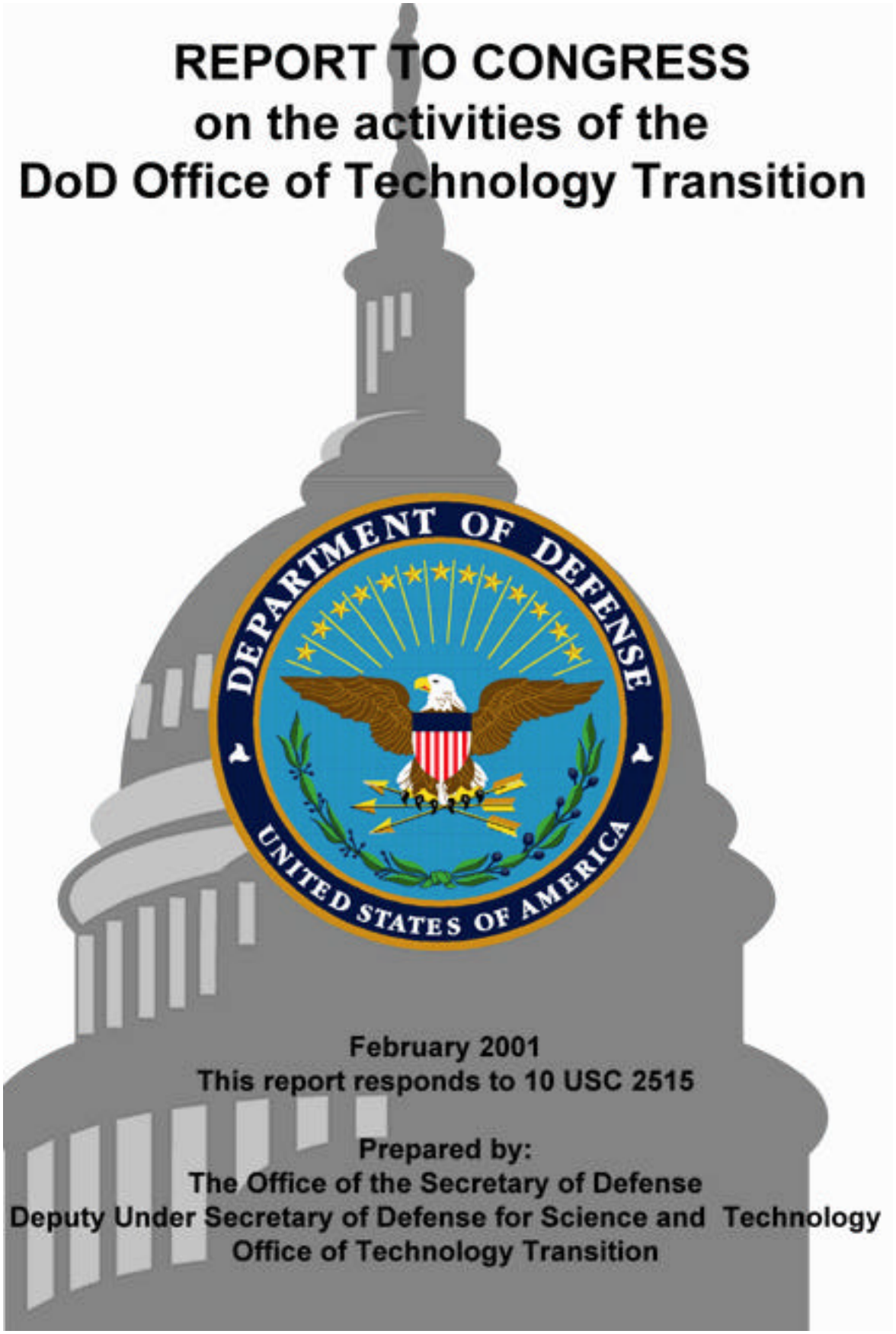
REPORT TO CONGRESS
on the activities of the
DoD Office of Technology Transition



February 2001
This report responds to 10 USC 2515

Prepared by:
The Office of the Secretary of Defense
Deputy Under Secretary of Defense for Science and Technology
Office of Technology Transition

EXECUTIVE SUMMARY

The Office of Technology Transition (OTT) was created by the Secretary of Defense in response to 10 U.S.C. 2515 to serve as a focal point for the domestic technology transfer activities of the Department of Defense. This report, required by legislation, summarizes OTT accomplishments for FY 2000.

OTT provides leadership, oversight, and focus for programs supporting the technology transfer mission of the Department. Specific activities discussed in this report are:

- Provided leadership for the DoD Technology Transfer Program.
  - Developed policy for technology transfer activities at the Federally Funded Research and Development Centers.
  - Identified the technology transfer mechanisms being used within the Military Services and Defense Agencies
  - Continued supporting the Federal Laboratory Consortium with 10 DoD representatives serving in elected and nonelected positions. Additionally, five teams of DoD scientists and engineers won the Federal Laboratory Consortium Annual Awards for Excellence in Technology Transfer and one person won the FLC Representative of the Year Award.
- Managed the DoD Dual Use Science and Technology (DU S&T) Program.
  - Thus far, more than 400 companies, universities, and nonprofits are participating in the Program. With a total value of over $1.0B, 327 DU S&T projects have been initiated.
- Managed the Office of the Secretary of Defense, Deputy Under Secretary of Defense (Science and Technology) Small Business Innovation Research (OSD DUSD(S&T) SBIR) Program.
  - There are two priority technology areas in the investment strategy planning for the OSD DUSD(S&T) SBIR Program: Cognitive Readiness and Smart Sensor Web.
  - The OSD DUSD(S&T) SBIR Program and Defense Health Program Office SBIR Program are jointly sponsoring a biomedical technology area.
- Provided oversight for the DoD Manufacturing Technology Program.
  - The annual Defense Manufacturing Conference continues to be a premier activity with over 700 leaders from government, industry, and academia attending the 2000 conference in Tampa, FL.
  - Two programs received this year's Defense Manufacturing Technology Achievement Award which recognizes Defense and private sector individuals responsible for developing innovative manufacturing processes that improve the affordability, cycle time, or readiness of Defense weapon systems or components.

- Directed the collection and dissemination of technology transfer information by the Defense Technical Information Center (DTIC).
  - As of December 31, 2000, the Defense Technology Transfer Information System (DTTIS) contained project information on 3,960 DoD Technology Transfer Activities, including 2,248 active Cooperative Research and Development Agreements and 201 active Patent License Agreements.
  - DTIC maintains the Independent Research & Development (IR&D) database with project description and financial information reflecting IR&D efforts conducted by Defense contractor activities.
- Coordinated the Independent Research and Development (IR&D) Program.
  - Annual IR&D investment by major defense contractors has averaged $2.9B since 1995.
  - During FY 2000, an action plan to revitalize the IR&D Program was developed with input from industry. Implementation is a shared responsibility and has started.
- Provided direction and oversight for the Defense Production Act Title III Program.
  - A key objective of the Title III Program is to accelerate the transition of new leading edge technologies from R&D to affordable production and to insert those technologies into defense systems.
  - In FY 2000, DoD initiated three Title III projects, began development of two others, and completed one project.
- Provided Direction and oversight for the Commercial Operations and Support Savings Initiative (COSSI).
  - COSSI has provided over $160M for 60 projects since the program began in 1997. Contractors have provided an additional $117M.
  - Seven COSSI projects started in FY 1997 have transitioned into production.

INTRODUCTION

Section 2515 of title 10, United States Code (Appendix A) directs that "The Secretary of Defense shall establish within the Office of the Secretary of Defense an Office of Technology Transition." It further directs that the head of the office will ensure the office will monitor research and development (R&D) activities of the Department of Defense; identify R&D activities that result in technological advances that have potential for non-defense commercial applications; serve as a clearinghouse for, coordinate, and actively facilitate the transfer of such technologies and technological advancements to the private sector; conduct its activities in consultation and coordination with the Department of Energy and the Department of Commerce; and provide private firms with assistance in resolving problems related to technology transfer. It also directs the Secretary of Defense to submit to the Committees on Armed Services and the Committees on Appropriations of the Senate and the House of Representatives an annual report on the activities of the Office at the same time the budget is submitted to Congress by the President. This report responds to that requirement and is the eighth annual report.

In keeping with the integrated planning and process team concept throughout the Department, the activities of the Office are conducted with the consultation, support, and active participation of personnel in the Military Departments and Defense Agencies. The ultimate goal is to achieve technically superior, affordable Defense systems while ensuring that technology developed for national security purposes is integrated into the private sector to enhance the national technology and industrial base.

In this report, the Office of Technology Transition is identified with specific programs and projects to support the technology transfer mission of the Department. These programs and projects work well together for this purpose. We note that many of the Military Department and Defense Agency offices and laboratory organizations have co-located and are managing these programs as part of their technology transfer efforts.

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A. Defense Technology Transfer Management and Oversight

The Defense Department operates a decentralized technology transfer program with the objective to transfer technology between the public and private sectors. The Military Departments are recognized as separate agencies for program implementation. However, there is collaboration, coordination, and interaction within the individual Military Departments and between the Military Departments and the Defense Agencies as this program is further developed and implemented.

The Office of Technology Transition has oversight and managerial responsibility for the Defense Department programs discussed in this report. These programs are consolidated into one office to ensure cohesion and synergy in implementation. As we've encouraged the Military Departments to look at these programs as parts of a whole, they have started integrating them and are now organizing so that, specifically, the Dual Use S&T Program, IR&D Program, and SBIR are key parts of their technology transfer efforts.

Early technology transfer legislation highlighted the importance of technology transfer to "ensure the full use of the results of the Nation's Federal investment in research and development." Part of this policy is a requirement that technology transfer is a responsibility of each laboratory science and engineering professional by job descriptions, employee promotion policies, and evaluation of job performance. Reports from our laboratories indicate this has now happened throughout the majority of our laboratory community. Our scientists and engineers as well as our laboratory directors are recognizing that technology transfer mechanisms enhance mission responsibilities.

Future Goals . . .Last Year

Our last report provided information on Service laboratory goals for FY 00. These goals were: 1) continue to conduct training in technology transfer for the Office of Research and Technology Applications (ORTAs), legal staff, S&Es, and R&D managers with an emphasis on intellectual property; 2) expand marketing efforts to include enhancing individual laboratory web sites and creating brochures featuring technology licensing opportunities, unique facilities that are available for use by the commercial sector as well as in-house technical expertise; 3) expand current efforts to identify technologies with the greatest potential for commercialization thereby enhancing patent licensing activity; and 4) enhancing collaborations with external partners through partnership intermediaries, alliances, and various state and local agencies.

We have met these goals by providing training specifically geared toward intellectual property, enhancing many of our websites to reflect technologies available for commercialization, working with our S&Es to identify technologies available for commercialization, and enhancing collaborative relationships and creating these relationships where they did not previously exist.

DoD Technology Transfer Policy

Both a DoD Directive and an Instruction were issued in May 1999 providing guidance on the DoD Domestic Technology Transfer Program. These two documents are being implemented in the Military Departments and are designed to ensure technology transfer activities are integral elements of DoD's pursuit of its national security mission and have a high priority role in our programs. We are evaluating "The Technology Transfer Commercialization Act of 2000" for changes needed to these guidance documents. One of the key changes is the requirement for additional data on patent licensing activities. We plan to design and implement procedures to collect appropriate data for this new requirement.

Defense Technology Transfer Working Group (DTTWG)

The DTTWG was established in 1994 and is comprised of representatives from each of the Military Departments and most of the Defense Agencies. This group meets monthly to review technology transfer issues requiring either consistent policy or approach from a joint DoD perspective. The issues for FY 2000 included:

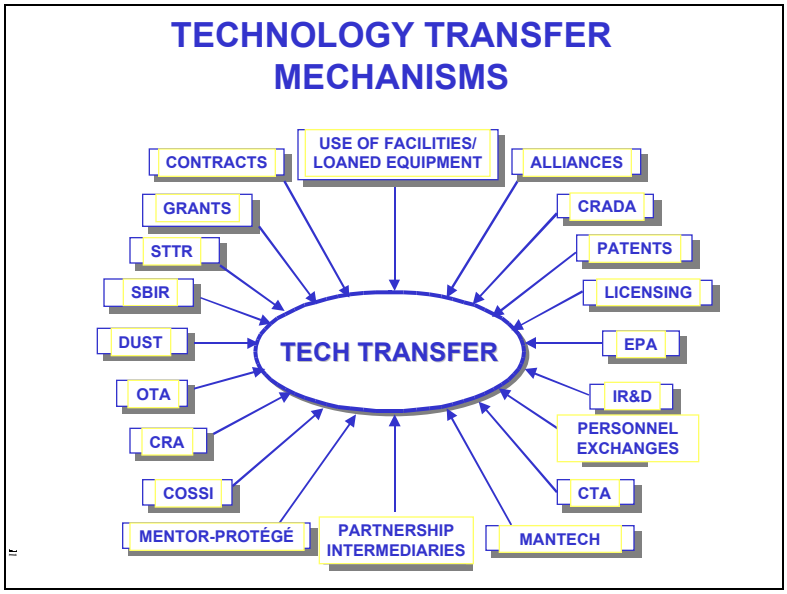
- Policy for equipment donation procedures using 15 USC 3710(i), 15 USC 3710a(b), and 10 USC 2194
- Drafting and commenting on Executive Order 12591, "Facilitating Access to Science and Technology"
- Policy for technology transfer at the Federally Funded Research and Development Centers
- Potential DoD awards for technology transfer efforts
- Need for data collection requirements for current and anticipated requests
- Participation in the Federal Laboratory Consortium for Technology Transfer, InterAgency Working Group on Technology Transfer chaired by the Department of Commerce, and the Industry/Federal Working Group on Technology Collaboration
- Use of patent royalties
- Development of a DoD Technology Transfer Handbook (in drafting stage)

Technology Transfer Mechanisms

Technology Transfer mechanisms are important to strategic planning at the laboratories to enable spin-off, spin-on, and dual use of technologies. They provide a variety of tools with the potential to leverage outside resources and, potentially, reduce the development and acquisition cost of technology products. The chart below identifies the wide variety of mechanisms that can be used for technology transfer purposes. Some of these mechanisms are discussed in later sections of this report, some are discussed here, and some mechanisms will be discussed in next year's report.

The specific number of technology transfer activities is identified in Appendix B; however, these are limited to Cooperative Research and Development Agreements (CRADAs), Patent License Agreements (PLAs), Facility Use Agreements, and Personnel Exchange Agreements. As of October 4, 2000, we had 1,919 active

CRADAs providing the ability to work with the private sector in a manner unique to this mechanism. This number of CRADAs grew to 2,248 by December 31st.



DoD paid over $1.5M to the Patent and Trademark Office for fees associated with obtaining and maintaining patents; from those patents with active licenses and receiving royalties in FY 2000, we received $1.6M in royalty payments. In recognition of the emphasis placed on patenting and licensing activities in The Technology Transfer Commercialization Act of 2000, DoD has been reviewing its patenting and licensing activities with a view toward ways to increase this activity since it is a true measure of technology transfer. Additionally, we have begun a study titled, "Patent Marketing and the Value of Licensing to DoD Laboratories."

Total Active Licenses

Service	FY98	FY99	FY00
Army	90	94	103
Navy	54	47	57
Air Force	44	55	70

Total Royalty Income

Service	FY98	FY99	FY00
Army	$429,600	$535,500	$865,900
Navy	$917,787	$676,555	$698,898
Air Force	$197,800	$156,000	$ 80,616

DoD has been very active in the use of Educational Partnership Agreements (EPAs). We recognize that our future scientists and engineers are today's students needing both faculty resources and equipment to test scientific knowledge. We have a significant number of formal EPAs with universities and community colleges as well as local public school districts to provide the needed support in the form of technical assistance, personnel exchange, and loan/donation of educationally useful laboratory equipment.

DoD Technology Transfer Integrated Planning Team (TTIPT) Workshop

The fifth DoD TTIPT Workshop was held in November 2000 and hosted by the Air Force. Over 100 technology transfer professionals gathered to discuss joint projects, best practices, lessons learned, and to hear about new legislation and information sources that will effect current technology transfer efforts. Each Military Department provided an update on its technology transfer program implementation, several interagency outreach activities were presented, partnership intermediaries discussed what they do to support technology transfer activities, a training session titled, "Technology Transfer: The Devil's in the Details" was presented, legal issues were discussed, and information sources currently available were highlighted (Defense Technology Transfer Information System, Virtual Technology Exposition, Edison Database, and the Intellectual Property Management Information System). Additionally, roundtable discussions were held on four topics: Facility Partnerships, Partnerships with Universities, Software Licensing, and Equipment Donation.

Interagency Working Group on Technology Transfer (IAWG/TT)

The three Military Services and DoD participate with the other Federal Agencies on the IAWG/TT chaired by the Department of Commerce. This working group has looked at technology transfer implementation in the various federal departments, how it varies based on Agency mission, and what we can learn from each other to improve our programs. It has also reviewed international partners in CRADAs, when they should be allowed, and how to assess potential concerns arising in these instances. The IAWG/TT has proven to be an effective mechanism for discussions among the Federal Agencies and for identifying ways to showcase success in technology transfer activities.

Federal Laboratory Consortium

The Military Departments and Defense Agencies have been participating in the Federal Laboratory Consortium for Technology Transfer (FLC) since its inception in 1974. Participation is achieved through financial support, participation in annual National FLC meetings, serving as FLC Executive Board members and/or Committee Chairs, and actively supporting interagency laboratory projects. The FLC provides an opportunity to share information with other Federal agency technology transfer professionals and learn about methods employed in other agencies that could help DoD.

The FLC presents Annual Awards for Excellence in Technology Transfer to recognize laboratory employees who have done outstanding work in the process of transferring lab-developed technology. Nominations are made by the laboratory representatives and are judged by a panel of experts in the field of technology transfer. The FY 2000 Department of Defense winners of the Award for Excellence in Technology Transfer are identified along with a description of their technology in Appendix D.

DoD representatives serve in both elected and nonelected positions with the FLC. These leadership functions facilitate sharing of information with other Federal

Departments and agencies and contribute to specific technology transfer activities. The following personnel hold positions in the FLC:

FLC Position	Name/Organization
FLC Vice Chair Chair, Planning and Policy Committee Chair, Nominating Committee	Dave Appler, DTIC
Chair, Program Committee	Norma Cammarata, Army Research Laboratory
Chair, Training Committee	John Griffin, Army Topographic Engineering Center
Chair, Awards Committee	Soheir Ibrahim, Army Yuma Proving Grounds
Co-chair, Legal Issues Committee	Vincent Ranucci, Army Soldier Systems Command
Coordinator, Mid-Atlantic Region	Richard Dimmick, Army Research Laboratory (Aberdeen)
Coordinator, Far West Region	Michael Sullivan, Naval Air Warfare Center, Weapons Division, Point Mugu
FLC Executive Board Member-At-Large	Sharon Borland, Army Cold Regions Research and Engineering Laboratory
FLC Executive Board Member-At-Large	Kurt Buehler, Air Force Flight Test Center
FLC Executive Board Member-At-Large	Karen Gordon, Army CECOM, Night Vision Electronic Sensors Division

In addition to the above positions, Mr. John Todaro, Director, Office of Technology Transition, Office of the Deputy Under Secretary of Defense (Science and Technology), and Mr. David Rossi, Department Head, Industrial Programs, Office of Naval Research, are currently serving on the National Advisor's Board to the FLC.

Industry/Federal Working Group on Technology Collaboration

The Industrial Research Institute's External Research Directors Network is working "to enhance the effectiveness of technological innovation in industry." Federal technology transfer was originally designed to ensure full use of the science and technology resources of the Federal Government to enhance the competitiveness of U.S. industry. These two objectives have merged with this working group on technology collaboration. DoD, and other Federal Agencies, are working to identify how best to provide access to the federal laboratories for private industry, how to identify specific capabilities and availability, and what mechanisms exist or need to be developed to allow the synergy of industry and government resources to be fully realized.

Defense Technology Transfer Information System (DTTIS)

The Defense Technical Information Center (DTIC) maintains the DTTIS in cooperation with the Military Services and Defense Agencies. As of December 31, 2000, the DTTIS contained project information on 3,960 DoD Technology Transfer Activities, including 2,248 active CRADAs and 201 active PLAs. Numerical data from DTTIS is available at Appendix B.

The Technology Transfer Commercialization Act of 2000 was signed into law on November 6, 2000, providing additional guidance on licensing of federally owned inventions and CRADAs. It also requests specific data on utilization of federal technology. The specific data required to respond to this request are not currently collected by the Defense Department. However, we plan to design an Intellectual

Property Management Information System (IPMIS) to provide the requested information. This IPMIS should provide the data in a manner consistent with the request and should allow for easy transition into the DTTIS for these new data elements.

Partnership Intermediaries

Last year's annual report discussed the various partnership intermediaries currently being used by the Defense Department activities. This year, we are focussing on the one partnership intermediary directed by Congress, TechLink. TechLink has proven beneficial in the DoD effort to transfer technology to the private sector.

TechLink

DoD began to sponsor TechLink in July 1999 as a regional technology transfer program. TechLink is a program established at Montana State University in Bozeman, Montana, to facilitate DoD technology transfer between companies in the TechLink region and all the DoD laboratories for development, transfer, and commercialization of new technologies. TechLink focuses on industries important to its region: Advanced Materials, Aerospace, Agriculture, Biomedical/Biotechnology, Electronics and Telecommunications, Environmental Technologies, Forest and Wood Products, Information Technology and Software, and Photonics and Sensors.

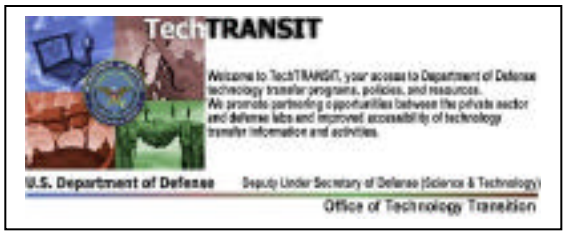
One of the key components of this program is a patent mining process which allows review of DoD-owned patents to determine which ones are ripe for commercialization efforts. This process begins with an understanding of industry focus area needs, an identification of technology applications, and a review of where these needs and applications intersect for technology transfer, development, or commercialization.

In an effort to increase awareness of DoD technology transfer opportunities as well as of TechLink as an agent for DoD technology transfer, TechLink developed a Strategic Marketing Campaign. A central part of the marketing campaign was the effort to concentrate initially on three industry focus areas: Photonics/Sensors, Electronics/ Telecommunications, and Biomedical/Biotechnology. This marketing campaign uses multiple tools: advertising, website banners, direct marketing, and personal contacts. An example of the print ad is the photo insert with this discussion and a larger version on the back cover of this report.

TechLink success is measured on the outcome of its transactions. One metric is the number of partnerships facilitated between DoD and the private sector in the TechLink region. In this first year of operation, TechLink facilitated

fourteen DoD-related partnerships and two patent licensing agreements. As we continue in the second year of operation, there are opportunities for more partnership arrangements through licensing agreements, Cooperative Research and Development Agreements, other partnership arrangements, and SBIR program awards.

Websites



TechTRANSIT is the gateway to DoD technologies promoting partnering opportunities between the private sector and Defense laboratories. The website address is http://www.dtic.mil/techtransit. This website provides information of interest to the technology transfer community and includes a DoD laboratory search capability to assist in finding a specific technology or laboratory.

Virtual Technology Exposition

The Virtual Technology Exposition (VTE) was created to provide the defense community with information on the latest technological advancements from the defense and commercial sectors. Access to this information will enable program managers to integrate advanced research into more extensive developmental activities and reduce product life-cycle costs. The Web site (https://vte.dtic.mil) is provided as a restricted service by the Deputy Under Secretary of Defense, Science and Technology (DUSD[S&T]).

The VTE provides the S&T community, industry, academia, and the acquisition and requirements community with advanced browse technology, full-text search capabilities, multimedia tools, the ability to submit information, and E-mail services that let users know of updated information. The VTE contains reference information, points of contact, descriptions of technology advancements, articles from professional journals, and references to related websites on a wide variety of subjects.

The VTE is a new Web site and is continually expanding its database of information on emerging technologies. As it matures, its advanced features should enable users to—

- Assist Program Managers to plan for future technology upgrades
- Monitor commercial technology and product development
- Look for technologies that show promise of enhancing Military capabilities
- Choose which technologies to leverage and which to develop with their own investments
- Access information that can lead to developing and refining requirements
- Check on the availability of resources for analysis of alternative assessments
- Obtain better information to better leverage ongoing and future technology development

- Assist industry in planning for future business opportunities
- Showcase research efforts to a broader audience.

The site will also have access to information about international research activities through an interface with the International Technology Watch Partnership (ITWP) website. Additional information on this website is available in Section E, Defense Technical Information Center.

Future Goals

We realize the Department's intellectual property needs to be better managed. The Technology Transfer Commercialization Act of 2000 identified specific data requirements for use in determining the utilization of federal technology. Although no funds were provided for this purpose, we plan to design and implement procedures to collect appropriate data for this requirement. We anticipate being able to supply the majority of the information in FY 2002 and the remainder in FY 2003. The system we are attempting to develop to assist in managing the Department's intellectual property is called the Intellectual Property Management Information System (IPMIS).

We are working toward guidance on donations of surplus equipment to schools using 10 United States Code 2194 and 15 United States Code 3710(i) so that we are consistent in the approach for these donations and so that we can track the items donated under these authorities. We are encouraging our laboratories to use these authorities to help ensure a well-trained future workforce is available to meet science and technology needs of the future.

We anticipate increased usage of the TechLink Partnership Intermediary by the Department laboratories as a result of TechLink's support thus far. TechLink is proving beneficial in finding partners for technology transfer purposes, both within the federal laboratory system and in the private sector. We are encouraging use of this resource for the further development and/or commercialization of technologies.

B. Dual Use Science and Technology Program

The ability of the United States to retain technological superiority on future battlefields will, in many cases, depend on the Nation's ability to take advantage of technological advances occurring in commercial industry. Commercial technology developments in such areas as electronics, advanced computing, communications, and medical research, are racing forward. These commercial developments are funded at levels that vastly exceed what the Department is currently able to apply. Greater reliance on commercial technologies not only will provide the Defense Department access to advances in technologies occurring in the commercial sector but also allow the Department to take advantage of the competitive pressures and market-driven efficiencies inherent in the commercial sector. This competitive, market-driven approach will increase the pace at which technological improvements are incorporated into defense systems while at the same time, reducing the costs of those systems.

The Department of Defense's (DoD) Dual Use Science and Technology (DU S&T) Program is designed to help the Department incorporate commercial technologies into defense systems. The Program was established in the Fiscal Year 1998 Defense Authorization Act. It has two primary goals. The first is to jointly fund and develop dual use technologies with industry. To support this goal, the Act provides for 50/50 government/industry cost share of development. Other incentives for industry to work with DoD's DU S&T Program besides the 50 percent project cost share by the government include: access to technology from the government, and increased market opportunities with the Military Services. In addition to these business incentives, the Department is making it easier for commercial companies to enter into agreements with the DoD by using procedures that are not subject to most of the Federal procurement laws and regulations. These procedures, known as "Technology Investment Agreements," which include "Other Transactions" and "Cooperative Agreements," offer a great deal more flexibility and fewer regulatory requirements than standard government contracting. The use of alternative procedures has provided the Department the ability to attract many commercial firms that would not otherwise do business with the DoD. The second goal is to make the development of dual use technologies with industry a normal way of doing business in the Services. The Fiscal Year 1998 Authorization Act established goals for the initiation of dual use projects. These goals started at 5% of each Department's applied research program in Fiscal Year 1998 and grew to 15% by 2001. The Military Services are actively working to meet these goals through the DU S&T Program.

Thus far, more than 400 companies, universities, and nonprofits are currently participating in the Program. 327 DU S&T projects have been initiated with a total value of over $1.0 billion. In addition to the growing size of investments, it is encouraging to see the number of commercial firms that have become involved in the Program. These firms are bringing many new ideas to the table. Service participation

in the DU S&T Program has been key to the Program's success, and the execution of the Program is transitioning from OSD to the Services. A fifth solicitation for proposals was issued for Fiscal Year 2001 in January 2000 and closed on 28 April 2000. As with the previous solicitation, this was a joint solicitation issued by the Air Force and was used as vehicle to launch an extensive outreach effort to industry. The DU S&T Investment Strategy Conference was held in February 2000 in New Orleans. This approach to educating industry about the Program and solicitation has proven very successful. As a result of this solicitation, the Services have successfully negotiated 41 proposals for a total value of approximately $120 million worth of Dual Use technology.

The FY02 solicitation is to be released in early April 2001 and will close at the end of July 2001. Approximately $60 million in government funding ($30 million Service DU S&T and $30 million Service field funds) are anticipated to form new partnerships with industry and to bring commercial technology development to the benefit of the Department.

Dual Use Science and Technology Achievement Award

In FY00, the Deputy Under Secretary of Defense for Science and Technology established an annual Dual Use Science and Technology Achievement Award to recognize successful dual use projects and honor those individuals responsible for their initiation and execution. Winning projects are selected by committee based on military benefit, commercial viability, and quality of cost share. The first annual award process resulted in the nomination of five Army projects, two Navy projects, and five Air Force projects. The responsible individuals identified from the winning project received a $5,00 award, and the two runners-up each received $2,500.

For more information on the achievement award, eligibility requirements, selection process, schedule, and nomination procedures, please visit the DU S&T web site at http://www.dtic.mil/dust. The following three projects are the winners and runners-up for the 2000 DU S&T Achievement Award, and are prime examples of the success DU S&T is seeing in partnering with industry to leverage our scarce S&T dollars to develop the best technology available for both defense and commercial application.

Electronically Controlled Active Braking System for Medium Duty Vehicles

Mr. Brad McNett, Program Manager, and Mr. Mark A. Mushenski, Project Engineer, of the Army's National Automotive Center, Tank-Automotive and Armaments Command, shared this year's first prize for their work with Continental Teves in developing an electronically controlled active braking system (ABS) for medium duty vehicles. The project has resulted in an affordable ABS that will be used on the Army's HMMWVs and on medium class commercial trucks to improve safety and performance. The project involved developing and integrating the MK50 ABS with low speed traction control on a M1097A2 HMMWV. The project successfully advanced the state-of-the-art for ABS for commercial vehicles while including the unique needs of the HMMWV early in the development cycle. As a result of this project, Continental

Teves has commercial orders of over 50,000 units per year starting in 2001. In addition, Continental Teves has been selected to be the brake supplier for the next generation HMMWV, the A4. Production of the A4 is expected to begin in 2003 and volumes are projected to be 3,000 to 5,000 vehicles per year. The expected ABS acquisition cost for the A4 is $500 to $700 per unit compared to approximately $2,500 per vehicle without a commercial production base. This will result in over $50 million in savings in reduced A4 acquisition costs.

Renewal of Legacy Software Systems (ROLSS)

This year's first runner-up award was presented to Mr. Charles Caposell, electronics engineer, at the Navy's Air System Command at Patuxent River, Maryland. Mr. Caposell has worked with CPU Technology of Pleasanton, California, to develop a process to update aging and obsolete hardware without requiring the costly rewrite and validation of already proven software. The project has resulted in a family of configurable processor frameworks called CFrame that allow processors and systems-on-chips to be quickly and cost-effectively configured to any given instruction set. The CFrame family offers a range of performance, up to an industry leading five billion instructions per second, 256-bit framework, the fastest in the world. One version of the CFrame is already being used in a Programmable Display Generator for the F-16 and has resulted in tens of millions of dollars of savings according to the F-16 program office. A CFrame is also being used to modernize the F-16's fire control radar with a projected saving of $150 million. The resulting savings from the project are estimated at up to $1 billion over the next decade. CPU Technology is actively participating in discussions with commercial aerospace companies to identify commercial applications of the technology.

Future Air Navigation and Traffic Avoidance through Integrated Communications, Navigation and Surveillance (FANTASTIC)

This year's second runner-up award was presented to Mr. Joel Arnold, project engineer, of the Air Force Research Laboratory at Wright Patterson Air Force Base. Mr. Arnold worked with Rockwell Collins to develop a cost-effective solution for upgrading tactical fighters and general aviation aircraft and business jets to meet future FAA regulations. These regulations will require that all aircraft be capable of reporting their GPS position, altitude, heading and air speed over SATCOM, have collision avoidance capability, and send, receive and display English text via a data link. This project has successfully demonstrated an effective solution to meet these requirements. The system developed has overcome the space restraints on tactical fighters and the cost restraints of the commercial general aviation and business jet market to develop a true dual use technology. The technology is planned to be used on the F-22 and will result in an acquisition saving of over $100M. It also is expected to be the technology of choice on the Comanche helicopter with similar cost savings, and is being considered for the Joint Tactical Radio System and the Joint Strike fighter. Rockwell Collins will be expanding into the huge (over 1,000,000) general aviation, and personnel aircraft market, which will reduce the cost to the DoD through economies of scale.

C. Small Business Innovation Research (SBIR)

The purpose of DoD's SBIR program is to harness the innovative talents of our nation's small technology companies for U.S. military and economic strength. DoD's SBIR program funds early-stage R&D projects at small technology companies -- projects which serve a DoD need and have the potential for commercialization in private sector and/or military markets. The program, funded at approximately $50 million in FY 2000, is part of a larger ($1.2 billion) federal SBIR program administered by ten federal agencies.

As part of its SBIR program, the DoD issues an SBIR solicitation twice a year, describing its R&D needs and inviting R&D proposals from small companies -- firms organized for profit with 500 or fewer employees, including all affiliated firms. Companies apply first for a six-month phase I award of $60,000 to $100,000 to test the scientific, technical, and commercial merit and feasibility of a particular concept. If phase I proves successful, the company may be invited to apply for a two-year phase II award of $500,000 to $750,000 to further develop the concept, usually to the prototype stage. Proposals are judged competitively on the basis of scientific, technical, and commercial merit. Following completion of phase II, small companies are expected to obtain funding from the private sector and/or non-SBIR government sources (in "phase III") to develop the concept into a product for sale in private sector and/or military markets.

The Deputy Under Secretary of Defense (Science & Technology) SBIR Program is sponsoring two new technology area initiatives this year, Cognitive Readiness Technology and Smart Sensor Web Technology. We are also co-sponsoring a third technology area, biomedical technology topics, with Defense Health Affairs.

All three Services and the Special Operations Command are participating in the Office of the Secretary of Defense (OSD) program this year. The Service laboratories act as our OSD Agent in the management and execution of the contracts with small businesses. The Army, Navy, and Air Force laboratories, often referred to as a DoD Component acting on behalf of the OSD, invite small business firms to submit proposals under this SBIR program.

Objectives of the DoD SBIR Program include stimulating technological innovation, strengthening the role of small business in meeting DoD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research and development results. The DoD Program strives to encourage technology transfer with a focus on advanced development projects with a high probability of commercialization success, both in the government and private sector.

Cognitive Readiness is ensuring that the warfighter is mentally prepared for accomplishing the mission and is performing at their optimal performance level. Cognitive readiness focuses on optimizing and enhancing the human dimension of U.S. forces. Extended further, the effectiveness of all DoD personnel can be maximized by improvements in cognitive readiness.

Optimization and enhancement of human performance is challenged by many different factors, such as general health issues, mental and physical stress, cultural and societal influences, environmental stressors, adequate education and training. Currently, there are two "core" Department of Defense program areas organized to address Cognitive Readiness issues, the Biomedical and Human Systems programs with subcomponents dealing in health, psychology, sociology, personnel and training, and human factors engineering issues. Of these issues, we have chosen to focus first, and in general, on technologies necessary for the education and training missions of the Department. Specifically, we are examining a focused investment in S&T projects to support the Department's Advanced Distributed Learning strategic plan.

While the emerging technology area of advance distributed learning (ADL) is generically addressed in the core human systems S&T program, the emergence of new information technologies present the opportunity to make significant improvements in training and education effectiveness through ADL technologies. In addition, providing ADL technologies to the DoD enterprise of education and training offers a key opportunity to reduce costs in these domains. The Cognitive Readiness Topics and the Service Laboratory Executive Agents, who will manage the projects, are:

- OSD00-CR01 Automated Dialogue Modeling Using Natural Language Understanding in ADL, by the Naval Air Warfare Center Training Systems Division (NAWCTSD)
- OSD00-CR02 Training Users' Cognitive Readiness for Combat Command Using an Intelligent Tutor to Model Expert Mentor Interactions by the US Army Research Institute (ARI) for the Behavioral and Social Sciences
- OSD00-CR03 A Personal Health and Fitness Assistant by the US Army Medical Research Acquisition Activity (MRMC)
- OSD00-CR04 Digital Resource for Instructional Design in CBT Authoring Environments by the Office of Naval Research (ONR)
- OSD00-CR05 Dismounted C4ISR Data Presentation and Dissemination by the Army Research Laboratory (ARL)
- OSD00-CR06 Enhancing Situation Awareness in Military Operations by the Army Research Institute (ARI), Ft. Benning
- OSD00-CR07 Personal Education and Training Assistant for Distance Learning (PETA) by the Naval Air Warfare Center Training Systems Division (NAWCTSD)
- OSD00-CR08 Common Operating Picture for Stability and Support Operations by the Army Research Laboratory (ARL), Ft. Huachuca

- OSD00-CR09 Cognitive Learning Strategies for Medical Skills Training and Sustainment via Distance Learning Means by the Special Operations Command (USSOCOM)
- OSD00-CR10 Computerized Cognitive Assessment Battery by the Office of Naval Research (ONR)

Smart Sensor Web (SSW) is a recent focus inspired by extraordinary technological advances in sensors and microelectronics and by the emergence of the Internet as a real-time communication tool. The near future will see a proliferation of sensors and associated processors available for battlefield use. Commercial and military space technology and systems will provide major leaps in coverage, timeliness, and resolution. Many efforts in these areas are ongoing in the Services and Agencies, and together could provide a tremendous new warfighting capability. The overall vision for SSW is an intelligent, secure, web-centric distribution and fusion of sensor information that provides greatly enhanced situational awareness, on demand, to Warfighters at lower echelons.

The Smart Sensor Web Topics and Service Laboratory Executive Agents to manage the SBIR topics in this technology area are:

- OSD00-SSW01 Sensor Data Collection Management Over a Web by Air Force Wright Lab, Rome, NY (AFRL)
- OSD00-SSW02 Agent-based Visualization by Air Force Wright Lab, Rome NY (AFRL)
- OSD00-SSW03 Semantic/Context Based Data Collection, Management and Visualization by Air Force Wright Lab, Rome, NY (AFRL)
- OSD00-SSW04 Target Tracking with a Distributed Sensor System by Office of Naval Research (ONR)
- OSD00-SSW05 Wireless Surveillance Scalable Sensor Netting by Office of Naval Research (ONR)
- OSD-SSW06 Low Cost implementation of High Density Wireless Networks by Naval Surface Warfare Center, Philadelphia Division (NSWC)
- OSD-SSW07 Wireless Networks for Disaster Control and Bandwidth Augmentation by the Naval Surface Warfare Center, Philadelphia Division (NSWC)
- OSD-SSW08 Hardware Compression of Video Data by the US Army Night Vision Laboratory (NVESD)
- OSD-SSW09 WeatherWeb Sub-Web Meteorological Sensor Array by the Army Research Laboratory (ARL)
- OSD00-SSW10 Unmanned Aerial Vehicle Meteorological Sensing Package by the Naval Research Laboratory (NRL)

The Jointly Sponsored Deputy Under Secretary of Defense (S&T) and Defense Health Program Office have established this focus area to explore biomedical technology research issues. The biomedical technology area is focused to yield essential technology in support of the DoD mission to provide health support and

services to U.S. Armed Forces. Most national and international medical S&T investment is focused on public health problems of the general population. Military medical S&T is concerned with developing technologies in order to preserve combatants' health and optimal mission capabilities despite extraordinary battle and non-battle threats to their well being. Preservation of individual health and well being sustains warfighting capabilities. The Biomedical Reliance Panel is included within the overarching structure of the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee, which provides joint coordination and cooperation to ensure synergy across all biomedical programs.

The Biomedical Topics and Service Laboratory Executive Agents to manage the SBIR topics in this technology area are:

- OSD00-HP01 Three-Dimensional Model of Thermoregulation by the Naval Health Research Center (NHRC) Detachment at Brooks Air Force Base, TX
- OSD00-HP02 Enhancing Malaria Vaccine Development by the Naval Medical Research Center (NMRI)
- OSD00-HP03 Functional Genomic Analysis of the Malaria Parasite by the Naval Medical Research Center (NMRI)
- OSD00-HP04 Systems For Improved Red Blood Cell Storage by the Army Medical Research Acquisition Activity (MRMC)
- OSD00-HP05 Blast Mitigation Jacket for Training by the Army Medical Research Acquisition Activity (MRMC)
- OSD00-HP06 Analysis and Interpretation of Real-Time Multi-Parameter Biological Data by the Army Medical Research Acquisition Activity (MRMC)

D. DoD Manufacturing Technology Program

DoD's Manufacturing Technology (ManTech) Program develops new and improved manufacturing processes to facilitate more affordable production of DoD weapon systems and components. The Program addresses process technology issues the systems development phase through transition to production and into sustainment. ManTech investments target defense-essential needs that industry would not otherwise pursue, alone, in timely manner. ManTech improvements generally translate into cost avoidance or cycle time reductions. However, investments also focus on developing "new" capabilities that actually may result in a more expensive component, but will provide dividends in system performance or life cycle cost that far outweigh the initial cost. The Program is structured around three major thrust areas:

- *Processing and Fabrication* activities develop affordable processes for metals, composites, electronics, and energetics/muntions by improving factory floor and repair and maintenance facility (depots, logistics centers, and shipyards) processes.
- *Advanced Manufacturing Enterprise* activities accelerate implementation of world-class industrial practices, advanced design, and information systems that support weapon system development, production and sustainment.
- *Sustainment* projects coordinate common DoD opportunities to increase the reliability and reduce the cost of repair processes for aging systems.

In response to the requirements of 10 U.S.C. section 2525(e), the Department issues an annual Five-year Plan for the ManTech Program in March of each fiscal year. The Plan, available on the Internet at http://mantech.iitri.org/pubs/pubs.shtml:

- Describes the ManTech Program's goals, priorities, investment strategy, management and planning processes.
- Presents Military Department and Defense Logistics Agency funding for fiscal year 2001, and planned funding for fiscal years 2002 through 2006.
- Includes a description of all projects completed in FY 1999 and FY 2000, and the status of implementation.
- Assesses the extent of cost sharing with commercial enterprises, defense program offices, other federal agencies, institutions of higher learning, and other sources.
- Summarizes program measures of effectiveness and the results of internal and independent reviews.
- Provides examples of success stories and achievements.

Technology Transfer & Dual Use

The ManTech program is driven by defense needs for technologies and systems that provide a superiority edge to the warfighters. In today's environment, DoD is involving the commercial industrial base as soon as possible, by either adopting its best practices or transferring results of military processes to the commercial arena. For example:

- The Navy's Best Manufacturing Practices (BMP), managed by ONR and funded by the Navy's Manufacturing Technology (ManTech) program, received the Hammer Award. The Navy's BMP program is based on companies' voluntary sharing of information and is executed through its unique on-site survey process. Teams of impartial experts from government, industry, and academia document best practices worthy of sharing. To date, 120 surveys have been conducted, 5,000 practices documented, how-to guidelines published, an Internet site established making BMP's resources easily accessible, and a partnership has been set up with the Department of Commerce and the University of Maryland at College Park to create the BMP Center of Excellence (BMPCOE). The BMPCOE and ten satellite centers around the country serve the Navy, the DoD, and U.S. industry. The BMP has changed the cultural bias of the U.S. industrial base toward technology transfer from a close-hold, company-proprietary mentality to a more open, willingness-to-share attitude.

- Two programs received this year's annual Defense Manufacturing Technology Achievement Award, which recognizes Defense and private sector individuals responsible for developing innovative manufacturing processes that improve the affordability, cycle time, or readiness of Defense weapon systems or components. The programs included:

  - The Army's Advanced Optics Manufacturing program developed a multi-axis, computer-controlled optical finishing technology, known as Magnetorheological Finishing (MRF), that provides significant cost savings in the manufacture of precision optical surfaces. Compared to conventional, labor-intensive processing methods, MRF reduces the typical cost of spherical optics from $100 to $60, and reduces system weight up to 30 percent. The MRF finishing machine is commercially available, and has received industry-wide acclaim, winning two of the optical industry's most prestigious awards for technology innovation and achievement: the Photonics Circle Excellence Award and the Laser Focus World (LFW) Commercial Technology Achievement Award. Manufacturers of photolithographic optics and several major optics shops in the United States have already installed multiple MRF machines to produce ultra-high precision optics.

- The Flexible Manufacture of Microwave Vacuum Devices program has resulted in significant cost reductions and increased yield in traveling wave tube devices for critical military applications, and improvement of on-shore domestic sources for devices previously imported from Europe. Microwave devices are used in over half of the current Defense weapon systems. With less than 20 percent overlap between the Defense and commercial markets, there is little opportunity for the Department of Defense to leverage means for commercial-off-the-shelf suppliers to provide cost effective, state-of-the-art devices. A government/industry team consisting of representatives from the Army, Navy, Air Force, the American Competitiveness Institute, Communications and Power industries, Northrop Grumman, and Teledyne Electronic Technologies led the initiative. The team worked on manufacturing improvements for devices in critical segments of the power/frequency spectrum.

Recent Management Initiatives & Accomplishments

The Science & Technology (S&T) Affordability Task Force continues to establish processes to strengthen the affordability content of the DoD's S&T programs. The objective is to identify mechanisms that focus DoD's technology programs on implementing Integrated Product and Process Development (IPPD), and facilitate use of Integrated Product Teams. In 2000, the Task Force:

- Reviewed and evaluated 20 S&T programs for attention to affordability.
- Continued development of training initiatives with each of the Military Services, including a prototype "Technology Insertion" course now being prototyped at the Defense Systems Management College.
- Hosted a session with acquisition program managers to identify barriers to transition.
- Published a handbook for S&T managers for use during formulation of affordability programs.

The annual Defense Manufacturing Conference continues to be a premier activity for networking and sharing the results of ongoing and completed manufacturing programs across the DoD, industry, and other government agencies. The 2000 conference was held in Tampa, FL. Over 700 leaders from government, industry, and academia attended. The conference featured panel sessions providing customer viewpoints from both the weapon systems and logistics community. Exchange of technical information was promoted by use of concurrent briefings spanning over 100 technical projects, and via evening receptions held with over 70 exhibitors from DoD, industry, and academia.

To improve ownership for the ManTech program, the Joint Defense Manufacturing Technology Panel (JDMTP) updated the "Overarching Strategy"

brochure. This document is being used to facilitate communication of ManTech's purpose, vision, role of the JDMTP, and success stories to improve program advocacy with the internal and external program customers across the DoD, with Congress, industry, and academia.

E. DEFENSE TECHNICAL INFORMATION CENTER (DTIC)

The Defense Technical Information Center (DTIC) is a major component of the Defense Scientific and Technical Information Program (STIP). DTIC provides access to and transfer of scientific, technical, and management information for DoD personnel, DoD contractors and potential contractors, and other U.S. Government agency personnel and their contractors.

DoD Technical Reports

DTIC is the central DoD repository for the collection and secondary dissemination of DoD scientific and technical information. Technical reports of DoD supported research, development, test and evaluation outcomes are collected, abstracted, indexed, and cataloged as part of DTIC's Technical Reports Bibliographic database. The database is accessed through the WED system (Web-Enabled Defense RDT&E Online System), available to registered users of DTIC (primarily DoD employees and contractors, and other Federal employees). The classified contents of the Technical Reports Bibliographic database are accessible to authorized users through the older DROLS (Defense RDT&E Online System) database.

In Fiscal Year 2000, the non-government sector of the Defense community used WED or DROLS to receive 176,680 output products directly from DTIC. During this same period, DTIC also supplied 12,668 technical reports to the National Technical Information Service (NTIS), the Federal government's focal point for delivering unclassified unlimited technical information to the public.

By disseminating the results of DoD science and technology, DTIC helps private sector organizations identify DoD work in fields of interest, and prevents duplication of research and development effort.

Portions of the technical report collection are also available on the Internet via DTIC's Scientific and Technical Information Network (STINET). Public STINET, available to the public, contains bibliographic citations to the unclassified unlimited technical report collection, as well as downloadable full text of recent releasable documents. Secure STINET is restricted to qualified, registered users, and provides encrypted transmission of citations and full text of recent documents, including unclassified, limited distribution reports.

In Fiscal Year 2000, there were more than 7 million Web accesses to Public STINET, from at least 13,530 unique user addresses and more than 1.2 million accesses to Secure STINET. There were 300,710 searches of the unclassified unlimited Technical Reports Bibliographic database, and 11,417 searches of the unclassified limited database. More than 5,800 full text documents were downloaded in FY2000, and 218,463 documents were downloaded in part (that is, the users

downloaded only the portions of a document that they wanted). There were also more than 300,000 searches of the external collections made available through STINET.

Registration for Access to DoD Technical Information

DTIC provides centralized registration services for access to Defense technical information. The registration system authorizes DoD organizations, DoD contractors, and prospective DoD contractors access to some or all of DTIC databases of ongoing and completed R&D, thus leveraging the nation's investment in DoD STI. Please note: registration is not required for access to the information available through Public STINET.

In Fiscal Year 2000, there were a total of 5,543 registered users. Of this total, 2,210 represented non-governmental industrial organizations, and 867 were educational organizations and institutions.

DTIC facilitates awareness of technology through its registration program by targeting prospective participants in the DoD Small Business Innovation Research (SBIR) program and the University Research Support program, as well as through outreach to Historically Black Colleges and Universities and Minority Institutions. Of the non-governmental industrial organizations registered with DTIC in FY 2000, 783 were participants in the SBIR program.

Defense Technology Transfer Information System (DTTIS)

DTIC maintains the DTTIS in cooperation with the military and defense agencies. As of December 31, 2000 the, DTTIS contained project information on 3,960 DoD Technology Transfer Activities, including 2,248 active Cooperative Research and Development Agreements (CRADAs) and 201 active Patent License Agreements. Approximately 100 Technology Transfer professionals are registered to use the DTTIS secure World Wide Web site to view and analyze T2 data. 2000 input into the DTTIS included 536 new records and 1714 modifications.

Independent Research and Development (IR&D or IRAD) database

DTIC maintains a database with project description and financial information reflecting Independent Research and Development (IR&D) efforts conducted by Defense contractor activities. In 2000, the database received 2700 project descriptions reflecting over $2.4 billion in 2000 IR&D investment. It is estimated that this reflects almost 85% of the cost recoverable IR&D efforts performed by defense contractors. The information in the database is proprietary and disseminated to registered U.S. government personnel via the World Wide Web. In 2000, DTIC brought on-line a secure IR&D Website to better serve DoD customers in the leveraging of IR&D technology for DoD purposes.

Internet/World Wide Web (WWW)

The DoD continues to maintain its position as a leader in improving access to information through innovative Information Technology (IT) solutions. In its development and maintenance of more than 80 DoD Web information systems, the DTIC continues to utilize leading-edge technologies in creating applications which will gather and distribute technology transition information in the most timely and accessible manner.

This support is exemplified most recently by the Virtual Technology Exposition (VTE), a Web site designed to provide the DoD and its academic and industrial partners access to current information concerning the most advanced technology research activities in the Department. Through easily accessed descriptions of recent research advances, the VTE offers program managers greater visibility of emerging technologies. It allows these managers to become more familiar with the technical resources available to them, and thus more effective in transitioning appropriate technologies into their specific weapon systems programs. In addition, the VTE can also be utilized to identify new collaborative opportunities with partners that possess specific expertise, experience in unique technologies or who have common program objectives. A wide array of program categories are included in the VTE, as well as other sources of published information related to research in these areas. The overarching purpose of facilitating such information transfer and relationship establishment is to create improved processes that will result in reduced cycle time and development/production costs.

The VTE is currently in the first phase of content development, and is continually expanding its offerings to give users a broad view of innovative DoD technologies. The site currently contains only unclassified information and is open to the DoD research community and other government agencies.

DoD Information Analysis Centers (DoD IACs)

The DoD IAC Program provides access via the World Wide Web (WWW) to 13 DTIC sponsored Centers and one Army sponsored Center for the analysis of scientific and technical information. Each IAC Home Page continues to experience a steadily increasing volume of inquiry traffic from the public sector, especially in Chemical and Biological Defense, Information Assurance (Electronic Security), and Y2K issues. WWW access provides significant opportunity for technology transfer of publicly accessible defense technical information plus a channel for two-way electronic communication with technology experts.

The DoD IAC Program has experienced steady growth, as evidenced by an increase to $174M in reimbursable and direct cite dollars placed on IAC contracts in FY 00. Other accomplishments of the DoD IAC Program during 2000 include:

a. Established one new IAC contract, Chemical Warfare/Chemical and Biological Defense IAC, January 2000.

b. Fielded Performance Results Evaluation Management Information System (PREMIS) at 13 IACs, Defense Supply Center Columbus Contracting Office, 19 Contracting Officer's Technical Representative locations and the DoD IAC Program Office at DTIC. This system provides IAC Program participants instant electronic access to technical area tasks status.

Additionally, extensive interaction is underway with two technical communities to explore the feasibility of establishing IACs in the areas of Data Fusion and Space.

F. Independent Research and Development (IR&D) Program

DoD Independent Research And Development

The purpose of the Department of Defense (DoD) IR&D Program is to encourage IR&D spending by industry to address defense needs for superior technologies at affordable prices and to ensure timely and effective use of these technologies in defense applications. IR&D is IR&D is research and development undertaken by defense contractors on their own initiative without direct Government funding. IR&D costs incurred by contractors are recognized by the DoD as necessary costs of doing business and are reimbursable as indirect expenses on covered contracts to the extent that these costs are allocable, reasonable, and not otherwise unallowable by law. Approximately half of IR&D expenses are currently reimbursed as indirect costs under defense contracts.

The law prohibits the DoD from prescribing regulations that would "infringe on the independence of a contractor to choose which technologies to pursue in its independent research and development program." The focus of the IR&D Program is on promoting communications between the DoD and industry regarding defense technological needs and IR&D technological accomplishments. By communicating technological needs and priorities to industry, the DoD influences industry's IR&D spending. Industry welcomes this information as a means of identifying future defense market opportunities.

Even though IR&D is neither funded nor managed directly by the DoD, IR&D constitutes a significant portion of R&D activities in support of defense needs. Annual IR&D investment by major defense contractors has averaged $2.9 billion since 1995. The amount of this investment mirrors changes in defense contract spending. IR&D expenditures peaked between 1984 and 1992, averaging nearly $5 billion annually. IR&D activity has declined substantially since 1992 as the market for defense goods and services has shrunk.

DoD Management of IR&D

DoD management of IR&D activities has undergone significant changes during the past decade, following amendments to IR&D statutory language in the Defense Authorization Acts for FY91 and FY92/93. Prior to these amendments, the DoD controlled IR&D activities by limiting allowable costs, by negotiating reimbursement ceilings, and by conducting formal reviews of IR&D plans and activities. The statutory revisions broadened the definition of allowable IR&D costs to encompass virtually any type of R&D, phased out negotiated ceilings on IR&D reimbursements, and eliminated the requirement for technical review of IR&D activities. The changes have resulted in reduced DoD control of IR&D spending and reduced DoD oversight of IR&D activities.

DoD Directive 3204.1 establishes the Technical Coordination Group (TCG) to provide oversight for the DoD IR&D Program and to promote communications between industry and the DoD concerning DoD's technological needs and industry's IR&D

accomplishments. The TCG is composed of senior science and technology (S&T) managers form the Military Departments and is chaired by a representative of the Director of Defense Research and Engineering (DDR&E) in the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. The TCG is supported by the IR&D Working Group, which includes representatives from the Defense Technical Information Center (DTIC), Defense Procurement, and the Military Departments and is chaired by the IR&D Program Manager in DDR&E. The individual Military Departments are responsible for technical interaction with contractors to explain DoD science and technology needs and to understand contractor IR&D accomplishments.

IR&D Program Action Plan

During FY00, the IR&D Program developed and began implementation of an action plan to revitalize the IR&D Program. The Plan emphasizes guiding IR&D investments and utilizing IR&D technical achievements. It focuses on four objectives:

- To improve IR&D Program policy, management, and planning
- To promote effective DoD use of technologies developed through IR&D efforts
- To improve Government/industry communications on the DoD's S&T goals and IR&D projects; and
- To evaluate other measures to increase the effectiveness of IR&D efforts.

The plan was developed by the IR&D Working Group with substantial input from industry and was approved for implementation by the TCG.

Implementation is a shared responsibility of the Office of the Secretary of Defense, the Military Departments, and the Defense Technical Information Center. Industry involvement is being encouraged through participation in IR&D Working Group activities. The widespread involvement in developing and implementing this plan reflects the importance of IR&D activities to both the DoD and defense industry.

IR&D Database

A major resource of the IR&D Program is the IR&D database maintained by the Defense Technical Information Center (DTIC). This database contains IR&D project descriptions provided (voluntarily) by major defense contractors. DoD employees search the IR&D database to identify IR&D projects that could fulfill defense requirements and to avoid undertaking duplicative R&D activities. The database of current projects contains approximately 4000 project descriptions representing IR&D expenditures of more than $4 billion.

G. Title III of the Defense Production Act

The Defense Production Act (DPA) (50 U.S.C. App. 2061 *et seq.*) is the primary legislation designed to ensure that the industrial resources and critical technology items essential for national defense are available when needed. Title III of the DPA provides a vehicle to establish, modernize, or expand domestic production capability and capacity for technology items, components, and industrial resources that are essential for national defense provided: (1) no domestic capacity exists or (2) the domestic capacity that does exist is insufficient to meet defense needs. Under the authorities of Title III, DoD can provide domestic firms with a variety of financial incentives to reduce the risks associated with establishing the needed capacity. These incentives include purchases or purchase commitments, development of substitutes, and the purchase or lease of advanced manufacturing equipment which can be installed in government or privately owned facilities. DoD uses purchases and purchase commitments most frequently. A key objective of the Title III Program is to accelerate the transition of new leading edge technologies from research and development to affordable production and to insert those technologies into defense systems.

The Department organizes and executes the Title III program as a DoD-wide program, generally focusing on materials and components that can be used in a broad spectrum of defense systems. The Office of the Secretary of Defense provides top-level management, direction, and oversight. The Air Force, acting as the Executive Agent for this program, structures and executes approved and funded projects for the Department. In 2000, the Department initiated three Title III projects, began development of two others, and completed one project.

Silicon-on-Insulator (SOI) Wafers

SOI substrates can significantly reduce costs and improve the performance of low power and/or radiation-tolerant integrated circuits used in military satellite communications systems, ballistic missile upgrades, surveillance systems, and inertial navigation systems. This project will establish domestic sources for SOI wafers (up to eight inches in diameter) that have emerged from research and development but which require lower-cost, higher-volume production capabilities before they can be inserted affordably into DoD systems. The project is designed to provide sufficient incentives to create a domestic SOI wafer production capacity of 1.4 million square inches per year. This project was initiated in March 2000 and will be completed in approximately 48 months. The total value of this effort, including industry cost sharing, is $14.3 million.

Laser Protective Eyewear

This project will establish a highly responsive, affordable production capacity for thin film dielectric coatings on polycarbonate substrates. These substrates are the basic component in laser protective eyewear such as helmet visors, goggles, and spectacles. The widespread proliferation of lasers in military operations is posing an increasingly significant threat of eye injury to military personnel. The project will assure that domestic producers are available to supply these devices in sufficient quantities and at affordable prices to meet defense needs. This Title III project is using purchase and purchase commitment incentives to assist in establishing a viable, domestic production capacity on a high-volume, commercial ("dual-produce") line for laser protective eyewear for military and commercial applications. This project will also accelerate the implementation of compatible interference filter technologies, such as dry process holographic filters and/or rugate filters, to protect against a broader range of laser threats. This project is strongly supported by all the Services since it enables the timely production and fielding of affordable protective eyewear that meets their requirements for protection and operational effectiveness. The total value of this project, including industry cost sharing, is $6.2 million. The project was initiated in August 2000 and is expected to be completed in approximately 36 months.

Microwave Power Tubes

Microwave power tubes generate and amplify microwave energy in radar systems, electronic warfare systems, and telecommunications systems and are required for applications requiring high frequency and high power. Microwave power tubes are a critical element underpinning current and future operational capabilities of most major defense systems and will be needed for the foreseeable future since there are no replacement technologies on the horizon. There are approximately 1,000 different types of microwave tubes used in 270 military systems (over 180,000 total tubes). This project will facilitate the Department's assured access to affordable microwave power tubes by providing incentives to encourage lower tier microwave power tube suppliers to make consistent, quality-driven improvements. DoD's goal is to transition advanced manufacturing processes to the lowest-tier suppliers, thus improving overall quality and lead times and driving down the production and life cycle costs of microwave power tubes to the DoD. The Department will use Title III authorities to facilitate supplier process improvements, qualify alternate materials and processes, and share integration and investments both horizontally across the supplier base and vertically between suppliers and tube manufacturers. Congress appropriated $3.0 million in the Fiscal Year 2000 Defense Appropriation Act (P.L. 106-79) and an additional $2.0 million in the Fiscal Year 2001 Defense Appropriation Act (P.L. 106-259) specifically for this Title III project.

Radiation Hardened, Thin Film SOI Wafers for Digital Devices

DoD is developing this project to establish domestic production capacity for radiation hardened, thin film SOI wafers for a variety of digital circuit applications.

Radiation hardened, thin film SOI wafers are used for fabricating radiation resistant ultra large scale digital devices such as microprocessors, application specific integrated circuits and static random access memory circuits. SOI technology materials are essential to defense telecommunications systems, ballistic missile systems, surveillance systems, radar, passive sensors, and inertial navigation systems. They provide a superior technology for sensitive battery powered applications due to reduced power requirements, increased device density, and faster device performance. This project will emphasize improving SOI wafer radiation hardness, quality, and yield; reducing wafer production costs; and promoting thin film wafer evaluation and qualification. Title III funding programmed for this project is approximately $3.8 million.

Radiation Hardened Microprocessors for Missile and Space Applications

DoD is developing this project to establish a manufacturing capability for radiation tolerant and radiation hardened ("Rad Hard") microprocessors for military and commercial space applications. The effort will develop the manufacturing processes required to produce advanced commercial microprocessors that meet military requirements for radiation hardening. The project will create an accelerated (and repeatable) fabrication process, leveraging commercial capabilities for affordable production. DoD hopes to narrow the performance gap between state-of-the-art commercial microprocessors and Rad Hard microprocessors for military aerospace applications and to increase the capabilities of the domestic industrial base to supply advanced microprocessors for military missile and space applications. Title III funding programmed for this project is approximately $7.5 million.

Semi-Insulating (SI) Indium Phosphide (InP) Substrates

InP substrates are vital to electronic defense applications requiring ultra high-speed operating frequencies (seekers and battlefield radar), lower power consumption (satellite crosslinks and battlefield communication systems), and exceptional low noise performance (Extra High Frequency low noise receivers and analog/digital converters). This project, which was completed in 2000, established a viable, long-term domestic manufacturing capability for InP wafers by accelerating the insertion of InP technology, expanding domestic production capacity, improving quality, increasing wafer diameter, and lowering production costs. Indium Phosphide substrates will have a far reaching, positive impact on DoD for several years to come. Savings for weapons systems alone have been calculated at $35 million through the year 2004. The project also will have a major commercial market impact by increasing access to large diameter, high quality, affordable substrates supporting next-generation wireless consumer products and greatly enhanced internet communication speeds. As a result of this project, wafer prices declined approximately 30 percent and the U.S. companies increased their global market share from less than one percent in 1996 to more than a combined 17 percent (forecasted) in 2000. Total funding for this project was $10.1 million including cost sharing by the contractors.

H. Commercial Operations and Support Savings Initiative (COSSI)

The purpose of the COSSI program is to reduce Department Defense (DoD) operations and support (O&S) costs by developing, testing, and inserting commercial technologies into fielded military systems. The cost of operating and maintaining aging equipment is a major concern for DoD because operations and support costs tend to rise as equipment ages. COSSI uses insertions of new technology to increase the reliability and reduce the operations and support costs of legacy systems. For example, figure 1 shows COSSI projects being done to improve the reliability and reduce the costs of operating and supporting the P-3 Orion aircraft.

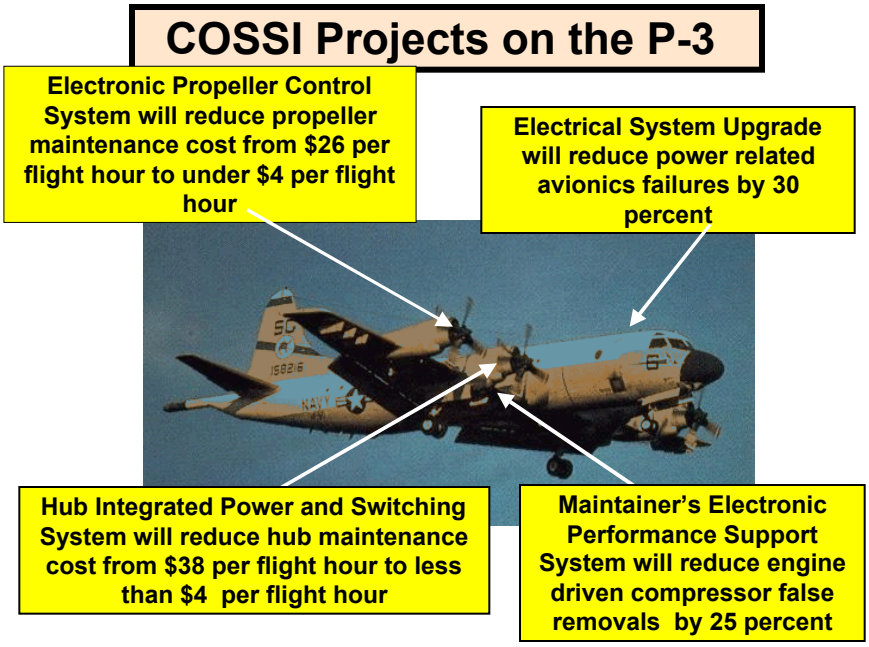


Figure 1

COSSI is also addressing obsolescence issues frequently associated with legacy systems. Some military-specific components in legacy systems are no longer manufactured and, therefore, difficult to acquire at any price. Using commercial items adapted to function in military systems (instead of military unique items) broadens the supplier base for spare parts.

COSSI is a two-stage process. In Stage I, a firm or a team that includes at least one for-profit firm, develops a prototype based on commercially available technologies. Stage I typically last two to three years. Proposals need to demonstrate that operations and support costs will be reduced after the prototype is inserted into the legacy system. DoD saves on R&D expenses because the core technology has already been

developed by the commercial sector. Project proposals must include written support from a "Military Customer" who has the authority to modify the system. After development, the prototype is tested to ensure it operates properly and will generate the projected savings. If the project is successful, production quantities of the prototype can be purchased and inserted into the host system in Stage II. COSSI program funds are only used to do Stage I. Procurement funds are used in Stage II.

Effectiveness

COSSI establishes Government and industry partnerships. The development of the prototype in Stage I is cost-shared between the government and industry reducing expenses for DoD. Cost sharing also signifies the contractor's commitment to the long-term success of the project. By involving commercial suppliers, COSSI is contributing toward the creation of an integrated military and commercial industrial base. Over one third of the firms participating in the COSSI program are considered non-traditional DoD suppliers.

Status

COSSI has provided over $160 million for 60 projects since the program began in 1997. Contractors have provided an additional $117 million. So far, seven projects have successfully completed Stage I development and entered into Stage II production.

Congress appropriated $52 million for the COSSI program in FY 2001. Twenty new projects were selected for funding in FY 2001.

Future Plans

The next COSSI solicitation is scheduled for the second quarter of FY 2001. Proposals received will be evaluated and ranked. Selections are expected to be announced in August.

Accomplishments

Seven of the COSSI projects started in FY 1997 have transitioned to production.

Discontinuous Reinforced Aluminum (DRA):

Two companies are fabricating fuel access panels and ventral fins for F-16s using wider DRA sheets (widths from 27" to 36" and in some cases, larger). The material was used to fabricate 321 fuel access doors and 358 ventral fins. The material is also being considered for F-16 engine access covers.

Mini-MUTES:

The AN/MST-T1(V) Mini-Multiple Threat Emitter System (mini MUTES) is an Air Force Electronic Warfare training system that simulates threat radar so aircrews can practice countermeasures. The system had an aging proprietary computer processor that required a continuously controlled environment. The COSSI project replaced obsolete hardware and re-hosted software on a robust commercial bus based system. The Air Force is purchasing 65 mini-MUTES kits.

Mainframe Computer Replacement for Guardrail System:

Guardrail Common Sensor Main System software was ported from an antiquated mainframe computer running a proprietary operating system to a small modern UNIX based computer running an open operating system. The new computer is faster, more reliable, and easier to maintain. The previous computer cost over $1M and was repaired by replacing expensive and obsolete circuit card assemblies. The new computer costs $130K and is heading toward a $60K computer with the potential for using a $7K computer.

Movement Tracking System (MTS):

The project converted commercial satellite tracking systems for military applications. The COSSI project hardened the network interface, converted the commercial system to a multiple satellite service system providing for communication support of ground devices, and secured and encrypted all traffic. These enhancements allow the Army to maintain continuous command and control of in-theater transportation vehicles using commercial satellites. The project was so successful that the quantity of MTS devices was increased from the initial 12,500 devices to 33,000 with a contract option for up to 40,000. This technology has garnered great interest from other DoD and non-DoD agencies, and the law enforcement community. In addition, there is a promising spin-off of this technology into a hand-held version.

Health and Usage Monitoring System in the H-60, H-53 Helicopters:

This project developed an automated diagnostic and monitoring system for SH-60 and CH-53 helicopters. The system was designed to use an open architecture and commercial interfaces. The system will reduce operations and support costs by providing for continuous rotor track and balance, vibration monitoring of the gearbox, drive train, and engine, and structural usage monitoring. Data generated by the system removes uncertainty about condition and usage, facilitating maintenance planning and extending maintenance intervals.

Versa Module Europa (VME) MILSTAR Antenna Position Control Unit:

A replacement digital antenna controller using an open architecture and commercial standards was developed for the MILSTAR contingency ground station.

The old unit was military-unique, expensive, and less reliable than the new replacement unit. The open architecture design provides a cost effective migration path for future technology insertions. The Air Force is purchasing 32 units.

Data Distribution Kits for Command Centers:

This project replaced data distribution networks for Mobile Consolidated Command Centers (MCCC) and other C4I command systems. The original system was highly specialized and relied on outdated radio frequency cable technology. The project replaced the data transport systems, voice circuits, ethernet circuits, serial data communications circuits, and network management systems with a high-speed asynchronous transfer mode (ATM) network consisting of commercial ATM switches, communications servers, edge devices, private branch exchange (PBX), and network management system. The new network will have dramatically increased bandwidth. The new system also has an open architecture, which will facilitate supportability and make future upgrades easier.

Several other projects are scheduled to transition to production during FY 2001. Projects started in FY 1999 and FY 2000 are ongoing with transition to production expected to begin in FY 2002.

APPENDIX A: 10 USC 2515, Office of Technology Transition

Section 2515. Office of Technology Transition

(a) ESTABLISHMENT. - The Secretary of Defense shall establish within the Office of the Secretary of Defense an Office of Technology Transition.

(b) PURPOSE. - The purpose of the office shall be to ensure, to the maximum extent practicable, that technology developed for national security purposes is integrated into the private sector of the United States in order to enhance national technology and industrial base, reinvestment and conversion activities consistent with the objectives set forth in section 2501(a) of this title.

(c) DUTIES. - The head of the office shall ensure that the office-

(1) monitors all research and development activities that are carried out by or for the military departments and Defense Agencies;

(2) identifies all such research and development activities that use technologies, or result in technological advancements, having potential nondefense commercial applications;

(3) serves as a clearinghouse for, coordinates, and otherwise actively facilitates the transition of such technologies and technological advancements from the Department of Defense to the private sector;

(4) conducts its activities in consultation and coordination with the Department of Energy and the Department of Commerce; and

(5) provides private firms with assistance to resolve problems associated with security clearances, proprietary rights, and other legal considerations involved in such a transition of technology

(d) ANNUAL REPORT. – (1) The Secretary of Defense shall submit to the congressional committees specified in paragraph (2) an annual report on the activities of the Office. The report shall be submitted each year at the same time that the budget is submitted to Congress by the President pursuant to section 1105 of title 31. The report shall contain a discussion of the accomplishments of the Office during the fiscal year preceding the fiscal year in which the report is submitted.

(2) The committees referred to in paragraph (1) are –

(A) the Committee on Armed Services and the Committee Appropriations of the Senate; and

(B) the Committee on National Security and the Committee on Appropriations of the House of Representatives.

Number of Reported Active Technology Transfer Mechanisms by Laboratory Center
FY 96 through FY 00

Laboratory/Center	FY96	FY 97	FY 98	FY99	FY00
ABERDEEN TEST CENTER ABERDEEN PROVING GROUND MD		3	2	2	3
AERONAUTICAL SYSTEMS CENTER WRIGHT-PATTERSON AFB OH		6	6	3	4
AIR FORCE ACADEMY COLORADO SPRINGS CO				0	1
AIR FORCE DEVELOPMENT TEST CENTER EGLIN AFB FL	2	8	3	3	4
AIR FORCE FLIGHT TEST CENTER EDWARDS AFB CA	6	8	13	15	22
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH				7	9
AIR FORCE MATERIEL COMMAND WRIGHT-PATTERSON AFB OH	24	87	72	14	11
AIR FORCE RESEARCH LAB EGLIN AFB FL				8	9
AIR FORCE RESEARCH LAB KIRTLAND AFB NM				32	40
AIR FORCE RESEARCH LAB ROME NY			9	27	33
AIR FORCE RESEARCH LAB WRIGHT-PATTERSON AFB OH				110	117
AIR FORCE WEATHER AGENCY OFFUTT AFB NE				0	1
AIR INTELLIGENCE AGENCY SAN ANTONIO TX			2	12	4
AIR UNIV MAXWELL AFB AL				0	2
ARMSTRONG LAB BROOKS AFB TX				1	1
ARMY AEROMEDICAL RESEARCH LAB FORT RUCKER AL	17	17	20	30	28
ARMY ARMAMENT RESEARCH DEVELOPMENT AND ENGINEERING CENTER	20	27	40	47	52
ARMY AVIATION RESEARCH AND TECHNOLOGY ACTIVITY FORT EUSTIS				21	27
ARMY AVIATION RESEARCH AND TECHNOLOGY ACTIVITY MOFFETT FIELD				34	36
ARMY AVIATION RESEARCH DEVELOPMENT AND ENGINEERING CENTER	2	2	2	5	4
ARMY CECOM INTELLIGENCE AND ELECTRONIC WARFARE DIRECTORATE	7	10	11	12	13
ARMY CECOM RESEARCH DEVELOPMENT AND ENGINEERING CENTER FORT	29	30	34	44	40
ARMY COMMUNICATIONS-ELECTRONICS COMMAND FORT BELVOIR VA	6	12	11	18	25
ARMY ELECTRONIC PROVING GROUND FORT HUACHUCA AZ	1	1	1	1	1
ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS	27	43	56	105	103
ARMY INST FOR SURGICAL RESEARCH FORT SAM HOUSTON TX	1		4	6	7
ARMY MEDICAL RESEARCH AND MATERIEL COMMAND FORT DETRICK MD	6	5	6	17	18
ARMY MEDICAL RESEARCH INST OF CHEMICAL DEFENSE ABERDEEN PG	2	1	1	11	10
ARMY MEDICAL RESEARCH INST OF INFECTIOUS DISEASES FORT DETRICK	66	66	70	103	101
ARMY MISSILE RESEARCH DEVELOPMENT AND ENGINEERING CENTER	10	11	15	27	32
ARMY NATICK RESEARCH DEVELOPMENT AND ENGINEERING CENTER MA	20	31	39	56	61
ARMY RESEARCH INST FOR THE BEHAVIORAL AND SOCIAL SCIENCES ALEXANDRIA VA	5	5	6	6	7
ARMY RESEARCH INST OF ENVIRONMENTAL MEDICINE NATICK MA	11	11	11	26	29
ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD				68	62
ARMY RESEARCH LAB ADELPHI MD				62	64
ARMY RESEARCH LAB CLEVELAND OH				1	1
ARMY RESEARCH LAB FORT MONMOUTH NJ				97	96
ARMY RESEARCH LAB HAMPTON VA				31	27
ARMY RESEARCH LAB WHITE SANDS MISSILE RANGE NM				5	5

Number of Reported Active Technology Transfer Mechanisms by Laboratory Center
FY 96 through FY 00

Laboratory/Center	FY96	FY 97	FY 98	FY99	FY00
ARMY RESEARCH OFFICE RESEARCH TRIANGLE PARK NC		1	1	1	1
ARMY SPACE AND STRATEGIC DEFENSE COMMAND HUNTSVILLE AL	4	2	1	7	7
ARMY TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT ACTIVITY REDSTONE ARSENAL AL				1	1
ARMY TOPOGRAPHIC ENGINEERING CENTER ALEXANDRIA VA	2	2	4	6	5
CENTER FOR HEALTHCARE EDUCATION AND STUDIES FORT SAM HOUSTON TX	1	1	1	2	2
CLINICAL INVESTIGATION REGULATORY OFFICE FORT SAM HOUSTON TX	38	34	95	179	256
COLD REGIONS RESEARCH AND ENGINEERING LAB HANOVER NH	28	25	34	89	95
CONSTRUCTION ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL	34	39	48	73	78
DEFENSE LANGUAGE INST MONTEREY CA	5	4	3	4	4
DEFENSE NUCLEAR AGENCY ALBUQUERQUE NM				1	1
DEFENSE NUCLEAR AGENCY ALEXANDRIA VA				5	5
GROUNDS MD	5	11	21	27	28
ELECTRONIC SYSTEMS CENTER HANSCOM AFB MA	12	8	25	13	13
HUMAN SYSTEMS CENTER BROOKS AFB TX				1	1
HYDROLOGIC ENGINEERING CENTER DAVIS CA				1	1
JOINT TRAINING ANALYSIS AND SIMULATION CENTER SUFFOLK VA		1	1	1	1
MARINE CORPS COMBAT DEVELOPMENT COMMAND QUANTICO VA				0	1
NATIONAL IMAGERY AND MAPPING AGENCY BETHESDA MD				2	2
NATIONAL IMAGERY AND MAPPING AGENCY RESTON VA				7	7
NATIONAL IMAGERY AND MAPPING AGENCY ST LOUIS MO				1	1
NAVAL AIR WARFARE CENTER AIRCRAFT DIV LAKEHURST NJ				1	1
NAVAL AIR WARFARE CENTER AIRCRAFT DIV PATUXENT RIVER MD				16	14
NAVAL AIR WARFARE CENTER TRAINING SYSTEMS DIV ORLANDO FL		2	7	9	7
NAVAL AIR WARFARE CENTER WEAPONS DIV CHINA LAKE CA	12	34	43	51	51
NAVAL AIR WARFARE CENTER WEAPONS DIV POINT MUGU CA		6	9	10	15
DIEGO CA				1	2
SPACE AND NAVAL WARFARE SYSTEMS CENTER SAN DIEGO CA				21	17
NAVAL EXPLOSIVE ORDNANCE DISPOSAL TECHNOLOGY CENTER INDIAN HEAD MD				4	4
NAVAL FACILITIES ENGINEERING SERVICE CENTER PORT HUENEME CA			2	1	1
NAVAL MEDICAL CENTER PORTSMOUTH VA				0	6
NAVAL MEDICAL CENTER SAN DIEGO CA			4	10	14
SAN DIEGO CA	32	39	45	71	103
NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND STENNIS SPACE CTR MS		2	3	4	3
NAVAL OBSERVATORY WASHINGTON DC			1	1	1
NAVAL POSTGRADUATE SCHOOL MONTEREY CA	7	6	9	6	11
NAVAL RESEARCH LAB STENNIS SPACE CENTER MS				3	3
NAVAL RESEARCH LAB WASHINGTON DC				106	101
NAVAL SEA SYSTEMS COMMAND WASHINGTON DC				1	1
NAVAL SURFACE WARFARE CENTER PORT HUENEME CA			2	2	2

Number of Reported Active Technology Transfer Mechanisms by Laboratory Center
FY 96 through FY 00

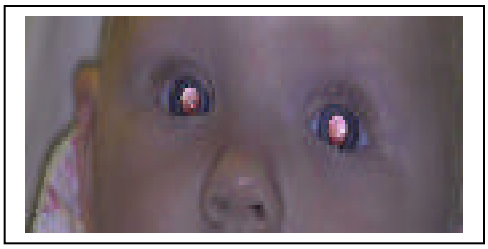
Laboratory/Center	FY96	FY 97	FY 98	FY99	FY00
NAVAL SURFACE WARFARE CENTER CARDEROCK DIV BETHESDA MD		14	18	25	20
NAVAL SURFACE WARFARE CENTER CRANE DIV IN		8	10	7	7
NAVAL SURFACE WARFARE CENTER DAHLGREN DIV VA	10	14	18	36	36
NAVAL SURFACE WARFARE CENTER INDIAN HEAD DIV MD	8	9	14	13	15
NAVAL UNDERSEA WARFARE CENTER NEWPORT DIV RI	17	21	25	3	18
NAVY CLOTHING AND TEXTILE RESEARCH FACILITY NATICK MA		2	2	28	3
NAVY EXPERIMENTAL DIVING UNIT PANAMA CITY FL			1	2	1
OFFICE OF NAVAL RESEARCH ARLINGTON VA		39	45	1	1
OGDEN AIR LOGISTICS CENTER HILL AFB UT	4	24	12	6	2
PHILLIPS LAB EDWARDS AFB CA				12	3
ROME LAB ROME NY				11	8
TACOM RESEARCH DEVELOPMENT AND ENGINEERING CENTER WARREN MI	33	28	37	67	71
TRADOC ANALYSIS CENTER FORT LEAVENWORTH KS	1	1	1	1	1
UNIFORMED SERVICES UNIV OF THE HEALTH SCIENCES BETHESDA MD	1	2	2	3	3
WALTER REED ARMY INST OF RESEARCH WASHINGTON DC	84	89	104	179	199
WARNER ROBINS AIR LOGISTICS CENTER ROBINS AFB GA	4	8	13	11	6
WATERVLIET ARSENAL NY	15	8	13	23	30
WHITE SANDS MISSILE RANGE NM			1	1	1
WRIGHT LAB WRIGHT-PATTERSON AFB OH	10	73	22	5	2
YUMA PROVING GROUND AZ	3	3	4	5	6

Appendix C - Success Stories

Army – Aviation and Missile Command Research, Development, and Engineering Center

iScreen

Using a CRADA, a digital ocular scanner that produces diagnostic quality images of the eye was developed. Advanced digital imaging techniques were integrated into a photo-screening system, which is capable of screening pre-verbal, verbal, and non-verbal children and adults for: amblyopia (lazy eye), strabismus (misaligned eyes), cataracts, as well as refractive errors such as myopia (near-sightedness), hyperopia (far-sightedness), and astigmatism (elliptical optical power). The screening requires no patient/screener interaction; the procedure is non-invasive, and requires only a few seconds for the entire process.



Called “iScreen,” it is a simple, fast, and accurate screening technology to detect ocular abnormalities in patients as young as 3 months of age. It is the fastest and most advanced system available, and results are over 90% accurate. In one year, over 500,000 eye-screening examinations have taken place across the country.

Army – U.S. Army Soldier Systems Command, Natick RD&E Center, Sustainability Directorate, Ration Systems Division, Ration Development Branch

Adaptation of Intermediate Moisture Food Technology Produces Quality Rations

A technical breakthrough in developing military rations that look freshly prepared yet can be kept at room temperature for up to three years has been achieved. Besides meeting Army mobilization requirements, the technology reflects innovations in intermediate moisture food (IMF) technology, which carefully balances moisture, pH, and water binding to give foods soft, moist qualities without promoting microbiological growth. The team's work led to the development of several types of pocket sandwiches.

The team's transfer of IMF technology to industry resulted in the commercialization of the rations with Sara Lee Bakery. Working under two CRADAs, Sara Lee Bakery and SSCOM (NRDEC) are actively producing extended shelf-life bakery items that do not

require refrigeration. A second CRADA with GoodMark Foods, Inc. focuses on developing and commercializing the meat-filled sandwich components. The team's success has also resulted in inquiries from other major industrial food organizations.

The technology simplifies shipping, distribution, and handling and increases solider acceptance, mobility, and consumption. The team's work also demonstrates how federal lab technology can strengthen the U.S. industrial base—providing synergistic benefits to all partners.

Navy - Naval Air Warfare Center Weapons Division (China Lake)

Maximally Security Computer Network for Processing Highly Sensitive Data

A breakthrough computer network security system called the SecureSwitch™ Information Security System (SSISS) by Market Central, Inc., and the Readykey® Information Security System for Computers™ (RISSC) by Radionics, Inc., has been developed for local area computer network security that is superior to existing techniques. The SSISS/RISSC security systems provide a maximally security computer network for processing highly sensitive data. Unlike standard data encryption and other software based computer security techniques, the new technology can work on any platform, any operating system, and any application software. The RISSC system combines a Radionics, Inc. Readykey Access Control System with patented security network switches developed by the Naval Air Warfare Center Weapons Division (NAWCWD) and Market Central, Inc., to provide a network security system with unparalleled password protection, authentication, discretionary access control, audit trail and network configuration management. The SSISS system follows a similar approach. By focusing on a computer system's need for power and network connections, the SSISS/RISSC systems are not affected by compatibility issues with upgrades to network computer software or hardware. Up to 18,000 users per site can be put on the new SSISS/RISSC computer security system without requiring specialized computer security software resident on the network computers that often conflicts with other software and slows the performance of the computers connected to local area networks. The SSISS/RISSC security system is much more security than a firewall. Using a SSISS/RISSC system, the basic computer security features no longer reside on each individual network computer platform. So as the network data processing computers evolve to new editions of software applications, upgrades to operating systems, and upgrades of computer hardware, the SSISIS/RISSC computer security system is unaffected by these changes. This approach keeps the life cycle cost of the SSISS/RISSC computer security system low. Several technology transfer processes including a CRADA, three patents, four remaining patent applications, and one exclusive patent license agreement covering the seven patents and patent applications were used to accomplish this transfer of technology.

Navy – Naval Surface Warfare Center Dahlgren Division, Coastal Systems Station

Omni-Directional Vehicle (ODV) Drive System

Conventional wheels on vehicles limit their directional mobility. In general, they are incapable of moving laterally, diagonally, or rotating within their own footprint. The turning radius of conventional wheeled vehicles is also quite limited. With an omni-directional vehicle (ODV), movement is capable in any direction.

When compared to standard or All Wheel Steer (AWS) vehicles, the ODV is mechanically simple with fewer components and easier to design, fabricate, and maintain than standard or AWS vehicles as the ODV eliminates complicated steering and drive mechanisms. The ODV employs a simple fail-safe control system, whether implemented in a manual, teleoperated, or automated vehicle. A three-axis joystick controls the velocity, direction, and rotation of the vehicle motion. Only a few minutes of training is required to learn to operate the vehicle safely. For robotic and automated unmanned vehicle applications the ODV drive system can easily accommodate a high-level control system. Unconstrained omni-directional movement, coupled with ease of implementing high level control systems, will enable the coordinated movement (slaving) of ODVs to transport oversize or heavy loads as well as the coordinated movement of two or more vehicles to perform a single task. Potential military applications for the ODV include ordnance handling, aircraft weapons loading, materials handling, jet aircraft engine handling/installation, and firefighting.

In January 1996, the Navy Coastal Systems Station, Naval Sea Systems Command, entered into a two year CRADA with Air Tracks, Inc., of Vineland, NJ, to transfer omni-directional vehicle technology. This company was incorporated to commercialize innovative technology to produce omni-directional vehicles. The company, now doing business under the name AIRTRAX Corporation, markets and sells two forklifts, the ATX-E3000 and the ATX-3000, and a helicopter ground handling machine based on ODV technology.

Air Force – Air Force Research Laboratory, Information Directorate

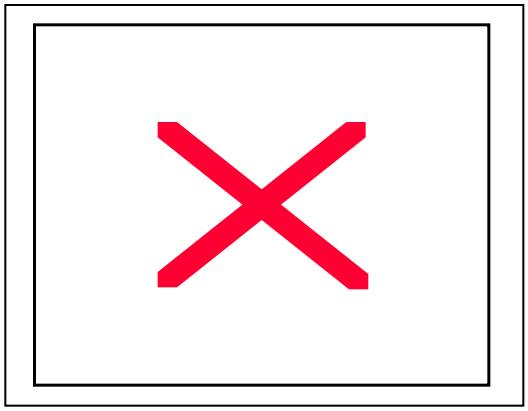
Know-It™

In FY2000, The Information Directorate completed its CRADA with TextWise, LLC, to determine the utilization potential of a chronological information extraction system developed by TextWise under a SBIR contract. This system, called KNOW-IT™, is a method of recognizing information-rich linguistic constructions that contain proper names or related phrases, then producing representations of the relations between concept pairs contained in those phrases. Knowledge produced

under this CRADA will help the Information Directorate satisfy its intelligence community technology requirements.

Air Force – Air Force Research Laboratory, Space Vehicles Directorate

Satellite Door



A patent was awarded to a joint team of laboratory and high school students resulting from work done under the Directorate's S.P.A.C.E. education outreach program. This joint team designed a protective satellite door that opens and closes with the aid of magnets. The student-designed door uses magnets to levitate the moving part of the door. Friction and wear can lead to door failure once a satellite is launched. By levitating the door in a magnetic field, the students were able to essentially eliminate the friction associated with a mechanical door. On August 29, 2000, patent number 6,109,564 was awarded for an electromagnetic, sliding space environment protection satellite door. The effort received national TV coverage highlighting the event, including a CNN Christmas special for children.

S.P.A.C.E. stands for Students Planning and Conducting Engineering. Through the S.P.A.C.E. program, the AFRL provides mentors and materials so that high school students can have a real-world research experience. Under the AFRL technology transfer for education systems engineering methodology, a teacher works with the Air Force mentors providing guidance as the students conduct a year-long research project. Final results are presented to scientists and dignitaries at the Kirtland AFB S.P.A.C.E. Symposium each spring.

Air Force – Air Force Research Laboratory, Materials and Manufacturing Directorate

All-Composite Lighter, Quieter Forearm Crutches

This new crutch design was born about three years ago as a CRADA effort among the Materials and Manufacturing Directorate; Ergonomics, Inc., a Dayton firm specializing in superior ambulatory aids, crutches, canes, and walkers; and the Wright Technology Network which promotes government-business partnerships and opportunities across Ohio. These forearm crutches are made from the same graphite-epoxy composite material used in the B-2 Stealth bomber and high-tech golf clubs. They are 60 percent lighter, 90 percent quieter, 20 percent stronger, more attractive, and far more durable than conventional aluminum crutches.

Ballistics Missile Defense Organization (BMDO)

Performance Measures

BMDO does not have laboratories per se, but funds small and large businesses, universities, and other Federal agency laboratories for advanced technology. In general, BMDO attempts to track the commercialization success of these companies, universities, and Federal laboratories in relation to their BMDO-funded research and development. Of the 485 research projects documented and approved through November 15, 2000, the BMDO Technology Applications program has tracked:

- **65 Spinoff Companies**: any time a new company is formed to help commercialize a technology developed with BMDO funding.
- **402 products on the market**: products now marketed that are based on or use technology developed with BMDO funding.
- **325 patents pending**: the number of patent applications filed by companies seeking to commercialize technology developed with BMDO funding.
- **690 patents granted**: the number of such patents that have been granted to date.
- **556 ventures**: any joint venture between an organization that has developed technology with BMDO funding and an outside concern, so long as the purpose of the venture is to help further the commercial prospects of a technology in some form. Examples of such ventures include licensing agreements, joint R&D, and marketing assistance.

Federal Laboratory Consortium Award for Excellence in Technology Transfer

Acoustic Physiological Monitoring Sensor

Michael Scanlon, Army Research Laboratory

The acoustic physiological monitoring sensor is a breakthrough technology with the potential to save many lives. Marketed as the Sudden Infant Death Syndrome Monitor and Stimulator (SIDSMAS), the sensor employs a fluid-filled bladder with a hydrophone inside that matches the acoustic impedance of an infant in contact with the pad. By removing impedance mismatches, excellent acoustic coupling of heart and breath sounds-as well as vocalizations and movement noises-is achieved. Scanlon's designs provide heat, soothing sounds and vibrations to help the child fall asleep and, with transmitter/alert functions, can be useful in nurseries, hospitals, day-care centers, and homes. A single acoustic sensor can collect information concerning heart, lungs, and digestive tract functions, or detect changes in voice or sleep patterns, motor activity, and mobility. The data collected and processed by Scanlon for this technology has been recognized by surgeons and research physiologists as outstanding, and is believed by many to be the basis for next-generation stethoscopes and long-term health monitoring.

The sole inventor and developer of the SIDSMAS, and the acoustic technology behind it, Scanlon holds three U.S. patents for the technology, and has three foreign applications pending. The primary beneficiaries of Scanlon's technology are infants, adults suffering from sleep apnea, and those who monitor their bodily processes during exercise. As additional licenses are initiated in the future, other recipients whose quality of life will be improved include the infirm, hospital patients, and the elderly. As many as half to three-quarters of the U.S. population stand to benefit from Scanlon's technology.

For more information: Michael Scanlon, (301) 394-3081, Mscanlon@army.mil

Digital Eye Screening - Today's Technology for the Public's Health

Wayne Davenport - U.S. Army Aviation and Missile Command Missile Research, Development, and Engineering Center (MRDEC)

Refractive photography has been used to diagnose eye diseases for years. The problem with this process is that the quality of a picture is uncertain until the film is developed. If the film is unsatisfactory, another photographic session has to be scheduled for the patient. Also, the entire process-from photographic session to analysis-can take several weeks. In 1997, Vision Partners of Memphis, Tennessee, visited the U.S. Army Aviation and Missile Command's MRDEC to investigate automating and improving the refractive process using advanced imaging and signaling processing. Wayne Davenport, an expert in digital imaging and optics who is also

knowledgeable in the mechanics of the human eye, immediately went to work on the problem.

Through a CRADA with Vision Partners, Davenport designed a system that is significantly smaller and lighter, provides real-time feedback, and increases accuracy versus standard 35-mm systems. Called the iScreen, the device is capable of screening both children and adults in a matter of seconds for eye diseases such as amblyopia, strabismus and cataracts and refractive problems such as myopia, hyperopia, and astigmatism.

Once the iScreen device was developed, Davenport constructed five of the photo-screening devices himself, eventually transitioning the construction process to SPARTA, Inc. of Huntsville, Alabama. Since then, SPARTA has successfully assembled 100 units. Currently, 35 units are being tested in doctors' offices, with another 250 units available for doctors' offices and schools. A patent will be issued for the iScreen sometime this year.

The immediate beneficiaries of this technology are the young children nationwide who undergo mandatory screening by pediatricians. However, the general public will benefit from the iScreen as well since children will be able to be screened through state-run programs that will make the process more affordable.

For more information: Wayne Davenport, (256) 876-8183, davenportw@redstone.army.mil

High Temperature FPE Dielectric Tech Transfer Program

Sandra Fries Carr and Dr. Robert Monter - Air Force Research Laboratory (AFRL) Propulsion Directorate

Sandra Fries Carr and Bob Monter developed a new high temperature, high performance dielectric film for use in aircraft capacitors-devices that store electrical charges. The film, called Fluorene Poly Ester (FPE), can be used at temperatures ranging from -55º Celsius to 227º Celsius. This technology fills a need in that state-of-the-art aircraft capacitors are considered to be the weakest link in the power electronic system due to their limited operating temperatures.

The team developed the technology under a partnership between AFRL and the Wright Technology Network. The technology transfer process was innovative, coupling technical assistance with a marketing "push-pull" mechanism. The technology was "pushed" into the marketplace by aligning all of the supplying manufacturers of FPE resin and introducing them to potential capacitor manufacturers. The technology was then "pulled" into the marketplace by supplying technical and lifetime test data to major capacitor manufacturers and introducing them to the supplying manufacturers.

Since the partnership was formed, in-depth interactions have taken place among numerous companies concerning in the development of the FPE resin, film, or capacitor

fabrication. Ultimately, the companies that became involved in the partnership included Ferrania, which manufactures FPE resin and a thicker film; TPL, which developed the casting parameters for two-to-six microns thick film; and Brady and Rexam, which commercially produces the thinner FPE films.

The initial beneficiaries of this technology will be the military and other government agencies such as NASA. However, FPE has the potential to be successfully applied in commercial settings such as oil well drilling, automotive, commercial aircraft ignition systems, and medical defibrillators. This is a true success story, in that the transfer of technology from the AFRL to the commercial sector resulted in numerous companies establishing business opportunities and new alliances.

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Polyhedral Oligomeric Silsesquioxane (POSS) Nanotechnology: The Next Generation of Polymers

Dr. Shawn Phillips, Dr. Joseph Lichtenhan, Dr. Joseph Schwab, Michael Carr, Dr. Timothy Haddad, Dr. Rusty Blanski, Dawn Hilton, Traudi Walker, Patrick Ruth, Justin Leland - Air Force Research Laboratory Propulsion Directorate

To meet the Department of Defense's demand for a new generation of lighter weight, higher performance polymeric materials, the team pursued the development of new chemical feedstock technologies based on POSS nanotechnology. The result is a revolutionary new material composition, which is a chemical hybrid between inorganic and organic systems. POSS is the first new chemical feedstock to be developed for the polymer industry in 40 years. Its incorporation into polymers and plastics enhances their properties by increasing their use and decomposition temperatures-thus providing greater strength and oxidation resistance-and by reducing flammability. The result is a radical upgrade of the thermal and physical properties of most plastics.

The technology transfer took the form of a CRADA between AFRL and Hybrid Plastics LLC-a company formed for the express purpose of commercializing POSS technology-and the licensing of previously assigned Air Force patent rights to a third party. To produce POSS chemical feedstocks on a commercial level, Hybrid Plastics transitioned the technology from the AFRL lab to its own production facilities. In return, Hybrid Plastics provided expertise, resources, and facilities to aid the AFRL's investigation of POSS polymer properties.

Since signing the CRADA, AFRL has negotiated with several third-party companies, including Aldrich Chemical Inc. and Gelest Inc., to provide them with materials and technical information. In addition, Hybrid Plastics is earning a profit in only its second year of business and has reduced the cost of certain POSS monomers. Other results from this technology transfer include a $2 million Advanced Technology Program grant from NIST and the creation of eight patents.

Primarily developed to meet military needs such as lighter weight, higher performance rocket motor insulation, POSS has the potential to significantly influence-and even revolutionize-the $140 billion American plastics industry. Commercial chemical companies now sell and distribute POSS monomers, and 25 specialty firms in the polymer industry are incorporating the material into their manufacturing processes.

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The LASFORM Rapid Prototyping System

Walter Roy, Daniel Snoha, Robert Dowding, Walter Roy, Frederick Stenton, Dr. Frank Arcella, Dr. Donald Krantz - U.S. Army Research Laboratory

A team of ARL and AeroMet Corporation engineers has successfully transferred a new rapid prototyping technology-the LASFORM laser forming system. This technology is a flexible, one-step process method by which a precursor material (usually a powdered metal introduced into a laser beam) is deposited as molten droplets onto a metallic substrate located beneath the focused beam. Through computer instructions, a multi-axis positioning system drives the substrate in motions reproducing a horizontal layer, or slice, of the part as described by a computer-aided design (CAD) model. After the initial layer has been deposited and fused to the substrate, the beam and powder delivery subsystem are indexed in the vertical direction by an amount equal to the layer thickness. A layer-upon-layer deposition sequence is then repeated until the desired density is achieved. Although other rapid prototyping processes are available, none has the size capability of LASFORM and the properties of their prototyped parts do not have sufficient strength or toughness to be used in the field.

The transfer effort is being executed through a CRADA between ARL and AeroMet (a subsidiary of MTS Systems Corp.) of Eden Prairie, Minnesota. AeroMet was founded in 1997 with the sole purpose of commercializing LASFORM, as well as capitalizing on ARL's vision and direction in rapid prototyping. To that end, AeroMet installed and is now operating the large-scale laser-forming system in its 16,000-square-foot facility. A number of companies are now evaluating the technology for reducing the cost of traditionally cast and forged components. Nontraditional partnerships have also been formed with companies such as General Electric and Wyman Gordon to share data and reduce the cost of exploiting new manufacturing processes. Also, AeroMet was awarded a $160,000 contract from Boeing, as part of a larger effort with the Navy, to demonstrate the viability of the LASFORM process in producing and repairing hard-to-get titanium spares for aircraft and ship applications.

LASFORM has produced benefits for AeroMet, which now can produce traditionally high-cost parts for both commercial and Department of Defense aerospace applications. Other users such as the Navy are seeing the cost of parts production decrease as much as $50 million.

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A Maximally Secure Computer Network for Processing Highly Sensitive Data

Ross Seybold, Stephen Bouthillier, Robert Sulkowski, Dana Kellogg, Brian Dodge, Randall Morse, Sydney Blowers, Kenneth Wesche, John Seybold, and James Pinnell - Naval Air Warfare Center Weapons Division

Information is precious. To the government, private sector businesses and financial institutions, the information that resides within a computer or server is often the organization's most valuable resource, its very lifeblood. In 1997, NAWCWD entered into a CRADA with Market Central, Inc. and Radionics, Inc., two leading companies in the information/physical security field. The purpose of the agreement was to investigate methods for achieving very high levels of computer security within a flexible system architecture adaptable to any computer-intensive industry.

The CRADA partners used a hardware approach to complement and extend - rather than duplicate - such widely used security techniques as encryption and firewalss. The result of this cooperative effort was the development of two security products now being marketed by the commercial partners - the Readykey Information Security System for Computers by Radionics, and the SecureSwitch Information Security System (SSISS) by Market Central - as well as seven licensed inventions.

The systems developed under the CRADA use an access card and a code, or PIN number issued to each user. The system is configurable to give varying degrees of access. Access rights can range from physical entry into the computer facility only, to use of select computers and servers, to blanket access to an entire corporate system. The system maintains a detailed log of user access. If a user attempts to gain access to an unauthorized area, computer, or server, the consequences can range from simple access denial to security alarm activation and armed response.

A unique aspect of the system is that until access authorization has been determined by the security system, the computers and servers are physically isolated by unique electronic switches. Under the CRADA, Market Central and the Navy co-designed and developed three computer-platform switches to control electrical power and network connections. Radionics provided the hardware/software expertise to interface the three switches with existing Radionics access-control products.

This CRADA provided a framework for the successful transfer of cutting-edge security technology to the private sector. Ultimately this cooperative effort will result in a higher level of security throughout the information-technology infrastructure, thereby benefitting industry, government, and consumers.

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Representative of the Year Award
Cynthia E. Gonsalves, DoD Technology Transfer Program Manager

Ms. Gonsalves has been instrumental in increasing awareness of technology transfer in the DoD. She was involved in the extensive revision of the agency Web site, increasing the number of site traffic to thousands of hits a week from internal and external users. In addition, Ms. Gonsalves demonstrated an unflagging committment to a congressionally funded effort to transfer DoD technology to organizations in the Northwest U.S. through the TechLink Center.

An active participant in numerous FLC activities, Ms. Gonsalves has extolled the benefits of tapping into FLC resources to agency representatives, laboratory directors, and ORTAs. Highly regarded and respected by her peers, Ms. Gonsalves is singularly proactive in identifying, initating and completing efforts to benefit every member agency and laboratory of the FLC.