its developed areas of expertise. The work of a given laboratory, although directly mission-related, may be very broad-based and encompass a wide variety of scientific and engineering disciplines.

The Defense Department laboratories, for example, include activities specializing in aircraft systems, shipboard electronics, civil engineering, rocket propulsion, aerospace medicine, human factors and psychology, communications and electronics, biomedical research, radar systems, targeting and night-vision devices, satellite systems, small arms and field equipment, and air weapons. The technology base supporting any given modern military system is vast; any one laboratory may have hundreds of ongoing technology-development and -exploitation projects, in-house and under contract, to support its major R&D programs.

The broad, interdisciplinary work at many Federal laboratories

The wide range of activities in the laboratories of the Department of Defense (DOD)

*Importance of mission-oriented R&D
in providing technologies for public
benefit*

*Changes in technology and the
assumption of new R&D
responsibilities by the private
sector*

*Stimulation of new industries
through technology transfer*

Mission-Related Research Provides Solutions to Public- and Private-Sector Needs

Mission-oriented, mission-essential Government R&D has assisted in providing solutions to public- and private-sector needs and problems. However, for most of the history of the Federal Government laboratories, this assistance has been attained by applying technologies that were developed originally to support programs or functions traditionally viewed as Federal Government responsibilities. R&D on forest products, environmental protection, energy and energy-alternatives, atmospheric/geophysical sciences, and satellite/space systems are a few examples of areas that traditionally have been Federal responsibilities—largely because of the absence of commercial incentive. Private industry could not afford to "get into the business" of basic research in many of these areas, so the Government conducted research or contracted with others to provide the public with the technologies for reforestation, clean water, weather modification and prediction, and satellites and their delivery systems.

As technologies emerge, and resource supplies and economics change, many traditional areas of Government research also change. For instance, high-technology solutions to reforestation and timber utilization are now economically feasible for the private sector. Private pollution-abatement and -control enterprises become more and more common because of legislation requiring corporate responsibility for environmental damage. Tax incentives (the final stage of Federally funded R&D) make alternate-energy system development economically viable (if not yet highly attractive). The availability of space-related technology and expanding requirements for private orbital platforms have spawned the recent commercial ventures in satellite development and launching systems—something practically unimaginable as a private venture a few years ago.

The Federal Government's R&D programs have stimulated new industries by assuming the risk of technological experimentation, and some transfer of technology has taken place over the years. Military-industrial technology transfer has been an area of significant progress in getting Federal technology into the larger U.S. economy because of the large-scale, defense-oriented R&D programs.

Passive Technology Transfer v. Active Technology Transfer

Passive technology transfer, as defined in the 1972 General Accounting Office study titled *Means for Increasing the Use of Defense Technology for Urgent Public Problems*, is essentially the collection and dissemination of scientific and technical information upon the request of a potential user, whereas active transfer involves the passive transfer methods supplemented by personal liaison between the technology developer and the potential user. Active technology transfer efforts, then, depend upon the active participation of the technology developer.³

Since World War II, when R&D became a major activity of the Department of Defense, the programmatic efforts related to technology transfer have been primarily passive. Significant active transfer by Federal agencies and individual laboratories has occurred only sporadically, usually on a program- or project-requirement basis.

Somewhere in-between passive and active technology transfer programs is the method of transfer that occurs through the normal operations of private industry under Government contract—particularly through companies engaged in defense contracting. These contractors develop extensive technical knowledge and experience and, at Government expense, build large technical and industrial facilities primarily to meet the requirements of defense contracts. These companies obtain secondary uses of the technologies and the facilities by transferring personnel and resources to work on products for other markets.⁴

Government's Legislative, Administrative, and Organizational Approaches to Technology Transfer

The intention and the philosophy of technology transfer have been integral to Federal Government R&D for some time. The Economy Act of 1932 and Executive Order 10521 established Federal Government policy for the broad utilization of Federal laboratories, including intergovernmental sharing of facilities and services. The Bureau of Budget reaffirmed this policy in the 1962 Bell Report to the President, which emphasized the desirability of a flexible-use policy for existing Government R&D

*Definition of passive and active
technology transfer*

*Primarily passive technology
transfer at DOD since World War II*

*Technology transfer through
normal Government contracting
with industry*

*Implementation of congressional
mandates, 1932-1968*

facilities. This was further emphasized in the 1968 Daddario Committee hearings on the utilization of Federal laboratories. However, significant administrative, legal, and perceptual barriers have hindered the implementation of active transfer policies and resulted in the conduct of only minimal—and mainly passive—technology transfer activities. The Defense Department has, in recent years, for example, maintained a formal Scientific and Technical Information Program to ensure that defense-related R&D makes "a maximum contribution to the advancement of science and technology" and provides for "interchange of STI [scientific and technical information] within and among DOD components and their contractors, federal agencies and their contractors, and the national and international scientific and technical community." This has been a useful and productive program, but hardly active technology transfer.⁵

Over the years, Government's recognition of the need for expanding technology transfer efforts to ensure the widest possible use of its technological achievements has been manifested in a number of administrative, organizational, and legislative approaches. For instance, the National Science Foundation was established in 1950; the Defense Technical Information Center was reorganized and broadened in 1951; and the post-war Publication Board developed into the Clearinghouse for Federal Scientific and Technical Information, and in 1970 became the National Technical Information Service.

NASA had the first major Government mandate to establish an agency-wide program to promote the transfer and application of its technological capabilities and expertise outside of its own arena. The basis for NASA's technology transfer program is a simple passage of the 1958 National Aeronautics and Space Act that states, "... [The Administrator of NASA shall] provide the widest possible, practical, and appropriate dissemination of information concerning its activities and the results thereof." NASA management initiative took over, and the agency has provided and promoted technology transfer and utilization in a variety of fields. NASA's transfer program has not only kept the agency on track with its legislative mandate, but also has served to help justify large public expenditures on space research and exploration by providing secondary uses of paid-for technology and capabilities to the public. NASA's mandated program, however successful, did not manage to successfully promote

Expanding technology transfer efforts through the National Science Foundation (NSF), the Defense Technical Information Center (DTIC), and the National Technical Information Service (NTIS)

Characteristics of the technology transfer program at the National Aeronautics and Space Agency (NASA)

similar activities among the laboratories of other Government agencies—nor did it provide the basis for other legislatively required active transfer programs.⁶

By 1968 it had become clear to some members of Congress that the Federal laboratory system could be utilized better in solving national problems. As a result of the Daddario Committee hearings on the utilization of Federal laboratories, the Subcommittee on Research and Development of the House Science and Astronautics Committee made several recommendations for the more effective use of the Federal laboratories, including flexibility in intergovernmental endeavors. The Intergovernmental Cooperation Act of 1968 (implemented via Office of Management and Budget Circular A-95 in 1969) encouraged interagency cooperation and authorized Federal agencies to provide some services to state and local governments. Further, the Intergovernmental Science Program of the National Science Foundation, established in 1967 to explore the possibilities for more effective relationships between the Federal and the state and local governments, received a modest \$150,000 from Congress in 1968. Significant results were not immediate, but the hearings and recommendations provided legitimacy and support for pioneering efforts in active technology transfer by DOD activities.

Domestic Action Program Provides Impetus for DOD Technology Transfer

In 1969, outgoing Secretary of Defense Clark Clifford stated that "the Department of Defense . . . which consumes nine percent of the gross national product of our Nation [and] employs four-and-one-half million Americans, has a deep obligation to contribute far more than it has ever contributed before to the social needs of our country." Secretary Clifford's successor, Melvin Laird, shared the belief in this obligation and, accordingly, established the DOD Domestic Action Program in April 1969. The resulting DOD directive provided only general guidelines on how the Program was to be carried out by the Armed Services. It encouraged the use of knowledge gained in defense programs to help solve critical domestic problems.

The Domestic Action Program had three primary elements: community relations, equal employment, and technical assistance. The response to the directive was, at best, sporadic and driven

Office of Management and Budget (OMB) Circular A-95, interagency activity, and modest congressional funding

DOD's obligation to respond to national social needs

Responses among DOD laboratories

primarily by the personal initiative of individual laboratory personnel. Although there was active Program participation in a number of DOD laboratories, very few of those activities involved significant effort in providing technical assistance. However, the establishment of the Domestic Action Program did serve formal notice that the Federal laboratories would be expected to provide additional applications for the technologies that the taxpayers had purchased.

***Active Technology Transfer Spawned
at Naval Weapons Center, China Lake***

It is at this point that the U.S. Navy, through the Naval Weapons Center at China Lake, California, developed active technology transfer mechanisms, initially for the DOD laboratories, and eventually for the laboratories of the Federal Government that would constitute the Federal Laboratory Consortium.

The Defense Department took the lead in establishing active technology transfer of defense-related technologies to help meet the needs of state and local governments, private industry, and other civilian activities. This occurred before the Stevenson-Wydler Technology Innovation Act of 1980, the first significant legislative dictum pertaining to Federal laboratory technology transfer.



*The beginning of the Federal
Laboratory Consortium*

*Anticipating the
Stevenson-Wydler Act*

Chapter 2

THE EARLY DAYS, 1970-1971

Developing the Mechanisms for the Active Transfer of Federal Technology

The beginning of the laboratory-centered active technology transfer program that eventually became the Federal Laboratory Consortium for Technology Transfer was essentially a chance encounter.

Naval Weapons Center at China Lake Takes the Lead

Following the DOD Domestic Action Program directive, several Naval Weapons Center (NWC) employees devoted significant off-duty time to Domestic Action activities. They formed a working group composed of personnel from medical, engineering, and scientific disciplines to investigate the application of NWC-developed and -exploited technologies and in-house expertise to improve medical technologies. In 1970, NWC's Domestic Action Coordinator, Fred Nathan, contacted a number of Federal scientific and technological program personnel to determine other areas in which NWC could contribute. The Office of Science and Technology suggested that NWC could contribute to problem statements developed by the NASA Technology Utilization Program, which was well established as a domestic technology transfer activity.

Although the Domestic Action Program provided awareness of the need and some impetus for transferring NWC technology and expertise, active efforts were limited and based almost solely on personal effort by a few individuals. It was a combination of

Working group at Naval Weapons Center (NWC) and its possible contributions to the transfer activity developed at NASA

Building a basis for active technology transfer at NWC in addition to participating in DOD's Domestic Action Program and an information exchange with NASA

A chance encounter linking the consulting services of C.A. Johnson and Associates and Perrin Associates with NWC

Formation of Technology Utilization Office (TUO) at NWC

Perrin's proposal to formalize NWC's assessment of technology applications

NWC's contract with Perrin

individual initiatives by NWC project personnel and a contractor consultant that provided the basis for a Center-supported active technology transfer program. NWC continued its participation in the Domestic Action Program and its information exchange with NASA while developing a more active program.

In 1970, at NWC, the Instrument Development Division of the Systems Development Department had just completed an 8-year Navy-funded research project utilizing digital computers in shipboard fire-control systems. The division head, Leroy Marquardt, had begun to explore ways to keep the project team together and to pursue further research along the same line while seeking additional Navy project funds. In the Spring, Clarence Mettenberg, a member of Marquardt's Division, found himself seated on an airplane next to Charles Johnson of C.A. Johnson and Associates. During the flight, a conversation ensued that brought out both the NWC Instrument Development Division's need for funding alternatives and Johnson's interest in technology transfer. Johnson brought the situation to the attention of J. Richard (Dick) Perrin of Perrin Associates, a Los Angeles consulting firm specializing in technology transfer. Johnson subsequently joined Perrin and remained involved in the program that was to result from the airborne meeting.

Immediate follow-up efforts by Perrin helped to establish a basis for active technology transfer efforts by NWC, which eventually led to the formation of the Center's Technology Utilization Office (TUO) in March 1971. The cornerstone for the building of the Federal Laboratory Consortium had been laid.

Perrin developed a concept paper entitled "NWC Technology Utilization Assessment" that stated the necessity for the Center to know the objectives and specific problem areas of various individual agencies. An assessment of NWC technology applications to help solve these problems could then be developed in support of the Domestic Action Program.

NWC convened an informal steering group in July 1970 to recommend action regarding further NWC support of the DOD Domestic Action Program and to review the Perrin proposal. Once management concerns of "What are they going to do for us?" and "Is this effort defensible?" were satisfied, a contract was awarded to Perrin on October 5th with the stated purpose of

assisting NWC in the transfer of a small amount of its capability for solving current social and environmental problems.

Between October 1970 and December 1971, Perrin Associates completed three contracts for NWC. The contracted efforts introduced civilian technology transfer concepts and activities to NWC's scientific, engineering, and management staff. The Perrin contracts, beginning with a 3-month assessment of NWC capabilities that might be related to technological problems in civilian agencies, concentrated on active participation in the transfer process. Perrin stressed that the laboratory must offer specific solutions to actual civilian-agency technical problems and not merely disseminate technical briefs and informational papers. Essential concepts to come out of this period of partnership included the necessity of (1) targeting laboratory technical capabilities toward meeting civilian agency-specific needs and (2) assigning a "transfer agent" to provide an active link between the NWC technical staff and the civilian agencies.

Perrin indicated in its first contract report that NWC should take the lead role in assisting other DOD laboratories in developing active technology transfer programs, and Perrin's report referred to utilizing NWC as a "national resource." The Center would, however, soon find that there were limits to serving as a national resource while maintaining its essential role as the Navy's principal research, development, test and evaluation (RDT&E) center for air warfare and missile weapon systems.

The Center did not simply "jump in" to the technology transfer effort proposed by Perrin. Dr. Ivar Highberg, the head of the Systems Development Department, voiced concerns about appropriate funding and benefits to the Center. After careful consideration of these concerns, Center management activated NWC's proposed follow-on program. Laboratory management's early recognition of tangible benefits to the Center from transfer initiatives was one of the factors that influenced not only the acceptance of the program, but also its ultimate success.

Equally important were the positive attitudes developed early on by the Center's scientists and engineers involved in the program and the effective working relationship between them and the contractor. To serve as a baseline for pursuing non-defense-agency program objectives, NWC personnel

Perrin's emphasis on key concepts needed for active transfer to civilian agencies

Perrin's pursuit of the establishment of a national resource

Recognition of tangible benefits to NWC from its transfer initiatives

Effective working relationships of scientists and engineers at NWC with the contractor

Strategic circulation of Perrin's contract reports, notably to Edward Glass at the Office of the Director of Defense Research and Engineering (DDR&E) at DOD

Glass's support of active-transfer efforts and a technology transfer agent and his proposal of an "adaptive engineering" concept

House subcommittee support of pilot program

developed one-page technology summaries describing how their individual fields related to civilian-agency problems.

Because of the pioneering nature of this active technology transfer effort, NWC and the contractor considered it imperative that DOD be kept well informed of the Center's growing involvement with other agencies. Accordingly, the first contract report was furnished to the General Accounting Office; the Congressional Research Service; the Subcommittee on Research and Development of the House Science and Astronautics Committee; and Edward M. Glass, Assistant Director for Laboratory Management in the Office of the Director of Defense Research and Engineering (DDR&E), DOD.

NWC Activities Lead to Pilot Programs and Congressional Interest

Glass was already a supporter of the program at NWC. In the very early stage of the program, Perrin had met with Glass and others in Washington, D.C., to discuss the effort, and at this meeting Glass stated that NWC should take a lead role in an expanded technology transfer program involving six or more DOD laboratories. He also supported the concepts of "active" transfer efforts and the establishment of a "technology transfer agent" (in this case, Perrin Associates) to match laboratory technologies with civilian agency needs. Glass had questioned the NWC distribution of NASA problem statements as an active effort, since the DOD involvement with the NASA program was basically an information exchange and not the active interchange advocated by himself and recommended by Perrin. Glass also pointed out the need to differentiate the DOD program from NASA's and proposed the "adaptive engineering" concept as part of the active technology transfer mechanism.

Based upon the growing interest in active technology transfer in Washington, D.C., the staff of the House Subcommittee on Science, Research and Development, Committee on Science and Astronautics, decided to (1) consider Congressional hearings on technology transfer in 1971, (2) support NWC efforts with Perrin as a feasibility demonstration, and (3) support a pilot program involving six to eight DOD laboratories with NWC as the focal point.

Concurrent with the contractor-headed technology-assessment program, Nathan and the Domestic Action Program at NWC continued to pursue a variety of approaches to linking NWC technological capabilities with domestic needs. By this time, transfer efforts at the Center were carried out in several different ways and monitored by NWC management with an eye to combining all efforts into a single, coordinated program. The NWC-NASA interchange continued as a "passive" attempt at technology transfer, whereas the rapidly developing NWC-contractor program was geared toward being a very active one.

In a January 1971 letter to Warren Donnelly of the Congressional Research Service, Perrin summed up the active technology transfer concept that would stay with the NWC program and form the basis of the later Federal laboratory program:

I really believe that technology transfer and subsequent utilization of the existing resources within the federal laboratories for solution of domestic problems requires an active communication process . . . Knowledge of available technologies is not obtained through reading quarterly progress reports which report *I'm doing fine and have no problems*, because they never provide viable contributions or approaches to solving a given problem. Technology is transferred only when boundaries of the problem and the limitations of the proposed solution are known to both parties through an active or personal communication approach.

In January 1971, Glass proposed a one-year pilot study of technology transfer involving six to eight major DOD laboratories representing more than one of the Armed Services. He suggested that NWC be designated the DOD lead laboratory for the study and that the other participants be selected by the Center based on their individual abilities to respond to the identified civilian-agency problems. Glass also proposed that each laboratory be allowed to use up to 25 percent of its discretionary independent research/independent exploratory development (category 6.1/6.2) funds to support the effort, and he suggested that continued involvement by Perrin Associates would be beneficial to the pilot project. Glass also commented on the potential problems that would be encountered with a multiple-service effort if the "bureaucratic hierarchy" of DOD

Coordination of efforts at NWC

Perrin's concept of the conditions necessary for active technology transfer

Funding and other terms of a pilot program proposed by Glass

Congressional support for DOD's transfer activities

Positive responses to NWC from John Foster, DDR&E, and from members of Congress

Support from the General Accounting Office (GAO) and the Office of Management and Budget (OMB)

were to become involved. He stated that this "could be the 'kiss of death' for this imaginative program in terms of coordinating technical effort and interactions with the civilian agency customers."

Glass also pointed out the need for Congressional support for DOD's transfer efforts. That support occurred when Congressman John Davis, Chairman of the Subcommittee on Science, Research and Development, sent a letter to Defense Secretary Laird that discussed the Subcommittee's October 1968 report on the utilization of the Federal laboratories and how NWC was accomplishing tasks recommended in the report. He expressed encouragement for the program at the Center and his desire to be kept informed of further progress and developments. At the Secretary's request, Glass responded to Davis' letter and added that "If the experiment is as successful as we envision it will be, we intend to expand this concept to include several more laboratories"

Based on Congressman Davis' letter, John Foster, DDR&E, communicated his direct support of the program to NWC's Technical Director, Haskell Wilson, along with a "Keep up the good work." Further, in early February 1971, California Congressman Barry Goldwater, Jr., (a new member of Davis' subcommittee) visited NWC for a briefing on the technology transfer program. Congressman Goldwater commended the Center for its efforts and "Far-sightedness and intelligent approach," and he assured NWC Commander RAdm. William Moran that the Armed Services Committee would be greatly interested in the Center's plans.

Foundations Are Laid for a DOD Consortium

The increasing Washington interest in the NWC experimental technology transfer program at China Lake prompted interest from other Government agencies. The General Accounting Office (GAO) initiated a study of NWC's methodology, comparing it to past methods of technology transfer and utilization, and the Office of Management and Budget (OMB) suggested that the National Science Foundation (NSF) provide a grant to the Center for expanding the transfer program. Perrin also was involved in these actions, briefing officials of both GAO and OMB on the China Lake program.

While negotiations of transfer activities with a number of civilian agencies continued, NWC extended its support contract with Perrin and, in March 1971, established the Technology Utilization Office—the TUO—to coordinate all of the Center’s expanding technology transfer efforts. The TUO, located in the Systems Development Department and headed by senior physicist George Linsteadt, was the result of management’s recognizing the possible lead role that NWC could play in a multiple-laboratory program.

Technical Director Wilson publicly expressed his support for the technology transfer effort, and in a statement of management policy he visualized 50 man-years of effort funded by civilian R&D needs. His estimate was, at best, optimistic, but his statement confirmed in no uncertain terms the Center’s dedication to the effort.

During 1971, the TUO pursued funding opportunities in telecommunications, law enforcement, biomedical technology, and air-quality control. NWC supplied the Federal Aviation Administration (FAA) with information on military radar, video, and data technology and test facilities for possible civilian application, and the FAA used unique NWC aircraft-test facilities to support airport system design. NWC also provided information on security, observation, and communications systems to the Law Enforcement Assistance Administration (LEAA); set up a monitoring program to conduct three-dimensional mapping of aerosols for the State of California; and formed the Medical Engineering and Scientific Working Group to pursue transfer and funding opportunities, particularly from the National Institutes of Health. During its first year, the TUO received only a small amount of funding, but nevertheless succeeded in establishing contacts throughout the Federal Government.

At the same time, a number of individual DOD laboratories began to present proposals involving potential solutions to domestic problems to various civilian agencies. This situation rapidly became a confusing one for the civilian agencies, and it became clear that a coordinated, multi-laboratory approach was needed to provide the optimum possible benefit, in terms of domestic problem-solving, utilizing the available DOD technology base.

The establishment of the Technology Utilization Office (TUO) at NWC under the direction of George Linsteadt

Haskell Wilson’s estimation of level of effort needed at NWC

Summary of transfer initiatives at NWC

Brisk activity from DOD laboratories and the need for coordination

The development of plans by TUO and Perrin for a consortium, and Glass's request that the NWC program be discussed with other laboratories

Varying responses from other laboratories

Other support for the establishment of an active technology transfer program

As a result, Perrin and the NWC TUO developed plans for a consortium of laboratories—as envisioned by DOD—to form the core of a coordinated technology transfer effort, and Center planning called for the retention of Perrin Associates as a "broker" for the effort. During this time, Glass requested that Linsteadt and Perrin visit several DOD facilities to discuss the NWC program and to determine the other laboratories' interest in forming a consortium. This initial coordination effort was a directed one, with the field of telecommunications chosen as the primary area of interest, because the most recent NWC contract with Perrin was in that area.

NWC accepted the lead-laboratory role (which Glass had also emphasized as appropriate) for the development and coordination of a DOD laboratory consortium for technology transfer.

Starting in mid-May, Linsteadt and Perrin visited and assessed the Rome Air Development Center, Air Force Cambridge Research Laboratory, Naval Air Development Center, and Army Electronics Research and Development Laboratory—all of which expressed interest in the technology transfer program. However, with the exception of the Rome Air Development Center, these laboratories had no ongoing formal technology transfer programs. The perceived reasons for the lack of transfer programs included lack of mission relevance, funds, and industrial support; and absence of DOD or service policy. There also were two objections by higher-echelon service management to such programs. With DDR&E support and NWC's groundwork, the establishment of a laboratory consortium became possible, even though funding was not available for these laboratories to support the activity.

These laboratories' interest in and enthusiasm for both the program and the development of a DOD consortium in participation with NWC allowed the planning and initial implementation to proceed, and subsequent visits to several Southern California DOD facilities had equally positive results. Efforts to bring the new technology transfer program to a broader audience continued throughout 1971 to 1974.



Chapter 3

THE DOD LABORATORY CONSORTIUM, 1971-1972

Shepherding the New Organization

Fred Nathan assisted Haskell Wilson in organizing sessions on science and technology for the national conference of the American Society of Public Administration (ASPA) in April 1971. Dr. Walter B. LaBerge, NWC Deputy Technical Director, chaired the overall meeting on science and technology, the first on the subject that ASPA had included in a national conference. As a result, NWC representatives established broader contacts and increased understanding and awareness of DOD and NWC initiatives in interagency and domestic technology transfer, and ASPA formed a Section on Science and Technology in Government, in which NWC representatives remained active. It was at this conference, too, that NWC's and eventually the DOD Laboratory Consortium's relationship with the National Science Foundation (NSF) was established.

At the ASPA conference, Leroy Marquardt, Fred Nathan, and George Linsteadt, all of NWC, met with Dr. Frank Hersman and Robert Crawford from NSF. The group explored the possibility of NSF supporting a DOD employee representing NWC and the DOD laboratories to effect liaison with other Government agencies. NSF expressed interest in supporting an NWC employee being detailed to NSF to serve as an interagency "linking agent."

By mid-1971, NWC, Edward Glass, and Perrin Associates had completed an implementation plan for a DOD consortium, and Linsteadt had submitted the plan to Wilson. The plan called for Perrin Associates to continue serving as transfer agents, with funding

Promising developments derived from contacts between NWC and the American Society of Public Administration (ASPA) at ASPA conference, 1971

Possible NSF support for a liaison agent to link NWC and the DOD laboratories with other agencies

NWC's approval of an organization plan for a DOD consortium

NWC's proposal of the plan to twelve R&D facilities at DOD, with an offer to help fund it

Favorable atmosphere for NWC's plan provided by congressional modification to the Mansfield Amendment

provided by the members of the consortium. The plan was approved by NWC management, and interested DOD laboratories received copies and an invitation to attend an organizing meeting at China Lake. The meeting also would be attended by Glass, representing DDR&E, and K. Guild Nichols, a Congressional staff member (House Committee on Science and Astronautics).

Representatives of 12 DOD R&D facilities met at NWC on July 1, 1971 to discuss the consortium concept and the implementation plan. Glass chaired the meeting, and the establishment of a laboratory consortium was formally proposed. The consortium would have two major objectives: a primary objective of transferring DOD technology to civilian agencies and a secondary objective of transferring ideas and technology between DOD laboratories. At that meeting, LaBerge indicated that NWC would help support a full-time staff person in Washington, D.C., to serve as a liaison between DOD and civilian agencies, and that the Center also was willing to help fund contracted transfer agents if that approach were chosen.

It also was noted at this meeting that the atmosphere appeared favorable for the proposed effort, especially in light of recent modifications to the Mansfield Amendment (Sec. 205). That amendment to Public Law 99-441 (Sec. 204) had been of significant concern to many of the laboratory technical directors because it (Sec. 204) specifically forbade the use of appropriated DOD R&D monies for activities without "a potential relationship to a military function or operation." The Mansfield Amendment had been used by several DOD laboratories as the rationale for not participating in technology transfer efforts—and for not obligating activity discretionary money to do so. The new section (Sec. 205), however, stated

It is the sense of the Congress that...

- ▶ an increase in Government support of basic scientific research is necessary to preserve and strengthen the sound technological base essential both to protection of the national security and the solution of unmet domestic needs; and
- ▶ a larger share of such support should be provided hereafter through the National Science Foundation.

The Mansfield Amendment caused enough concern for Glass and others in the DDR&E office that Glass requested Perrin Associates to contact Senator Mansfield's staff regarding the DOD technology transfer program. Mansfield indicated he would not object to the program, but that he did not want to see it used to prolong the life of a laboratory that no longer had a viable mission.

July 1, 1971 Meeting Launches DOD Consortium

The result of the July meeting was the formation of the DOD Technology Transfer Laboratory Consortium. The new organization was essentially an informal group endeavor funded largely by NWC discretionary money and directed toward demonstrating the efficacy of a multiservice-laboratory-centered program of active technology transfer. It was decided that the contracted transfer-agent concept would not be pursued immediately, but that Perrin Associates would be retained to support market research.

The laboratories and activities represented at that first meeting formed the core of the DOD Consortium. The Navy participants were the Naval Weapons Center, Naval Air Development Center, Naval Ordnance Laboratory, Naval Civil Engineering Laboratory, Naval Missile Center, Naval Undersea Research and Development Center, and Naval Electronics Laboratory Center. The Air Force participants were the Space and Missile Systems Office, Air Force Rocket Propulsion Laboratory, Air Force Cambridge Research Laboratories, and Rome Air Development Center. The Army participant was the Army Electronics Research and Development Laboratory.

Shortly thereafter, Harold Metcalf, an NWC employee who had been Director of Staff Training in ACTION (Peace Corps) in Washington, D.C., was selected to serve as the Center's representative to NSF. The assignment, commencing in September, was to be a 1-year detail in Washington as the "Technology Agent" for the DOD laboratories. Metcalf's role was to provide the stimulus, corporate knowledge, and communication that would help link the Federal civilian agencies with the DOD laboratories so that DOD technology and technological expertise could be effectively brought to bear to help solve domestic problems. The role of the Technology Agent

Senator Mansfield's conditional approval of a DOD technology transfer program

Formation of the DOD Technology Transfer Laboratory Consortium, July 1, 1971, with Perrin Associates retained to support market research

List of R&D facilities from the armed services participating in the first meeting of the DOD Consortium

Assignment of Harold Metcalf of NWC to NSF as "Technology Agent" for DOD Consortium, with responsibility for identifying both "pull" and "push" mechanisms for technology transfer

Consortium beginning as a demonstration project with Navy and Air Force endorsements

DDR&E's support of the NWC-NSF plan and its independent handling by the participants

Favorable GAO report in December 1972, of NWC's technology transfer operations, with favorable effects on DOD's policies concerning technology transfer

included the (1) identification and establishment of the "pull" mechanisms necessary to identify and effectively utilize the available DOD technologies and capabilities presented by the laboratory transfer agents, and the (2) identification and establishment of the "push" mechanisms and strategies necessary to attract the interest of potential technology users and to maintain the awareness of the transfer agents in considering technologies for domestic application. Metcalf's 1-year detail became a 3-year assignment.

Glass emphasized the need to begin with a smaller-scale initial effort as a demonstration and noted that, if such an effort were successful, official DOD policy on such a program could be forthcoming—making possible a full-scale, properly funded program with broad involvement and an official mandate. To help ensure the official backing that the program required, Glass and Perrin arranged for August and December 1971 memoranda from the Assistant Secretary of the Navy and the Air Force Director of Laboratories endorsing the DOD program and authorizing the laboratories to participate.

Navy Headquarters' interest in the program continued to increase. In August, Assistant Secretary of the Navy Robert Frosch expressed interest in the Navy laboratory technology transfer efforts to the DDR&E, and at the same time Capt. Gordon Smith, Special Assistant to the DDR&E for Domestic Action Programs, met with Hersman to discuss the proposed NWC-NSF joint venture. DDR&E supported the NWC-NSF plan, partly because it was viewed as experimental. DOD gave the project official support, although not in writing, and decided not to "get into the act," but to let the participants handle the project instead of risking any bureaucratic encumbrance.

By mid-September 1971, as Metcalf was settling in at NSF, the General Accounting Office (GAO) was conducting a study on the methods used by Government agencies, particularly DOD, to disseminate R&D results to other potential users. That same month, GAO personnel visited NWC to study the operation of its Technology Transfer Program, assess its accomplishments, and look into existing constraints on secondary application of Navy-developed technologies. GAO's investigation of NWC's technology transfer operations and the release of its findings in

December 1972 had positive effects on DOD's policies concerning technology transfer and transfer programs.⁷

During the same period, the first transfer efforts coordinated through Harold Metcalf and NSF were initiated. The first project involved assisting the National Institute of Law Enforcement and Criminal Justice, which wanted to use two Federal laboratories and one nonprofit research institution as "prime contractors" in a comprehensive R&D program for law-enforcement and crime-prevention equipment. The new DOD Consortium held a meeting to discuss the project, providing a basis for further Consortium activities.

During the first few months of his liaison detail at NSF, Metcalf provided interchange and discussed laboratory capabilities with a number of other civilian agencies, including the Environmental Protection Agency (EPA); National Oceanographic and Atmospheric Administration (NOAA), U.S. Department of Commerce; and Department of Transportation.

The Consortium met again on December 7 at NSF in Washington, D.C., and had 15 laboratories as official members. Linsteadt chaired the meeting, which revealed a great deal of interest in technology transfer activities by non-DOD agencies and organizations. Representatives of NASA, EPA, NOAA, and other non-DOD agencies/organizations attended the meeting. Capt. Smith of DDR&E's office affirmed the Navy Headquarters' interest in the program, but warned that forthcoming DOD policy on technology transfer might have stringent guidelines.

Policy Development and Recommendations for Technology Transfer Activities

Policy development and recommendations for increased Federal technology transfer activity were at an all-time high in the early months of 1972.

Smith had been directed by DDR&E to draft guidelines for discussion purposes, and these eventually led to the formation of official policy and guidance. Smith met with Sherman Gee of the Naval Ordnance Laboratory, John Keegan of the Naval Underwater Systems Center (NUSC), and Linsteadt and Metcalf to work out general guidelines for DOD policy on technology

First transfer project in 1971, with National Institute of Law Enforcement and Criminal Justice, coordinated by Metcalf

List of other civilian agencies in discussions with Metcalf during early months of the DOD Consortium

By December 1971, with fifteen laboratories in the DOD Consortium, high interest among non-DOD agencies but also the possibility of stringent guidelines in forthcoming DOD policy on technology transfer

The drafting of guidelines for DOD policy on technology transfer, based on the 1972 policy statement of the Federal Council for Science and Technology (FCST)

transfer. The DOD policy was to be based upon Federal Council for Science and Technology (FCST) policy. The FCST policy, entitled "Policy for Expanded Interagency Cooperation in Use of Federal Laboratories," which was approved on January 28, 1972, stated, in part, that interagency relationships should be

Consistent with existing laws and with established relationships with private industry, universities, and non-profit institutions. It is the policy of the Executive Branch that existing R&D capabilities in federal establishments be utilized effectively to define and solve decisions relating to some of the urgent national civilian needs, e.g., environment, pollution, transportation, health, housing, communications, agriculture and forest resources, water and land resources, and energy.

Based on a number of inputs, including the FCST policy, Smith developed a draft policy statement for the utilization of the defense laboratories for non-defense purposes and submitted the draft to DOD higher echelons.

The FCST document and other policies in effect at this time made it clear that the official policy of the Federal Government was that its laboratories were to be used to their maximum effectiveness and benefit for both mission and, wherever appropriate, non-mission programs.

In addition, the first draft of the GAO technology transfer review of NASA and DOD laboratories was completed in January and submitted for NASA and DOD review. DOD representatives met with James Wakeline, Assistant Secretary of Defense for R&D, to discuss closer cooperative working relationships between DOD and NASA activities and NSF. The GAO report, issued in December as *Means for Increasing the Use of Defense Technology to Meet Urgent National Civilian Needs*, recommended NSF as one of only two agencies warranting consideration as the location for a recommended technology transfer consulting team.

One of the most important policy considerations to emerge from the studies at the time was the recommendation, endorsed in both the FCST policy statement and the GAO draft report, that DOD positions engaged in technology transfer activities be exempted from agency personnel ceilings. Mandated personnel ceilings were an area of great concern to DOD activities, and individual activities

Federal Government policy concerning mission and non-mission programs represented in FCST document

NSF named as one of two possible locations for a technology transfer consulting team in GAO's technology transfer review

understandably showed great reluctance to dedicate essential scientific and engineering personnel to technology transfer efforts when those efforts did not appear to be directly mission related. The Office of Management and Budget (OMB) emphasized that there was no Federal restriction placed on personnel ceilings, but DOD had imposed and enforced the ceilings upon itself.

The proposal for ceiling relief called for flexibility in manpower ceilings when a Federal laboratory was asked to perform work within its areas of expertise for another Federal agency and when funding was to be transferred for that purpose. The importance of removing some of the personnel constraints was stressed among Metcalf, Smith, and Osmund Fundingsland of GAO in their discussions of the proposed technology transfer policy.

DOD and Navy Headquarters also discussed the ceiling-exemption proposal, which had been forwarded to OMB for endorsement. Dr. Joel Lawson, Director of Navy Laboratories, deemed the proposal to be unworkable and stated in late March that "The proposal that employees be temporarily assigned to technology transfer activities and to work for other government agencies be exempt from DOD personnel ceilings is attractive but is unworkable as personnel ceilings are now administered. This proposal will require some changes in the administration of ceilings before it can be implemented effectively."

In early 1972, DOD had determined that official policy on technology transfer was unnecessary because official policies and guidelines already in effect allowed the effort to be conducted in a sufficient manner. Instead of stated DOD policy, a memorandum of endorsement was written. It was based on the guidelines developed by Smith, the FCST Committee, and others which encouraged where appropriate the conduct of non-defense work by DOD laboratories. The memorandum, "DOD Policy for the Utilization of Defense Laboratories for Non-Defense Purposes," remained the DOD policy for some time, but in the Spring of 1972, the Navy issued an instruction on military-civilian technology transfer and cooperative development.

OPNAV Instruction 5700.13, "Military-Civilian Technology Transfer and Cooperative Development," was issued March 17, 1972 to implement SECNAV Instruction 5700.14 of February 28; the OPNAV Instruction designated the Chief of Naval Material

DOD's policy of imposing its own ceiling limits within its agencies for personnel assigned to non-mission programs, despite more lenient Federal restrictions

The importance of relief from personnel ceilings, an issue in drafting guidelines for DOD policy on technology transfer

The proposed exemption from personnel ceilings, as currently administered, deemed unworkable by the Director of Navy Laboratories

In early 1972, a memorandum of endorsement from the Navy, instead of a specific DOD policy on technology transfer

The Navy's OPNAV Instruction 5700.13, in March 1972, designating an agent for "military-civilian technology transfer and cooperative development matters"

(CNM) to act for the Chief of Naval Operations (CNO) "as the responsible agent for the execution of military-civilian technology transfer and cooperative development matters." OPNAV Instruction 5700.13 also created within the Naval Material Command (NAVMAT) the position of the Director of Military-Civilian Technology Transfer and Cooperative Development, a position with broad responsibilities for surveying, evaluating, and identifying potential areas of technology transfer, and for establishing liaison and cooperation with government, industrial, and academic activities. Additional guidance was planned, but it never materialized, and implementation instructions were left to individual activities.

Science and Technology Partnerships: Federal Laboratories Can Help Solve Domestic Problems

The inability of many laboratories to accept proposals because of DOD's personnel constraints, despite promising discussions

During the Spring of 1972, Metcalf reported, "A lot of business, but none for profit—yet." The Consortium's contacts grew, and potential cooperative ventures were discussed and negotiated with everyone from the EPA to the Stanford Research Institute. Most of the work through the Consortium at this time was review, consultation, and discussion. Some low-level funded activity was taking place at some centers and laboratories, but personnel constraints still stood in the way of many laboratories' abilities to accept proposals for "outside" work—funding aside.

Two events in 1972 supporting technology transfer: President Nixon's message to Congress on science and technology and a resolution by the National Action Conference on Intergovernmental Science and Technology

In addition to the FCST policy recommendations and the GAO report on using Federal laboratories, two other activities highlighted the necessity of bringing the resources of the Federal laboratories to bear on solving urgent domestic problems: President Nixon's message on science and technology delivered to the Congress on March 16, 1972, and the National Action Conference on Intergovernmental Science and Technology's resolution on June 21-22, 1972.⁸

Support by the National Action Conference for utilizing Federal laboratories to help solve domestic problems

The National Action Conference on Intergovernmental Science and Technology was held in Harrisburg, Pennsylvania, on June 21-22, 1972, and attended by 200 representatives of Government, academia, and industry. The conference objective was to help develop a science and technology partnership between Federal, state, and local governments. The conference selected six specific resolutions—evolved through workshop/participatory sessions—supporting concepts and/or

efforts that were deemed to have high potential for immediate benefit. One of the resolutions adopted was for the utilization of Federal laboratories in helping solve domestic problems. The resolutions were forwarded to those agencies that had the power to act upon them.

The Harrisburg conference was only a beginning, but it served as a notice to the Federal Government RDT&E establishment that state and local governments would be looking increasingly toward the Federal laboratories for active assistance and leadership in solving pressing domestic problems—regardless of the stated mission of a given laboratory. Further, since the DOD Consortium liaison activity was located within the Office of Intergovernmental Science of NSF, it was logical that the DOD laboratories (including those not as yet members of the Consortium) should be increasingly considered as technical resources for state and local governments looking for technological solutions to their various problems.

Government Grants Establish Non-Federal Programs To Promote Technology Transfer from Federal Laboratories

Assistance had already been offered to some state and local governments and activities at the time of the Harrisburg conference, but still on a limited scale and still without widespread awareness and participation.

To help increase the awareness and the utilization of available Federal laboratory resources, NWC proposed the concept of establishing an active multi-laboratory technology transfer effort targeting the State of California. Other Federal agencies also became more involved in state programs, and NSF-sponsored projects continued to help spread Federally developed technology to a broader base. For instance, NSF and NASA sponsored the "Four Cities" program, which helped transfer aerospace technology to municipal governments.

The California and the Four Cities programs used government grants to establish non-Government activities to promote technology transfer from the Federal laboratories. This was an important step in providing visibility for the transfer programs and in avoiding real and perceived problems caused by personnel ceilings and vague Headquarters guidance.

Alerting the Federal Government RDT&E establishment, through the National Action Conference resolution, of the expectations of state and local government

Two initiatives: a statewide technology transfer program in California, proposed by NWC, and the "Four Cities" program of NASA and NSF

In both programs, visibility for technology transfer and concern of personnel ceilings

The nonprofit Public Technology, Inc. (PTI), funded by local government subscriptions to broker technology transfer

Initiation of the Massachusetts Technology Exchange (MTE) for bringing state government, academic, and industrial technology resources to the attention of small business firms

At the DOD Consortium meeting, in July 1972, discussion of manpower constraints and possible authorized increases

Another organization, Public Technology Inc. (PTI), was formed from the Technology Application Program as a nonprofit organization sponsored by various cities and funded by subscriptions from local governments. PTI was established to act as a broker between technologists and potential users. As one of its early efforts, PTI used an NSF grant to establish an Urban Technology Clearinghouse to help apply existing Federal technologies to pressing urban problems.

The Massachusetts Technology Exchange (MTE) was another organization established about this time. Funded by NSF and the state, MTE's purpose was to integrate the state's government, academic, and private-industry technology efforts and requirements with existing Federal technologies, and to bring available technologies to the attention of small entrepreneurial firms for exploitation. MTE's first exchange workshop was held in late April—with a DOD Consortium member providing a potentially marketable technology to help start the effort.

Personnel Constraints Remain Consistent While the Consortium Matures and Its Activities Expand

By the next meeting on July 11-12, 1972, the DOD Consortium had 17 members. One of the prime topics of discussion was manpower constraints. Smith noted that the laboratories had been turning down about fifteen percent of their overall work because of those constraints, and he asked for examples of cross-agency work that had been refused due to personnel problems. Only 200 man-years of effort were authorized for technology transfer in fiscal year 1972. Smith discussed efforts to get further authorizations for technology transfer work. He also emphasized the need for Consortium members to carefully screen potential nonmilitary work for appropriateness and to help ensure the earliest possible industry involvement in those transfer efforts. Headquarters support for manpower increases for transfer activities was improving at the time; DDR&E had requested 400 man-years for fiscal 1973 from OMB, and Smith said that by fiscal year 1974 up to 600-700 man-years might be available to support technology transfer.

At the July meeting, RAdm. T.D. Davies, Deputy Chief of Naval Material for Development and newly appointed Navy Director for Technology Transfer, distributed the NAVMAT Instruction on technology transfer (NAVMAT Instruction 5700.2, implementing OPNAV Instruction 5700.13) and stated that the transfer representatives at RDT&E facilities would be half- to full-time positions—a level of effort that was supported in CNO, NAVMAT, and Congressional offices. Activities' overhead funds would support these positions.

Appropriate methods and avenues for "marketing" the resources of the Consortium members, relief from personnel restraints, and the problems associated with the transfer of classified information of high potential value to the solution of public or industrial problems were other issues being addressed by the Consortium. It was also noted at this meeting that the Atomic Energy Commission (AEC) laboratories were beginning to emphasize technology transfer.

The base of interest in the activities of the DOD Technology Transfer Laboratory Consortium continued to grow rapidly, and during the July meeting there were portents of the movement toward a broader-based consortium of Federal laboratories. That meeting was attended not only by representatives of DOD and Navy Headquarters, but also by NASA, AEC, EPA, National Institutes of Health (NIH), Department of Transportation (DOT), Department of Commerce (DOC), and PTI and MTE. DOC was proposing to establish its Experimental Technology Incentives Program at the time, and representatives requested that DOC be made an *ex-officio* member of the Consortium; its status as "unofficial observer" was agreed upon, and a formal meeting invitation was promised—along with whatever assistance the Consortium could provide. No official membership status was conferred to DOC at this time. Several attendees requested that a "Federal Laboratory Task Force" be formed consisting of DOD, NASA, AEC, DOC, and other laboratories concerned with transfer efforts, but the Consortium members showed little interest in the notion, noting that there was no common area of interest aside from technology transfer and that the DOD Consortium members "at least have the same boss." Linsteadt later commented that the task force idea would have been more feasible—and far more acceptable—if the other agencies had had organizations similar to the DOD Consortium.

Distribution of NAVMAT Instruction 5700.2, authorizing half- to full-time positions at RDT&E facilities for the purpose of technology transfer

Also discussed at the Consortium meeting: marketing the laboratories' resources, relief from personnel restraints, and transfer of classified information

Growing interest among other agencies in expanding the base of the DOD Consortium

Transfer of technology in the field of inventory and plant-accounting to the New York City Police Department, funded by NSF and monitored by Metcalf

Potential fragility of DOD partnerships with the NYPD, and with civilian agencies, demonstrated by an attack from the press

A significant Consortium milestone occurred in July 1972 when the New York City (NYC) Police Commissioner requested direct assistance from the Consortium. This was the first time a very large city had requested laboratory assistance, and in September, Metcalf and representatives from five Consortium laboratories met with the NYC Deputy Police Commissioner and his division chiefs. The discussion focused around a cooperative effort to assist the City's in-house R&D program for new law-enforcement and crime-prevention equipment. NSF funded the initial effort with a \$50,000 grant arranged by Hersman, and Metcalf monitored it. One of the original objectives of the project was to transfer some advanced crime prevention and apprehension technology, but when the early laboratory proposals made it to the Deputy Commissioner's level, he made it clear that NYC didn't need any better methods of apprehending criminals—they had no place to put them as it was—but that they needed major help with their inventory and plant-accounting system. The project, therefore, began with "low-tech" transfer, but it quickly resulted in high-dollar savings for the City of New York. As a result of that initial contact, the Naval Underwater Systems Center supported the New York City Police Department's (NYPD) accounting program for many years thereafter.

An interesting aside to the Consortium-New York relationship illustrating the potential fragility of civilian agency-DOD partnerships—and demonstrating Smith's considerable public-relations ability—began with the "discovery" of the DOD-city partnership by the *Village Voice*. Because of Vietnam, the country's antiwar, antimilitary sentiment was still running high in 1972, and the *Voice*, championing that sentiment, learned of the defense laboratory-NYPD partnership and responded with a story protesting the relationship as yet another precursor of the consolidation of a "police state." This, of course, created some unpleasant public-relations problems for NSF as well as DOD and NYPD. The future of not only the New York City partnership but also of the entire Consortium was threatened when Smith stepped in to defuse the bad-press bomb. Later, Metcalf wrote to Linsteadt that, "For a moment I felt as if the future of the program was hanging by a thread, and as monitor of the [NSF] grant [for the NYPD project], that I was about to be hanged."

The NYPD experience was not, however, the Consortium's first cooperative venture with a law-enforcement agency. Metcalf and NWC had been working with the Law Enforcement Assistance Administration (LEAA) of the Justice Department, and the Four Cities program had provided assistance to the Police Department of Pasadena, California.

The increased interest in the Consortium's activities and the visibility for them were reported to NWC by Metcalf in July 1972. This is especially true with reference to the relationships established with DOC and LEAA, and the rapidly increasing interest of the private sector. However, Metcalf stated in his report that the same critical stumbling block continued to remain in the Consortium's path:

Opportunities for technology transfer projects are presenting themselves from a number of different sources. The past several months of promotion and marketing by the DOD Consortium is beginning to pay off. Unless some resolution of the manpower issue is found soon, we will have to turn down some very significant programs.

By the November meeting, the Consortium had grown to 21 members, primarily from the Navy. The Consortium also had initiated what would become a quite productive series of seminars for the civilian agencies. The Consortium-sponsored Management Control System Seminar, conducted at the Environmental Protection Agency, laid the cornerstone for further seminars and DOD-activity support of management innovations in other agencies.

The meeting revealed a significant high-level interest in the Consortium's activities. Smith reported that Defense Secretary Laird had been briefed on the subject of technology transfer and the specific problems associated with DOD's program, including manpower constraints on technical personnel, the lack of program coordination within the civilian agencies, and the lack of an effective system within DOD for getting technological innovations into the commercial market.

DOD now *officially* wanted to know just what its Technology Transfer Laboratory Consortium was doing, and the necessity for high visibility "up the line" was stressed. Now the member representatives were expected to keep Metcalf in Washington

Other arrangements in which the DOD Consortium worked with law enforcement agencies

Amidst growing interest in the Consortium's activities, Metcalf's concern over the need to resolve the manpower issue

Initiation of a promising series of seminars for civilian agencies

The briefing of Defense Secretary Laird on the program's problems: manpower constraints, lack of coordination among civilian agencies, and lack of a system for engaging the commercial market

The Consortium's need for developing a high visibility in upper management within DOD

Operational decisions at the Consortium meeting, November 1972, including the chairmanship, bureaucratic encumbrance, and a statement of goals and general operating principles

Drafting and reviewing an operating policy, emphasizing the Consortium's informal nature, focusing on communication, and avoiding competition with private industry

apprised of all technology transfer activities and projects going on in the individual laboratories. The laboratories also were encouraged to write a letter directly to Secretary Laird to inform him of successful DOD transfer activity program results.

At this time, too, the Consortium was taking further steps toward a broader-based and more refined organization. For instance, members explored methods by which the Consortium could pull together the similar, but rather fragmented, technology transfer programs pursued by various civilian agencies, and they examined the Consortium's mode of operation in detail. During the November meeting, the Consortium agreed upon the following three operating principles:

- ▶ At the time, it would be inadvisable to rotate the chairmanship, so George Linsteadt, NWC, should keep it;
- ▶ An official organizational charter should be developed; and
- ▶ "Bureaucracy" should not be allowed to creep into the Consortium's operations.

There was, however, some disagreement about the second point, since it seemed that, by its nature, a formal, signed charter would only hasten the advent of the very bureaucratic encumbrances that the Consortium was determined to avoid. Therefore, the majority of the membership eventually agreed to develop an unsigned "charter" that would simply state the Consortium's goals and objectives and set forth the general operating principles of the organization.

Consortium members quickly wrote the draft charter; Smith and Metcalf reviewed it and made changes early in 1973. In February 1973, Linsteadt circulated to DOD Consortium members the proposed, unsigned, Consortium "Operating Policy" consisting of very general statements emphasizing the Consortium's "informal" nature, its focus on communication, and its policy of avoiding any competition (real or perceived) with private industry. The purpose of the Consortium was set out as

" . . . coordinating interactions with other Federal Agencies and technology users at federal, state, and local level, and coordinating civil sector work being performed for others." The "main thrust" of Consortium activity emphasized technology transfer through "person-to-person mechanisms."

By the end of 1972, the DOD Consortium had considerable visibility within DOD, and in most of the rest of the Federal Government, but the members still faced the same manpower and coordination problems they had faced previously. Further, although the liaison effort between the DOD Consortium and NSF was working out as well as anyone had anticipated, Metcalf found himself working more for NSF and commensurately less for the Consortium.⁹ The one-man liaison office was stretched rather thin, and NWC began to consider alternatives.

Status of the Consortium by the end of 1972: high visibility within and beyond DOD, but difficulty over problems of manpower and coordination

The NWC Technology Utilization Office (TUO) continued to operate while the DOD Consortium developed. The second-year review of the TUO's efforts showed an increase in funding and the attainment of significant funding agreements from outside agencies, including \$158,000 from the Federal Railroad Administration for testing, and \$150,000 from the FAA for warm-fog-clearing experiments. The review noted that the TUO had only "average success" in bringing funded civilian-agency work to the Center, but that it had been "quite successful" in its involvement with the fledgling DOD Laboratory Consortium. Linsteadt stated in 1972 that the process taking place between the TUO and the civilian agencies was more "cooperative development" than actual "technology transfer." He had, however, sought and managed to maintain a leadership role for NWC in the DOD Laboratory Consortium, and this involvement was increasingly cited in his program reviews as a demonstrated success.

Under Linsteadt's direction, NWC's emphasis on cooperative development with civilian agencies and its leadership in the DOD Consortium

In December, GAO released to Congress its report on the utilization of defense technology for solving national problems. The report cited NWC as the first DOD laboratory to demonstrate a successful active technology transfer program and recommended the establishment of formal policies and guidelines for active technology transfer, and for ceiling exemptions for personnel assigned to transfer activities and other tasks for which costs were reimbursed by other agencies.

The GAO's report to Congress, December 1972, citing NWC's successful demonstration of active technology transfer and recommending formal policies, including ceiling exemptions



DOD LABORATORY CONSORTIUM HOLDS ANNUAL MEETING AT CRANE

DOD Laboratory Consortium on technology transfer held its annual meeting at NAD Crane, 15-17 May. CAPT McARTHUR welcomed the 30 participants who shared ideas and presented summations of efforts to meet energy, crime, health and welfare, safety and environmental protection demands in the civilian sector.

"The Consortium, which as originally formed by Naval Research labs in 1971 to interact with other federal agencies and technology users at federal, state, and local level, works as an unstructured affiliation emphasizing individual cooperation," Mr. George Linsteadt, chairman, explained. Today, over 24 Navy, Army, and Air Force activities participate and are funded over \$11 million for their efforts. NAD Crane joined the consortium in 1972 with projects for NASA, HEW, Departments of Transportation and Interior, FAA, Environmental Protection Agency and State of Indiana.



Pictured from L to R, Row 1: Harold Metcalfe, National Science Foundation; H. E. Tillitt, NAVMAT; James Jolly, Naval Postgraduate School; David Birnbaum, NADC; Robert Seebold, Naval Research Laboratory; Gerald Miller, NELC; Stanley M. Fasig, R&D; CAPT Richard L. McARTHUR; CAPT Gordon SMITH, Pentagon; Russell Shelton, Aberdeen Proving Ground; Bob Cravens, R&D; Andrew Assur, Army Cold Regions Research and Engineering Laboratory; Fred DiMaggio, Rome Air Development Center. From L to R, Row 2: George Linsteadt, NWC China Lake; William McKenney, NWL Dahlgren; Howard Haglund, National Science Foundation; MAJ Gordon GOFF, Army Materiel Command; George Krudvatez, Department of Commerce; Sigmund Ecthaus, Edgewood Arsenal; Jerome Bortman, NADC; Sherman Gee, NOL White Oak; William Lawrence, Air Force Rocket Propulsion Lab; Steven Bullock, Naval Coastal Systems Laboratory; E. H. Early, Naval Civil Engineering Laboratory. Not Pictured: Joseph Antinucci, Naval Underwater Systems Center.

Chapter 4

THE DOD LABORATORY CONSORTIUM, 1973-1974

Making Way for the Federal Laboratory Consortium

The Consortium had been moving steadily toward a broader, better coordinated program, and in early 1973, NWC took a major step toward establishing a program that operated on a more expansive Federal level.

Linsteadt suggested to Dr. G. W. Leonard, the head of the Propulsion Development Department (where Linsteadt's Technology Utilization Office was located), that Metcalf's function in NSF should be transferred to the Department of Commerce, since it had been pursuing the possibility of a joint technology transfer program with the Navy. Linsteadt felt that an Office of Technology Transfer in Commerce would create a more productive liaison effort with Federal agencies across the board. He also was concerned that under the present structure, the Consortium's interagency liaison and its coordination depended upon a single individual:

The DOD Consortium presently depends upon the services of one individual that, although his salary is paid by NWC, works only part-time on Consortium affairs. If Metcalf decided to retire in the near future, it is this writer's belief that NSF would not invest its own funds for his replacement. The Consortium should depend upon the services of an established office, rather than one man. Since the DOC is making overtures to the Navy regarding a joint technology program, it appears to at least have interest. Metcalf has

Linsteadt's proposal to broaden the institutional base of the DOD Consortium by transferring Metcalf's function at NSF to the Department of Commerce (DOC)

Representative Goldwater's lack of response to a proposal for the institutional change

The possibility of locating the DOD program in the Office of Intergovernmental Science and Research Utilization at NSF, and the possibility of competing with NSF's Research Applied to National Needs (RANN) Program

Linsteadt's conversations with NSF representatives, and his letter to Guyford Stever, Director of NSF, about placing the experimental program in a permanent location

concluded with these thoughts and would transfer his activity to DOC if the opportunity presents itself.

Charles Johnson of Charles A. Johnson Associates, a contractor to NWC, drafted a proposal for establishing an Office of National Technology Transfer within DOC. The draft was submitted in December 1972 to Representative Goldwater of California, but unfortunately, it was never considered by the Congressman's office. This thwarted efforts by NWC and the Consortium to consolidate operations. Instead, they focused on improving coordination, and in finding a permanent, official home for the Consortium liaison function.

Continuing to house the DOD program in the Office of Intergovernmental Science and Research Utilization of NSF was a possibility. However, this office was in the Research Applied to National Needs (RANN) Program, which had the primary mission of marketing NSF applied research products to the world. Up to this time, RANN had little direct success. In contrast, the DOD Consortium had offered more than \$10,000,000 worth of funded work to civilian agencies and state and local governments during fiscal year 1972, and consequently, RANN saw the Consortium as a direct competitor. The NSF Director, Dr. Guyford Stever, however, supported the Consortium, so the Office of Intergovernmental Science and Research Utilization didn't make too big an issue about competition.

In early March, Linsteadt contacted Hersman, NSF, regarding the relationship between the Consortium and the Foundation. Linsteadt expressed the desire to see Metcalf's liaison function institutionalized in an office backed by an official charter. Metcalf had announced his retirement at the end of the fiscal year, and the concerns of the Consortium relative to its entire liaison operation being vested in a single person came to the fore—along with the fact that the current situation left the Consortium's only representative spread very thinly across a broad base of projects. Later that month, Linsteadt met again with NSF, this time with Deputy Director Raymond Bisblinghoff, to continue discussions on the future of the Consortium at the Foundation. Linsteadt reiterated the Consortium's positions and concerns, and Bisblinghoff suggested that these be communicated directly to Stever. A letter to Stever was drafted for signature by Dr. John Foster, DDR&E, who either declined to sign it or never saw

ii. The letter, which was eventually signed by Linsteadt after the incorporation of some further recommendations, stated in part, that the Consortium felt

It is necessary, for the continued success of the DOD Technology Transfer Laboratory Consortium, to establish within the charter of either an existing or recently established office the responsibility now performed by [the] present Federal Program Manager [Metcalf]. With the proposed increase in responsibility charged to NSF by the President [of the United States], maybe now is the time to look at the DOD Consortium and judge its worth. If it is felt that bringing the resources of the DOD Laboratories to bear on urgent national problems is of value, and if the present experimental program has indicated expected success, then permanent location of this program should be found for its continued coordination.

George Linsteadt's signature may not have carried as much instant clout as John Foster's, but Stever and NSF got the point.

Although the letter was forwarded in June, it was not until October that Stever responded. Stever admitted that he recognized the need to review the overall effectiveness of Federal technology transfer programs and that he had placed the issue on the agenda of the FCST to determine what action was required by the Federal Government. Stever's response was also very clear regarding furthering the official technology transfer effort: "It is my intention that the Federal Council for Science and Technology (FCST) will be intensifying its efforts to encourage the development of new policies to facilitate the transfer of technology from federal laboratories to the civilian economy." A meeting was scheduled for October 23, 1973 to discuss these issues and recommend actions.

Meanwhile, the Committee on Federal Laboratories (COFL) drafted three documents with the intent to set Federal Government Executive Branch scientific policy relative to laboratory utilization. COFL sent them to Dr. D.V. DeSimone, the FCST Executive Secretary, and to Dr. Richard Roberts of NBS, the COFL Chairman. At the suggestion of DeSimone, G.E. Auman, COFL Executive Secretary, drafted a "Science Policy Statement" to be issued jointly by Stever and Roy Ash, the Director of OMB. He also wrote an OMB Circular to officially reference and implement the policy and a press release to

The subject of finding a permanent location for the Consortium referred by Stever to the FCST for discussion at its October 1973 meeting

Documents drafted by the Committee on Federal Laboratories (COFL) for the FCST meeting, including a science policy statement, an OMB Circular to implement it, and a press release

Activities of the Consortium and recommendations of COFL reviewed at the FCST meeting on "Intergovernmental Uses of Federal R&D Centers and Laboratories"

Summary of a proposed Federal Laboratory Utilization Policy, as drafted by COFL

accompany the science policy statement. A COFL task force continued to work on a draft policy statement until its unveiling at the October meeting.

The October 23, 1973 meeting on "Intergovernmental Uses of Federal R&D Centers and Laboratories" was a significant one. It presented the activities of the DOD Technology Transfer Consortium and the COFL policy-making task force and laid out the recommendations of FCST, the DOD Consortium, and the Council of State Governments regarding the broader use and utility of the Federal laboratories.

Stever opened the meeting, which was attended by high-level representatives of the NSF and other Federal agencies, including the Science and Technology Policy Office (STPO) and representatives of several public-interest groups. Roberts followed with a presentation on the proposed Federal Laboratory Utilization Policy:

The COFL Task Force dealing with technology transfer and assistance has identified a number of ideas that it plans to consider as a basis for possible specific future action. Briefly, some of them are:

- ▶ To seek specific legislation authorizing and funding agency technology transfer responsibilities.
- ▶ To promote well-planned, periodic open house programs by the Federal laboratories to acquaint regional potential users with their resources.
- ▶ To aggressively promote exclusive patent licensing arrangements for use of Government-owned patents.
- ▶ To push for increased funding and use of the Intergovernmental Personnel Act.
- ▶ To sponsor a suitably structured and oriented symposium in the Spring of 1974 to explore or to promote appropriate aspects of technology transfer.
- ▶ To establish a central technology transfer contact and responsibility in every agency and also a central focal point for the Federal Government.
- ▶ To design an appropriate system for categorizing information for ready reference and exchange.

There were no real surprises in the COFL recommendations. The language of the proposed policy was straightforward and reflected most of the principal concerns of the Federal laboratory technology transfer agents.

Also at the October meeting, William Carey, Vice President of Arthur D. Little, Inc., summarized a report (produced under the direction of Carey) of the Council of State Governments, *Intergovernmental Uses of Federal R&D Centers and Laboratories*, including recommendations for action. The report's recommendations were very much in line with the thinking of COFL and the Consortium. However, its recommendations concentrated on OMB, requiring it to take actions ensuring appropriate organization, funding, and staffing in line with the Presidential message on the utilization of the Federal laboratories as national resources. The report also stressed the need for face-to-face exchange between technology developers and potential users and called for the establishment of pilot programs on a regional basis to serve as a foundation for a broader program. This report also included a "Matrix of Utility of Selected Federal Laboratories Relative to Priority Needs of the States" (see Appendix A) that provides an excellent picture of the areas in which the Federal Government laboratories—especially the DOD activities—could contribute to the public.

This brief report, aside from helping to legitimize the concept of a Federal laboratory consortium, also was used to generate Congressional interest and awareness concerning technology transfer activities. Some 500 copies of the executive summary of Carey's report were reprinted and, with Hersman's blessing, mailed to selected Senators and Representatives.

The October meeting also served as a forum for reviewing the DOD program and making recommendations for further action to the senior NSF personnel. The Consortium's concerns and recommendations were very similar to those expressed in the COFL policy draft and the Council of State Governments report, although directly tied to the concerns of the DOD laboratories. Issues involving manpower (ceiling constraints), funding, and continuity of coordination and objectives were of primary concern. *It was also at this meeting that Smith first suggested to a broad audience that the DOD Consortium could profitably be expanded into a Federal laboratory consortium.*

Presentation at the FCST meeting by the Council of State Governments, confirming COFL's recommendations and specifying OMB's responsibilities

Distribution of the Council of State Governments report to selected members of Congress

Also at the FCST meeting: discussion of ceiling constraints, funding, and coordination, and the first broadly public suggestion of a Federal laboratory consortium

The effectiveness of the symposia, open-house programs, and seminars coordinated by Metcalf during 1973

Some examples of the participation of civilian agencies in these programs

Heightened public interest in the possibilities of using DOD laboratory assistance to solve national problems

Promoting the Federal laboratories through symposia and "open-house" type programs, as stressed by the COFL policy proposals, had already proved effective. During 1973, Metcalf's liaison efforts for the DOD Consortium had been conducted entirely within the civilian agencies. A large part of his effort was devoted to developing seminars that shared the experience and techniques of the DOD laboratories with the civilian agencies, and to increasing general awareness of the capabilities of the DOD activities. For example, several DOD laboratories were involved in environmental quality programs, and Metcalf pursued liaison with EPA to inform that agency of the expertise available within DOD. One area of interchange with EPA was the Consortium-sponsored Management Control System Seminar held in 1972 and mentioned earlier.

In 1973, EPA implemented Management Control Systems, and as a result, a number of other civilian agencies [notably the U.S. Postal Service; Department of Health, Education, and Welfare (HEW); National Oceanographic and Atmospheric Administration (NOAA); and Bureau of Mines] began to show interest in Consortium-sponsored seminars and symposia. Further, in June 1973, Metcalf planned and coordinated a seminar on preventive maintenance and maintenance management—an area in which much expertise existed within the DOD activities, and one in which there was relatively little experience at the time within the civilian agencies. The Consortium, the Navy Department, and the Pennsylvania Technical Assistance Program (PENNTAP) sponsored the seminar which was so successful it became the first of a multi-year series of Consortium- and Navy-sponsored maintenance seminars for the civilian agencies and the public sector.

By the end of 1973, the public sector and the various civilian agencies showed more interest than ever in the activities of the Consortium and in the possibilities of using DOD laboratory assistance to solve national problems. The direct interaction between the DOD laboratories and the public sector had increased significantly, and PTI's Urban Technology System program was operational—relying upon the Federal laboratories for technical consultation and support.

Even though the civilian agencies and the public sector displayed new interest in using the DOD R&D activities to help solve national problems, the members of the Consortium were still constrained by DOD restrictions on their "outside" efforts. Money, manpower, and "mission-appropriateness" remained prime, and unsolved, issues.

Clear Guidance and Appropriate Coordination Between Government and Industry Technology Transfer Needed

In January 1974, FCST held a special meeting to inform its members on the various Federal agency activities in transferring Federally developed and exploited technologies to state and local governments and to private industry. Stever addressed the group and again stressed the need for interagency technology transfer as well as external transfer. At this meeting, the FCST established an action committee on domestic technology transfer chaired by Al Linhares of DOT. At this point, the real and perceived restrictions on DOD laboratory participation in civilian-agency/industrial technology development and application efforts became a major area of concern outside of Defense, and the lack of both clear guidance and appropriate coordination between the Federal Government and industry regarding technology transfer was becoming very clear.

In the midst of the earlier policy- and recommendation-making and other activities, Stever tasked the Science and Technology Policy Office (STPO) to analyze the roles of the various Federal laboratories and their parent organizations in the technology transfer process. STPO reviewed the activities of the DOD Consortium and the members' presentations regarding their support to state and local governments. Thomas Wellington gave a preliminary report of STPO's analysis to the Consortium members at its mid-November meeting at the Naval Electronics Laboratory Center. STPO's analysis defined four levels of activity possible for Consortium involvement with state and local governments:

- Ad hoc consultation (evaluations, referrals, quick fixes);
- Task-type engineering (off-the-shelf adaptations, intermittent commitments);

But also the continuing burden of DOD restrictions on money, manpower and mission-appropriateness

DOD's restrictions on laboratory participation in technology transfer, a major concern at the FCST meeting in January 1974, with calls for action

Analysis by the Science and Technology Policy Office (STPO) of the Consortium's involvement with state and local governments, specifying four levels of activity

The National Academy of Engineering (NAE) report on technology transfer and utilization, in February 1974, criticizing allocations of money and emphasizing the need for more effort on active transfer

Warning and cautions from Smith, at the May 1974 Consortium meeting, concerning DOD's personnel restrictions and the issue of "appropriateness" in undertaking all projects

- ▶ Continuing services (formal support or service agreements); and
- ▶ Product development (actual development agreements).

STPO warned that each level of increased involvement had increased potential for conflict (regarding both the intent and the interpretation of some regulations), and members were warned to avoid even the semblance of competition with industry at any of these levels.

In February 1974, the National Academy of Engineering (NAE) issued its report and recommendations on technology transfer and utilization. The NSF-sponsored NAE report, *Technology Transfer and Utilization: Recommendations for Redirecting the Emphasis and Correcting the Imbalance*, was critical of the overall approach of the Federal agencies to technology transfer:

"Although federally-funded research and development totaled \$17 billion in FY 1973—of which nearly \$1 billion went into the collection, processing, and dissemination of information about the resulting technology—only \$43 million (or 0.25 percent of the total R&D budget) was spent to stimulate substantial and profitable secondary uses of the technology. . . ."

The NAE recommendations, echoing the concerns of the Consortium and the 1972 GAO report, emphasized the need for more active technology transfer efforts . . . for "*shifting the focus of federal concern from simply telling . . . about promising technologies to actually transforming technical information into ultimate uses . . .*" The recommendations included calls for appropriate incentives—such as "seed money" and marketing assistance—and a reminder that the Federal Government must not become a competitor with private industry.

At the May 1974 meeting of the Consortium, Smith informed members that DOD remained concerned about personnel restrictions. Personnel and money—internal as well as external funding commitments—were interrelated concerns, and committed funding would not result in increased manpower for the laboratories. The Department continued to support the civilian agencies, but Smith warned the laboratories to concentrate on short-term projects and to stay away from

high-dollar, long-term commitments. He also cautioned the Consortium members to be acutely aware of the issue of "appropriateness" regarding every project they pursued; projects should be mission-related, and not even appear to be in competition with private industry. Most importantly, though, was Smith's report on the "legality" of DOD technology transfer activities.

Smith had obtained an informal ruling from the DOD General Counsel on the Consortium's activities in light of the Mansfield Amendment, which was still being used by some to justify nonparticipation with the claim that the Amendment made DOD technology transfer efforts "illegal." The General Counsel's ruling was that these efforts were, indeed, perfectly legal under the Mansfield Amendment. However, the laboratories could not use R&D "seed money" for transfer programs, and funding for developing project proposals or for adaptive engineering projects had to be considered individually to determine potential DOD applications.

The expansion of the Four Cities Program into the California Innovation Group, with Del DelaBarre as president, was also announced at the May meeting, and the outlook for further cooperative efforts within the state appeared to be growing even more positive. More—and more productive—contacts with industry were reported. However, state/federal technology transfer cooperation was soon to become complicated to the point of virtual extinction.

Some circles, including the DOD Consortium itself, voiced a concern that the Consortium essentially had ignored technology transfer efforts with private industry. This perception resulted from the lack of active outreach efforts by the DOD laboratories, which resulted from the lack of guidance on how to work with industry in such endeavors. The minimal guidance on DOD/civilian-agency interaction (complicated as it was by manpower, funding, and mission-appropriateness issues; management reluctance; and responsibility uncertainties) caused confusion and consternation for the laboratories actively engaged in technology transfer. Relations with industry were often far more "touchy" than relations with the civilian agencies because all government/industry relationships were, and still are, covered by a daunting body of regulations, instructions, and standards

DOD General Counsel's favorable ruling of Consortium activities in light of the Mansfield Amendment, but its caution over using R&D seed money for technology transfer

Establishment of the California Innovation Group, with Del DelaBarre as President, despite impending complications in transfer cooperation

Growing concern over not including private industry in transfer activities, and the reasons for this omission

concerning technical, contractual, and organizational obligations. Without specific guidance on the subject, active technology transfer efforts with private industry were perceived as rather risky. As Linsteadt put it, "Rather than become involved [with industry] and take the chance on finding out you were doing something wrong, it was easier for you to assume that industry was not interested in the DOD lab system." But that was not the case.

Despite Concerns, Industry Organizations Establish Relationships with Consortium

Industry still expressed interest in DOD technology transfer despite the absence of clear guidelines and the concerns over the legalities.

The National Security Industrial Association (NSIA), as it became more aware of the role of the DOD laboratories in technology transfer, had sent Max Magner, the Chairman of the NSIA Research and Engineering Council, to the office of DOD's DDR&E to obtain some guidance on how the NSIA-represented industrial concerns could become more involved in transfer of defense-related technologies to industry and the public. The NSIA brought forward a number of concerns, including the perception that the 1972 GAO study of DOD laboratory utilization had essentially ignored industry. As a result, NSIA helped DOD concentrate more on involving industry in technology transfer.

The other significant 1974 industrial contact came from the Technology Transfer Ad Hoc Group, a group based in Los Angeles and composed primarily of local industry representatives interested in technology transfer, assessment, and forecasting. The group invited Linsteadt to address one of its early meetings (January 1974) and to discuss the role of the DOD Consortium and possible interchange with industry. The Los Angeles group, which included several Federal employees, remained involved in technology-exchange activities. After about a year of significant growth, the ad hoc group became the Technology Transfer Society, representing the interests of a fairly broad spectrum of industrial and governmental activities.

*Concern by the National Security
Industrial Association (NSIA) over
the omission of industry from the
laboratory utilization program*

*Another group representing
industry: the Technology Transfer
Ad Hoc Group, later established as
the Technology Transfer Society
(TTS), based in Los Angeles*

In late January 1974, the California Lieutenant Governor, Ed Reinecke, sponsored a meeting of California Federal laboratory directors to discuss potential cooperative projects of mutual interest. Following that meeting, Reinecke sent a letter to NWC Commander RAdm. Paul Pugh asking him to assign a liaison officer from NWC to work directly with the State of California in Sacramento. Personnel constraints prevented that assignment, but Linsteadt maintained a relationship with the State through his office.

Although interest in and contact with the DOD laboratories by the private sector were less than overwhelming at the time, the public sector was rapidly becoming what Linsteadt termed a "constant companion" of the Consortium laboratories. The Consortium's February 1974 report to Stever on unfunded efforts supporting state and local governments showed a phenomenal increase in activity. The report cited, for example, the Naval Air Development Center's (NADC) involvement with the Philadelphia Mayor's Scientific and Technical Advisory Council, the involvement of several DOD activities in California with a statewide technology transfer program, and the close involvement of the Naval Ocean Systems Center (NOSC) with both the City and County of San Diego. Other entities receiving information and/or active support from Consortium members included the States of Rhode Island, Oklahoma, Ohio, and Illinois; the City of Long Beach, California; Virginia Polytechnic Institute and the University of Maryland; and the National Fire Protection Association.

The Federal Consortium Concept Grows

The flurry of activity during late 1973 and early 1974 also had an unexpected benefit: the DOD laboratories were becoming well acquainted with the capabilities and resources of the other Federal laboratories, many of which also were involved with state and local projects. Federal civilian agencies actively involved with transfer activities related to or of interest to the Consortium included the: U.S. Coast Guard, National Bureau of Standards, General Services Administration (GSA), Department of Agriculture, Federal Highway Administration, NASA, EPA, NOAA, AEC, DOT, and others. Many of these laboratories were actively involved in liaison and exchange activities with the laboratories of the DOD Consortium. DOD's interest in expanding to a "Federal" Consortium was increasing, and several

Request by Ed Reinecke, Lieutenant Governor of California, that NWC assign a liaison officer to work with the State

The Consortium's report to Stever, Director of NSF, in February 1974, citing unfunded efforts in behalf of numerous state and local governments and organizations

Growing interest at DOD and also NSF in the development of a Federal agency-wide consortium

Harold Metcalf's use of this growing interest to convey the importance of other interagency transfer agreements

Metcalf's reservations about the management of a single large agency, in view of the DOD Consortium's increase in size and in the number of unsolved problems

Metcalf's planned retirement from his NSF liaison post in 1974, his concept paper, which Richard Green forwarded to Alfred Eggers in NSF, and recommendations about continued transfer efforts, which Green forwarded to DOD

members of NSF had already indicated their interest in seeing the development of a Federal agency-wide consortium, possibly composed of a number of agency-organized programs like the DOD Consortium.

Expansionist sentiment spread quickly. Harold Metcalf was talking in terms of the larger Federal laboratory picture by the Spring. He noted in a March letter to the National Institute of Law Enforcement and Criminal Justice (NILECJ, an enthusiastic participant in Consortium activities) that a proposed interagency agreement between NILECJ and the Naval Underwater Systems Center (NUSC) was a means to provide "convenient access to the technological resources of the consortium of Federal R&D Centers and Laboratories, particularly the Department of Defense (DOD) Laboratories." *The implied Federal consortium was not far from becoming an actual Federal consortium.*

Metcalf was a proponent of the agency-organization approach to a Federal consortium. However, his reservations about a single, large, broad-based technology transfer consortium were based upon his own experience in coordinating the programs of the DOD Consortium, and founded in what he saw as the inherent (and significant) problems in managing and coordinating the efforts of a group as large—and as highly diversified—as the Federal laboratory community. Metcalf's concerns about the size of the Consortium and its management were undoubtedly colored by the fact that during his three years at NSF, the number of laboratories involved had grown from 11 to 34, thus contributing to his "spread-thin feeling." These problems were obviously exacerbated by the largely unresolved problems of laboratory manpower limitations, funding restrictions, and management commitment.

Using Assets of Consortium and Laboratories To Support RANN, an NSF Program

By the late Spring of 1974, Stever had not responded officially to the Fall 1973 recommendations of the Consortium, COFL, and A.D. Little (Council of State Governments report) concerning intergovernmental laboratory use and technology transfer management. However, NSF took some action with regard to promoting the use of the Federal laboratories to support RANN Program projects. In early May, Richard Green, NSF Deputy Assistant Director for Research

Applications, forwarded his recommendations for the replacement of Metcalf, who was planning to retire from his NSF liaison post at the end of the summer. Green also gave Metcalf's brief concept paper, "Assets of the DOD Consortium and Associated Federal Laboratories for Support of the RANN Program," to Alfred Eggers, NSF Assistant Director for Research Applications, and Metcalf's recommendations to the Deputy Director for Research and Advanced Technology (DDR&AT) of the DDR&E Office to ensure the continued effectiveness of DOD technology transfer efforts.

Metcalf's seven-point paper gave an excellent overview of just where the past several years' efforts had brought the Consortium. He listed among its assets:

- ▶ A network of 30 major R&D Centers and Laboratories . . . strategically located in 17 states and backed up by extensive R&D facilities, 20,000 scientists and engineers . . . An effective, nation-wide, person-to-person communication network for promoting and implementing intergovernmental science and technology programs and projects.
- ▶ Demonstrated accomplishments by the DOD Consortium in the application of defense technology to civilian sector problems as evidenced by over 100 active projects funded by user Federal agencies . . . in all of the following categories, many of which are relevant to RANN objectives: Fire and Safety; Environment; Health and Medical; Law Enforcement and Crime Prevention; Transportation; Analysis and Testing; Instrumentation; and Productivity.
- ▶ Interagency agreements and intergovernmental placements of scientists and engineers . . . assigned to the National Institutes of Health, EPA, NSF, and negotiations underway with LEAA and the New York City Police Department.

Metcalf reiterated the importance of the NSF liaison position and recommended several DOD actions "essential to any significant growth of the program toward a much greater potential impact." These actions included:

- ▶ Providing incentive for laboratory director participation through increased personnel ceilings and relaxation of

The size of the DOD Consortium and the scope of its activities, as outlined by Metcalf

Metcalf's recommendations, concerning DOD's personnel constraints, interpretation of the Mansfield Amendment, and the need for a modest budget for the cost of documentation and dissemination

constraints on DOD professionals under the Intergovernmental Assignment Program;

- Clarifying DOD guidance and Mansfield Amendment interpretation and issuing a policy directive for assisting state and local governments; and
- Providing a small budget for technology transfer dissemination activities.

Metcalf's budget proposal was, indeed, a small one: \$100,000 for fiscal year 1975 to support the documentation and dissemination of significant accomplishments, selected technology assessments, and public-relations and educational material, and to provide "seed money" for promising feasibility studies and adaptive-engineering efforts and workshops, and technical seminars.

Green also informed Eggers, who had been a less than enthusiastic supporter of the Consortium, that both the FCST and Stever, the NSF Director, endorsed this activity. Stever had written to COFL Chairman Roberts in early May stating, "In view of the increasing importance of the application of technology to civil sector problems, this important resource should be coupled effectively to mechanisms that can serve to identify needs and match needs with capabilities." Stever, too, at this point was talking in terms of a broader Federal laboratory effort. The "resource" he cited was "the Federal laboratory system." He also noted that the "Continuing pressures to reduce overall Federal employment will restrict the flexibility that laboratory directors would desire in dealing with this issue."

Broadening the base of Federal laboratory technology transfer and application activity was a key to DOD laboratories faced with the drawdown atmosphere of the mid-1970's (especially with respect to the DOD activities following the end of the Vietnam War). The early 1970's also began a period in military R&D when the incorporation of existing technologies into existing systems became the bureaucracy-favored development strategy. Product improvements and capability expansions, sometimes at the expense of major novel technological exploration, became the main channels of R&D expenditure.

Evidences of Stever's support of a broader Federal laboratory effort

Effect on technology transfer of the military drawdown following the Vietnam War: an emphasis on using existing technologies instead of new ones, sometimes at the expense of major technological exploration

The potential effectiveness of the DOD laboratories in solving national problems also had been hampered by a barrier that Green described to Eggers as "... the absence of a clear signal from NSF and RANN management as to the extent to which involvement with the Federal labs is to take place." The required signal had been given by Stever; and, as Linsteadt reported, "With Metcalf's direct influence and this letter by Green, the NSF waters became calm, and again the Consortium sailed smoothly along."

There had been some problems between NSF's RANN Program and the DOD Consortium, aside from the perception in some quarters that the Consortium was a competitor for RANN in applying technology to national needs (an area in which the laboratories were not funded, but in which they were nonetheless enjoying excellent success). It had not been so much a case of open hostility against the Consortium by NSF, but rather some higher-level NSF management attitudes that were not favorable to a Consortium-type organization operating within NSF. By charter, NSF did not conduct in-house "operational activities," and, to some, supporting the Consortium through the Intergovernmental Office was tantamount to "running a program." There was also the traditional tension between those engaged in "basic" and those engaged in "applied" research. A segment of NSF management was opposed to any NSF involvement with applied research/technology projects—including RANN. Fortunately for the Consortium—and for RANN—Stever supported NSF-centered transfer efforts. Frank Hersman took the brunt of any higher-management ill-will directed at these programs, and as he put it, "Leaving Metcalf and the working-level people free to do their work."

Even with the Consortium and NSF back to running on the same track, the manpower and management issues—and the lack of official Headquarters guidance—were still major problems. The official resolution (if not the ideal resolution) of these issues came on the eve of Harold Metcalf's retirement.

Dr. Malcolm Currie, DDR&E, in a June 14, 1974 memorandum for the Assistant Secretaries (R&D) of the military departments, reiterated Deputy Secretary of Defense Kenneth Rush's January 1972 general guidelines for nondefense work in the DOD activities, and promulgated more precise guidance for the

Green's appraisal of Eggers about Stever's support of NSF's involvement with the Federal laboratories

Unfavorable attitudes in high-level NSF management about applied research and about consortium-type organizations, fortunately minimized by Stever's support and Hersman's willingness to absorb them

On the eve of Metcalf's retirement, an official (if not ideal) resolution of major problems of manpower, management, and lack of official guidance

Finally, an operating policy from DOD, in a DDR&E memorandum of June 14, 1974, specifying limits on personnel and on the scope and nature of activity, and emphasizing cost-recovery

Consortium's activities. The Currie memorandum included the three-page "Operating Policy of the Department of Defense Technology Transfer Consortium." This document finally, officially, established the DOD policy for the Consortium:

- ▶ No personnel or facilities were to be added;
- ▶ Projects were to be both inside the activity's mission area and outside industry's purview;
- ▶ Major emphasis was to be on the adaptation of existing technology;
- ▶ Funding was to be documented and costs recovered;
- ▶ Services were not normally to be furnished on a continuing basis; and
- ▶ Work was not normally to be performed for private industry, except where the laboratory possessed unique facilities not available in the private sector.

Also, the following additional constraints are placed upon the operation of this Consortium:

- ▶ The expenditure of in-house effort in any one laboratory shall be limited to three percent of the professional man-years at that laboratory unless expressed approval of the parent Military Department is granted to exceed this limit.
- ▶ The DOD commitment to support the brokerage function at the National Science Foundation shall not exceed two man-years per year through FY76, subject to the continued willingness of the Military Departments to absorb the costs.

The last two items of the Currie memorandum concluded with the most direct limitations on the Consortium so far (limits, however, that could conceivably be extended if the Consortium members could impress their Headquarters sponsors well enough). Again, there were no real surprises in the DOD policy for the Consortium. Very simply, whatever the DOD laboratories do for the nondefense community, it better not cost anything, take any time, use up any materials, get in the way of anything else, or even appear to compete with private industry.

The Policy's additional constraints on the allowable percentage of in-house effort for technology transfer and on DOD's support of the brokerage function at NSF

Interpretation of the DOD policy constraints

*The End of an Era:
Metcalf and Smith Move On*

Metcalf retired from Federal service June 28, 1974. The general consensus of the Consortium and NSF participants: it was unlikely that the DOD Technology Transfer Consortium would have been as successful without his personal efforts and insights. As Linsteadt put it: "One wonders if the Consortium had started at some other time and place, would it have succeeded without the efforts of this single individual."¹⁰

Fortunately for the Consortium, Metcalf agreed to stay on for a few more weeks to help orient and train his replacement and to produce some reports of transfer activities. Unfortunately for DOD technology transfer projects and for the continuity of Consortium corporate memory, Captain Gordon Smith had been reassigned shortly before Metcalf's retirement. Smith, known affectionately to Consortium members as "The Godfather" for his wise counsel and for his power and influence within DOD, was widely respected for his broad competence, his public-relations mastery, and his ability, in Metcalf's words, "To steer a course along that fine line of being within the law and knowing how far the elastic limits of the law would stretch. . . . He was like a weather vane to forewarn us of any threats to our informal operations . . . He could coach the [transfer] agents in the back room and then stand before the highest echelons of government and represent the Consortium like a defense attorney."

Metcalf's June 1974 progress report (submitted in August during his "few more weeks") noted of Smith that he "Gave strong and continuing support to the technology transfer efforts of the DOD Consortium. He also made a significant contribution to the activities of the Committee on Federal Laboratories and the FCST." And of his own career, Metcalf noted, "The most exciting of the thirty years were the last three, working in the Federal Laboratories Program here in NSF/ISRU (Office of Intergovernmental Science and Research Utilization). I am convinced that the person-to-person approach is critical in the technology transfer process, and I have met many highly motivated, dedicated persons from the Federal Laboratories. Thanks for your cooperation and support!"

The end of an era with Metcalf's retirement, June 28, 1974 and Linsteadt's citation of Metcalf's critical importance

Metcalf's high praise for Captain Gordon Smith, the Consortium's "Godfather," upon his reassignment to other duty

Metcalf's June 1974 progress report and his conviction of the critical importance of person-to-person relationships in technology transfer

*Jim Terrell named to replace Smith,
and Joseph Antinucci named to
replace Metcalf*

*Some examples within DOD of
issues that provided reasons for
noncooperation in the technology
transfer effort*

In late June, Jim Terrell replaced Smith in the Office of the DDR&AT, but without the same enthusiasm for the job that Smith had. The Naval Underwater Systems Center assumed the role of supporting the Federal Laboratories Program Manager when a NUSC employee, Joseph D. Antinucci, accepted the job. He reported to the NSF post in mid-July.

Factors External to DOD Consortium Satisfactory; Internal Operations Still Not Ideal

By the end of 1974, the long-awaited official guidance on DOD transfer activities was in place, the relationship between the Consortium and NSF was improving, the no-conflict ruling on the Mansfield Amendment had occurred, and relationships between the DOD and civilian-agency technology transfer principals were improving. However, the operational atmosphere of the Consortium was far from ideal.

Technology transfer programs, especially within DOD, were still severely limited by personnel constraints, funding problems, Mansfield-Amendment-conflict fears, and a number of other issues and conflicts that provided reasons for noncooperation. Currie's requirements for case-by-case project-funding consideration caused further bureaucratic entrenchment of high-potential projects, and the military services themselves added to the administrative problems by issuing conflicting guidance. For example, the Navy, which led the formation of the DOD Consortium, had developed a new instruction in early 1972 dealing with technology transfer programs, but in July 1974, Assistant Navy Secretary David Potter wrote a memo for the record (and as an agenda item for the upcoming meeting of laboratory commanders and directors) stating his belief that it was unwise to engage in this type of program except under unusual circumstances. The Potter memorandum reiterated many of the fears of laboratory managers—these efforts would impact mission-essential work, encumber management, and require reassignment of mission-essential personnel to nonessential projects. Potter's contentions had already been answered numerous times at numerous levels in numerous forms by the Consortium members. Nevertheless, the proposed Navy instruction was never issued, and the stumbling blocks in the path of increased laboratory transfer effort remained in place.

Concept of FLC Accepted as an Organization To Coordinate Other Federal Government Laboratory Consortia

Antinucci hadn't been at NSF very long before he started considering the Consortium to be a *Federal* affair. This was in line with the rapidly expanding sentiment at NSF. NSF management and staff (including Stever), down through ISRU and the RANN Program, were becoming more explicit in the opinion that the effectiveness and viability of the DOD Consortium could be greatly enhanced if it were a consortium of all Federal laboratories.

At the November 14, 1974 Fall meeting of the DOD Consortium in Monterey, California, Antinucci discussed his perceptions of his role as the Consortium/laboratory/NSF liaison, and during the discussion the issue of inviting non-DOD departments and agencies to join the Consortium was brought forward.

The DOD Consortium membership, 33 laboratories by this meeting, easily approved the concept of forming the Federal Laboratory Consortium for Technology Transfer: the FLC.

The general assumption of the Consortium representatives at the time was that, just as in Metcalf's conceptualization, the DOD Consortium would remain in existence (along with a NASA Consortium, etc.) and that the FLC would be a coordinating body of Federal Government laboratory consortia.

The business of the November meeting, however, as had generally been the case since the inception of the Consortium, was largely concerned with administrative problems and the continuing problem of perception. Smith, now a guest at this meeting, reminded the members that technology transfer efforts must not in any way impede laboratory mission-essential work—an issue of significant concern in DOD and in many of the laboratories. Further, Smith said that Currie had indicated he would support a doubling of laboratory technology transfer efforts (from the three percent baseline set in June), but that in a year or so, he wanted to review the achievements of the Consortium to see if its operations should continue. The possibility of greater support from Currie's level was encouraging. However, the prospect of more reviews and further requirements for justifying involvement in minor projects and expenditure prior to initiating them was discouraging.

Growing sentiment at NSF of expanding the DOD Consortium to all Federal laboratories

At its meeting on November 14, 1974, the DOD Consortium membership's approval of a Federal Laboratory Consortium for Technology Transfer (FLC)

The Consortium representatives' assumption that the FLC would coordinate other Federal Government laboratory consortia

The prospect of an increase in the allowance of transfer activities by DOD but also the prospect of more performance reviews

Some examples of new support for the DOD Consortium by state and local governments, with positive response from the Executive Branch

In general, 1974 ended on a positive note for the DOD Consortium. The groundwork was laid for the establishment of the FLC, and by many accounts, the Federal Laboratory Consortium had been established unofficially by year's end. The Consortium improved its relationships with state and local governments around the nation. In December 1974, Federal laboratory representatives met with the California Innovation Group, which now represented several large cities in the state, to discuss formal mechanisms for ensuring communication between the Federal laboratories and potential users. The same month, U.S. Conference of Mayors President Joseph Alioto wrote to the President of the United States and suggested that the Conference and the mayors it represented could contribute effectively to the implementation of Federal-laboratory-developed technologies in solving national problems. Alioto's letter received a positive response from the Executive Branch, and it helped initiate a long and prosperous relationship between the Conference and the FLC.





*Group photo of FLC Fall Meeting 1975 attendees during trip to the National Center for Atmospheric Research. **Front Row:** Walter Johnson, Bob Brandon, Gerry Miller, Fred Schoenberger, James Stinson, Alan Sjöholm, Susan Doscher, Phil Forhan, Gene Stark, Del DeLaBarre. **Back Row:** Cliff Lanham, Chuck Kubokawa, Harold Neher, Wally Creighton, Gene Early, Os Fundingsland, Don Courter, Joe Berke, Linda Massaro, Joe Antinucci, Clint Beckner, George Linsteadt, Jerrold Rittman, Chuck Miller, Bob Cox, Peg McNamara, George Connolly, Dick DiCicco, Douglas Crombie.*

Chapter 5

THE FEDERAL CONSORTIUM EVOLVING, 1975 -1980

Making Great Headway, But Still Awaiting Legislative Foundations

By the beginning of 1975, the FLC had been established unofficially, and it took less than a year for the nature of the Consortium to change significantly. The DOD Consortium was no longer a DOD organization, and the cadre of "sub-consortia" did not materialize, although the various agency-organized "subsets" were generally regarded (at least on paper) as individual elements that constituted a greater whole. The continued growth of the "DOD Consortium," with increased participation by activities of the non-Defense agencies, raised concerns over the fact that the organization—the unofficial FLC—had no institutional foundation and, more significantly, no legislative *raison d'être*.

Consortium members, however, maintained the belief that the Consortium and its efforts were meaningful, productive elements of national policy, and the first year of "unofficial" existence for the FLC was one of necessarily rapid development of organizational structures and relationships. Joseph D. Antinucci, Federal Laboratories Program Manager, began the groundwork in January for NSF funding of the FLC. The search for firmer legislative legs for the FLC to stand on also continued for some time, but this remained an area of major concern for the Consortium for at least the next 5 years. Hopeful signs did appear now and then, such as Senate Bill 2374: the Technology Transfer Act of 1975, which was to establish a reasonably well-funded transfer agency within DOD. The bill never passed.

The unofficial FLC, no longer a DOD organization but still without any institutional foundation or legislative rationale

Rapid development of organizational structures and relationships, groundwork for NSF funding of the FLC, and the beginning of a long search for a firmer legislative basis

The first non-DOD activities joining the FLC: the laboratories of the Atomic Energy Commission (AEC), under the direction of the new Energy Research and Development Administration (ERDA)

Joint agreement between NASA's Technology Utilization Office and the NSF Federal Laboratory Program, establishing a separation from the DOD Consortium, largely ignored by NSF and lasting for about a year

At the first FLC meeting, in 1975, NASA's intention to remain separate but DOD Consortium representatives favoring a Federal organization

The FLC Begins To Develop a Structure

The Atomic Energy Commission (AEC) laboratories [now under the new Energy Research and Development Administration (ERDA)], created in October 1974, some of which had been non-member participants in the DOD Consortium for several years, were the first non-DOD activities to join the new FLC. Perrin, although no longer directly involved with NWC, had remained very involved in fostering Federal technology transfer efforts, including the 1974 NAE study mentioned earlier. Perrin contacted and briefed the new ERDA Administrator, Dr. Seamans, on technology transfer programs, and had landed technology transfer contracts with Lawrence Livermore National Laboratory and Lawrence Berkeley Laboratory. The energy activities slipped right in to the Consortium fold.

The evolution of NASA's relationship with the fledgling FLC was a different matter. In January 1975, a "consortium" for transferring technology from aerospace applications to state and local governments was established by joint agreement between NASA's Technology Utilization Office and the NSF Federal Laboratory Program. This move seems to have been made to put the NASA activity on the same level as the FLC within NSF, but it was largely ignored within NSF and by the DOD Consortium. By the Spring, a formal relationship had been established between NASA and NSF, and Hersman's Federal Laboratory Program funding request included \$10,000 for the NASA Consortium (soon to be the NASA/NSF Technology Sharing Consortium); \$20,000 for the DOD Consortium; and \$25,000 for two other programs. The NASA Consortium was able to maintain a separate identity within NSF for about a year.

The first big FLC meeting was held in June 1975 at NSF. NASA was in attendance, but it was clear that the NASA Consortium would remain separate from the FLC. This occurred despite the fact that DOD Consortium representatives had essentially dismissed the concept of maintaining and identifying with their separate DOD organization in favor of organizing a Federal one.

The NWC Technology Transfer Representative, George Linsteadt, had been the Chairman of the DOD Consortium since it was established, and he continued to provide leadership to the evolving Federal Consortium. NWC also continued its active

technology transfer efforts outside of the Consortium. However, it concentrated its involvement with other Federal agencies rather than with state and local entities. During 1975, NWC sought transfer opportunities with a wide variety of Federal agencies, including the Departments of Transportation, Agriculture, Interior, HEW, Justice, and Commerce; the Federal Energy Administration and ERDA; EPA; NASA; and, of course, NSF. The majority of the project proposals for 1975, as was the case in 1974, dealt with energy-alternatives development.¹¹ NWC's primary association with local governments during this time was via the California Innovation Group; NWC's and FLC's relationship with the State of California virtually disappeared during the year.

As part of its organizational deliberations, the Consortium considered the concept of regional organizations. This decision was based on an earlier related regional activity. The 12-member California Consortium of Federal Laboratories had been quite successful with state and local transfer efforts in California, and had come to the attention of a number of state and local governments around the nation. The development of this and further regional technology transfer organizations was greatly influenced by the California Innovation Group and its successes. Over the course of the year, New England, Florida/Alabama, Maryland/Virginia, and the Pacific Northwest considered and/or initiated similar regional activities. In November, the New England Innovation Group was established to better coordinate the state/local exploitation of Federal technological resources. The Group was funded by the Intergovernmental Programs Office of NSF and was a sister project to the California Innovation Group established the previous year from the Four Cities Program.

The potentially highly productive relationship that California Lieutenant Governor Reinecke had been working to establish between the state and the California Consortium of Federal Laboratories was eliminated with the election of Governor Edmund G. Brown, Jr. Shortly after taking office in January 1975, Brown eliminated the Office of Science and Technology (which had been created within the Lieutenant Governor's Office by former Governor Ronald Reagan), and appointed an ex-astronaut as "scientific advisor." The new advisor wanted nothing to do with any Federal R&D activity except NASA (which still had a rather competitive relationship with the FLC),

In addition to George Linstead's leadership role in an evolving Federal Consortium, NWC continuing its own active technology transfer efforts, primarily emphasizing other Federal agencies but including the California Innovation Group

Based on the success of the California Consortium of Federal Laboratories, the forming of regional consortia in Alabama/Florida, Maryland/Virginia, the Pacific Northwest, and the New England Innovation Group funded by NSF

Essential elimination of the California Consortium of Federal laboratories by the election of Governor Brown, whose "scientific advisor," was uninterested in any Federal R&D activity except NASA

FLC membership totaling 54 by the end of 1975, Linsteadt named FLC Chairman, and FLC purposes set forth: to provide technical assistance to state and local governments and to transfer technology between laboratories

Fostering a linkage with the National Technical Information Service (NTIS) to support the FLC's market development, briefing several levels of Government on NSF's Federal Laboratory Program, and forming the Technology Transfer Institute

so the California-DOD laboratory connection was essentially eliminated.

By the end of 1975, the DOD Consortium, still a sub-element of the FLC, had grown to 36 member activities. The FLC had 54 members and was organized informally according to programs (e.g., NASA Technology Utilization Program). George Linsteadt was named FLC Chairman because of his dominant position as DOD Consortium Chairman.

During the year, the FLC set forth its primary, simple and straightforward purposes, and its easily defensible operating principles:

- ▶ To provide technical assistance to state and local governments wherever and whenever possible, and
- ▶ To transfer technology between laboratories.

Market Development Efforts, Seminars, Briefings, and International Relations

Throughout its premier year, the FLC fostered new Federal Consortium contacts and working relationships within the Federal Government. In the Fall of 1975, Linsteadt began developing a relationship between the FLC and the National Technical Information Service (NTIS), a Department of Commerce activity, to support FLC market-development efforts and to provide a liaison position linking NTIS and FLC/NSF. The FLC also began pushing a more "Federal" image by sponsoring a "Federal Laboratory Technology Transfer Seminar" in March and briefing several levels of Government on the NSF's Federal Laboratory Program. The Technology Transfer Society was created during 1975 and provided significant support for the fledgling Federal Consortium. The Technology Transfer Institute also was formed during the year, giving the Consortium international access through the Institute's home office in Japan and other offices in Los Angeles, CA and Washington, DC.

The sub-consortium concept never really caught on, since many agencies had no interest in forming "in-house" consortia. The DOD Consortium had an official identity that remained for some time, as did the NASA Consortium. The Energy laboratories had a corporate identity that provided a measure of group identification, but the one-consortium-of-many-agency-consortia idea had been pretty well dismissed by early 1976.

Organizational and management issues continued to be important considerations throughout 1976. The FLC pursued the concept of forming regional organizations and sought firmer legislative and agency-centered foundations. The Army produced a draft regulation on military-civilian technology transfer activities, and the other services were urged to produce technology transfer implementing instructions. The proposed scope-of-work for the NASA/NSF Technology Sharing Consortium, which retained autonomy for that organization within the NSF and the FLC, was reviewed, but it was not signed.

By Spring 1976, the Consortium had grown to an identifiable entity. The FLC had an "outreach" brochure for use by member activities, thus further solidifying the across-the-board Federal image of the new Consortium. Antinucci had briefed Army Materiel Command R&D managers on the Consortium and presented the possibility of increased Army involvement in technology transfer. Army officials were enthusiastic and looking forward to implementing the Army regulation promoting technology transfer (which became effective July 1). In April, the Assistant Secretary of the Navy (R&D) approved a temporary assignment for an FLC representative to be located at NTIS, and a Consortium representative was appointed to the Advanced Technology Standing Committee of SEARCH Groups, Inc.

Organizational development was one of the main topics at the June 1976 FLC meeting in Newport, RI. Ed Cushen of Mathematica reported on the company's impact assessment and evaluation of the Federal Laboratory Program, and Gilmore Trafford of NASA's Wallops Flight Center (Virginia) suggested developing a Mid-Atlantic Consortium of Federal laboratories as a regional activity of the FLC. The Consortium pursued the regional-organization idea and polled representatives from several geographical regions regarding the proposed scheme.

Dismissal of the sub-consortium concept, despite the official identities of the DOD Consortium and the NASA Consortium and the corporate identity of the Energy laboratories

Pursuit of regional organizations, firmer legislative foundations, and technology transfer implementing instructions from the military services, while the scope-of-work for the NASA/NSF Technology Sharing Consortium remained unsigned

By Spring 1976, an "outreach" brochure, the prospect of the Army's increased involvement, the Navy's temporary assignment for an FLC representative at NTIS, and representation in SEARCH Groups, Inc.

At the June 1976 FLC meeting, an impact assessment and evaluation of the Federal Laboratory Program, the proposal for a Mid-Atlantic Consortium, and a polling of members about the regional scheme



Joe Antinucci (center) receives a special FLC Award of Appreciation at the Spring 1976 FLC meeting held in Newport, RI. The award was presented by Nicholas Pryor, NUSC Technical Director (left); Nicholas Montanarelli (right) replaced Mr. Antinucci as the FLC Representative at NSF.

NSF's funding of the preparation of a Program Plan, published by NWC in 1976 and proposing a consortium to meet a national need for making mission-oriented technologies accessible to many users

At the same time, Linsteadt was wrapping up the *Program Plan* for the operation of the FLC. The *Plan*, prepared by Linsteadt, Antinucci, and Del DelaBarre of the California Innovation Group under an NSF grant and published by NWC in July 1976, stated the purpose and application of the FLC in very simple terms:

Existing federal laboratories are strongly mission-oriented . . . extra-mission projects (those which derive second and third uses from existing technology) which have significant cost-benefit potential to a wide class of users are usually undertaken on an exception basis with the lowest possible priority. What is needed is an interagency resource management structure and incentive environment which will continually stimulate multiple applications. In addition, transfer mechanisms which are demonstrated and have potential for wide use must be analyzed, measured, assessed and replicated. The Consortium is proposed as one way of

meeting this national need.

The *Plan* was a synthesis and synopsis of the organizational ideas and efforts that the FLC and NSF representatives had been working on for more than a year. Much of the "planned" organizational work was well under way by the time the *Plan* was issued. Linsteadt called for the establishment of a "Secretariat" to provide staff support and technical assistance to the NSF Federal Laboratory Program Manager, and the *Plan* assumed a regional organization for the FLC (four regions had been identified and were already being established). The Coordinating Committee (also already well on the way to being a reality) representing the member Federal agencies also was organized. NSF's acceptance of Linsteadt's grant proposal—the core of which was the *Plan*—essentially established the FLC Secretariat function, which provided increasingly essential staff support to the NSF Program Manager, now Nicholas Montanarelli from the Army Edgewood Arsenal.

At the November 1976 FLC meeting in Berkeley, CA, the Consortium, unable to argue with success, renamed George Linsteadt Chairman, and organizational discussion was in accord with Linsteadt's *Program Plan*. With its growth to 69 Federal laboratory members, the FLC realized it could no longer be run effectively by a handful of volunteers (who also had "real" jobs at their own laboratories) supporting the Federal Laboratory Program Manager at NSF. Therefore, a committee was convened to coordinate FLC activities and agency interactions. Fourteen laboratory representatives volunteered to serve on the Coordinating Committee, and they held the first meeting in December. A regional scheme had been refined by this meeting, and the first regional reports were given by the four individuals who had volunteered to coordinate the newly established FLC regions—the Southeast Region (Robert Brandon, Air Force Civil Engineering Center); Mid-Atlantic Region (Jerome Bortman, Naval Air Development Center); Northeast Region (George Connolly, Naval Underwater Systems Center); and Far West Region (George Linsteadt, Naval Weapons Center).

*Specified in the Plan:
a "Secretariat" to provide
technical assistance to NSF's
Federal Laboratory Program
Manager and a Coordinating
Committee representing member
Federal agencies*

*At the November 1976 FLC
meeting, Linsteadt renamed
Chairman, the appointment of a
Coordinating Committee, and
reports from four new FLC
regional consortia*

A major concern at this meeting over how to address growing indications among some segments of private industry that FLC was a competitive threat

The Coordinating Committee's decision to limit membership in the FLC to Federal R&D activities, and to call for the drafting of a constitution

In the first few months of 1977, the engagement of FLC's officers and committees in drafting needed documents

Presentation of a draft constitution to the Consortium Steering (formerly Coordinating) Committee, which tasked the Chairman with collecting and reviewing members' responses

Aside from organizational issues and interagency relationships, the major concern of the Consortium at the November meeting was how to address growing indications that some segments of private industry were perceiving the FLC as a threat (although the avoidance of even the impression of competition with industry was a long-standing specific concern of the Consortium and its members).

The FLC Coordinating Committee held its first meeting in December in New York City and addressed the issue of having "associate" or "liaison" members. A number of groups and institutions (primarily users of FLC services) had expressed interest in official FLC affiliation, but these activities were not part of the Federal Government establishment or laboratory community and, therefore, were outside of the charter of the Consortium. The Committee decided against offering FLC membership to activities or institutions that were outside of the Federal system or without R&D expertise and capabilities. The Committee also decided that a Consortium charter or constitution that included corporate goals and objectives was an immediate necessity, and the process of drafting a constitution, to be presented at the Spring FLC meeting, was initiated.

Preparing a Constitution, Implementation Instructions, and Resource Manuals

The first few months of 1977 were very busy ones relative to getting the FLC "on paper." The development and implementation of instructions, advertisements, grants, and the "for-lack-of-a-better-term-constitution" occupied the FLC's officers and committees in the months leading up to the Spring Consortium meeting.

The draft "FLC Constitution" was presented to the Consortium Steering Committee (formerly the Coordinating Committee) and reviewed during the meeting. Little time was allowed for reviewing the draft, so no solid decisions were made regarding its adoption or possible changes, but the term "constitution" was not met with great enthusiasm by either the Committee or the membership. The Committee set a June deadline for comments on the draft and tasked the Chairman with collecting and reviewing the commentary. The draft document called for a Policy Committee, which included Headquarters representatives.

an Advisory Committee; and a Steering Committee. The proposed charter/constitution also established annual member-activity dues to support the Consortium.

Work on the "FLC Resource Manual" continued, and the membership reviewed a proposed format. Informatics also submitted its "Federal Laboratory Technology Transfer Operations and Reference Guide" to the Consortium for review.

A new FLC brochure was designed for use with a Consortium exhibit at the World Fair for Technology Exchange, held in Chicago in February. In addition to the Fair, the FLC participated in the Institute of Environmental Sciences' Annual Technical Meeting and Exposition and the Space Simulation Conference in April in Los Angeles.

An excellent opportunity for the Consortium came in late February 1977 when President Jimmy Carter issued a memorandum for the heads of the Executive Departments and Agencies reminding these officials of his campaign-stated commitment to involve state and local officials in the development of his administration's policies and priorities. The President asked his executives for descriptions of how they had been fulfilling this commitment. This gave the Consortium an opportunity to showcase some of its activities.

Spring/Summer of 1977 proved to be a time of rapid expansion for the FLC, both in terms of state and local visibility and of actual membership. By the May 1977 meeting held in Portland, OR, the Consortium counted as members 72 Federal R&D laboratories and centers. Since the FLC was still providing technical assistance to the public sector—and still on the look-out for "outreach" opportunities—the Spring meeting was organized around a technology transfer-utilization workshop for local government officials in the Pacific Northwest. The Consortium deemed the workshop successful as an outreach and an educational effort.

Also in May, the U.S. Conference of Mayors' Urban Economics Committee approved and forwarded to the full Conference a resolution—which passed readily—listing primary areas of concern as those related to national science and technology efforts; the resolution also proposed greater use of the Federal Government laboratories in solving local government problems.

Continuing work on the "FLC Resource Manual" and review by the membership of a "Federal Laboratory Technology Transfer Operations and Reference Guide"

A new FLC brochure for use at technology fairs, meetings, and conferences

President Carter's memorandum on involving state and local officials in the development of his administration's policies and priorities, providing the FLC with a showcase opportunity

May 1977 FLC membership at 72, and the May FLC meeting featuring a technology transfer utilization workshop for local government officials in the Pacific Northwest

Proposal of the U.S. Conference of Mayors to make greater use of Federal laboratories in solving local government problems and indications of Congressional interest

Letter to NSF from Governor du Pont of Delaware, announcing the creation of a Delaware subunit of the Technology Acquisition Unit in Maryland supported by the FLC

FLC membership doubled by the inclusion of the U.S. Forest Service, and additional NSF funding for the FLC Secretariat

A draft of a Center Instruction regarding technology transfer and cooperative-development programs approved by NAVMAT for use by all Navy activities

The Fall 1977 FLC meeting, attended by staff members of the U.S. Conference of Mayors and by a member of the House Staff on Science and Technology who reported back to the Committee on the FLC's phenomenal growth

This was one reason that the Fall FLC meeting would be a large and lively one; another reason was that Congressional interest was again turning to the Consortium, possibly as a result of the increased interest in the Consortium's program shown by various constituents, some of which was no doubt sparked by the Conference of Mayors' resolution.

In July, Governor du Pont of Delaware wrote to NSF concerning his recent discussion with Montanarelli on potential Consortium assistance to his state. Du Pont commended the NSF for its efforts and endorsed the concept of technology transfer—and he announced the creation of the "Delaware Unit," a subunit of an existing Technology Acquisition Unit in Maryland supported by the FLC.

FLC Gets New Members, Additional Funding, and Renewed Interest from Agency Management and Congress

In late Summer, the U.S. Forest Service, U.S. Department of Agriculture, joined the Consortium, an event which more than doubled the membership of the FLC, and in September, NSF came through with additional funding to NWC to continue the operation of the FLC via the extension of the Linsteadt/Secretariat grant.

This upswing in active interest in both joining and using the FLC during 1977 also was coupled with some active management interest. Early in the year, NWC had drafted a Center Instruction that promulgated Center policy and implemented Navy policy regarding technology transfer and cooperative-development programs.¹² The Center's Headquarters Command, NAVMAT, which was also responsible for implementing the Navy's technology transfer program, approved the instruction. It was issued in late May and approved for use by all Navy activities as a basis for technology transfer instructions.

By its Fall meeting in Philadelphia, PA, the Consortium represented 156 member activities. A staff member of the House Committee on Science and Technology attended and reiterated the renewed Congressional interest in Consortium activities. The staffer was able to report the significant organizational maturation and phenomenal growth of the FLC in membership, breadth, and state/local contacts to the House Committee. Several staff

members of the U.S. Conference of Mayors also attended and interviewed many of the laboratory technology transfer representatives to determine the Consortium's potential for solving the problems identified by the Conference and to learn more about the barriers—both real and perceived—to the laboratories' transfer and support efforts at the local-government level.

The Consortium membership, especially the Naval Underwater Systems Center (NUSC), also had begun to use the mobility provisions of the Intergovernmental Personnel Act (IPA) of 1970 quite productively. The IPA allowed temporary assignments of technical personnel between Federal, state, and local governments. During 1977 under the IPA, the FLC members began providing temporary "Technical Advisors" to state and local governments, and the FLC continued to encourage the expansion of IPA mobility assignments by the member laboratories whenever possible.

The Consortium had, indeed, grown into a broad-based and highly accomplished organization by the Fall of 1977. The FLC's establishment of highly successful working relationships with regional Consortium activities and with local governments was counted as its most notable achievement in the end-of-fiscal-year "Final Report" to NSF on the FLC grant. The report also highlighted the FLC's work with the growing variety of state/local technology transfer activities, citing joint accomplishments with organizations such as the California Innovation Group, San Diego Technology Action Center, Mayor's Science and Technology Advisory Council, Pennsylvania Technical Assistance Program, and Delmarva Advisory Council.

The List of Accomplishments Grows

By the beginning of 1978, the accomplishments of the Consortium, still being operated under an NSF grant to Linstead at NWC, were significant indicators of the success of NSF's and the member laboratories' overall technology transfer programs.

The Consortium printed and began distributing the "FLC Resource Directory" in January, and FLC representatives met with Congressional staff members to discuss Consortium and Navy technology transfer projects.

The FLC's support of the Intergovernmental Personnel Act (IPA) of 1970, which allowed temporary assignments of technical personnel between Federal, state, and local governments

The FLC's year-end report to NSF, highlighting many successful working relationships with regional Consortium activities and with local governments

Distribution of the FLC Resource Directory in January 1978 and meetings with Congressional staff members

Development of a database, TECTRA, of successful technology transfer cases into the first FLC Accomplishment Document and a monthly publication

Meetings of Navy technical transfer representatives, emphasizing the goal of the 1977 NAVMAT Instruction and asking all Navy R&D activities to participate

Concern over the Navy Master Plan's inclusion of only minimal interface activities with state and local governments, and, in response, the NAVMAT staff member's assurance and explanation

Also in January, James Jolly, a professor at California State University, Sacramento, submitted a proposal to develop a database, TECTRA, of the Consortium's successful technology transfer cases. NSF supported the database concept, along with additional documentation of the FLC accomplishments in a manner similar to NASA's "spin-off" documents. So NWC contracted with CADCOM, Inc., to develop the first FLC Accomplishment Document under contract to NWC. NWC also contracted with Jolly to produce a monthly publication describing technologies from TECTRA that had been recently transferred to the public and/or private sector.

The Navy, too, was giving major attention to the development of appropriate technology transfer policies and guidance. Navy officials met in February to examine the contemporary OPNAV instruction on technology transfer and to develop a master plan for Navy transfer activities. The development of objectives and guidance emphasizing a long-range approach to technology transfer was decided upon, and the Navy reaffirmed its support of the technology transfer efforts under way. Navy technology transfer representatives met later that month and emphasized the role of NAVMAT as the service's transfer agent, the need to ensure that Navy technology was made available to small business, and the need to transfer technology into the Navy from other sources. The representatives' meeting also resulted in the development of a program plan and guidelines to meet the goals of the NAVMAT technology transfer instruction issued in 1977. All Navy R&D activities were asked to participate and to ensure that the program would reflect not only standing policies, but also a long-term view and a consistent, implementable program.

In November, Linsteadt expressed to NAVMAT the Consortium's concerns with the Master Plan's inclusion of only minimal interface activities with state and local governments. In December, Perry Newton, the NAVMAT staff member charged with overseeing the Navy technology transfer program, assured the Consortium that transfer of technology to the state and local levels would not be abandoned. Newton explained that the intent of the Plan for the Navy's technology transfer efforts was to continue the program, building upon the successes of the past, including the FLC's notable achievements, and to map out five-year objectives for strengthening efforts in private-sector transfer and increasing benefits for the Navy's technology transfer program.

NSF, too, began developing a five-year master plan for technology transfer. The plan included a request that each program manager provide a five-year program plan to the NSF Executive Committee for review.

In early Spring of 1978, the NSF funded the Community Technology Initiative Program (CTIP), which supported technology transfer to local governments and agencies. The FLC jumped in immediately. NSF Program Manager Montanarelli sent out an "Opportunity for Assignment to Local Government as a 'Circuit-Riding Technology Agent'" to the Federal laboratories and centers requesting volunteers for one-year technical-advisor assignments under IPA. Seven circuit-rider IPA positions were advertised to support the CTIP, with the salary costs being split between the laboratory of origin and NSF, which also provided travel funds. Many local governments and agencies were already well acquainted with the Consortium by this time (as evidenced, for example, by a letter to NSF from the City Manager of Tacoma, WA, supporting further funding of the FLC and citing its contributions in solving the city's problems), but the opportunity to expand its base was not one that Montanarelli and colleagues could pass up—especially when the FLC's rapidly growing catalogue of successes on national, regional, state, and local levels had become a major share of the ammunition supporting the establishment of such programs.

Also in early Spring, George Linsteadt gave up his position as Far West Regional Coordinator when Charles Miller of Lawrence Livermore National Laboratory volunteered to serve as chair. Through his efforts and those of Del DeLaBarre, the President of the California Innovation Group, the Region established a demonstration project with the Santa Clara, CA, Chamber of Commerce to provide technical assistance and information exchange. Funded by the Chamber, the project was scheduled for a six-month test period.

This demonstration project was the first of several conducted by FLC Regions in cooperation with local governments. All were seen as an efficient way of disseminating information to a broader base of local small businesses. The Far West Region began a second demonstration project, a local-government-assistance project, with the San Diego Technology Application Center. "Spin-offs," such as the "Federal Laboratories Technology"

NSF also developing a master plan for technology transfer

The FLC's positive response to NSF's funding of the Community Technology Initiative Program (CTIP) and its opportunity announcement for "circuit-riding technology agents"

Through the efforts of Charles Miller, Coordinator of the Far West Region, and Del DeLaBarre, President of the California Innovation Group, a demonstration project with the Santa Clara, CA Chamber of Commerce

Following this model, other demonstration projects with local governments and small businesses that generated "spin-off" demonstrations

Suggestions for more demonstration projects with public interest groups, universities, and city consortia in all Regions, and modest funding furnished by FLC

DelaBarre, a contracting consultant, "loaned" by Lawrence Livermore National Laboratory to FLC to assist in writing grant proposals to NSF

DOD's report to the U.S. Senate Appropriations Committee supporting the FLC, Representative Christopher Dodd's sponsorship of technology transfer conferences, and Representative George Brown's field hearing and findings

session of the 15th Space Conference in April, began to appear with increasing regularity.

The FLC Executive Committee (formerly the Steering Committee) suggested all Regions should conduct demonstration projects in cooperation with public interest groups, universities, and city consortia. The encouragement and the funding of further demonstration projects were major issues at the October Consortium meeting in Santa Fe, NM. Even though the FLC funded these projects for modest amounts of \$3,000 to \$4,000 each, the projects produced extremely effective outreach, education, and application results.

DelaBarre also became involved with the administration of the Consortium when he was contacted by Linsteadt to assist in writing grant proposals for NSF funding. DelaBarre was working as a contractor consultant to Lawrence Livermore National Laboratory, an FLC member activity that "loaned" his services to Linsteadt and the Consortium. DelaBarre continued to support the FLC in this manner under contract to Livermore and as an independent contractor to the Consortium to conduct additional demonstration projects.

Increasing interest in the Consortium and its activities was even more apparent by the beginning of 1979. In January, DOD submitted to the U.S. Senate Appropriations Committee a report that among other things reiterated its commitment to the FLC and its activities: "It is our view that the activities of defense organizations in the Consortium are an important step toward achieving national goals expressed by the Congress and the Executive Branch in the area of domestic technology transfer."¹³ In March 1979, Representative Christopher Dodd (D-CT) sponsored a technology transfer conference in Farmington, CT, where Representative George Brown (D-CA), Chairman of the House Science, Research, and Technology Subcommittee, also conducted a field hearing on various Federal agency activities in intergovernmental technology transfer. Brown's Subcommittee released its findings in a staff report entitled *Congressional Options for Improving Technology Transfer Programs*. Additionally, Congressman Dodd sponsored a Technology Transfer Forum and Exposition in Hartford, CT, in May 1979, and gave the keynote address at the Spring FLC meeting that same month.

President Carter bolstered the cause of the Consortium with his March 1979 science and technology message, which stressed the importance of the Federal Government's efforts in solving the pressing problems of state and local governments.

NASA lent its support to Consortium efforts as well. John McFall, NASA Langley Research Center, and Cortland Dugger, Air Force Systems Command, replaced Montanarelli as the Federal Laboratory Program Managers at NSF. This provided both NASA and the traditional DOD input to the position (the first three Program Managers—Metcalf, Antinucci, and Montanarelli—all having been DOD employees).

In response to a request from the Office of Personnel Management (OPM) for a detailed description of the role of a "technology transfer coordinator," the Consortium developed a baseline description for technology transfer administration. This description supported the efforts of the NSF to establish the Coordinator position within the Civil Service system. Further, a survey was developed and distributed to FLC Representatives later in the year to assist OPM in its determination of the necessity of establishing a Coordinator position. By April, OPM was contacting people active in technology transfer to obtain current information on transfer activities in the Federal Government and elsewhere. OPM also had indicated its support of using the IPA mobility program as a tool in meeting President Carter's cooperative-development policies regarding state and local governments, which the Consortium continued to push as an excellent vehicle for outreach and active technology transfer. Although it supported the FLC's goals, OPM did not support the establishment of the "Technology Transfer Coordinator" position description, so no "TTPD" (technology transfer position description) was developed for Civil Service.

The Agency for International Development (AID) approached the FLC, via NSF, expressing interest in applying proven transfer methodologies to establishing better technology transfer to developing countries. The Consortium Executive Committee (formerly the Coordinating/Steering Committee) approved the concept, and a proposal to assist the Agency (FLC/AID Support Program) was issued in August.

President Carter's message on science and technology and the problems of state and local governments

John McFall, of NASA, and Cortland Dugger, of the Air Force Systems Command, replacing Montanarelli at NSF, providing both NASA and traditional DOD input

Developing a baseline description for a technology transfer coordinator, in an effort to establish that position in the Civil Service system, and support for the IPA mobility program

A proposal to assist the Agency for International Development (AID) in applying proven transfer methodologies to developing countries

Resolution of the U.S. Conference of Mayors expressing concerns about national science and technology efforts and also barriers to cooperation with respect to the Federal laboratory system

The U.S. Conference of Mayors—which had become a significant player in bringing forward the technology transfer needs and concerns of local governments, often contributing to the visibility and the success of the Consortium—also remained interested in FLC progress. In May, it passed a resolution on two areas: priority concerns related to national science and technology efforts, and the Federal laboratory system and the real and perceived barriers to complete cooperation.



Pictured at the FLC Awards ceremony of the Spring 1979 Meeting in Gaithersburg, MD are: James Wycoff, NBS; James Atkinson, NUSC (Metcalf Awardee); George F. Linsteadt, FLC Chairman; Richard Eckfield, U.S. Conference of Mayors (Outstanding Service Award winner); and Robert Crawford, NSF.

FLC Active with Public Interest Groups, Industry, and Local Governments

By early 1979, the Consortium already had expanded its efforts significantly in private-sector cooperation. Regional demonstration projects, which were funded by supplemental grant funds from NSF and administered by NWC, linked Government and industry. The Mid-Atlantic Region was organizing a "Technology and Business Opportunity Conference"; the Mid-Continent Region was developing formal interchange mechanisms with a trade association; the Far West Region was active with the Technology Action Center in Santa Clara, CA; and the FLC had contracted with DelaBarre to conduct an in-depth study on the development of a National Resource Center. The Center, described by Linsteadt in his March 1978 request for funding for planning and concept demonstration, would

Serve as the vehicle by which the required integration and coordination can be accomplished and provide common ground where public and private sector officials can interact with technology experts (primarily from the Federal Laboratories) to develop mechanisms and agreements which couple business, political and technical interests.

In June 1979, as part of its continuing effort to broaden and maintain its effectiveness in assisting local governments, the FLC requested additional funding from NSF to develop a clearinghouse/documentation activity for successful technology transfers and innovations that would be useful to local government activities.

The Consortium also extended its technical resource capabilities to support the groups comprising NSF's new National Innovation Network. The FLC encouraged regional coordinators to become *ad hoc* members of the innovation groups' boards and to attend their meetings. Likewise, the directors of the various innovation groups sought *ad hoc* memberships in the appropriate FLC regional organizations and attended these meetings.

The superstructure of the Consortium was growing along with its programmatic base. Linsteadt retained the Secretariat function, operating out of China Lake and adding more duties to that administrative function. The FLC Executive Committee created a permanent Planning Subcommittee and charged it with drafting

Expanded efforts in private-sector cooperation by early 1979, more regional demonstration projects, and the proposal to plan for a National Resource Center

Request for funding from NSF for a clearinghouse activity to document successful technology transfers and innovations

The FLC encouraging its regional coordinators to exchange memberships with the groups in the National Innovation Network

The increasing formality of the FLC's administrative functions, with a permanent Planning Subcommittee charged with submitting plans and policies to the Executive Committee

The austerity of the Defense budget from the mid- to late 1970's, the sharp increase in the extent and the cost of technology transfer efforts, and the need to seek funding from other sources

A letter from Governor Thompson of Illinois to Congressman Brown, praising FLC and suggesting it as a resource in decision-making for public policy

and submitting policies and plans to the Executive Committee for approval. This move reflected the increasingly "formal" nature of the Consortium as an entity.

Funding the Consortium's increasing number and scope of programs became a significant issue, due to the austerity of the Defense budget from the mid-1970's through the late 1970's. The three-year funding proposal submitted in Fall 1979 to NSF by NWC requested more than \$862,000 to support FLC operations. NSF granted \$250,000 for the first year—a considerable increase from Hersman's Federal Laboratory Program funding request of \$20,000 for the DOD Consortium made only 5 years earlier. Since the individual member activities were paying for their representatives and for the support of those representatives, the total Federal R&D community commitment to technology transfer and domestic problem-solving was much greater than indicated by the amount of the NSF grant. By the end of the year, the Consortium more than ever before was seeking funding from sources other than NSF.

Even with a bigger budget, the Consortium continued to contend with demands that easily outstripped resources. Its supporters—satisfied "customers" for the most part—did come forward. In October Governor Thompson of Illinois sent a letter to Congressman Brown praising the FLC and its efforts with state and local governments and pushing for more Congressional support for Consortium laboratories and their assistance efforts. The Governor also suggested that FLC resources and capabilities could be integral to the public-policy decision-making process:

Although the Consortium is becoming recognized throughout the country for its public service commitment, member laboratories are operating under severe financial and personnel constraints while trying to provide this valuable help. . . . I would suggest for a nominal fiscal and program commitment, the FLC resource capabilities can become an integral component in the public policy decision making process for state and local governments.

. . . As public officials working in a period of declining resources, it behooves us to utilize to the greatest extent possible readily available resources and expertise throughout the country.

State and local governments, too, were "feeling the pinch" of the 1970's. During the latter 1970's and early 1980's, the "taxpayer-revolt" attitude, the growing environmental movement and other "special-interest" movements brought significant changes to the demands placed on all levels of government, as well as to the resources available to all levels of government.

The popular demand for greater fiscal accountability was coupled with an often-contradictory demand for more services. For example, the "Proposition 13" property-tax initiative which passed in California in June 1978 (similar tax-abeyance measures in other states followed) exacerbated existing budgetary problems confronting local governments and affecting their ability to continue to provide the services demanded by their constituencies. These conditions actually enhanced the need for Federal laboratory involvement, and the FLC pursued further interchange in a variety of areas.

Procuring and providing energy in its various essential forms was a prime concern for state and local governments, and the Consortium began investigating transferrable technology applications. As a result, the Consortium developed the Energy Link Project in 1980. This was a simple, efficient resource- and technology-locator system. Energy Link was designed specifically to improve the accessibility and usability of the vast storehouse of energy-related technology available within the Federal laboratories. More importantly, Energy Link, designed from the point of view of the local-government user, allowed the user to identify immediate and projected needs and to "pull" from the entire Federal laboratory system all available resources applicable to those needs. Efficiency was a prime requirement for any Consortium activity; with funding severely limited to both local-agency users and Federal-agency providers, maximum utility at minimum fiscal impact had to be a deciding factor above and beyond utility.

The "tax-payer revolt" attitude, the growth of special-interest movements, and consequent changes in demands on the limited resources of state and local governments

The popular demand for fiscal accountability yet more services, the enhanced need for Federal laboratory involvement, and the FLC's response

The importance of transferrable applications in procuring and providing energy and the Consortium's Energy Link Project, 1980, a resource-locator system designed for the local-government user

Increasing references in Congress to the FLC's success

Congressman Brown's introduction of the National Technology Foundation Act in 1979, to establish a National Technology Foundation patterned after NSF with functions transferred from NSF and the Department of Commerce

The proposed legislation not enacted, but Brown's continuing support of NSF and the Consortium in their efforts to secure legislative footing

Continued efforts by the Consortium with initiatives for technology transfer legislation in both houses of Congress

Developing Firmer Legislative Foundations and Financial Support for Technology Transfer

Congressional efforts to advance technology transfer and cooperative-development programs intensified as resources dwindled in the late 1970's. Congress often cited the successes of the Consortium as evidence of the effectiveness of appropriately applied active technology transfer.

Congressman Brown, a great friend of the FLC, introduced the National Technology Foundation Act in September 1979, creating an independent agency specifically "to promote technology for the national welfare." Patterned very much after NSF, the National Technology Foundation (NTF) would be funded at \$500,000,000 for fiscal 1981 and reach \$875,000,000 for 1983 and be organized into seven branches, one of which was "intergovernmental technology." The Foundation's programs would be primarily transfers from NSF and Commerce Department, with NTF absorbing the DOC agencies including the National Bureau of Standards, Patent and Trademark Office, and the National Technical Information Service.

The National Technology Foundation Act was not enacted, but Brown and his associates continued to support the efforts of NSF and the Consortium and to pursue similar legislation to further the application of technology in the national interest. The Consortium and its members continued their efforts to provide firmer legislative footing for technology transfer and application projects. This included providing comment, review, and testimony, and organizing support for a variety of Congressional efforts.

Significant Congressional momentum for developing firmer legislative foundations for technology transfer was even more evident by early 1980. Various forms of technology transfer/utilization legislation were being championed by members of both houses of Congress and at several levels of their constituencies. The Consortium continued to be actively involved in these legislative endeavors. High-level support became more necessary as the Consortium searched for alternative sources of funding for continuing its operations and expanding its programs.

Los Alamos Scientific Laboratory proposed that it provide public affairs programs for this support. Such a program was consistent with the Consortium's and the President's domestic technology transfer goals, but funding for such a program was not available from the NSF operating grant. The Consortium tried to get the Department of Commerce to have NTIS fund the FLC Regional Coordinators to assist NTIS in accomplishing industrial-innovation initiatives directed by the Executive Branch. NTIS declined, so the FLC Executive Committee decided at its Spring meeting to solicit at least \$2,000 from each member laboratory to cover the cost of the public affairs programs. Getting funds out of the laboratories—especially at a time when laboratory budgets were strictly controlled and hiring was virtually frozen—was never as easy as asking for it. Funds were getting tighter, but legislative relief was getting ever closer.

Members of the U.S. Conference of Mayors' Urban Economics Committee, Science and Technology Subcommittee, met with Senator Charles Mathias (R-MD) in March 1980 to generate further Congressional support for increasing local-government involvement with Federal laboratories and to promote the Conference of Mayors' legislative proposals, which were remarkably similar to parts of what would become Public Law 96-480. Mathias, a strong FLC ally, wrote to Linsteadt thanking the Consortium for its efforts on behalf of the recent successful Technology Exchange Conference and stating his support for further Federal laboratory-supported technology transfer efforts. He also gave his assurance of continued substantial FLC involvement in the process:

I am more committed than ever to making this talent available to state and local governments all over this country. My staff is already working on legislation to do just that. You can be certain that your testimony will be included in the hearings that are planned, and your thoughts incorporated into the legislation as it develops. . . . There is a clear national need to make better use of our nation's scientific and technological expertise, and we have, in the FLC, a ready, willing and able group of scientists and engineers to help meet that need. Support and interest are building; in Congress, in state and local governments and in the federal laboratories themselves. . . . The momentum is there and with your help I'm confident that we can harness this force and

With NSF funding unavailable for public affairs programs and NTIS funds unavailable for industrial-innovation initiatives, solicitations sought from member laboratories to cover costs

Support by Senator Charles Mathias of Maryland, and his letter to Linsteadt promising a legislative initiative, which was overtaken by even broader legislation

direct its energy toward a productive solution that will benefit all segments of our society.

Dr. James Atkinson, FLC Northeast Regional Coordinator, was detailed from NUSC to work with Mathias to help develop S.3016, the Governmental Efficiency in R&D Act of 1980, which Mathias introduced in August. The Consortium reviewed the bill and provided commentary, but the Mathias proposal was overtaken quickly by even broader legislation.

By Fall 1980, the Consortium boasted 190 member laboratories. The "big news," however, was that the Consortium had acquired the long-awaited legislative foundations for its efforts.

By Fall 1980, the FLC's 190 member laboratories received the long-awaited legislative foundations

Stevenson-Wydler Technology Innovation Act Passes

Arguably the most significant milestone in FLC history since the founding of the DOD Laboratory Consortium was reached with the passage of the Industrial Technology Act by Congress on October 1, 1980. The Act authorized \$285,000,000 for 5 years for programs to improve the Nation's industrial technology. The Act became law, Public Law 96-480, on October 21 and was named the Stevenson-Wydler Technology Innovation Act in honor of retiring U.S. Senator Adlai E. Stevenson (D-IL) and retiring U.S. Representative John W. Wydler (R-NY). The new legislation established centers for the study of specific technologies that had uses in a variety of important industries. It also encouraged the Federal laboratories to transfer the technology they developed to state and local governments and to private industry. The Senate passed the bill, S.1250, on May 28; the House acted on September 8, after making amendments that added a role for NSF, transferred Federally developed technology to private industry, and provided for a National Technology Medal.

The Stevenson-Wydler Act, Public Law 96-480 as of October 21, 1980, authorizing technology transfer to state and local governments and to industry and including relevant provisions

The Stevenson-Wydler Act incorporated many of the ideas and intentions of the Federal Laboratory Consortium and its stalwarts.¹⁴ The 10-year efforts and the hard-fought successes of the Consortium and its members had a great deal of influence upon the content of the bill and upon its acceptance by Congress. Public Law 96-480 incorporated some of the provisions that had been championed—and some that had already been enacted—by

the Defense Department and its agencies, the Federal laboratories, and the Consortium members. In its final form, the Act

- ▶ Created an Office of Industrial Technology within the Department of Commerce to monitor technology development in U.S. industry, to recommend government measures to advance innovations, and to exploit foreign innovations.
- ▶ Authorized the Secretary of Commerce to assist in establishing industrial technology centers affiliated with universities or other nonprofit organizations for the purpose of developing technologies with widespread application to industry.
- ▶ Allowed each center the option of acquiring title to any invention made within the center and supported in part by Federal funds, but required that patent royalties be used only to compensate the inventor or to promote the educational or research activities of the center.
- ▶ Instructed NSF to assist in establishing centers, but authorized no new funds for this purpose.
- ▶ Established a 15-member National Industrial Technology Board to review the activities of the Office of Industrial Technology and to advise the Director.
- ▶ Required Federal laboratories to establish Offices of Research and Technology Applications (ORTAs) to promote the use of laboratory-developed technologies by private industry and by state and local governments.
- ▶ Required Federal agencies to devote 0.5 percent of their budgets to promoting the transfer of Federally developed technology.
- ▶ Required each large Federal laboratory to have at least one professional full-time equivalent position in its Office of Research & Technology Applications.
- ▶ Established a Center for the Utilization of Federal Technology in the Department of Commerce to coordinate the activities of the various offices of applications and to act as a clearinghouse for information on technology originating in the Federal laboratories.

The Consortium's influence over ten years' time on the contents of the legislation, reflected in the Act's provisions, as listed

The beginning of the FLC's planning for implementation of the legislation and for long-range development of technology transfer, and request by Chairman Linsteadt, for NSF's review of FLC funding

Limitations on Federal personnel regulations

- ▶ Established a National Technology Medal to be awarded by the President to individuals or companies that made outstanding contributions to the promotion of technology.
- ▶ Instructed the Commerce Secretary and NSF to encourage exchanges of scientists and technicians among universities, industrial activities, and Federal laboratories.
- ▶ Authorized \$5,000,000 in fiscal 1981; \$9,000,000 in fiscal 1982; and \$14,000,000 in fiscal 1983, 1984, and 1985 for the Secretary of Commerce to carry out the provisions of the Act.

With Stevenson-Wydler's passage, the Consortium devoted its Fall meeting to the pleasant task of providing information on the Act and its ramifications to the membership. With what Linsteadt termed "a form of legitimacy," the FLC began planning its own extensive involvement in implementing the provisions of the new legislation and developing a Long-Range Development Plan. As one of his last actions as Chairman, George Linsteadt submitted the FLC's grant request to NSF for review and action.

The passage of "The Act" was, indeed, a major milestone, but implementing PL 96-480 would prove to be no mean feat. Even with the assurance of firm legislative legs under it, the Consortium still had to face department and agency hiring freezes, program reorganizations, shifting and reshifting priorities, and Congressional interests. For instance, although the new law mandated dedicated staff members from each large laboratory, it came about in an era in which Federal Government employees were plagued by a variety of contracting-out and personnel-ceiling regulations—regulations from which the Federal laboratories were not entirely spared.

On the positive side, Charles Miller, Lawrence Livermore National Laboratory (LLNL), and James Atkinson, Naval Underwater Systems Center (NUSC), who had replaced Cortland Dugger and John McFall at NSF in Fall 1980, added the perspective of the Department of Energy to the NSF-level technology transfer operations while maintaining the traditional DOD input to the Federal Laboratory Program position. This broader perspective at the NSF level reflected the broadening perspective of the FLC. Also, George Linsteadt helped to maintain this perspective when he was elected President of the Technology Transfer Society in 1980, an organization that had been associated with the Consortium for 6 years.

In November 1980, the Consortium elected as FLC Chairman Dr. Eugene Stark of Los Alamos National Laboratory (LANL), and George Linsteadt was appointed the Consortium Executive Director. Stark served full time as the technology transfer focal point at LANL. He established the technology transfer program at LANL in 1974 and served as the laboratory's representative to the FLC from June 1975. When elected FLC Chairman, he was Regional Coordinator for the Mid-Continent Region, a member of the Executive Committee, and the FLC Technical Specialist on Energy.



In 1980, new managers of the NSF Federal Laboratory Program, Charles Miller, Lawrence Livermore National Laboratory (LLNL), and James Atkinson, Naval Underwater Systems Center (NUSC), furnishing perspectives from both DOE and DOD

The election of Dr. Eugene Stark, Los Alamos National Laboratory (LANL), as the FLC Chairman, the appointment of Linsteadt as Executive Director, and the anticipation of many implementation battles ahead

Chapter 6

FAIT ACCOMPLI—NEARLY, 1981-1988

The Evolution of the Consortium After Stevenson-Wydler

Under the leadership of Chairman Gene Stark, the FLC philosophy and approach focused on the role of the individual—the researcher, the engineer, the technology transfer official—in a setting of close teamwork. Long before empowerment and networking became buzzwords, the network of individual FLC representatives learned from each other, used each others' legal and administrative precedents to jump-start initiatives, and developed cross-Lab, cross-Agency cooperation that worked.

Legislatively, now quite visible, the Consortium still faced the dual problems of ensuring its own economic survival while dealing with the rather thorny questions of how to implement Public Law 96-480 and of how to determine what role the Consortium would play in that implementation.

Legislative Mandates v. Reality

In February 1981, Chairman Stark called a meeting of technology and laboratory experts to assess the impact of PL 96-480 on the Consortium and its operations. Even though the Stevenson-Wydler Act encouraged technology transfer, it was becoming more and more obvious that the implementation of the Act was going to prove difficult. Major stumbling blocks were shifting Congressional support; changes at NSF; and the significant OMB Bulletin banning "wasteful spending" on Government periodicals, pamphlets, and audiovisual products.

Under Chairman Stark, FLC philosophy and approach focusing on individuals and on their learning from each other

Assessing the impact of PL 96-480 on the Consortium and major stumbling blocks, especially the OMB Bulletin limiting documentation, including products key to FLC's success

Explanation of NSF's enabling grants, 1979 to 1981, and the present need to develop stable financial support for FLC

Summary by James Wyckoff, NBS Liaison for State and Local Government Affairs at DOC, of budget cuts and other constraints on technical aid to state and local governments

The latter had the distinct possibility to curtail or even eliminate the very products that were seen as key to successful Consortium efforts. In March, NSF informed the Consortium that the funding planned for its 1982 operations would not be available because of OMB-mandated cuts. By November, grant funding from NSF for the operation of the FLC had been all but eliminated.

NSF Grant ISP, initially approved in January 1979, had been followed by an amendment with a final expiration date of January 1981. This grant period overlapped another NSF grant during the period January 1979 through November 1979, and yet another NSF grant during May 1980 through January 1981. NSF grant support had been instrumental in the DOD Laboratory Consortium's evolution from a loosely structured consortium to a formal organization capable of nurturing the FLC transfer activities developed over the years. The passage of PL 96-480 during the grant period clearly confirmed the need for this formalized FLC on a national scale—even if it hadn't provided clear funding for continued progress. The challenge to FLC now was to develop stable financial support for its operations.

The atmosphere of the times was summarized well in a March 16 memorandum by James Wyckoff, the National Bureau of Standards (NBS) Liaison for State and Local Government Affairs at the Department of Commerce (DOC). The memo highlighted the massive changes making increased technology activities more difficult or even unlikely. These included changes in the Federal bureaucracy beginning under the Reagan Administration, the budget cuts already affecting the Federal agencies' technology transfer efforts, Congressional realignments affecting the support base for technology transfer, and the organizational changes within agencies. While Federal budget cutting initiatives were of concern, the Consortium continued to develop its public affairs and publications programs directed at expanding the technology user base.

Approaches to Implementing PL 96-480

Congressional interest in the Consortium was not entirely lacking, though. In the Fall, Congress held an important hearing on the Stevenson-Wydler Act and asked the General Accounting Office to assess the adequacy of Federal agency implementation of the Act. Although most Federal agencies had not issued policies and instructions regarding PL 96-480 to their laboratories, many laboratories on their own initiative had established an in-house Office of Research and Technology Applications (ORTA), as specified by PL 96-480. Some agencies were providing policy support to FLC, and some of their member laboratories also were providing financial support.

In addition, the U.S. Conference of Mayors initiated a City/Federal Laboratory Program, a proactive approach designed to implement Section 11 of the Stevenson-Wydler Act. The Conference's program called for funding from NSF, direction and policy from the Federal agencies, and oversight from Congress. None of these was received in any significant measure, but the impending plight of the FLC and its activities received increased attention.

During the early 1980's, the Consortium's character clearly was changing: the FLC was becoming an even broader-based organization, and it was a more "outgoing" entity—more concerned with outreach to the public and the larger issues of putting technology to work. With its solid, legislated foundation established, much of the energy that had been expended on surviving within the Federal Government was turned toward achieving broader utilization outside of the Federal Government.

In 1981, the Consortium re-established *TECTRA*, formerly a publication that became available on-line as an interactive computerized data bank of successful technology transfer cases. *TECTRA*, funded by the FLC and operated by the School of Business and Public Administration of the California State University (CSU), Sacramento, was the first complete, accessible source of information regarding Federal laboratory innovations having potential application to the technology needs of the public and private sectors. This database combined both source (laboratory) and user (municipality, local agency, industry, etc.) data. Each case documented in *TECTRA* summarized the

No policies yet forthcoming from most Federal agencies, but the establishment of an Office of Research and Technology Applications (ORTA) in many laboratories and the support in some for the FLC

A proactive approach by the U.S. Conference of Mayors to implement Section 11, calling for action by NSF, the Federal agencies, and Congress

Changing emphasis within the FLC on public relations and the larger issues of technology transfer, changes from survival toward broader utilization

Putting TECTRA on-line, in addition to a newsletter, as an interactive data bank of successful technology transfer cases, summarizing technologies, transfer mechanisms, and contact points for potential users

Funding by NSF, but not at the level or with the certainty promised by the Act

Efforts in Congress to increase NSF funding for technology transfer and to appropriate money to implement the Center for Utilization of Federal Technology authorized by the Stevenson-Wydler Act

Laboratories whose funding support was of particular note

technology/technologies transferred and the transfer mechanism(s). Most importantly, the summary also documented user experience and provided contact points for both technology source and technology user organizations. The Consortium covered all costs associated with the service including distribution of a monthly newsletter, the *Federal Laboratory Consortium TECTRA Newsletter*. This brief publication generated considerable interest—well over 1,000 requests for further information, as well as some 370 additions to the distribution.

The FLC still expended efforts within the Government to maintain some sort of solvency. The NSF transferred another \$15,000 to NWC in June and an additional \$8,000 in August to support expanding Consortium operations. However, this was not at the level or with the certainty authorized by the Act.

Richard E. Eckfield, the Chairman of the Oversight Committee on Policy for the Technology Transfer Society, recommended that NSF continue to fund the FLC, and in March, Representative Doug Walgren (D-PA), Chairman of the House Science, Research and Technology Subcommittee, responded positively to the suggestion. The House Science and Technology Committee agreed to add \$1,000,000 to the line item for NSF's Scientific, Technology, and Internal Affairs to the NSF authorization bill for fiscal year 1983 with the expectation that the Consortium would be funded with a portion of the increase. At the same time, Walgren and Congressmen Fuqua (D-FL), Brown (D-CA), and Watkins (D-OK) were working to convince the Appropriations Committee to provide funds beyond the Administration's request for implementation of the Stevenson-Wydler Technology Innovation Act. A portion of the funds would be for the Center for Utilization of Federal Technology, established by the Act but as yet unrealized.

Fortunately, numerous laboratories and agencies followed the suggestions of the Stevenson-Wydler Act and provided increasing funding for the FLC from 1982 through 1986. Of particular note was support from the Army Materiel Command, the Navy laboratories, the DOE laboratories, and the Forest Service.

As part of its efforts to continue to expand its user base, the Consortium developed the concept of an "advisory committee" representing the transferred-technology-user community. The advisors were established during 1982 with members representing universities, state and local governments, and private industry. The Consortium also had initiated the development of a formal and comprehensive Public Affairs Program through the LLNL. To assist in this effort, NBS assembled the *Federal Laboratory Directory* and published it in 1982. This highly useful "Directory" listed all Federal laboratories by location, size, and areas of expertise.

Following on the early success of *TECTRA*, the Consortium supported the development of "TECLAB," a research project of the School of Business and Public Administration of CSU Sacramento. CSU compiled the TECLAB database containing information on new technologies developed by the Federal laboratories and available for commercialization. Geared toward user needs, TECLAB would output contacts at various levels. DOC funding paid for the development and operation of TECLAB as a dissemination service, rather than a brokerage service. During its first year of operation in fiscal year 1983, the project received 860 follow-up requests for information, and in FY 1984, that number nearly doubled. TECLAB also published a newsletter featuring current technology transfer cases. The distribution was at 4,500 in FY 1983 and grew to nearly 8,000 in FY 1984.

Publishing and disseminating the Consortium's informational pamphlets were new activities for the 1980's. *FLC 1982* and subsequent publications in the series identified laboratory and Consortium contacts, activities, and some specific technologies. Distributing some 10,000 copies proved to be a worthwhile communications endeavor. For example, the FLC used feedback regarding the 1984 issue and nearly doubled the size of the *FLC 1985* version. The Consortium also had put in place an exhibit program that provided FLC presence at a variety of "far-flung" conferences, exhibitions, meetings, demonstrations, and forums.

Establishing user advisors from universities, state and local governments, and private industry and a Public Affairs Program, assisted by the Federal Laboratory Directory assembled at NBS

The TECLAB database, and also a newsletter, of technologies developed by Federal laboratories and available for commercialization, supported by DOC as a dissemination service rather than a brokerage service

Publishing FLC 1982 and subsequent informational pamphlets, and mounting an exhibit program to provide an FLC presence at conferences and other forums

The Department of the Army and its laboratories, a dominant force in FLC during the 1980's, and special brochures highlighting the Army's expanding technology transfer program

In 1982, the first workshop for Government laboratories and industry, sponsored by Northern Regional Research Center and co-sponsored by Aladdin Industries, and increasing participation in subsequent workshops by Fortune 500 companies

Establishment of the FLC/Agency Liaison Group, reflecting the interest of representatives of Federal agencies in strengthening relationships between their headquarters organizations and the FLC

The Special Award for Excellence in Technology Transfer established in 1983

Also, during the early 1980's, the Department of the Army and its laboratories became the dominant DOD force in technology transfer activities, including providing significant funding for FLC activities. The Army Coordinating Group was established within the Army FLC/technology transfer community, and that group met during each FLC national meeting, thus providing additional focus for Army efforts. Special brochures were even developed for the Department of the Army's expanding technology transfer program, detailing its program and FLC involvement, highlighting specific available technologies, and spotlighting specific activities.

Building Organizational Structures for Outreach

The first of the large-scale laboratory/industry workshops was held in March 1982 in St. Louis, MO. Organized by the Northern Regional Research Center (USDA) and co-sponsored by Aladdin Industries, the first laboratory/industry workshop attracted participants from 10 Government laboratories and 25 industrial concerns. Industry participation, representing mostly Fortune 500 companies, continued to increase throughout the decade.

In the Spring of 1983, the Consortium began the formation of the FLC/Agency Liaison Group. Representatives of Federal agencies met with Stark to discuss methods for strengthening the relationships between the FLC and the headquarters organizations of its member laboratories. The interest expressed by the various Government agency representatives in maintaining and strengthening interagency information exchange with regard to technology transfer policies and projects led to the establishment of the Liaison Group as a standing committee to which the Consortium reported its results, progress, and problems, and sought suggestions.

At the May 1983 meeting in White River Junction, VT, in a further move to increase and improve overall agency/laboratory involvement, the FLC Executive Committee approved a proposal by NBS representative Jim Wyckoff for establishing an award for laboratory employees who had made outstanding efforts in transferring specific technologies. Late in the year, the Special Award for Excellence in Technology Transfer was formally established to recognize those individuals. The first of these

awards was presented in May 1984 in conjunction with the Consortium's 10th anniversary meeting in Alexandria, VA.

The Summer of 1983 saw the initiation of what would eventually become the *FLC Resource Directory*. The FLC funded NWC China Lake to develop a laboratory-personnel-locator database that would answer questions related to institutional and individual areas of expertise and the availability of technological resources.

The FLC-China Lake relationship continued to be a strong one—one centered upon, but not confined to, George Linsteadt. The Consortium's long-standing productive relationship with DelaBarre and Associates also continued to expand during this period, and the company was hired to arrange the Fall FLC meeting in Biloxi, MS.

Late in 1983, Giora Pelled, Army Headquarters, assumed the Laboratory Program Manager position at NSF. When Pelled returned to the Army in 1985, the NSF Program Manager's job was not filled. Although the FLC Executive Committee recognized the need for continued high-level Consortium presence in the Nation's capital, and reaffirmed it, it was late 1986 before more positive action was taken to ensure such a presence.

Another end to an era occurred in 1983 when, in September, George Linsteadt resigned as Executive Director of the Federal Laboratory Consortium. Linsteadt continued to be actively involved in the Consortium through his retirement in 1989 from Civil Service at the Naval Weapons Center and on into post-"retirement" work. Ted Maher of the USDA Extension Service was named as Executive Director to follow Linsteadt.

Demonstrations of the FLC's Networking Capabilities among Diverse User Groups

The Consortium continued to highlight its networking capabilities as its most valuable assets, its ability to link its "internal" national network of Government laboratories, agencies, and institutions with the larger world. By mid-1985, the Consortium's networking efforts had brought it into close cooperation with a large number and wide variety of national interest groups and coordinating organizations. The following list of organizations

FLC funding of NWC to develop a laboratory-personnel-locator database, the beginning of the FLC Resource Directory

FLC's continuing relationship with NWC and with DelaBarre and Associates

1983, Giora Pelled, Army Headquarters, new Laboratory Program Manager at NSF

Also in 1983, Linsteadt's resignation as Executive Director, and the new Executive Director, Ted Maher, USDA Extension Service

FLC's networking capabilities and the diversity of its customer base, as indicated in the 1984 Report to the FLC/Agency Liaison Group

The pioneering Technical Volunteer Service (TVS), member laboratories assisting nearby communities and also providing expensive consulting services at no cost

was taken from the 1984 *Report to the FLC/Agency Liaison Group* and illustrates the diversity of the FLC customer base at large. The list does not include the names of smaller state and regional networks and interest groups accessed via individual FLC representatives.

Public Interest Groups

International City Management Association
National Association of Counties
National Conference of State Legislatures
National Governors' Association
National League of Cities
U.S. Conference of Mayors

Special Interest Groups

American Iron and Steel Institute
National Association of Manufacturers
Small Business High Technology Institute
Society of Manufacturing Engineers

National Networks

Community Technology Initiatives Program
Urban Consortium for Technology Initiatives
Urban Technology Initiatives Program

Another area of outreach pioneered in the early 1980's was the Technical Volunteer Service (TVS). FLC member laboratories—notably the Naval Underwater Systems Center—working in concert with other public and private organizations took the lead in establishing a volunteer service program to assist the communities surrounding the Federal laboratories. TVS gave laboratory staff the opportunity to provide technical expertise, perspective, and assistance to their communities. TVS also provided expensive consulting services at no cost to either Federal laboratory or community, and the Service was able to arrange the help of retired staff members when appropriate. The FLC and several of its member

laboratories held TVS training sessions and information exchanges, and the Service roster soon included members from the Army, Energy, and Navy laboratories. FLC/TVS efforts also grew to include cooperative and coordinating ventures with other volunteer technical-service organizations, (e.g., the retiree organization of the Union Carbide Corp.).

By early 1984, the FLC's education and outreach efforts showed tangible results, and the need to maintain and expand public-affairs activities became more clear. Thus, the FLC created the Public Affairs Committee, which was renamed the Marketing and Public Affairs Committee and given permanent status in 1985. In May, the Consortium celebrated the publication of the 100th issue of its monthly informal newsletter, *FLC News Items*, which was distributed to more than 300 interested individuals and organizations. The newsletter became *FLC News* in April 1985, a more formal, streamlined, and cost-effective information and marketing tool. *FLC News* better represented the FLC as the mature organization it was becoming.

By 1985, the FLC's professional outreach efforts included a number of "demonstration projects" initiated at the FLC Regional level to test out new methods and avenues for transferring Federal technologies.

In early 1985, under the direction of Regional Coordinator, Loren Schmid, the Far West Region and the NASA Industrial Applications Center (NIAC) based at the University of Southern California entered into a formal agreement that provided NIAC clients with direct access to the Region's member laboratories and their technological expertise. One FLC representative received and monitored requests—150 of which were directed to the Consortium from NIAC in the first 10 months of the cooperative operation. Requests for information and/or assistance were handled by a team of FLC representatives from NBS, NWC, and Pacific Northwest Laboratory working with the FLC Technical Specialist Coordinator. The effort used a more formal and directed methodology well described in the 1984-1986 *Report to the Federal Agencies* as "an orderly procedure based on a rifle shot rather than a shotgun approach in distributing requests to other FLC representatives . . ."¹⁵ The FLC/NIAC demonstration project showed that a clearinghouse concept could be used to provide answers to questions and referrals to more appropriate

1985, the Marketing and Public Affairs Committee, and the newsletter, FLC News, a formal information and marketing tool

Clearinghouse concept demonstrated by the agreement between the Far West Region and NASA Industrial Application Centers (NIAC), referenced in the FLC's 1984-1986 Report to the Federal Agencies

A computer-based directory of Federal laboratory resources, and its development into the FLC Clearinghouse through a Navy/FLC proof-of-concept demonstration and a Far West Region demonstration and evaluation

An additional demonstration through a partnership of the Far West Region and Napa Valley College

A demonstration project by other regions, relating the Consortium's resources to regional economic growth in advanced technology/R&D business areas

sources of information. The demonstration project was successful enough from the outset that other NASA Application Centers were added as the project progressed.

The FLC/NIAC demonstration project also directly influenced the form and formation of the FLC Clearinghouse which used the *Resource Directory* developed for the Consortium by NWC in 1983. The FLC had taken the lead role in developing a computer-based, widely accessible directory of available Federal laboratory technological resources. A successful Navy/FLC proof-of-concept demonstration of the personnel-locator database during 1984 led to the expansion of both the concept and the demonstration.

In January 1986, a Far West Region demonstration and evaluation of a new *FLC Resource Directory* was initiated. This highly successful year-long project had four primary objectives:

- ▶ To review and modify the Navy conceptual model for operational application;
- ▶ To provide an operational design;
- ▶ To demonstrate an operational capability; and
- ▶ To establish operating and maintenance requirements, an FLC-wide design (including system enhancements), and operating procedures and associated recurring costs.

Additional demonstrations were established in relatively short order, including a Far West/Napa Valley College partnership involving the Lawrence Berkeley Laboratory. This proved that a network which included several colleges could efficiently supply their communities and states with economic-development opportunities.

A Northeast and Mid-Atlantic Regions/Southern New Jersey Technology Consortium demonstration project was formed and included other New Jersey organizations which drew on Consortium resources to increase the region's economic growth in advanced-technology/R&D business areas.

The involvement of the DOE National Laboratories in the Consortium continued to increase. Sandia National Laboratories helped the Consortium develop a modern information/communication system and in 1984 provided FLC executives and regional representatives free access to its COMET electronic-mail system. In 1985, Los Alamos National Laboratory took over the duties of the Consortium's financial administration, and LLNL granted subscription-fee-waived access to its Technical Information System (TIS) gateway computer to all FLC members. This permitted the Consortium to establish an expanded communications network based on the system. Within a year, 91 member laboratories were using TIS, a communications system with far broader access than the COMET system. The FLC Secretariat office and all the NASA Industrial Applications Centers also were linked via TIS, thus enhancing interlaboratory communications and allowing the establishment of regular electronic conferences.

Involvement of the DOE National Laboratories and access to the Technical Information Service (TIS), enhancing interlaboratory communications and enabling electronic conferences

The widespread use of the TIS system allowed the Consortium to experiment with the ever-expanding variety of information-support technologies. Realizing that these technologies and systems would be the core of the Consortium's communications network in the near future, the Consortium's efforts and investigations into electronic communications were formalized in 1986 through the establishment of the Information Management Committee. The Committee's initial task for fiscal year 1987 was to explore available communications and information systems, to demonstrate possible systems and schemes, and then to recommend a permanent communications/electronic-mail system for the FLC. The Committee and the Consortium quickly recognized that information-management efforts needed to be formal and ongoing with the fluid nature of electronic communications and the accompanying ephemeral nature of applied technology and systems—especially with regard to the high-technology arenas in which the Consortium operated. These efforts subsequently were consolidated into a standing Information Systems Committee that was to continue to provide leadership in the communications area.

FLC's exploration of available communication and information systems by an Information Management Committee, later consolidated into a standing Information Systems Committee

1985, the first of the directed "common interest groups" (CIGs), involving universities, and later CIGs tailored to small business, large industry, and research institutes

An Industry Task Force, and the evolution of an Industry/Government/University Relations Standing Committee

A membership of 328 laboratories, with a Secretariat, an Executive Committee, six Standing Committees, and six Regions, a variety of linking media, and major funding from the laboratories and the Army Materiel Command

During the mid-1980's, the FLC took an organizational approach to the specialized needs and concerns of potential technology users. It initiated the development of directed "common interest groups," or CIGs, for the purpose of increasing interaction between the Consortium and its customers. The first group undertaken in 1985 was the University CIG. A steering committee composed of six university representatives and an FLC Representative/liaison member developed goals and implementation strategies that would help ensure the consistent flow of Federal technology into the university community. The results of the early CIG efforts easily validated the concept, and by late 1986, several new CIGs were under development, including groups tailored to small business, large industry, and research institutes.

At this time, too, the Consortium established the Industry Task Force to develop mechanisms for strengthening relationships with commercial/industrial concerns and to ensure close working relationships with the industrial user community. Within a year, this group became the Industrial Interaction Committee and began to pursue a variety of training and educational initiatives beneficial to technology transfer representatives and users alike. Continuing the Consortium focus on developing and maintaining formal organizational and interorganizational entities, the Interaction Committee later became the Industry/Government/University Relations Standing Committee.

Status of the FLC in 1986

By late 1986, the FLC was an impressive, well-knit organization consisting of 328 member laboratories spanning 10 different Federal departments and agencies and a membership organized into six Regions. It was supported by a central Secretariat, an Executive Committee, and six Standing Committees, and was represented by a variety of increasingly professionally-produced media products that helped to link the membership with many hundreds of civilian, industrial, and academic institutions and establishments across the United States. Major funding for Consortium operations was coming directly from laboratory support and from the Army Materiel Command. While the Navy provided some program-development funding, the Department of the Army remained the major funder in that respect.

largest deal of the 1980 Stevenson-Wydler Act had never been implemented, and several of its major provisions had been omitted or eliminated by later action. At this point, too, the Consortium was viewed by lawmakers as "an existing ad hoc group of scientists who form a network among the Federal laboratories to transfer technology. . . . funded by voluntary contributions from the member-agencies."¹⁶ Although the FLC had certainly evolved well beyond the "ad hoc group" status, it was, nonetheless, viewable as informal and only quasi-official by the legislative hierarchy.

The need for legislation to extend PL 96-480 for the rest of the decade and beyond was a major topic of discussion for the Consortium from 1984 through 1986. At the November 1985 FLC meeting, Stark reported on the proposed "Technology Transfer Act of 1985" and the profound affects it would have on the Consortium, providing services from the NSF and defining its functions (generally, those which it had already been performing). The proposed legislation, again with a five-year financial structure, further defined the system of "set-aside" funding from the large laboratories and authorized additional activity support.

By early 1986, it was clear that the proposed new technology transfer legislation would, indeed, be implemented. There remained some relatively minor disagreements between House and Senate versions regarding set-aside funding and patent-royalty-sharing provisions, but of most direct relationship to the FLC was the placement of that organization within the Federal system: the House version of the bill placed the Consortium office within NSF, while the Senate version called for its establishment within the NBS. However, as stated in the Legislative History, "It is the clear intent of both Houses that, to the extent possible, the existing programs and initiatives of the FLC be continued uninterrupted" In 1987, the NBS and FLC signed a memorandum of understanding for necessary services.

In the meantime, the Consortium did some internal restructuring, some of which was motivated by directions included in the proposed Act and by the recognition that the new legislation was soon forthcoming. The first FLC change abolished the position of Executive Secretary and contracted out the FLC Administrator function. FLC management also began investigating the need for an established representative in the Nation's capital.

Some major provisions of the Stevenson-Wydler Act still not implemented by 1985, especially the authority of Federal laboratories to engage with industry, and the FLC seen as quasi-official

The need for legislation to extend PL 96-480, the Consortium's efforts with lawmakers, the proposed Technology Transfer Act of 1985, and the anticipated consequences of the new legislation

By early 1986, the clear prospect of legislative implementation to put the FLC within the Federal system, although its relationship to NSF or NBS still to be established

Internal restructuring in anticipation of the proposed Act, notably abolishing the Executive Secretary position and contracting out the FLC Administrator function

*The Federal Technology Transfer Act of 1986 (PL 99-502):
authorizing Federal laboratories to enter into cooperative research with private industry, universities, and others, and specifying the laboratories' fiscal contribution to support the Consortium*

1987, President Reagan's Executive Order 12591 ensuring universities and the private sector access to federally funded research and technology

PL 99-502, the legislative realization of the basic intentions of the Stevenson-Wydler Act, providing official status for the Consortium in the Federal laboratory system

Reorganization of FLC as the only member-based Federal Agency, governed by its laboratory and agency representatives

Under the Federal Technology Transfer Act of 1986, FLC Takes "Official Action"

The Federal Technology Transfer Act of 1986 (PL 99-502) became law in October. The stated purpose of the bill was to

Improve the transfer of commercially useful technologies from the Federal laboratories and into the private sector. It amends the Stevenson-Wydler Technology Innovation Act of 1980 to allow the Federal laboratories to enter into cooperative research with private industry, universities, and others; it establishes a dual employee award system of royalty sharing and cash awards; and it establishes the Federal Laboratory Consortium for Technology Transfer.

The bill also required Federal agencies to support Consortium operations by contributing .005 percent of laboratory R&D budgets, which amounted to approximately \$1,000,000 per year, for 1987 through 1991. The Act further provided for administrative services on a reimbursable basis from the NBS.

In 1987, President Reagan issued Executive Order 12591 to ensure that Federal agencies and laboratories assist universities and the private sector. This order facilitated access to science and technology and promoted commercialization of patentable results of federally funded research.

The PL 99-502 was the legislative realization of the basic intentions of the Stevenson-Wydler Act and the legislative affirmation of the role of the Federal Laboratory Consortium as an essential, integral part of the Federal laboratory system and of the American industrial-academic-governmental technology establishment. During the 6 years under Stevenson-Wydler, the Consortium grew—it became diverse, more accomplished, more polished, and far more visible. Under the Federal Technology Transfer Act of 1986, the FLC became "official."

At the Fall 1986 meeting in Albuquerque, NM, FLC representatives reorganized and re-established the FLC based on the legislated charter. The FLC thus became the only member-based Federal organization, governed fully by individual laboratory and agency representatives, using democratic voting to govern the FLC, including budgeting and selection of leadership.

Now, the Consortium was required to deal with a variety of new requirements—requirements seen by the dedicated membership as outstanding opportunities to finally put into practice the ideas and ideals expounded and developed since the inception of the organization in 1971. Also at this meeting, and right on the heels of the new Act, the FLC established the Washington, D.C. Representative position as the "small Washington presence" described in the Legislative History. The Representative's position was essentially the same as that of the NSF Laboratory Program Manager of earlier years, and a selection committee for the position was established at the October meeting.

The first Washington, D.C. Representative was Lee Rivers. The appointment of Mr. Rivers, who had recently retired from industry, was announced in April and represented another departure in direction for the Consortium, since the (equivalent) position had been traditionally filled by Federal laboratory personnel.

The broad use of contracted-for services was also a new direction for the FLC. The Consortium set out the requirements for an overall administrative/service-support contract, which included the Administrator function, and opened competition for the contract, with Los Alamos National Laboratory acting as FLC procurement agent. The first administrative-support contract was awarded in early 1987 to DelaBarre and Associates, Inc., and long-time Consortium associate Del DelaBarre was appointed FLC Administrator, maintaining and expanding the Executive Secretariat functions he had performed for many years.

Recognizing its compounded requirements and responsibilities under the new legislation, FLC leadership initiated the development of a "strategic plan." The initial strategic plan was approved in October 1987, and it

- ▶ Emphasized the role of regional activities;
- ▶ Reinforced the overall Consortium commitment to support the diversified organization;
- ▶ Emphasized continued commitment and training;
- ▶ Emphasized the development of the person-to-person contacts that experience had shown so successful; and it

Establishing the position of the FLC's Washington, D.C. Representative, essentially the same as the former position of the NSF Laboratory Program Manager

The first Washington, D.C. Representative, Lee Rivers, recently retired from industry and thereby representing a change from the former equivalent position

With administration now a contract service, the first administration-support contract awarded to DelaBarre and Associates, maintaining and expanding the functions that DelaBarre had long performed

The first strategic plan, emphasizing regional activities, diversification, training, person-to-person contact, relationships with technical societies, and the sharing of experiences and strategies

Also included in the plan, issues of funding, both during and following the implementation of PL 99-502, and interagency teamwork needed to surmount bureaucratic impediments to cooperative efforts

The Act's provision for decentralization of technology transfer, the courting of regional advisors from user communities in each of the six FLC Regions, and the first formal group of regional advisors

The Act's support of a national communications infrastructure for technology transfer, the Consortium's implementation of an e-mail system, and the rapid expansion of an electronic network

- Recommended expanding the direct Consortium/technical society relationships and the open sharing of successful experiences and strategies for transfer cases, cooperative agreements, and the like.

Consortium planning also included considerations of the issues of continued funding for transfer activities, both during the implementation of PL 99-502 (the timely transfer of agency set-aside funds became and remained an immediate problem) and following its fiscal terminus; the interagency teamwork required to expeditiously surmount the considerable bureaucratic impediments to cooperative programs, agreements, and licenses; and the evident and foreseeable problems in the arena of software and software technology access, transfer, and application.

Supplementing the mandates of PL 99-502 caused a flurry of activities in 1987. The Act supported "*a decentralized approach to technology transfer, in which the laboratories contribute to regional development.*" A strong regional structure already existed—so more emphasis was added to the individual activities of each FLC Region, although never to the detriment of the national organization. The new legislation called for the development of regional advisors from the user communities, and each of the six FLC Regions courted and established advisors from its user-base. By mid-1987, the Far West Region had brought together the first formal group of Regional Advisors. Each Region, too, continued to actively develop its programs and its networks—despite the lack of financial support for Regional activities. Although funding had been allocated, the transfer of funds did not materialize until late in fiscal year 1987. As a result, regional efforts did not expand until fiscal year 1988.

The Act also supported the development of a national communications infrastructure for technology transfer, and the expansion of the electronic mail (e-mail) system was specifically mentioned in the legislators' deliberations. In late 1987, the Consortium chose an institutional e-mail system and began its nation-wide implementation, which was relatively smooth and rapid because of earlier experiments and experiences. By the early Spring of 1988, 61 Federal laboratories and 11 allied organizations were linked directly by the Consortium's e-mail system and other communications systems. The electronic network expanded rapidly, and the use of electronic

communications systems for interlaboratory information transfer, user interface, and even committee meetings, became routine by the end of the decade.

Even more impressive was the development of the Consortium's rapidly expanding *Resource Directory*. In less than 5 years with minimal funding, the Directory had evolved from an experimental "laboratory-personnel-locator database" to a national-resource directory comprised of laboratory expertise enveloping 135 Federal laboratories. The Directory also provided the foundations for a number of other technology transfer and outreach programs conducted by the FLC and its regional organizations.

Also in compliance with the PL 99-502, the FLC established the Federal Laboratory Consortium clearinghouse in July 1987. The purpose of the clearinghouse (which was by no means a new concept to the Consortium) was to provide technology requestors direct access to Federal laboratory staffs—individual-to-individual, ideally, as opposed to "organizational" contacts. Like a brokerage, the clearinghouse used the *Resource Directory* to "match" a requestor with the most likely laboratory or laboratories. The clearinghouse would then personally contact each laboratory's technology transfer office to identify the key technical individual(s) and arrange for appropriate contacts. By February 1988, the clearinghouse had already responded to requests and inquiries from 28 states, primarily from businesses (86 percent), with the vast majority of the total contacts (73 percent) citing specific technical interests rather than requesting general information. During 1987, the project was successful enough, its utilization high enough, and its design flexible enough, that the Consortium began to expand the concept. *TECTRA/TECLAB* information capability was added to the clearinghouse, and plans called for additional access to more detailed technical databases, such as that maintained by the National Technical Information Service (NTIS). For the rest of the 1980's, the strategy for the clearinghouse was to continue moving toward a position that would allow the complete decentralized FLC organization to function both regionally and nationally as a technology transfer clearinghouse.

The Consortium's rapidly expanding Resource Directory, providing the foundations for technology transfer and outreach programs by the FLC and its regional organizations

In compliance with PL 99-502, establishment of the FLC Clearinghouse, using the Resource Directory to match needs with resources, providing direct access to individuals in laboratories, and incorporating TECTRA/TECLAB capability

Set-aside funding for demonstration projects with non-profit organizations

The first demonstration project, with two universities in Utah, a Technology Targeting Database, matching available technologies from three laboratories with the interests of more than 1,000 companies

Further development of intensive Technology Transfer Conferences, initiated by the Northern Regional Research Center and Aladdin Industries in 1982, involving a dozen laboratories and forty companies by 1987

With an expanding business base, four standing subcommittees created for FLC's Industrial/Government/University Relations Committee to ensure separate focus on small business, large business, academia, and state and local governments

By the late 1980's, briefer reports to Congress and the Federal agencies, with "philosophical directions" and hard-sell advertising of the past replaced by action items, funded and focused on FLC's brokerage function

Strengthening Relationships with Industry and with Universities

The Act had further promoted demonstration projects with non-profit organizations and required a set-aside of five percent of the Consortium's funding for the purpose.

The first demonstration project was related to other computer-based communications and information projects and involved a contract with the Utah Consortium for Research and Education (University of Utah and Brigham Young University) to modify its "Technology Targeting Database" for use by Federal laboratories. The project was aimed at matching available technologies from three Federal laboratories (Naval Civil Engineering Laboratory, LLNL, and Ames Research Center) with industry interests using a database containing data on more than 1,000 companies.

The FLC continued its efforts to strengthen relationships with both the industrial and small-business sectors. The intensive Technology Transfer Conferences, initiated by the Northern Regional Research Center (USDA) and Aladdin Industries in 1982 became highly successful vehicles for laboratory-industry interaction. By 1987, the Conference involved a dozen Federal laboratories sharing the newest technologies available for transfer with 40 major companies. This occurred in both general and one-on-one sessions and led to substantive collaborations. This initiative also formed the basis for a small company.

With its increasingly expanding "business" base, the FLC's Industrial/Government/University Relations Committee (formerly the Industrial Interaction Committee) was soon overcome. Four standing subcommittees were established in early 1988 to ensure that the appropriate focus was maintained on the Consortium's primary targets: small businesses, large businesses and industry, universities and academia, and state and local governments.

By the late 1980's, the FLC was a well-established player in laboratory-industry interactions. The reports to the Congress and the Federal agencies were briefer and more direct—"plans" now had actual funded projects behind them, and the "philosophical directions" of the past were action items. Consortium communications became more focused on cooperating with trade associations, nonprofit organizations and projects, and

educational institutions; maintaining a presence at symposia, conferences, and exhibits; and maintaining the Clearinghouse as a central aspect of its "brokerage" function.

The FLC was establishing itself as a known, available, and viable resource for the nation as a whole—a resource to be drawn upon, whenever appropriate, and to be relied upon to provide immediate, applicable linkage between technological exigency and technological expertise.

An example of this direction is a cooperative project that was initiated by Lee Rivers, FLC Washington, D.C. Representative, and conducted by the FLC and the Industrial Research Institute (IRI). The IRI, representing U.S. industry's compelling need for access to Federal Government manufacturing-technology programs, sought assistance in electronics manufacturing technology from the Consortium. Responding to this request, the Consortium co-sponsored with IRI a special conference on computer-assisted manufacturing that included representatives from the laboratories of the military services, NBS, NASA, and DOE. State- and local-based organizations and more than 50 U.S. companies attended. The response to this focused conference was overwhelmingly favorable on all sides, and the relationships were strong and productive. This event sparked considerable interest in additional focused initiatives in other areas of manufacturing technology and technology transfer, setting out another area in which the Consortium would concentrate its network-linking efforts.

The relationship between the FLC and the IRI spawned other profitable activities, too. *Putting Technology to Work*, a report documenting 138 examples of successful transfers from 31 laboratories, was produced by the FLC primarily for IRI; the report was distributed at the 1988 IRI Meeting and soon found a much larger audience. It provided an excellent format for additional publications. A new volume was compiled and issued in 1990. The two small publications highlighted 194 successful transfers involving 53 Federal laboratories spanning 10 different agencies.

FLC establishing itself as a reliable national resource, providing immediate linkage between technological exigency and technological expertise

FLC and the Industrial Research Institute (IRI), a conference on computer-assisted manufacturing, with representatives from laboratories of the military services, NBS, NASA, and DOE, and from state and local organizations and more than 50 companies

An FLC publication documenting 138 successful transfers, Putting Technology to Work, produced for the IRI in 1988, a new volume in 1990, and other publications highlighting 194 successful transfers

Continued assistance to small business through state-level programs and government innovation workshops, and working with the NIACs and Small Business Innovation Research (SBIR) awardees

In 1988, a major demonstration project with the Oklahoma State Department of Vocational and Technical Education (VOTECH), training VOTECH staffs to use FLC and other transfer resources and conducting workshops involving 13 laboratories.

Success of the VOTECH project, leading to a state-level consortium for technology transfer in Oklahoma and other follow-ons in six states by 1990

Small businesses are important to job creation and national competitiveness. For these reasons, the FLC continued to assist them by

- ▶ Working with state-level programs;
- ▶ Participating in government innovation workshops;
- ▶ Following up on successful transfer experiences of individual laboratories; and
- ▶ Working with the NIACs and with Small Business Innovation Research (SBIR) contract awardees.

In 1988, the Consortium undertook a major demonstration project with the Oklahoma State Department of Vocational and Technical Education (VOTECH) to link Federal laboratories with small businesses. The project included training staffs from the 41 VOTECH centers to use FLC and other transfer resources. As part of this project, the FLC conducted technology transfer workshops involving 13 laboratories to discuss available technologies with public- and private-sector representatives.

The success of the VOTECH project would prove a significant factor in future FLC initiatives in the areas of small-business outreach and assistance, and in education and training. The project's direct results included a follow-up workshop in April 1989, and the development of a state-level consortium for technology transfer in Oklahoma. Based on this positive experience, the FLC developed similar programs to help other states promote economic development. The first of these follow-ons was with Fresno City College in California, and the 106 other California community colleges were invited to participate in cooperative training. In 1990, six states sponsored FLC/VOTECH-type workshops in conjunction with the Consortium, and 18 other states explored similar possibilities.

Regional Operations Expand and Constituency Diversifies

In 1988, all six FLC Regions received direct financial support, and they pursued diverse projects based upon the needs and interests of their constituency. Although the FLC national organization maintained its coordinated program of initiatives to develop and maintain the infrastructure and interest on a national scale, it continued to promote the development of a strong, well-networked, and decentralized operational organization for technology transfer.

By this time, too, the FLC was collaborating with other technology transfer organizations. During 1988 and early 1989, the Consortium entered into formal agreements with public and private organizations, such as the Electric Power Research Institute and the Center for the New West, to provide cooperative endeavors in technology application, economic development, and laboratory assistance. The Consortium formalized its strong relationships with other agency transfer programs (such as NASA Applications Centers, NTIS, DOE TRADE Network, and the National Academy of Sciences), with U.S. cities via the U.S. Conference of Mayors, and with various universities and educational associations (e.g., Oak Ridge Associated Universities).

The FLC also continued to strengthen its intramural relationships with the NBS and related organizations. For example, the FLC-National Institute of Standards and Technology (NIST, formerly NBS) partnership developed for dealing with the implications of the Omnibus Trade and Competitiveness Act evolved into a rather extensive, diversified partnership centered on training and extension programs.

The Consortium was helping to make technology transfer an automatic, assumed function of Government-industry relations, thus ensuring the appropriate transfer of taxpayer-paid-for technology directly to the appropriate sectors. The national FLC organization, then, ideally would become less prominent locally and allow the regional FLC organizations to increase their linkage and brokerage functions. These functions would be funded voluntarily, and as a matter of course, by the FLC Regions and their respective laboratories and supported by the appliers and end-users of the cooperatively transferred and exploited technologies.

Diverse projects in the six FLC regions based on needs and interests of the constituencies, confirming the decentralized operational nature of the FLC for technology transfer

Some examples of FLC's collaboration with other technology transfer organizations, both public and private

Strengthening intramural relationships with the NBS and related organizations, and with an extensive and diversified partnership with NIST for training and extension programs

The Consortium, helping to make technology transfer an automatic function of Government-industry relations and thereby transferring technology paid for by taxes to the appropriate sectors of the economy



Chapter 7

THE CONSOLIDATING YEARS, 1989-1994

The FLC Becoming a National Presence

In November 1988, Dr. Loren C. Schmid of the Pacific Northwest Laboratory was elected Chairman of the FLC. Schmid had served as the Far West Regional Coordinator since 1983, and on the executive and various standing committees of the FLC. Margaret McNamara from the Naval Underwater Systems Center, first elected Vice Chairman in 1982, continued to serve as the Vice Chairman of the FLC. She was one of the many women assuming leadership in the FLC. Schmid's and McNamara's tenure officially began in January 1989. In 1990, Dr. Beverly Berger, from the Department of Energy, was appointed Washington, D.C. Representative.

The Consortium was increasingly well positioned for its role in the 1990's and beyond. As the organization matured under Schmid, emphasis was placed on strengthening the FLC network, the committee structure, and the regional infrastructure. In addition, the experience and knowledge of the Consortium was captured in key publications. In a sense, the FLC became a more formal organization, and its operations became more systematized. By 1994, its membership consisted of more than 600 R&D laboratories and centers from 16 departments and agencies.

As the end of the 1980's neared—and as the Consortium approached its twentieth year—the first laboratory representatives involved in the FLC were beginning to retire from Federal

1988 election of Dr. Loren C. Schmid, previously the Far West Regional Coordinator, as Chairman of the FLC, the continuation of Margaret McNamara as the Vice Chairman, and the appointment of Dr. Beverly Berger as Washington, D.C. Representative

The FLC well-positioned for its role in the 1990's and beyond, the increasing formality of its committee structure and regional infrastructure, the knowledge captured in its publications, and membership of more than 600 laboratories and centers from 16 departments and agencies

The retirement of the first FLC laboratory representatives, and the establishment of the FLC Emeritus-at-Large Program in 1988

The FLC's stature by the late 1980's, and the diversity of its initiatives

FLC points-of-contact for superconductivity and for drug-control research, interaction with the National Drug Control Policy Group, a broad-based demonstration project with the U.S. Conference of Mayors, and placement on SEMATECH Advisory Council

Setting standards in specialized information exchange with a Directory of 170 Federal laboratories, a Clearinghouse with satellite service centers, and an e-mail system linking 290 participants

service. Many of these individuals who served the FLC for several decades still wished to remain active in technology transfer and in the organization. Therefore, the FLC Emeritus-at-Large Program was established in 1988 to utilize this valuable pool of corporate memory and experience, and to recognize the efforts of these technology transfer pioneers.

Also by the late 1980's, the FLC was represented, recognized, and welcomed throughout all levels of government, industry, and academia. The organization undertook national educational and training initiatives as priorities, and also pursued technology transfer and application initiatives in such diverse areas as superconductivity, drug control, municipal services, and economic development.

A sampling shows the breadth of the FLC's outreach. In response to a request from the Office of Science and Technology Policy, the Consortium assigned an FLC point-of-contact for superconductivity. It assigned a point-of-contact for drug control research in response to a request from the National Drug Control Policy Group. The FLC also helped the Group establish a technology transfer award program and provided a public opportunity to present the awards. Initiating a second Technology Transfer Act demonstration project, the FLC undertook a broad-based cooperative effort with the U.S. Conference of Mayors (USCM). The project included the USCM's working with six cities and facilities to foster economic development. The National Defense Authorization Act of FY 1988-1989 placed the FLC Chairman on the Advisory Council for Federal participation in SEMATECH, an organization established to provide the U.S. semiconductor industry the domestic capability for world leadership in manufacturing.

In 1988, the FLC Clearinghouse and electronic Resource Directory were setting standards in specialized information exchange and brokerage. Potential customers had access to a Directory comprised of the technological-expertise base of some 170 Federal laboratories, and the Clearinghouse operation had been strengthened by the addition of the FLC Service Center concept, which allowed the establishment of "satellite" Clearinghouse service centers. The electronic-mail system, initiated only a few years earlier, had been expanded to more than 100 locations representing 290 laboratories and centers, advisors, and FLC initiative participants.

By the end of the decade, the Consortium was fostering a diversified, independent, regionally-based organization, one that nonetheless was integrated well and linked increasingly via electronic media. The FLC Regions themselves had fostered functional and advisory bodies representing industrial giants, academic institutions, public utilities, trade/technology organizations, and government commissions.

And the Federal Laboratory Consortium for Technology Transfer was prepared and positioned for its ever-more-essential role in the U.S. technological arena.

At its 1990 Spring Meeting in Denver, CO, the FLC convened a panel to consider outstanding issues regarding the implementation of the Federal Technology Transfer Act of 1986. In conjunction with this panel, the FLC developed a summary of some remaining issues that might require policy-level resolution.¹⁷ The summary was issued in November 1990 and became the base for future actions by policymakers.

Assisting State and Local Governments and Private Sector Firms

As a recognized player in the technology transfer arena, the FLC received numerous requests to provide speakers for public and private sector organizations, as members of panels or plenary sessions. In order to provide a consistent message, the FLC prepared standard presentations and implemented a Speakers Bureau in 1990. The Regional Coordinators and Deputy Coordinators were enlisted as speakers whenever possible. This assisted in not only meeting the needs of the sponsoring organization, but also in strengthening regional interactions—an FLC initiative.

The FLC's small business initiative also gained momentum in 1990. Based on the experience acquired by providing small business workshops for the Oklahoma VOTECH project, the FLC leadership realized that small businesses needed special attention. The Consortium implemented a strategy to strengthen the state organizations that were interacting with the small firms so that they could better direct their clients to laboratories and organizations that could meet the firms' technical requirements. One state, South Dakota, was so impressed by the strength of a

The FLC, a diversified, independent, regionally-based organization linked increasingly by electronic media and enhanced by advisory bodies from many sectors

An FLC panel's summary of some remaining issues requiring policy-level resolution for implementing the Federal Technology Transfer Act

In response to numerous requests for FLC speakers, preparing standard presentations, implementing a Speakers Bureau in 1990, and using Regional Coordinators and Deputy Coordinators whenever possible

Gaining momentum for FLC's small business initiative in 1990: based on the Oklahoma VOTECH project, a strategy to strengthen state organizations that were interacting with small firms

A leveraging strategy, enabling local organizations to continue to serve business as part of a delivery vehicle and linking capability, and a memorandum of understanding with NIST to support each other's small business initiatives

Beginning a demonstration project with the National Association of Management and Technology Assistance Centers (NAMTAC) in 1991, pertaining to innovative, effective methods of transfer from the Federal laboratories to private-sector, commercial applications

In 1991, NASA's support of state and local governments and private sector firms through six Regional Technology Transfer Centers (RTTCs) aligned with FLC regional offices, strengthening regional infrastructures

The FLC's participation in planning for NASA's National Technology Transfer Center (NTTC) and with the NTTC's staff to enhance the technology transfer process

Consortium like the FLC that it implemented a consortium of economic development organizations.

This strategy provided important leverage by working with organizations that were already meeting the non-technical or technical needs of small businesses. An important aspect of the leveraging is that, after laboratory staff leave, the local organizations continue to serve the small businesses and are part of a delivery vehicle and linking capability for future assistance from the laboratories. In January 1990, the FLC signed a Memorandum of Understanding (MOU) with the National Institute of Standards and Technology to provide mutual support to each other's small business initiatives.

The National Association of Management and Technology Assistance Centers (NAMTAC) began working with the FLC in a demonstration project in 1991. The objective of the project was to demonstrate innovative and effective methods for moving new technologies from the Federal laboratories to commercial applications in the private sector. The project identified manufacturing needs of small- and medium-sized companies in two different industrial regions of the nation and matched them with Federal laboratory and related resources.

In 1991, NASA selected six Regional Technology Transfer Centers (RTTCs) to replace its Industrial Application Centers as a support system to state and local governments and private sector firms. Experience gained by the FLC in working with the Industrial Application Centers provided input for the scope and capabilities of the new centers. The RTTCs intentionally were aligned geographically with the FLC regional offices to provide improved interactions and support. These relationships strengthened the regional infrastructures by enhancing activities that make federally-developed technology available for use by state and local governments and the private sector.

In late 1991, NASA also initiated the National Technology Transfer Center (NTTC) to assist the public and private sectors with their technology needs. NASA requested the FLC to participate during the planning stages for the NTTC. The FLC established a Task Force to work with NASA. After the NTTC was established, the same Task Force worked with the NTTC staff to develop and carry out an MOU for coordinating efforts to enhance the technology transfer process. The MOU was signed in May 1992.

Reaffirming the Technology Transfer Mandate, Strengthening the Network, and Improving Operations

In the Spring 1991 FLC meeting in San Diego, CA, attorneys from member laboratories and agencies evaluated the need for a legal networking group to enhance the objectives of technology transfer and to support the laboratory representatives more effectively. As a result, the FLC officially established a new legal networking group as a subcommittee of the Member Services Committee attracting both lawyers and non-lawyers from the Federal and private sectors. Later it became the Legal Issues Committee. This group provided a positive mechanism for the free exchange of ideas, evaluated issues for more effective transfer, and broadened FLC training opportunities.

On February 4, 1992, Congress passed the American Technology Preeminence Act of 1991 (Public Law 102-245), and the President signed it on February 14, 1992. The Act reaffirmed the value of the FLC and removed the requirement for the national demonstration program.

President Bush's 1992 National Technology Initiative (NTI) provided a forum through which the Consortium helped agencies and their laboratories increase nongovernment awareness of Federal resources. The FLC was included as a full partner in the effort, and the Consortium identified laboratory and agency speakers for the Technology Transfer and Intellectual Property Workshops and for the plenary sessions. The ABC television network's "Business World" program on competitiveness reported on the NTI program and encouraged industry to use the FLC for access to Federal expertise.

As part of a 1992 strategic planning effort, the FLC identified a vision for the next five years and the critical factors necessary for its long-term success. This resulted in a re-evaluation of the FLC organizational structure and functions in light of the vision and objectives. The recommendations from a Restructuring Task Force were accepted through By-Law changes at a Business Meeting of the FLC membership in November 1993.

The establishment of a legal networking group to support the laboratory representatives, a subcommittee of the Member Services Committee, which later became the Legal Issues Committee

The American Technology Preeminence Act of 1991 (PL 102-245 as of 1992) reaffirming the FLC mandate and removing the requirement for the national demonstration program

The provision for a forum through President Bush's 1992 National Technology Initiative (NTI), the FLC's participation in workshops and plenary sessions, and the ABC television broadcast

A strategic planning effort in 1992, re-evaluation of the FLC's structure and functions in the light of its objectives, and 1993 changes in the FLC's By-Laws

*Included in the By-Law changes:
an Executive Board with its own
Executive Committee, term limits
for executive personnel, and a
structure of ten standing
committees (as listed)*

*The importance of the semi-annual
FLC meetings, addressing a range
of needs from professional
development to national policies
and serving increasingly more
participants*

*Beginning in 1992, Spring
meetings emphasizing the needs
of user communities and Fall
meetings focusing on Consortium
members, with training sessions
appropriate to each emphasis*

These were the first changes to the By-Laws since 1986, and key ones included forming an Executive Board and an Executive Committee of that Board; limiting the terms of the officers, chairpersons, and board members; and establishing a structure of six Standing Committees to focus on Consortium operations and four Standing Committees to represent and interact with the user communities. Standing Committees on operations were established for Planning and Policy, Financial Management, Information Systems, Legal Issues, Member Services, and Marketing and Public Relations. Standing Committees representing user communities were established for Small Business, Large Business, State and Local Governments, and Educational Institutions.

FLC semi-annual meetings were set up to provide the primary opportunities for exchange that keep the network functioning. Historically, each meeting had been designed to serve a broad range of needs from professional development for FLC representatives to open discussion of emerging national policies. As the technology transfer function became more visible and garnered more participants from across the public and private sectors, the importance of FLC meetings increased along with the attendance, and the number and scope of every meeting's objectives.

It became difficult to try to meet everyone's needs in a single meeting, so the FLC changed the nature of its meetings. Beginning with the Spring 1992 meeting, the "FLC National Technology Transfer Meetings" began to emphasize the needs of specific user communities. The Fall "Federal Laboratory Consortium Meetings" focused on the needs of the Consortium members and their representatives. General training sessions were modified to reflect the different audience needs, and in response to requests from FLC Representatives, the training session called "FLC Fundamentals" was expanded from a half-day to a full-day curriculum in the Fall. The laboratory attendees and their potential technology transfer partners have confirmed that the training sessions offered at the Fall and Spring meetings increase their effectiveness.

In the Fall 1993 FLC Meeting in Tulsa, OK, member agencies met jointly for the first time. This meeting focused on common measurements for technology transfer efforts. Previously, agencies met individually as part of the FLC meeting format. The Fall 1993 meeting set a precedent, and the agencies have continued to meet jointly as well as separately since then.

The FLC strengthened and improved the effectiveness of its Washington, D.C. Representative's office in 1992. It expanded its office space and added a Technology Transfer Associate to support the position and the functions of the Washington, D.C. Representative. Over the years, the number of opportunities to promote the FLC and to interact with industry, professional societies, trade associations, and government agencies had increased significantly. A test case of temporarily reassigning a laboratory employee to the Washington, D.C., office showed the mutual advantages of short-term training assignments of laboratory staff to the office. In 1993, the Consortium formally established the FLC "Fellows Program." Short-term intern assignments continued, and the Fellows Program allowed longer-term training and educational assignments.

As the regional FLC operations were strengthened, demonstrations were undertaken with partners in the regions. An FLC Mid-West Region and State of Ohio demonstration in 1992-1993 was undertaken to turn federally-developed technologies into market-leading products and processes for area companies. An FLC Mid-Atlantic Region, The Association of Technology Business Councils, and *TechNews* demonstration project provided a technology transfer and laboratory directory insert in the February 1992 issue of *Washington Technology*. The insert was a great success, and the demonstration became the predecessor for the national *Technology Transfer Business* magazine. To coordinate these and other efforts between FLC regional programs, the Consortium established a Regional Officers Council in 1993.

Capturing Experience and Knowledge in Publications

During 1991 through 1994, the FLC prepared and published documents to increase the awareness of Federal technology transfer and to supplement training efforts. These printed tools continue to be highly valued by laboratories, agencies, academic institutions, and industrial users.

The Fall 1993 meeting, focusing on common measurements for technology transfer efforts

Beginning in 1992, the expansion of the Washington, D.C. Representative's office and the evolution of the FLC Fellows Program, with term assignments of laboratory employees to the Washington, D.C. Representative's office

Demonstration projects with the Mid-West Region and the State of Ohio and with the Mid-Atlantic Region, the Association of Technology Business Councils, and TechNews, and the establishment of a Regional Officers Council

From 1991 through 1994, the FLC's publication of documents to increase the awareness of Federal technology transfer and to supplement training

Publications, including a matrix of resources and services, an outline of processes for gaining access to Federal technology and expertise, an annotation of technology transfer legislation, and a set of training and reference manuals

Awareness documents identifying laboratory expertise available to the automotive industry, resource manuals for creating partnerships, and regional directories produced in cooperation with RTTCs

An FLC-related document concerning intellectual property, was submitted for the record to both House & Senate and reviewed as the most complete information to date on issues surrounding the commercialization of federally-created software

Because of the FLC's broad knowledge base and ability to focus quickly, requests by Senate and House subcommittees for its input into institutional, process, and policy issues

A sampling of these publications includes *Tapping Federal Technology: Inventions, Expertise, and Facilities*, a matrix defining clearinghouses, information centers, catalogs, bulletin boards, and databases, and identifying the accessibility to these services and the costs of them; *Mechanisms for Accessing Federal Resources*, an outline of the processes available for gaining access to Federal technology and expertise; *Technology Innovation*, an annotated version of the technology transfer legislation, executive orders, and references; and the *FLC Handbook Series*, a set of training and reference manuals on topics such as patenting and licensing and cooperative research and development agreements.

Other FLC documents were developed to identify laboratory expertise available to the automotive industry; resource manuals were aimed at creating partnerships in technology reinvestment; and regional directories, produced in cooperation with RTTCs described FLC member laboratories and list state technology transfer organizations.

The FLC also prepared a summary of "Issues Related to Copyrighting Federal Software." It was submitted for the record by Schmid to the House Committee on Science, Space and Technology and in July 1992 to the Senate Judiciary Committee. The document dealt with intellectual property generated by government and non-government Federal laboratory employees, its protection and licensing, and payments to the creators of the intellectual property. The August 1992 edition of *Cooperative Technology RD&D Report* published the entire analysis with the comment "... (this) provides the most complete information to date on the issues surrounding the commercialization of federally-created software."

Assisting with Institutional, Process, and Policy Issues

Because of the broad knowledge base that resides in the FLC members and the organization's ability to focus quickly on a specific technology transfer issue, the FLC is called upon frequently for input on institutional, process and policy issues. For example, between June 1989 and August 1994, the Consortium received requests to provide input to ten Senate and House subcommittee hearings.

On October 23, 1993, the White House announced the first technology programs awarded under the President's Technology Reinvestment Project (TRP). A proposal called "Technology Access for Product Innovation" (TAP-IN), submitted jointly by the FLC and the NASA RTTCs, was one of 41 programs chosen for funding through the TRP. The TAP-IN links leading technology development, technology deployment, and business service organizations. As a result, private firms will have more access to Federal technology. Though national in scope, TAP-IN focuses on regional needs and opportunities, and it strengthens inter-regional infrastructure so firms, especially small businesses, can realize those opportunities locally.

In 1994, an important and timely document, *Technology Transfer in a Time of Transition: A Guide to Defense Conversion* was issued. It drew from an invited keynote presentation by the FLC Washington, D.C. Representative, Dr. Beverly Berger, in March 1993 and a statement by FLC Chairman Schmid before the Research and Technology Subcommittee of the House Armed Services Committee, U.S. House of Representatives in April 1993. The statement was titled "The Role of the Federal Laboratory Consortium in Defense Conversion."

FLC Member Laboratories Helping the United States Meet Its Changing Needs

Federal laboratories have developed and exploited technologies in every area, and their contributions to scientific and technological advancement have had and will continue to have major influence in the development of basic knowledge and the application of it. The laboratories of the Federal Government, in concert with industry, business, academia, and local governments, will help provide the basis for the next generation of technological advances in both "scientific" and "practical" areas—in agriculture and forestry, construction and civil engineering, energy production and energy alternatives, manufacturing and production technology, atmospheric and oceanographic sciences, medical technology and medicines, materials and structures for "high-" and "low-" technology applications, and computing and information systems.

Under the Technology Reinvestment Project (TRP), early funding in 1993 of a joint proposal by the FLC and the NASA RTTCs of a proposal for Technology Access for Product Innovation (TAP-IN)

1994 publication of Technology Transfer in a Time of Transition: A Guide to Defense Conversion, drew on a presentation by Dr. Beverly Berger and from Schmid's statement to a House Armed Services Subcommittee

Contributions of the Federal laboratories so far and the prospects of more to come

With the end of the Cold War in regard to the DOD and DOE laboratories, an increased need for the Consortium's services to benefit the nation

As the world political picture changes, so do our national priorities change—and so must the missions and the objectives of the Federal laboratories change to meet those priorities.

As the extent of the projected post-Cold War drawdown becomes ever more clear, especially with regard to the highly productive but highly directed Department of Defense and Department of Energy laboratories, the need for the services of the Consortium—for the mechanisms developed, practiced, and emplaced by it over the years—also becomes ever more clear: *the technologies pioneered in the Federal laboratories must be shared with others and exploited to the greatest extent*, and new applications must be pursued that will help strengthen American industry and academia; ensure the viability and availability of government services; and maintain the United States as an economic, political, and technological leader into the 21st century.

The Federal Laboratory Consortium for Technology Transfer truly has earned its place as an important, integral member of the technological establishment of the United States.



Endnotes

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1. Roman, Daniel D. *Research and Development Management: The Economics and Administration of Technology*, New York, NY, Appleton-Century-Crofts, 1968.
 2. *Ibid.*
 3. *Ibid.*
 4. David W. Taylor Naval Ship Research and Development Center. *Technology Transfer in the Navy: The Historical Background*, by Dr. David Kite Allison. Bethesda, MD, DTNSRDC, September 1982. (DTNSRDC-82/091, publication UNCLASSIFIED.)
 5. *Ibid.*
 6. *Ibid.*
 7. General Accounting Office, *Means of Increasing the Use of Defense Technology To Meet Urgent National Civilian Needs*, OSD Case #3420, Washington, DC: General Accounting Office, Feb. 1972.
 8. As part of its publicity campaign, the Consortium had some 500 copies of this speech printed as a flyer, complete with a half-page photo of President Nixon on the cover.
 9. It is important to note that those increasingly time-consuming NSF-sponsored projects being supported by Metcalf—e.g., the National Action Conference and the Federal Technology Transfer Symposium—were also essential elements in advancing the cause and the development of the Consortium.
 10. Metcalf's review comment to Linsteadt: "George, had I been authoring this history, this could more deservedly have been said of you."
 11. This interagency technology-transfer work helped to advance the geothermal-resource exploration and exploitation at NWC that resulted in the opening of the Coso Geothermal Power Plant.
 12. The instruction, "Military-Civilian Technology Transfer and Cooperative Development" (NAVWPNCENINST 5700.1 of 23 May 1977), was authored by Linsteadt and stood as Center policy until revised in mid-1985.

13. The DOD report, reproduced in Appendix B, provides a very brief but very useful description of the history and accomplishments of the Consortium as of January 1979. This report is also significant in that it was requested by Congress as part of the DOD Appropriations Bill, 1979.
14. The legislative history of the Stevenson-Wydler Act includes significant background information on the Legislation and on the Consortium. See *Legislative History, P.L. 96-480: Stevenson-Wydler Technology Innovation Act of 1980* (Congressional Record, Vol. 126, 1980).
15. *Report to the Federal Agencies on the Activities of the Federal Laboratory Consortium (FLC), October 1982-August 1984 and September 1984-August 1986.*
16. U. S. Congress. *Legislative History, P.L. 99-502: Federal Technology Transfer Act of 1986.* Washington, D.C., *Congressional Record*, Vol. 132, 1986.
17. Federal Laboratory Consortium for Technology Transfer, *Some Remaining Issues Related to Federal Technology Transfer*, Washington, DC: Federal Laboratory Consortium, November 1990.



Appendix A

Matrix of Utility of Selected Federal Laboratories Relative to Priority Needs of the States

Development of the Matrix The Council of State Governments

Excerpt taken from *Intergovernmental Uses of Federal R&D Centers and Laboratories*:

The matrix was developed from a listing of subjects relevant to state technological needs as ascertained in a previous study, *Power to the States, Mobilizing Public Technology*, and the listing of Federal R&D installations from the National Science Foundation's *Directory of Federal R&D Installations*.

Research budget constraints prevented researchers from visiting at least a sample of the laboratories mentioned. Therefore, the capabilities assigned to the laboratories are probably much understated and should be regarded as an indicator of the vastness, rather than as an exhaustive accounting, of the potential Federal resource.

Only those facilities with more than 100 professional personnel were considered. One hundred professionals was assumed to be a sizeable enough staff to pursue outside agency work on any appreciable basis. There are numerous facilities with under 100 professionals which can contribute to specific endeavors; however, coordination of these facilities is considerably more complex.

The following are brief explanations of certain categories and abbreviations used in the matrix.

- ▶ The Economic Development category refers to, primarily, R&D facilities' capabilities in producing new products adaptable for commercial use.
- ▶ The Public Safety category includes law enforcement and fire protection.
- ▶ The General Systems category refers to capabilities in medium to large-scale systems development including, for example, computer applications, mathematical models and regional planning.



MATRIX OF UTILITY OF SELECTED FEDERAL R&D INSTALLATIONS
RELATIVE TO PRIORITY NEEDS OF THE STATES

Federal Department or Agency	Total Number of Installations with over 100 Professionals	Total Number of Professionals in Selected Installations	Air Pollution Control	Airways	Consumer Protection	Drug Abuse Control	Economic Development	Environment	General Systems	Highways	Housing	Inspection and Permits	Land Use	Liquid Waste Disposal	Mental Health	Motor Vehicle Regulations	Noise Pollution Control	Public Health	Public Safety	Public Welfare	Solid Waste Disposal	Transportation	Water Pollution Control
Department of Agriculture	12	2,259	1	—	5	—	8	8	—	—	2	—	4	1	—	—	—	2	—	—	—	—	1
Atomic Energy Commission	18	16,814	2	—	—	—	3	17	3	—	1	3	3	3	—	—	1	13	—	—	—	—	7
Department of Commerce	6	3,010	1	—	4	—	3	4	2	1	2	4	—	—	—	—	1	2	—	—	—	2	—
Department of Defense	82	39,165	11	32	5	5	6	43	9	8	2	1	1	2	6	4	12	16	25	8	1	48	13
Health, Education & Welfare	11	3,939	1	—	1	1	—	2	1	—	—	1	—	—	2	—	—	11	1	2	—	—	—
Department of Interior	4	1,998	3	—	—	—	3	4	—	3	—	—	1	1	—	—	—	—	—	—	—	—	4
National Aeronautics and Space Administration	27	35,977	6	11	—	—	7	16	2	—	—	—	1	—	1	—	4	3	—	1	—	19	—
National Science Foundation	1	214	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

MATRIX OF UTILITY OF SELECTED FEDERAL R&D INSTALLATIONS
RELATIVE TO PRIORITY NEEDS OF THE STATES

(continued) Federal Department or Agency	Total Number of Installations with over 100 Professionals	Total Number of Professionals in Selected Installations	Air Pollution Control	Airways	Consumer Protection	Drug Abuse Control	Economic Development	Environment	General Systems	Highways	Housing	Inspection and Permits	Land Use	Liquid Waste Disposal	Mental Health	Motor Vehicle Regulations	Noise Pollution Control	Public Health	Public Safety	Public Welfare	Solid Waste Disposal	Transportation	Water Pollution Control
Tennessee Valley Authority	1	129	—	—	—	—	1	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Department of Transportation	2	357	1	1	—	—	—	1	—	1	—	—	1	—	1	—	—	—	—	—	—	2	—
Veterans Administration	1	4,724	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	1	—	1	—	—	—
TOTALS	165	108,586	27	44	15	7	31	97	17	15	7	9	11	8	11	4	16	48	26	12	1	71	26

Source: Report to The Council of State Governments. *Intergovernmental Uses of Federal R&D Centers and Laboratories*. Lexington, KY: The Council of State Governments, 1973, pp 17-19.

Appendix B

Report by the Department of Defense to the Committee on Appropriations United States Senate

REPORT BY THE DEPARTMENT OF DEFENSE
TO THE COMMITTEE ON APPROPRIATIONS
UNITED STATES SENATE

ACTIVITIES OF THE DEPARTMENT OF DEFENSE
IN THE FEDERAL LABORATORY CONSORTIUM
FOR TECHNOLOGY TRANSFER

January 1979

January 1979

REPORT BY THE DEPARTMENT OF DEFENSE
TO THE COMMITTEE ON APPROPRIATIONS
UNITED STATES SENATE

ACTIVITIES OF THE DEPARTMENT OF DEFENSE
IN THE FEDERAL LABORATORY CONSORTIUM
FOR TECHNOLOGY TRANSFER

The Committee for Appropriations, United States Senate requested the Department of Defense to submit a brief report on Department of Defense activities in the Federal Laboratory Consortium for Technology Transfer. The request was made on page 34 of Committee Report No. 95-1264, Department of Defense Appropriations Bill, 1979 which reads as follows:

The Committee is aware that the Department was instrumental in establishing a technology transfer consortium which is now known as the Federal Laboratory Consortium. This consortium of Federal laboratories provides technical assistance to State and local officials and facilitates the transfer of research and technology developed in Federal laboratories to the public sector. The current Department policy to authorize any one of its laboratories to expend up to 3 percent of its professional man-years for this technology transfer effort is important. The Committee desires this effort with State and local governments to continue and requests that the Department provide the Committee a brief summary of their activities in this area by January 31, 1979.

Research and development conducted and sponsored by the Department of Defense has over the years resulted in very significant transfer of technology to the domestic sector. The Department of Defense has long recognized that technology and products originally developed for military

use also have potential for application in the U.S. domestic sector. Technology transfer to the private sector has been particularly successful because about 75 percent of the Department's research and development and practically all production is performed by a broad base of university and industrial organizations. This assures that the results of Department of Defense programs are in the commercial domain which is best equipped for adapting technology and products to meaningful civil uses. The process is further enhanced because the in-house/university/industry development efforts span a spectrum of activity ranging from new concepts to useful end products. This team effort has worked over a number of years and permits greater and wider use of the Department's developed or sponsored research and development.

Technology transfer in the context of this report is the beneficial use of technology in applications other than those for which the technology was originally developed. It is sometimes referred to as "secondary" or "spinooff" technology. The application of federally developed technology to the solution of domestic problems has been established as a national and Department of Defense objective by the following actions.

- o Secretary of Defense participation in the Domestic Action Council.
- o The President's March 1972 message to Congress on Science and Technology.
- o A General Accounting Office report on the use of Department of Defense laboratories for domestic technology transfer.

- o The National Science and Technology Policy, Organization and Priorities Act of 1976.
- o Increasing emphasis by user groups in the application of federally developed technology to meet their specific needs.
- o Continued interest by members of Congress.

In 1971, 11 in-house Department of Defense facilities joined together to form the DoD Technology Transfer Consortium in an effort to improve domestic technology transfer processes. The goal was to establish technology transfer points-of-contact at each research and development activity and thus form a person-to-person network to facilitate the flow and application of technology from Department of Defense laboratories to the solution of domestic problems. Since 1971, the Department and the National Science Foundation have banded together to promote and stimulate technology through these linkages and the Department of Defense Consortium has been expanded into a Federal Laboratory Consortium for Technology Transfer. Consortium membership has grown to about 180 Federal laboratories and centers representing not only the Department of Defense, but also the Commerce, Transportation, Justice, Energy, Health, Education and Welfare Departments and the National Aeronautics and Space Administration. Department of Defense participation has grown to 45 installations and continued close linkage is maintained with the National Science Foundation, home of the Consortium.

The National Science Foundation has provided the Consortium an organizational base, administrative capability and programmatic support as part of the National Science Foundation's Division of Intergovernmental

Science and Public Technology Program. The Department of Defense has provided a program manager for the Federal program over the past six years. Mr. Harold Metcalf of the Naval Weapons Center, Mr. Joseph Antinuucci of the Naval Underwater Systems Center and Mr. Nicholas Montanarelli of the Army Chemical Systems Laboratory have served successively as Program Managers in the National Science Foundation for approximately two years each. Currently, Mr. Cortland Dugger of the Air Force Systems Command and Mr. John McFall of the National Aeronautics and Space Administration are serving in that capacity.

An important milestone was the establishment of a Secretariat to service the Consortium in the achievement of its goals. The Secretariat is provided by the Technology Transfer Office of the Naval Weapons Center with National Science Foundation funding support. The Secretariat supports the Consortium Program Managers by planning, organizing and developing the capacity of the Consortium to meet national objectives and operational support advice to members. Mr. George Lindsteadt of the Naval Weapons Center serves as the Chairman of the Consortium and his activity has been a significant factor in achieving Consortium goals.

Department of Defense participants in the Consortium have assisted state and local governments in areas of transportation, public safety, economic development, energy, public works, environmental improvement and community development. These contributions have come about primarily as a result of the active nature of the Consortium which

emphasizes the transfer and adaptation of technology through person-to-person mechanisms via both individual and cooperative efforts of laboratories and centers. Among the achievements of the Department in the Consortium are state and local government activities that includes:

- o Technical support to the Southwest Innovation Group, New England Innovation Group, Georgia Innovation Group, Oklahoma Innovation Group and other public networks.
- o Maintains liaison with the U.S. Conference of Mayors, National League of Cities, the National Conference of State Legislatures and other public interest groups.
- o Support of state and local governments through the Intergovernmental Personnel Act.
- o Improved monitoring and dispensing of fuel for the New York City Police Department.
- o Transfer of soft body-armor technology to the law enforcement sector.
- o Transfer of night vision technology to law enforcement agencies, border security functions and numerous other applications.
- o Conduct a water purification project to remove asbestos fibers from Lake Superior.
- o Provided advice on the selection of hydraulic fluids for use in vehicles in water saturated areas.
- o Assessed fire alarm options for a city.
- o Provided instrumentation for a solar energy demonstration project.

- o Assisted in the development of energy conservation in public buildings.
- o Developed field measurement techniques for determining potential aerosol hazards of sprinkler irrigation systems.
- o Assisted in the design of disaster alarm systems.

There appears to be a consensus that the person-to-person linkage provided by the Consortium has been most useful in strengthening technology transfer activities. It is clear that the Consortium, with a relatively small investment of resources, has been useful in increasing the national utility of Federal laboratory products and processes. In view of this, the Department of Defense, on 12 June 1978, restated its strong endorsement of the Consortium and extended its participation with the National Science Foundation through FY 1980. It is our view that the activities of Defense organizations in the Consortium are an important step toward achieving national goals expressed by the Congress and the Executive Branch in the area of domestic technology transfer.

Attachments 3

- 1 - DoD Memorandum, 22 June 1978
- 2 - Operating Policy
- 3 - Directory of Federal Technology Transfer



RESEARCH AND
ENGINEERING

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

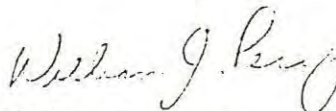
22 JUN 1978

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (RESEARCH, DEVELOPMENT AND
ACQUISITION)
ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGINEERING AND
SYSTEMS)
ASSISTANT SECRETARY OF THE AIR FORCE (RESEARCH, DEVELOPMENT
AND LOGISTICS)

SUBJECT: Non-Defense Work in DoD Laboratories and R&D Facilities

Reference is made to DDR&E memorandum of 29 July 1976 on the above subject which endorses the DoD Laboratory Consortium as an effective means of improving domestic technology transfer. The Consortium (now the Federal Laboratory Consortium) is an important factor in meeting DoD's obligation to make technology developed in our laboratories available for use in the solution of critical domestic problems. The importance of this goal has been emphasized by the National Science, Engineering and Technology Policy, Organization and Priorities Act of 1976, Members of Congress and the President's Science Advisor. I urge continued support of the Consortium by DoD organizations.

In view of DoD's important role in the functioning of the Consortium, the brokerage function at the National Science Foundation is authorized through FY 80 subject to the willingness of the Military Departments to absorb the cost.


William J. Perry

OPERATING POLICY OF THE
DEPARTMENT OF DEFENSE
TECHNOLOGY TRANSFER CONSORTIUM

Purpose - The purpose of this policy is to establish the basic framework and direction of the Department of Defense (DoD) Technology Transfer Consortium.

Background - The DoD currently funds approximately half of the total Federal expenditure for R&D. Civil government agencies are expressing an increased interest in the exploitation of defense technology for the solution of problems in the civil sector. The Military Departments have been encouraged to cooperate in this endeavor, subject to considerations promulgated by the Secretary of Defense.

Consortium Purpose - The DoD Laboratories are a source of technology for the solution of these civil sector problems which are amenable to technological solutions. The primary role of the in-house laboratories is to provide a research and development base for the development of systems required to fulfill the national security mission of the DoD. However, these laboratories can serve a vital secondary role in the adaptation of technology to other fields and areas of need to the extent that it does not adversely impact on the primary DoD mission. A consortium of DoD Laboratories is formed for the purpose of coordinating interactions with other Federal Agencies and technology users at federal, state, and local level, and of coordinating the efforts in this endeavor. The technology transfer consortium is an association of DoD Laboratories working together through an informal affiliation. The main thrust of the consortium activity is through the individual and cooperative efforts of the laboratories involved, with an emphasis on the transfer and adaptation of technology through person-to-person mechanisms.

Criteria for Laboratory Consortium Membership - The following criteria for the participation of a DoD Laboratory in Consortium activities shall apply:

- o The participation of any laboratory shall be undertaken with the full knowledge of the parent Military Department and the director or commander of the laboratory.
- o For each participating laboratory an individual shall be designated by name to represent that laboratory to the consortium, and to coordinate the technology transfer activities of that laboratory. Procedures should be adopted within each laboratory to preclude the dilution of the efforts of middle and top level management by their involvement in the administrative aspects of the technology transfer effort.

- o Any laboratory may withdraw from the Consortium by notifying the Consortium Chairman of this intent.

Criteria for Conduct of Work - It is the view of the Consortium that the civil sector should rely on the private enterprise system to provide those services which are reasonably and expeditiously available through ordinary business channels. The laboratories shall attempt to provide a supplemental resource that is not technically available or that is obtainable only at an excessive cost. Such services shall not supplant existing private or industrial resources but are offered to enable other Federal agencies, state and local governments to avoid unnecessary duplication of special service functions.

The following criteria shall apply for the conduct of work undertaken in the technology transfer program:

- o In order for work to be undertaken for any government organization each of the following criteria must be satisfied:
 - a. Laboratory staff will not increase as a result of the additional work.
 - b. Laboratory facilities will not be added for non-DoD work.
 - c. Proposed work should relate to a laboratory's area of particular expertise and the laboratory should be a significant resource in the particular subject area.
 - d. A determination should be made that the laboratory's background, experience and facilities are such that private industry could not perform the work except at a significantly increased cost.
- o The major emphasis of the Technology Transfer Consortium should be directed to:
 - a. The transfer or adaptation of existing technology, either directly, or after being subjected to adaptive engineering.
 - b. The preparation of documentation and technical assistance in those activities unique to the mission of the DoD laboratories.
- o Work will be performed for private industry only on an exception basis, such as when the laboratory possesses unique-facilities that are required and which are not available in the private sector.

- o Description of the work to be accomplished and the funds to be transferred will normally be specified in a formal interagency agreement.
- o All costs shall be recovered from the receiving government organization, including realistic overhead costs, except that cooperative developments on a shared cost basis are encouraged where there is a distinct military application.
- o Laboratory production of hardware shall normally be limited to prototypes or test units required to prove feasibility.
- o Adaptive engineering shall not be performed on technological innovations for which a patent application has been made by a private industrial firm unless permission is received in writing from that firm.
- o Technical, consulting, and support services will not normally be furnished another agency on a continuing basis.
- o Work in the form of analytic services shall not normally be undertaken in areas where comparable expertise exists in competitive industry. An exception to this provision is acceptable in areas of problem definition where existing Defense technology offers a unique potential solution.

Directory of Federal Technology Transfer

JUNE 1977

EXECUTIVE OFFICE OF THE PRESIDENT
Federal Coordinating Council for Science, Engineering
and Technology



FOREWORD

I am pleased to present the second edition of the Directory of Federal Technology Transfer. The publication of this document represents a key step toward increasing the utilization of science and technology in the public sector by bringing together in one place an indexed description of the program resources and contact points at the Federal level that can be drawn upon by persons in industry and particularly in State and local government.

However, far more than a single report is necessary to effect technology transfer. A series of coordinated efforts is needed to strengthen the partnership among the Federal government, State and local governments, and the private sector as each seeks to develop and utilize science and technology in the domestic sector. These include more user participation in the setting of Federal research agendas, more attention to research assessment and concept demonstration, and higher priorities on transforming research findings into specific science and technology applications.

The Office of Science and Technology Policy (OSTP) is committed to making Federally supported research and technology more useful to the domestic sector and is actively supporting two major efforts. The Intergovernmental Science, Engineering, and Technology Advisory Panel, composed of State and local officials, is helping OSTP identify possible Federal policies to obtain State and local government input into Federal R&D agenda setting activities and to facilitate the transfer and utilization of research and development research for civilian needs. The Federal Coordinating Council for Science, Engineering and Technology, composed of Federal policy level officials, will continue to carry out and encourage inter-agency activities concerned with improving the transfer of knowledge and technologies to State and local governments and the private sector. OSTP welcomes your suggestions on ways to increase the utilization of science and technology to meet human needs.

I want to thank Dr. H. Guyford Stever for his support of the Federal Council on Science and Technology under whose auspices most of the work for this report was conducted. I also want to express appreciation to Mr. A. B. Linhares for his leadership of the Committee on Domestic Technology Transfer which has developed this report.



Frank Press
Director, Office of Science
and Technology Policy
Chairman, Federal Coordinating
Council for Science Engineering
and Technology

INTRODUCTION

In its broadest sense, technology transfer encompasses the collection, documentation, and dissemination of scientific and technical information, including data on the performance and costs of using the technology; the transformation of research and technology into processes, products, and services that can be applied to public or private needs; and the secondary application of research or technology developed for a particular mission that fills a need in another environment. This directory is a guide to all these activities as carried out in the departments and agencies of the Federal Government. Each section of the directory describes the agency's program, including the agency's research base, its technology transfer policy and objectives, areas of responsibility, methods of implementation, accomplishments and user organizations. Contact points through which you can find the most pertinent elements of the agency are provided. There is an index to help you find activities or applications related to your areas of interest and also determine whether these areas are common to more than one Federal agency.

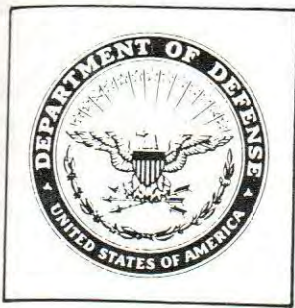
This, the second edition of the *Directory*, is a revised and expanded version of the first edition issued in 1975. Changes have been made on the basis of responses to a survey form included with the first edition. There are increased references to specific programs related to State and local government, and to available publications, newsletters, and manuals. Greater effort has been made to ensure uniformity of content across agencies, and an improved index has been developed. With the prospect in mind of keeping the *Directory* updated and as responsive to your requirements as possible, we have included a survey form in this edition, attached as a foldout to the back cover. We would greatly appreciate your sharing your reactions to the *Directory* with us by filling out the form and returning it to us. In this way we can plan for a more useful third edition.

Since the first edition of the *Directory* was issued in 1975, Federal agencies have devoted increasing attention to the development and improvement of programs intended to facilitate the transfer of knowledge and technology to appropriate users. We believe that Federal research and development programs will be increasingly responsive to the needs of the Nation, and that Federal efforts to facilitate the introduction into the civilian economy of the products of this research and development investment will be increasingly effective. The coordinating and interagency communication activities of the Committee on Domestic Technology Transfer of the former Federal Council for Science and Technology will continue under the auspices of the new Federal Coordinating Council for Science, Engineering, and Technology. Like its predecessor, the Federal Coordinating Council provides a major focal point for interagency research and development policy making, including domestic technology transfer policy.

We encourage you to take full advantage of the benefits of the public investment in research and development as carried out through the programs of Federal agencies. We hope this *Directory* serves as a useful resource as you seek to match your problems and needs with the products of that investment.



A. B. Linhares
Chairman, Committee on Domestic Technology Transfer



DEPARTMENT OF DEFENSE

Enabling Legislation and Mission

The Department of Defense (DOD) is the successor agency to the National Military establishment, created by the National Security Act of 1974. It was created as part of a comprehensive program designed to provide for the security of the United States through the establishment of the integrated policies and procedures for the departments, agencies, and functions of the Government concerned with national security.

Research Base

Scientific and technical matters; basic and applied research; research, development, test and evaluation of weapons, weapon systems, and defense material; and design and engineering for suitability, productibility, reliability, maintainability; and environmental services are the responsibility of the Department of Defense. Many elements of this research and engineering have secondary application in the civil sector.

Technology Transfer Policy and Objectives

A DOD Policy Memorandum was issued on June 21, 1972, from the Deputy Secretary of Defense to the Secretaries of the military departments and the Director of Defense Research and Engineering, encouraging the military services to participate in technology transfer to critical nondefense work. Such non-defense work must not impede the mission of the service or laboratory; it is to be supported by the beneficiaries. Work may be performed in support of Federal, state, and local governments. Work will be performed for the private industrial sector only in special cases.

Jointly supported projects are permitted when there is also a direct application to a military requirement. Although the development of detailed implementation policy was left to the prerogative of each military ser-

vice, a memorandum for the Director of Defense Research and Engineering issued on June 14, 1974, clarifies the level of effort that may be applied to civilian problems, and forwards the operating policy of the DOD-Federal Technology Transfer Consortium as general policy guidance. As a result, all three services encourage their laboratories and technical activities to assist in solving urgent civilian problems to the extent it is consistent with primary mission responsibilities, and the availability of manpower and facilities.

The objectives of the DOD-Federal Technology Transfer Program are:

- To derive the maximum benefit from the investment of R&D funds by the Department of Defense.
- To facilitate the transfer of existing military technology and research products to the solution of critical domestic problems.
- To utilize Government-owned R&D facilities more efficiently in the national interest.

Technology Transfer Responsibility

The forty-one DOD laboratories that have become active in the Federal Laboratory Consortium are interested in a more active technology transfer program. The Consortium is an informal association of the technology representatives from the member laboratories. Through this informal working group, technology transfer efforts and interactions with other Federal agencies and with potential users at the Federal, state, and local level are coordinated and reinforced. This has enhanced the individual efforts of the three services and their participating laboratories. The Consortium elects its own chairman and is represented by a full-time liaison person in the Washington area, located in the Division of Intergovernmental Science and Public Technology (ISPT) at the National Science Foundation. This liaison function links the Federal laboratories with user agencies at all levels of government.

Implementation

The approach to program implementation within the Air Force, Army, and Navy varies, however each service emphasizes on the importance of person-to-person communications in the technology transfer process.

AIR FORCE

The Air Force cooperates with and responds to the initiative of civil agencies of Government and can point to a significant number of important transfers. The most important example is the broad Air Force contribution to the U.S. commercial aviation industry. This is documented in a DOD-NASA-DOT study, entitled Research and Development Contribution to Aviation (RADCAP), available from the National Technical Information Service (accession numbers, Vol. I, 750108; Vol. II, 750109).

ARMY

The Army implemented its Regulation 70-57, Military-Civilian Technology Transfer, on 1 July 1976. This regulation prescribes Department of the Army (DA) policies and procedures; and establishes responsibilities for technology transfer between DA activities and the civilian sector, and for identification and possible cooperative development of new technologies of interest to both the military and civilian sectors. It sets forth the DA policy to promote military-civilian technology transfer and cooperative development, particularly with state and local governments or consortiums thereof.

Navy

SECNAVINST 5700.14 issued by the Secretary of Navy on 28 February 1972, established a systematic and comprehensive policy for the transfer of appropriate technology developed by the Navy for national defense purposes to the civilian sector and for the identification and cooperative development of coming technologies of both military and civilian interest. From a small nucleus of Naval laboratories which experimented with technology transfer in the late sixties and early seventies, the Navy program has grown to approximately 97 focal points.

DOD Information System

A well-organized R&D information data base is a vital component of any technology transfer process. The Defense Documentation Center is the primary R&D data source for military R&D.

The Defense Documentation Center (DDC) makes available scientific and technical reports produced each year by U.S. military organizations and their con-

tractors. The Center also operates computer-based data banks of management and technical information on R&D projects. Although originally created to serve the military, DDC services have been extended to all Federal Government agencies and their contractors, subcontractors, and grantees.

DDC does not serve the general public directly, but the scientific and industrial community has access to reports having no security or other distribution restrictions. Such reports are sent to the National Technical Information Service (NTIS) of the Department of Commerce where they are made available and sold in full size or microfiche copies to the general public.

DDC also provides status information on Defense R&D in progress. Information on 13,000 of these work units is available to the general public through the Smithsonian Science Information Exchange (SSIE) which also maintains for public use, similar information about ongoing research supported by other Federal Agencies as well as many non-Federal organizations. More information about the SSIE appears under that entry in this Directory.

In addition to DDC, there are other special-purpose information centers, such as the Navy Research and Development Information Center (NARDIC) and the Air Force Information for Industry Offices, which facilitate technology transfer. NARDIC makes information regarding Navy research and development available to industry. It was established because of the recognized benefit to the Navy of civilian participation in research and development relevant to Navy needs. The three Air Force offices were established for similar reasons and are located in Washington, D.C., Dayton, OH, and Los Angeles, CA.

Technology Transfer Accomplishments

Every effort is made in the DOD laboratories to maximize the use of existing communication networks and mechanisms for technology transfer. Some of the resources which contribute to the success of the DOD program are:

- The nonprofit technology brokers, such as Public Technology, Inc., are sources of information on the technical problems of state, cities, and local governments. Grants sponsored by the National Science Foundation's Intergovernmental Science and Public Technology program have helped establish institutional arrangements vital to identifying fruitful areas for the application of DOD technology to states, cities, counties, and private sector. Examples of such grants are the Pennsylvania Technical Assistance Program (PENNTAP), the California Innovation Group, the Massachusetts Science and Technology Foundation, and the Georgia Science and Technol-

ogy Commission, the California Science and Technology project, the Alabama Innovation Group, and the New England Innovation Group.

- The NASA problem statements are made available to the DOD Consortium, and an opportunity is provided for responding with feasible technical solutions.
- The network of regional technology transfer agents of the Small Business Administration is a resource for determining the technological needs of small business.
- Federal civil agencies have been cooperative in sharing their program plans with the DOD laboratories in order that intelligent assessments of relevant DOD technology and facilities can be made.

Some examples of specific transfer mechanisms employed by the DOD laboratories are:

- Seminar/workshops have been conducted with the general theme of "domestic applications for military technology" at several Naval laboratories and centers throughout the country. These expositions of laboratory capability potentially applicable to the solution of domestic problems were attended by Federal, State, and local government officials, university staff members, and representatives from private industry.
- A number of new technical partnerships were formed and projects initiated as a result of the meetings held at the U.S. Army Harry Diamond Laboratories, Washington, D.C., U.S. Army Mobility Equipment R&D Command, Ft. Belvoir, VA, Naval Underwater Systems Center, Newport, Rhode Island, the Naval Ship Research and Development Center, Maryland, and the Naval Electronics Laboratory, San Diego, California.

The following are samples of accomplishments by the tri-services during the past two years in the area of technology transfer.

- A team of Naval Research Laboratory scientists developed a family of novel coating materials composed of fluoro-condensation polymers. The new materials, which have properties similar to those of TEFLON, are expected to find important uses in the military and non-military industries. Some varieties have been developed as spray-paint protective coatings for Navy equipment. Others are expected to perform an important function in the medical world by providing protective molding coatings for the implantation of prosthetics into the human body.
- At the Naval Research Laboratory, a new technique has been developed for mosquito control. The technique calls for the application on mosquito-laden water of non-ionic, organic liquids which spread spontaneously on the surface of the water, forming thin (one-molecule thick) layers of film. The thin film reduces the surface tension of the water which

prevents mosquito larvae from attaching themselves to the surface, causing the larvae to literally "drown" as they sink to the bottom. Since the films used at NRL are nontoxic, they are suitable for use on reservoirs and irrigation bodies. In addition, they do not interfere with gas exchange across the air-water interface and thus do not cause oxygen starvation of marine life in the underlying water.

- A wide range of technical assistance is being provided to The U. S. Geological Survey. The U.S. Army Harry Diamond Laboratories is analyzing the technological needs of USGS in the area of safety and pollution control in oil drilling operations on the outer continental shelf. Using the technical resources of other consortium laboratories as well as their own, this Army lab is pursuing projects applying communications technology, fluidics, and remote sensing to the solution of USGS mission problems.
- The Army Night Vision Laboratory participates in numerous activities resulting in a continuous transfer of technology to the government and private sectors. Technology Transfer activities have ranged from general briefings, demonstrations, technical assistance to loans of unique and specialized night vision equipment. Medical establishments, law enforcement agencies, universities, government and industrial research firms have sought guidance as to the application of night devices for the solution of their particular problems. Such night vision systems as the Handheld Thermal Viewer, Night Vision Goggles, Airborne Forward Looking Infrared Sensor, Handheld Searchlight, Starlight Scope and Night Observation Device were used in applications for night blindness, beach patrol, narcotics traffic, burglaries, forest fire detection, law enforcement, low income housing winterization, star guiding and astronomy and aircraft safety. Investigators also used night vision devices in the biological and behavioral aspects of the white tail deer, Haitian Hutia, sea turtle, rodent, chimpanzee, Greenburg and Pecan weevil.
- The United States Postal Service (USPS) is a major beneficiary from the Army's knowledge and experience in the area of fabric and garment quality control. Clothing technologists at a U.S. Army lab are responsible for developing, distributing, and enforcing fabric and garment specifications for USPS. This service is provided for such items as letter carrier uniforms, window clerk uniforms, utility uniforms, rainwear, cold weather clothing and footwear.
- Advances in food preservation techniques have long had an impact on the civilian marketplace. One such program currently under way at a U.S. Army lab is the development of dehydrated maple syrup. Under-

taken to assist the food industry in the State of Vermont, improvements in maple syrup processing and preservation are expected to enhance the State's marketing and distribution capabilities and thereby affect the State's total economy. The technology transfer resulted from the lab's experience with developing dehydrated foods for military use.

- The need for lightweight, corrosion-resistant packaging for military rations led to the Army to pioneer in the development of thermally-processed foods packed in flexible pouches. The shelf-stable, retortable pouch, known as the "flex pack," is a three-layer lamination of polyethylene, aluminum foil and polyester. Because of its advantages in reducing the weight and volume of foods, while at the same time increasing their shelf life, the flex pack is being considered a possible replacement for the standard tin can now in supermarkets. Foods packaged in flexible pouches are already on the market in Canada, Europe, and Japan. In the United States, the flex pack is awaiting approval by the Food and Drug Administration (FDA). Once approval is granted, several major U.S. food companies are planning to market flexibly-packaged foods for consumers.
- Among today's many exotic proposals for energy conservation, the Naval Facilities Engineering Command is implementing a plan which is unique for its simplicity and practicality: the use of municipal solid waste as a boiler fuel. Solid waste, 70% of which is combustible, gives off 700 BTU's per pound, which means a saving to the user of 1.5 barrels of oil for every ton of waste burned. Additionally, the low sulfur content of solid waste makes it less of an air pollutant than most coal and fuel oils.
- The Civil Engineering Laboratory is researching two concepts for processing refuse into self-encapsulated, biologically stable slugs having densities exceeding 65 pounds per cubic foot. These processes involve forcing refuse through an extrusion die under considerable pressure, using either a screw or hydraulic cylinder to provide the required force. As the refuse is forced through the die, the frictional resistance of the die compacts and heats the material, melting the plastic constituents and partially pyrolyzing the paper at the surface, and fuses it into a dense, hard-shelled slug. The solid waste slugs are then easily placed in landfill areas requiring little or no additional compaction. They are also ideally suited for use as fuel for heat recovery incinerators.
- The Naval Undersea Systems Center (NUSC) is implementing a computerized Asset Management System (AMS) for the New York City Police Department. AMS is an adaptation of a management information system developed at NUSC to control the Center's extensive inventory of scientific equipment.

- Today, with ecology and pollution control a paramount concern, scientists at the U.S. Army Natick Research and Development Command, Natick, MA, are refining a technique for converting waste paper, cardboard, plastic scraps, leaves, grass and tree trimmings into glucose sugar. The glucose can be further processed to produce ethanol, a low emission fuel, or used as a raw material for the production of chemicals and plastics now made from petroleum. Using cellulosic materials ranging from urban wastes, industrial wastes, agricultural residues, food processing wastes, forest residues to animal feed lot wastes, Natick scientists are now capable of converting 1,000 pounds of cellulose per month into 500 pounds of glucose. The conversion of cellulosic wastes into useful products holds potential promise for helping to alleviate the world's food and energy supply problems, while at the same time reducing the environment's pollution level.

- The most important contribution by both the Army and the Navy to technology transfer has been their past and continuing development beginning in World War II of the computer and its application to every area of national, industrial and defense interest.

Since 1971 over 450 projects have been carried out by the Consortium utilizing existing DOD technology to meet requirements of other agencies. The projects covered a wide range of problems relating to fire and safety, the environment, health and medicine, law enforcement and crime prevention, transportation, analysis and testing, and instrumentation.

Most of the projects mentioned above were in support of other Federal agencies. However, transfers are now in progress with state and local governments.

Publications

- A Navy monthly publication called the FACT SHEET has been distributed since December 1975, and now is distributed to 1,500 recipients. Approximately 300 Office of Naval Research Technical Disclosures Bulletins are being distributed on a monthly basis throughout the U.S. for the greatest exposure to the Navy/civilian sector. The Technical Disclosure Bulletins, which may be referred to in the open literature, consist of concise descriptions of developments resulting from research and development efforts of laboratories, activities, and contractors of the Department of the Navy and are intended to disseminate scientific and technical data which may be of interest to the private sector.
- A Navy Technology Transfer Annual Report is prepared for the SECNAV. This publication contains data provided by participating Navy activities

as part of the annual report on the Department of the Navy Technology Transfer and Cooperative Development Program. The data reported reflects the Federal Interagency Projects, State and Local Government Projects of participant Navy activities. Descriptions of high commercial potential Navy patents and inventions developed at participating Navy activities are also included. Navy inventions are published in "Government Inventions for Licensing."

- Each month the Federal Laboratory Consortium publishes the technology transfer NEWS ITEMS. This compilation of news items is an informal dissemination mechanism intended for individuals interested in Federal Laboratory utilization and technology transfer. Its contents are collected from the laboratories and agencies participating in the Federal Laboratory Consortium for Technology Transfer and are organized into the following categories: Activity Highlights; Consortium Notes; Meetings, Conferences and Symposia; Problem Definition and Needs Assessment; R&D Summaries and New Technologies; Legislative Activities; Regulations and Policy; Clippings and Reprints; and Budget Submissions and Agency Descriptions.

Appendix C

Chronological Development of the FLC Establishing a Presence

Chronology

This brief chronological overview highlights some of the significant events in the history of the Federal Laboratory Consortium for Technology Transfer. Particular emphasis is placed on the formative years of the organization.

1950

National Science Foundation (NSF) established.

1951

Defense Technical Information Center (DTIC) reorganized and expanded, in part as a Government attempt to ensure broad use of technological achievements.

October 1968

As a result of Daddario Committee hearings on the utilization of Federal laboratories, House Subcommittee on Science, Research, and Development recommended expanding interagency use of Federal laboratories and technology transfer from mission agencies such as Department of Defense (DOD), NASA, and Atomic Energy Commission (AEC) to the civilian sector.

April 1969

DOD implemented a Domestic Action Program to encourage use of technology developed for defense programs to help solve domestic problems. DOD directive provided general program guidelines.

Early 1970

Fred Nathan, Naval Weapons Center (NWC) Domestic Action Coordinator, contacted several Government organizations involved in science and technology activities to ascertain whether NWC capabilities could contribute to the health of the nation. Leroy Marquardt, an NWC division head looking for funding alternatives for a long-term NWC research project, began efforts to market Center capabilities to other Federal organizations.

May 1970

NWC's Technology Transfer Program was initiated to evaluate and apply existing developed technologies to the solution of domestic problems.

July 1970

DODINST 7730.53 was issued. It permitted DOD components to provide specialized or technical services to state and local governments.

October 1970

NWC engaged Perrin Associates, specialists in technology transfer, to serve as the transfer agent between technology developers and potential users, and to introduce technology transfer to NWC's scientists and engineers.

January 1971

Edward Glass, Assistant Director of the Office of Defense Research and Engineering Management, proposed a 1-year pilot study of technology transfer within DOD. NWC was the lead laboratory and would select other DOD laboratories representing more than one service.

March 1971

Technology Utilization Office (TUO), headed by George Linsteadt, was established at NWC to coordinate technology transfer.

May 1971

At the request of Edward Glass, Linsteadt and J. Richard Perrin of Perrin Associates began visiting DOD laboratories to discuss the potential of forming a consortium of DOD laboratories.

July 1971

Representatives from 12 DOD R&D facilities met at China Lake, CA on July 1 to develop a cooperative technology transfer program. Result of the meeting was the formation of the DOD Technology Transfer Laboratory Consortium.

September 1971

Harold Metcalf began work at the National Science Foundation (NSF) in Washington, D.C., for the purpose of providing a full-time technology transfer liaison to link civilian agencies and DOD laboratories. Position was a 1-year detail.

December 1971

Second DOD Laboratory Consortium meeting was held with representatives from 15 DOD laboratories, in Washington, D.C.

February 1972

SECNAVINST 5700.14 stated that it was DOD's policy to promote technology transfer and cooperative development. Implementing the policy was to be the responsibility of the Office of the Chief of Naval Operations (CNO).

March 1972

CNO issued OPNAVINST 5700.13, assigning Chief of Naval Material (CNM) the responsibility for military-civilian technology-transfer and cooperative-development matters.

President Nixon endorsed the technology transfer concept in a Special Message to Congress.

April 1972

Frank Hersman, head of NSF Office of Intergovernmental Science Programs, accepted NWC's offer to extend Metcalf's detail assignment and to continue the cooperative agreement between NWC and NSF.

June 1972

Two hundred leaders from all levels of government, academia, and industry met in Harrisburg, PA for a National Action Conference on Intergovernmental Science and Technology. They passed resolutions to use

Federal laboratories to back up state and local governments in the areas of each laboratory's technical competence and to make technology available to all through a national technology transfer program.

November 1972

Seventeen laboratories were represented at the fourth meeting of the DOD Laboratory Consortium at NSF.

December 1972

General Accounting Office (GAO) reported to Congress on ways to increase use of defense technology to solve urgent public problems. Report cited NWC as the first DOD laboratory to demonstrate a successful, active technology transfer program and recommended that formal policies and guidelines be established for technology transfer programs.

February 1973

George Linsteadt, Consortium Chairman, issued a draft proposal for the Consortium's operating policy.

June 1973

Linsteadt recommended to Dr. Guyford Stever, Director of NSF, that the temporary liaison function occupied by Metcalf be established as a permanent function.

October 1973

Capt. Gordon H. Smith, Special Assistant to the Deputy Director of Research and Advanced Technology in the Department of Defense, suggested that the DOD Laboratory Consortium be broadened into a total Federal Laboratory Consortium.

November 1973

State of California took initial steps to establish a State-Federal laboratories partnership.

January 1974

DOD Laboratory Consortium met with members of a newly formed ad hoc group on technology transfer in Los Angeles, CA. The Office of the Lieutenant Governor of California sponsored a California-Federal Laboratory Directors' Meeting to discuss the possibility of California and Federal laboratories working together on projects of mutual interest.

May 1974

Metcalf recommended an incentive for Federal laboratories to participate in technology transfer through the use of 2 to 3 percent of laboratory personnel for technology transfer work.

DOD Laboratory Consortium met at NSF, where, in response to concern over the Mansfield Amendment, the general counsel ruled that the Consortium's technology transfer efforts were legal. Counsel also ruled that laboratories could not use R&D money for technology transfer programs.

June 1974

Metcalf retired; he was replaced in July by Joseph D. Antinucci. Capt. Smith was reassigned and replaced by Jim Terrell.

November 1974

At semiannual DOD Laboratory Consortium meeting in Monterey, CA, a majority of members decided to invite other Federal laboratories to join as full participating members.

December 1974

Joseph Alioto, President of U.S. Conference of Mayors, wrote to the President suggesting mayors could contribute to the implementation of Federal R&D transfer activities. Alioto's letter marked the beginning of a long and prosperous relationship between the Consortium and the U.S. Conference of Mayors.

January 1975

Federal Laboratory Consortium for Technology Transfer (FLC) was established unofficially. The DOD Laboratory Consortium became part of FLC.

Antinucci began the groundwork to have NSF fund the FLC. The FLC had 34 member laboratories at this time.

Technology Transfer Society was established; it provided major support to the fledgling FLC.

Technology Transfer Institute formed, with its home office in Japan and offices in Washington, D.C. and Los Angeles, CA.

April 1975

NASA/NSF Technology Sharing Consortium was established, although the FLC and NASA's Consortium remained separate.

June 1975

FLC representatives from 41 member laboratories met at NSF.

California Governor-elect Jerry Brown did not fund the previously established State Office of Technology Transfer. This resulted in the discontinued use of Federal laboratories to help the State.

December 1975

NTIS agreed to provide market development support to FLC, as well as a liaison at no cost to NSF.

May 1976

An NSF grant to NWC to cover operational aspects of FLC design, development, and evaluation became effective. FLC membership consisted of 53 laboratories and centers.

July 1976

Nicholas Montanarelli replaced Antinucci at NSF.

November 1976

At FLC meeting in Berkeley, CA, it was decided that Linsteadt would continue as FLC Chairman.

Industry's perception of FLC as a threat and ways to alleviate the situation were discussed. FLC membership consisted of 69 laboratories and centers.

December 1976

The newly established FLC Coordinating Committee agreed that FLC members had to be from Federal departments and agencies and have a strong connection to R&D.

May 1977

A draft of the proposed FLC "constitution" submitted to the FLC Steering Committee for comment. The constitution, which discussed a steering committee, a policy committee of headquarters representatives, and an advisory committee, was held for further consideration. The FLC had 72 members.

September 1977

NSF provided an additional \$90,000 to its original grant for FLC operations.

February 1978

A Navy meeting was held to discuss shortfalls in current OPNAVINST on technology transfer and to develop a master plan. The goal was to develop program objectives and guidelines to provide a long-range approach to technology transfer. Later in the month, all Navy R&D activities provided inputs on their desired objectives, methods of implementation, and guidelines for an effective technology transfer program.

March 1978

Community Technology Initiative Program (CTIP) began.

Spring 1978

By now, two to three laboratories joined the FLC each month.

NSF pushed Intergovernmental Personnel Act (IPA) assignments for employees of Navy laboratories for the purpose of furnishing technology assistance to local governments and facilitating transfer of Federal technology.

May 1978

Grant proposal for the design and development of FLC service elements was submitted to NSF.

FLC bylaws approved at FLC Executive Committee Meeting in Baton Rouge, LA.

FLC had nearly 170 members.

June 1978

The Under Secretary of Defense urged Assistant Secretaries of Army, Navy, and Air Force to continue supporting FLC.

July 1978

The Office of Technology Assessment conducted a project on the National Laboratory System. Many FLC representatives were invited to a roundtable session on improving state and local government access to laboratories and improving interagency access to National Laboratories.

October 1978

At the FLC meeting in Santa Fe, NM, FLC members agreed to fund a variety of technology transfer demonstration projects.

January 1979

A DOD report to the Senate Appropriations Committee stated that the FLC's activities were an important step toward achieving national technology transfer goals as expressed by Congress and the Executive Branch.

February 1979

FLC demonstration projects were under way in several regions, including projects with the Technology Action Center in Santa Clara, CA; Technology and Business Opportunity Conferences; and commercial trade associations.

FLC developed a plan to increase the commercialization of technology.

John McFall and Cortland Dugger replaced Nicholas Montanarelli at NSF.

March 1979

President Carter, in his Science and Technology message, stressed the importance of the Federal R&D effort in solving pressing problems of state and local governments.

May 1979

The first FLC Accomplishment Document printed and distributed to potential users.

At the FLC Executive Committee meeting in Bethesda, MD, the Agency for International Development (AID) expressed interest in learning how to better transfer technology to other developing countries.

August 1979

A proposal for an FLC/AID Support Program was issued.

September 1979

Congressman George Brown introduced the National Technology Foundation Act to create an independent agency to promote technology for national welfare. [Did not pass Congress.]

October 1979

At the meeting in San Antonio, TX, the FLC Executive Committee decided that the FLC should function as a technical resource to the innovation groups, but not as an integral part of their organizations.

March 1980

The FLC Executive Committee decided to pursue a formal public-affairs program.

May 1980

The Public Affairs Plan proposed by Los Alamos Scientific Laboratory was accepted, and the Plan was included in the Indoctrination Manual (distributed in Fall 1980).

A bylaw amendment was proposed to establish the position of Executive Director within the FLC organization.

September 1980

James Atkinson and Charles Miller replaced Cortland Dugger and John McFall as Federal Laboratory Program Managers at NSF.

Linsteadt, FLC Chairman, was elected President of the Technology Transfer Society.

1980

FLC developed the Energy Link Project, designed to improve the use of energy resources available from the Federal laboratory system.

October 1, 1980

Public Law 96-480 cleared Congress: the Stevenson-Wydler Technology Innovation Act became law.

November 1980

Dr. Eugene Stark, Los Alamos National Laboratory (LANL), elected FLC Chairman, and Linsteadt appointed Executive Director.

The grant renewal package submitted to NSF for review and action.

1981

Much of this year's effort spent in determining how to implement PL 96-480.

TECTRA, an on-line, interactive computerized database of successful technology transfer cases, initiated.

February 1981

Stark brought together a distinguished panel of technology and laboratory experts to gain a greater understanding of implications of PL 96-480.

March 1981

NSF informed FLC that funds planned for 1982 were unavailable because of OMB cuts.

The new *TECTRA Newsletter* proved quite successful during fiscal year 1980, thus indicating the need for expanded programs in both databases and publications.

By Spring, it was clear that, even with the Stevenson-Wydler Act in place, technology transfer implementation would continue to be difficult because of reorganization of intergovernmental programs in NSF; shifting Congressional support; and OMB Bulletin banning "wasteful spending" on Government periodicals, pamphlets, and audiovisual products.

May 1981

The *FLC Resource Directory* began along with a system of available resource brochures.

July 1981

At a House hearing, the Reagan Administration announced a policy to implement Section 11 of the Stevenson-Wydler Act, the Utilization of Federal Technology.

October 1981

A Congressional hearing was held on the Stevenson-Wydler Act. The General Accounting Office asked to assess adequacy of agency implementation of the Act.

November 1981

NSF funds drastically reduced, all but eliminating grant funds available from NSF to operate FLC.

U.S. Conference of Mayors initiated an effort called City/Federal Laboratory Program, designed to begin implementation of Section 11 of the Stevenson-Wydler Act.

March 1982

The Technology Transfer Society's Oversight Committee on Policy presented a paper to the House Science and Technology Committee's Subcommittee on Science, Research and Technology. Representative Walgren helped get increased funding for NSF and began working with other Congressmen to increase authorization for PL 96-480.

First Government/industry technology transfer conference undertaken by the Northern Regional Research Center (NRRC, USDA) and Aladdin Industries.

October 1982

TECLAB, a database/newsletter follow-on to *TECTRA* begins operation. *TECTRA* describes technologies developed by a Federal laboratory and believed to have potential for commercialization by industry.

An Army Coordinating Group started meeting during each National FLC meeting. The Army by this time became the dominant DOD force in technology transfer, and a significant portion of the funds for FLC activities came from the Army.

1983

An FLC/Agency Liaison Group formed in the Spring. Representatives of Federal agencies and the FLC Chairman met to discuss strengthening the relations between the FLC and Headquarters organizations of its member laboratories.

March 1983

The first of the highly successful laboratory/industry workshops held by the Consortium in cooperation with Aladdin Industries.

June 1983

The Technical Volunteer Service (TVS) program went into full swing. TVS training sessions and information exchanges established.

NWC received funding to develop a laboratory personnel locator database, which became the *FLC Resource Directory* in 1985.

September 1983

Linsteadt resigned as Executive Director of FLC. He was replaced by Ted Maher, U.S. Department of Agriculture, Extension Service.

October 1983

Giora Pelled, Army Headquarters, became Laboratory Program Manager at NSF.

March 1984

The Consortium recognized the need to expand public affairs activities and created the FLC Public Affairs Committee. This later became the Marketing and Public Affairs Committee.

Spring 1984

FLC began modernizing its communications, and Sandia National Laboratories grants access to FLC representatives to use COMET Electronic Mail System.

Summer 1984

Stark began working with House and Senate staff, at their request, to expand the Stevenson-Wydler Act, yielding the Federal Technology Transfer Act of 1986, PL 99-502.

1985

Pelled left NSF to return to Army. Pelled was the last Laboratory Program Manager at NSF.

The need for FLC presence in Washington, D.C., recognized by the Executive Committee, but nothing done until 1988.

Early in the year, Los Alamos National Laboratory became the FLC financial administrator.

April 1985

The *FLC News* took the place of previously published *FLC News Items* and appeared as a bimonthly periodical. In alternate months, the FLC printed a newsletter on available laboratory technologies.

Ted Maher resigned as FLC Executive Director. Clifford Lanham, Army, was appointed Executive Secretary, and DelaBarre and Associates served as FLC Secretariat.

Spring 1985

Several FLC Regions initiated demonstration projects to test new methods and avenues for transferring Federal technology. An early project between the Far West Region and NASA Industrial Application Centers at the University of Southern California led to the formation of the FLC Clearinghouse, using the *Resource Directory* developed by the Navy in 1983. A Memorandum of Understanding (MOU) to initiate the Clearinghouse signed in 1985 and actual work started in 1986.

The Summer of 1985, Stark began working with the House of Representatives and the Senate to amend PL 96-480.

June 1985

Lawrence Livermore National Laboratory offered to put all FLC members on its Technical Information System (TIS) gateway computer. This expanded FLC electronic communications capability.

1986

Administrative restructuring began by abolishing the position of Executive Secretary and establishing the FLC Administrator role as a contract function. Los Alamos became the FLC Financial Administrator and served as FLC agent in the procurement process for the Administration/Service Support contract.

October 1986

The Federal Technology Transfer Act of 1986 (PL 99-502) became law.

The Washington, D.C., representative position established at the Fall FLC meeting. This position was essentially the same as the NSF Laboratory Program Manager of earlier years. Lee Rivers, who had recently retired from Allied Signal, was appointed the first representative.

April 1987

PL 99-502 required each FLC region to develop Regional Advisors. The Far West brought together the first group of regional advisors.

The FLC issued its first *Report to the President and Congress*, as required by the new Technology Transfer Act.

May 1987

DelaBarre and Associates, Inc., awarded the first FLC administrative contract, and Del DelaBarre was appointed FLC Administrator.

Budget and Financial Management Committee established.

July 1987

FLC Clearinghouse established to provide clients direct access to Federal laboratory staffs.

September 1987

Language in PL 99-502 made it necessary for the FLC to establish demonstration projects each year. First contract awarded to the Utah Consortium for Research and Education to modify its Technology Targeting Database containing data on more than 1,000 companies.

October 1987

FLC strategic planning process completed. Following passage of PL 99-502, FLC felt it important to have a strategic plan.

1988

Early in the year, FLC began assisting VOTECH in Oklahoma. The activities developed into a major demonstration project to link laboratories and small businesses, and grew to include an intensive training workshop that served as a model for similar endeavors across the country.

Dr. Loren C. Schmid, Pacific Northwest Laboratory, elected FLC Chairman, and Margaret McNamara, Naval Underwater Systems Center, first elected Vice Chairman in 1982, re-elected to that position.

Spring 1988

FLC Emeritus-at-Large Program established.

Summer 1988

The Omnibus Trade Act of 1988 increased the FLC's funding formula (as a set-aside of Agency intramural R&D budgets) from .005 percent to .008 percent.

1989

Regional activity development emphasized during 1988 and most of 1989. The number and the size of demonstration projects also increased.

The Subcommittee on Science, Research, and Technology of the U.S. House Committee on Science, Space, and Technology requested a statement on implementation of the federal technology transfer.

1990

Success of the 1988 VOTECH workshop in Oklahoma stimulated other states to explore the use of these workshops as a means to bring technology transfer to small businesses. During this year, six states sponsored workshops, and 18 other states explored the possibility.

Dr. Beverly Berger, Department of Energy, assumed the position of FLC Washington, D.C. Representative.

The document "Some Remaining Issues Related to Federal Technology Transfer" issued.

Speakers Bureau implemented.

Memorandum of Understanding signed with the National Institute of Standards and Technology to support each other's small business initiatives.

The Subcommittee on Science, Research, and Technology of the U.S. House Committee on Science, Space, and Technology requested a statement on federal agency and laboratory compliance with the Federal Technology Transfer Act.

1991

The National Association of Management and Technology Assistance Centers initiated an FLC demonstration that matched manufacturing needs of small businesses with federal laboratory and related resources.

NASA established six Regional Technology Transfer Centers (RTTCs) and located them in the FLC Regions to improve interactions and support with the FLC Regional Offices.

FLC Task Force participated in the planning for the National Technology Transfer Center (NTTC). NASA established the NTTC.

The FLC Legal Networking Subcommittee formed as a part of the Member Services Committee.

The compilation of technology transfer legislation, *Technology Innovation*, issued.

The Subcommittee on Oversight and Investigations of the U.S. House Committee on Energy and Commerce requested a statement on problems that impede the transfer of commercially useful technologies.

Linsteadt appointed FLC Administrator and DelaBarre and Associates awarded the management support contract.

1992

FLC and NTTC signed an MOU to work together to enhance the technology transfer process.

The American Technology Preeminence Act of 1991 became law and reaffirmed the FLC mandate.

Participation in President Bush's National Technology Initiative provided a forum to increase nongovernment awareness of federal resources.

The documents Mechanisms for Accessing Federal Resources and Tapping Federal Technology: Inventions, Expertise, and Facilities issued.

A series of handbooks for the technology transfer professional initiated with the issuing of the FLC Representative's Handbook and the ORTA Handbook.

Format of FLC national meetings changed to better meet member and user needs.

The Washington, D.C. Office strengthened and improved effectiveness. A responsibility for training was added.

The Subcommittee on Government Information and Regulation of the U.S. Senate Committee on Governmental Affairs requested a statement on the federal role in technology policy and competitiveness.

The Subcommittee on Patent, Copyright, and Trademarks of the U.S. Senate Judiciary Committee and the U.S. House Committee on

Science, Space, and Technology each requested a statement on issues related to copyrighting federal software.

1993

FLC issued "Job/Task Analysis Data for Technology Transfer Policy Makers, Technology Transfer Officers, Technical Managers and Staff".

The White House announced that the proposal involving the FLC Regions and the RTTCs and titled "Technology Access for Product Innovation" (TAP-IN) was one of the President's Technology Reinvestment Project winners.

The Subcommittee on Research and Technology of the U.S. House Committee on Armed Services requested a statement on the role of the Federal Laboratory Consortium in defense conversion.

The Subcommittee on Economic Growth and Credit Formation of the U.S. House Committee on Banking, Finance, and Urban Affairs requested a statement on facilitating technology transfer and commercialization.

The Subcommittee on Science, Technology, and Space of the U.S. Senate Committee on Commerce, Science, and Transportation requested a statement on the Technology Commercialization Act.

Linsteadt appointed FLC Administrator and DelaBarre and Associates awarded the FLC management support contract.

1994

The document Technology Transfer in a Time of Transition: A Guide to Defense Conversion issued.

The document Winners in Technology Transfer: Success Stories from the Federal Laboratory Consortium issued.

CRADA, and Patent and Licensing handbooks added to the FLC Handbook Series.

Technology Innovation updated.

Appendix D

Acronyms and Initialisms Found in FLC History

Acronyms and Initialisms

AEC	Atomic Energy Commission
AID	Agency for International Development
ASPA	American Society of Public Administration
CIG	California Innovation Group
	Common-interest group
CNM	Chief of Naval Material [U.S. Navy]
CNO	Chief of Naval Operations [U.S. Navy]
COFL	Committee on Federal Laboratories
CSU	California State University
CTIP	Community Technology Initiative Program
DAP	Domestic Action Program
DDR&E	Director of Defense Research and Engineering [DOD]
DDR&AT	Deputy Director (Research and Advanced Technology) [DDR&E]
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DOT	Department of Transportation
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
FAA	Federal Aviation Administration [DOT]
FCST	Federal Council for Science and Technology

FLC	Federal Laboratory Consortium for Technology Transfer
GAO	General Accounting Office
GSA	General Services Administration
HEW	Department of Health, Education, and Welfare
INST	Instruction [e.g., OPNAVINST, DODINST, NAVMATINST]
IPA	Intergovernmental Personnel Act
IRI	Industrial Research Institute
ISRU	Office of Intergovernmental Science and Research Utilization [NSF]
LANL	Los Alamos National Laboratory [DOE]
LEAA	Law Enforcement Assistance Administration
LLNL	Lawrence Livermore National Laboratory [DOE]
MTE	Massachusetts Technology Exchange
NADC	Naval Air Development Center [U.S. Navy]
NAE	National Academy of Engineering
NAMTAC	National Association of Management and Technology Assistance Centers
NASA	National Aeronautics and Space Administration
NAVMAT	Naval Material Command [U.S. Navy]
NBS	National Bureau of Standards [DOC]
NIAC	NASA Industrial Applications Center
NIH	National Institutes of Health
NILECJ	National Institute of Law Enforcement and Criminal Justice
NIST	National Institute of Standards and Technology [DOC, formerly NBS]
NOAA	National Oceanographic and Atmospheric Administration [DOC]
NOSC	Naval Ocean Systems Center [U.S. Navy]

NSIA	National Security Industrial Association
NTF	National Technology Foundation
NTIS	National Technical Information Service [DOC]
NTI	National Technology Initiative
NTTC	National Technology Transfer Center [NASA]
NUSC	Naval Underwater Systems Center [U.S. Navy]
NWC	Naval Weapons Center [U.S. Navy]
NYPD	New York [City] Police Department
OMB	Office of Management and Budget
OPM	Office of Personnel Management
OPNAV	Chief of Naval Operations [Office of, U.S. Navy]
ORTA	Office of Research and Technology Applications
OST	Office of Science and Technology
OSTP	Office of Science and Technology Policy
PENNTAP	Pennsylvania Technical Assistance Program
PL	Public Law
PTI	Public Technology, Incorporated
RANN	Research Applied to National Needs [Program, NSF]
R&D	research and development
RTTCs	Regional Technology Transfer Centers [NASA]
SBIR	Small Business Innovation Research [Program]
SECNAV	Secretary of the Navy [Office of]
STPO	Scientific and Technology Policy Office
T ²	technology transfer

TAP-IN	Technology Access for Product Innovation
TIS	Technical Information System [LLNL]
TRADE	Training Resources and Data Exchange [Network, DOE]
TRP	Technology Reinvestment Project
TUO	Technology Utilization Office [NWC]
TVS	Technical Volunteer Service
USCM	U.S. Conference of Mayors
USDA	U.S. Department of Agriculture
USPS	U.S. Postal Service
VOTECH	Vocational and Technical Education [Oklahoma State Department of]

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