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

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This report responds to 10 USC 2515

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EXECUTIVE SUMMARY

The Office of Technology Transition (OTT) was established 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 Section 2515 (See Appendix A), summarizes the accomplishments and highlights key technology transfer efforts throughout the Department for FY 2002 and FY 2003.

This tenth report discusses our major successes in transferring technology using methods discussed in Section B of this report. Appendix B provides the number of reported active technology transfer mechanisms by laboratory centers for FY 1998 through FY 2003. Appendix C displays specific data elements showing the trends in Cooperative Research and Development Agreements (CRADA) and Patent License Agreements (PLA), and the increase in royalty income as a result of licensing DoD developed technologies. Appendix D highlights some of the technology transfers such as “the Vein Viewer” which is a system and method for enhancing visualization of veins, arteries, and other subcutaneous natural or foreign structure in the body. Appendices E and F provide the details of the Federal Laboratory Consortium (FLC) awards to DoD activities for FY 2002 and FY 2003, respectively.

In FY 2003, DoD had 361 active patent license agreements which generated over $9.9M in royalties. It was actively engaged in 2,134 partnerships using CRADAs with revenues in excess of $51 million. Recognizing that the true value of CRADAs and PLAs is significantly higher than the income generated, some specific highlights are:

- The Naval Surface Warfare Center, Carderock Division, developed the combined wedge flap for improved ship powering in the range of 5 to 15%; increased top speed by nearly 1 knot, and produced annual fuel savings of $195,000 per ship. The Navy fuel cost savings as of this date is $29.8 million.
- A low-cost escape mask that uses microfibrous filter technology previously funded by the Missile Defense Agency is on the market.
- An Air Force Research/Laboratory Air Vehicles Directorate scientist and an independent inventor jointly developed a high efficiency forced air snow remover. To date, 138 military de-icing vehicles have been delivered to the Air Force, and 40 commercial vehicles have been delivered to the commercial airline industry.
- BiSkit, a Biological Sampling Kit, was non-exclusively licensed in April 2003 to Quicksilver Analytics, Inc. (QS) to meet the challenges presented by anthrax contaminations. It is currently in full-scale manufacturing to provide 3,000 kits for the Department of Homeland Security.

The use of Independent Research and Development (IR&D) information from the IR&D database is a tool to seek and start new research and development (R&D) partnering projects required by the DoD. Some of the activities initiated as a result of using the database are:

- In FY 2003, the U.S. Army Research and Development Command's Communications and Electronics Research and Development Center (RDECOM CERDEC) conducted 17 technical interchange meetings with private industry. One successful outcome is the establishment of a joint group between RDECOM CERDEC and General Dynamics to work Science and Technology (S&T) initiatives weekly with meetings between engineers.

- The U.S. Army Benet Labs/Watervliet Arsenal in New York and Picatinny Arsenal in New Jersey are working with local communities to establish business and technology partnership centers on site. These partnerships take advantage of laboratory and manufacturing space on military installations that might be used by small business and academia to develop capabilities, while providing on-site training for the installations.

Other programs within the OTT supporting transfer technology efforts include:

- The IR&D program has developed a database that will improve the way DoD program technology is communicated to industry. The IR&D database is accessible to DoD users. This service will identify defense needs, and will avoid duplication of contractor IR&D activities funded directly by DoD.

- The DoD Manufacturing Technology Program focuses on production and development efforts early in the design phase. It is an important link for technology inventions, to production of defense critical needs, and to ensure manufacturing of DoD weapons are affordable and deployable anywhere in the world.

- The Defense Production Act (DPA) Title III mission is to improve the overall quality of manufacturing technology products to the DoD warfigher. It provides a cost-effective method to develop and implement technology service on demand within the U.S. For FY 2003, the DPA has implemented eight projects to meet the needs of the DoD warfighter. This information is highlighted in Section E of this report.

We anticipate these focused efforts to enhance our transfer opportunities and provide increased technical capabilities available for the warfigher—the ultimate customer of DoD's technology investments.

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INTRODUCTION

Section 2515 of title 10, United States Code (Appendix A) directs that the Secretary of Defense shall establish within the Office of Secretary of Defense (OSD) an Office of Technology Transition (OTT). 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 the Defense; identify R&D activities that result in technology advances that have potential for non-defense commercial applications; serve as a clearing house for, coordinate, and actively facilitate the transfer of such technologies and technological advancements to the private sector; conduct its activities in consultation and coordinate 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 tenth report.

The FY 2004 Defense Authorization Act (Section 1031(a)(23)) changes the frequency of this report to biennial, and requests it be submitted in even-numbered years. The report is to contain discussion of the accomplishment during the two fiscal years preceding the fiscal year in which the report is submitted.

This is the tenth report on the activities of the Office of Technology Transition (OTT). This report does not include technology transfer efforts from the Defense Technical Information Center (DTIC) or the Small Business Innovation Research (SBIR) Program which was included in previous reports. DTIC now is organizationally under the Defense Information Systems Agency and their efforts are reported through that channel. However, DTIC continues to maintain information systems to assist in oversight of the Technology Transfer Program. These systems are the Defense Technology Transfer Information System (DTTIS) and the Independent Research and Development (IR&D) database supporting the IR&D program. At one time, the OSD SBIR program was managed from OTT; however, when OTT transferred into the Office of the Deputy under Secretary of Defense for Advanced Systems and Concepts in June 2002, the SBIR element remained in the Office of the Deputy under Secretary of Defense for Science and Technology.

A. Defense Technology Transfer

The Department of Defense (DoD) Technology Transfer Program is implemented through a decentralized process. Each Military Service and participating Defense Agency has guidance for implementation along with an Office of Research and Technology Applications (ORTAs) at each laboratory and technical activity plus patent attorneys located at the various sites, and the appropriate authority to transfer technology both into and out of the laboratory. While this decentralized approach allows the local technology transfer processes, procedures, and projects to fall within the specific mission-related activities of the local laboratories, there is overarching DoD guidance in place to ensure common policy and objectives.

Technology Transfer mechanisms can be beneficial in a wide range of DoD organizational activities. These mechanisms can improve R&D efforts, bring in commercial technology to enhance warfighter capabilities, introduce a product in the commercial marketplace which may reduce the long term purchase cost to DoD, and provide an effective method to establish partnerships with the private sector.

In this report, specific technology transfer statistical data elements are included in Appendix C. While these data give an indication of the level of activity, they do not give the most definitive pictures of the benefits of technology transfer mechanisms to DoD. These benefits are reflected in Appendices D and E of this report highlighting awards received and successful transfer of technology for commercial and military application.

B. DoD Technology Transfer Program

The DoD Technology Transfer Program is unique in the federal government because DoD is the primary customer of the technology being developed in our laboratories and through contracts for military items. Other Federal Departments develop technologies for private sector consumer use or other Department use. Because the DoD focus is on military requirements, there may be less opportunity for commercial applications; however, where appropriate, we continue to pursue suitable partners to engage in technology transfer efforts.

There are six specific areas of focus in the DoD technology transfer efforts in FY 2003:

1. Patents/Royalties/CRADAS
2. Conference and Tradeshows
3. Technical assistance provided to local and small business
4. Independent Research and Development (IR&D) to find partners for R&D efforts
5. TechLink and other Partnership Intermediaries under 15 USC 3715
6. Transferring technology in support of Homeland Security needs.

Each of these areas is discussed below followed by other ongoing activities, lessons learned, and the program plan for FY 2004.

1. Patents/Royalties/CRADAs

Appendix C is a spreadsheet with the specific data elements in response to P.L. 106-404, Section 10. This legislation requested information on plans for conducting technology transfer, plans for securing Intellectual Property (IP) rights in laboratory innovations with commercial promise, and plans for managing laboratory IP so as to advance DoD's mission and benefit the competitiveness of the U.S. industry.

DoD's investment in technology R&D is to ensure we can provide the military forces with the capabilities needed to deter war and to protect the security of our country. However, this R&D must be in a form which can be useful to forces i.e., in a product, system, or component part. One way to ensure technology usage is through licensing. Additionally, where possible, DoD would like to purchase from an economically viable industry which can produce items for both military and commercial applications. According to the Greater Washington Board on Trade's Report, *Technology Commercialization in Greater Washington: January 2004 Benchmark Study,* "Licensing…is a fairly robust indicator of the level of technology transferring out of research institutions and into the commercial sector."

The FY 2003 Senate Armed Services Committee Report accompanying the Defense Authorization Act for FY 2003 requested a report and plan on patenting and licensing DoD inventions with an emphasis on increasing the royalty income. Royalty income has increased and, as result, we are finding that the medical field is producing the largest revenue stream to DoD thus far. Royalties are used for other R&D efforts on technologies with commercial potential, inventor share, legal costs associated with world-wide patent applications, and other awards. We have completed this study and plan to submit to Congress after internal coordination is complete. In the meantime, we believe the following two charts show the trend in Patent License Agreements (PLAs) and the increase in royalty income as result of licensing DoD developed technologies.

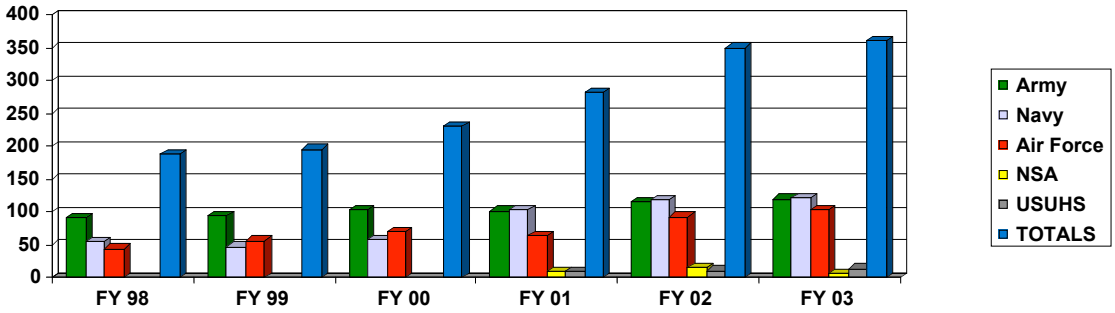


Chart 1: Number of PLA by Military Service/Defense Agency

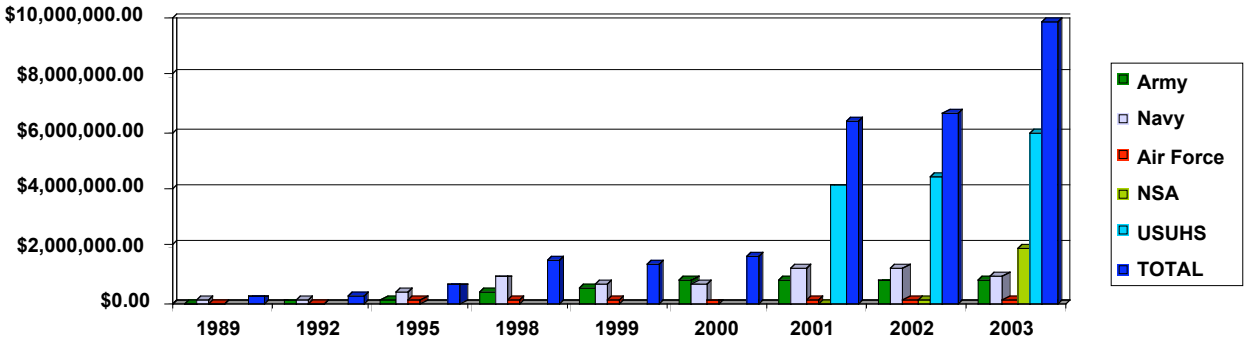


Chart 2: Royalty Income Fiscal Years 1989, 1992, 1995, 1998, 2000, 2001, 2002, 2003

Cooperative Research and Development Agreements (CRADAs) appear to be relatively stable in number after a rapid build-up in the 1990s and hover at around 2,000 active CRADAs per year. In FY 2003, DoD was actively engaged in 2,134 partnerships using CRADAs. CRADAs are agreements outside the Federal Acquisition Regulations with intellectual property (IP) protection for the private sector partner as well as the flexibility of working on joint R&D of technologies having both commercial and military applications. The appearance of a decline in the actual numbers of CRADAs from FY 2000 to FY 2002 is not a decline in usage; rather, this is a correction in the way Material Transfer Agreements from

one organization was reported previously. In some technical areas, CRADAs are the only tool used for research. For example, CRADAs are essential to conduct clinical research studies at Army medical treatment facilities. In CRADAs, federal government activities are allowed to accept funds from the private sector for joint research and/or development activities. The funds are used on the work covered in the specific CRADAs receiving the funds. This income is reflected in Chart 4 below.

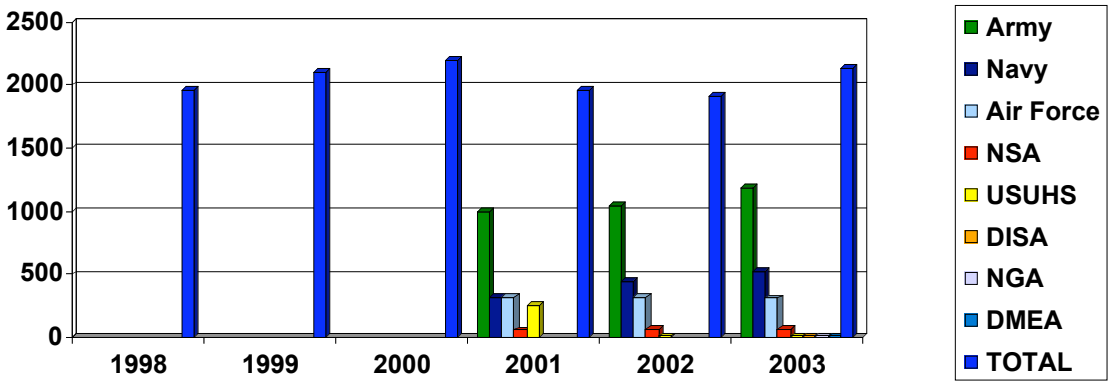


Chart 3: Number of Active CRADAs by Fiscal Years

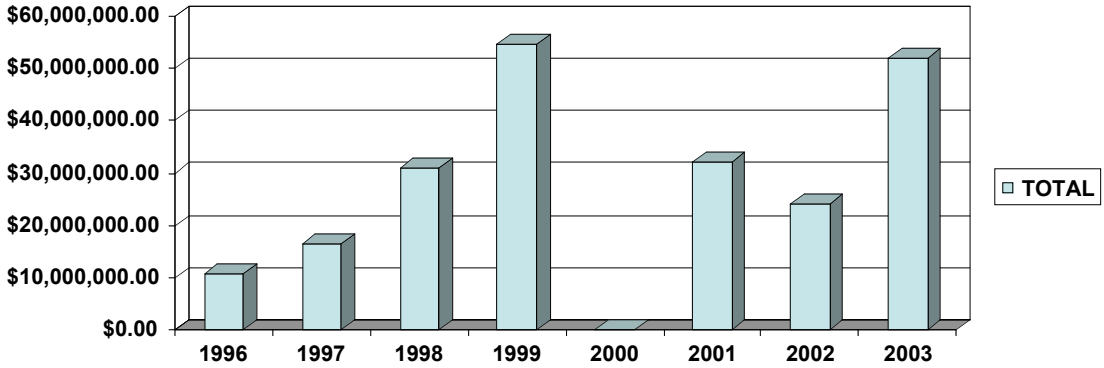


Chart 4: Revenue from Partners for Joint Development under CRADAs.

The DoD Technology Transfer Program is broader than patents, PLAs, and CRADAs. There are a variety of mechanisms which can be used. The combined number of technology transfer activities in FY 2003, identified by laboratory in Appendix B, includes PLAs, CRADAs, Facility Use Agreements, Personnel Exchange Agreements, and Educational Partnership Agreements.

2. Participation in Conferences and Tradeshows

DoD activities have participated in a wide variety of conferences and tradeshows with mixed results as far as the focus on transferring technology is concerned. Some have proven quite effective in showcasing technologies and finding partners interested in joint R&D efforts. Other conferences have not

proven as effective. We have reviewed and are now focusing on determining which conferences and tradeshows to participate in the future. Additionally, we are looking at who should attend these conferences and tradeshows. In some cases, the scientist may be the best source to have in contact with the private sector when trying to generate partnerships in specific R&D areas. However, the scientists need to know what tools are available (i.e., CRADAs) and how to use them if s/he represents the laboratory at conferences/tradeshows. Here are some specific examples of where conferences and tradeshows have been worthwhile:

- The Maryland Technology Development Corporation's (TEDCO) Federal Laboratory Partnership Program, whose goals are to create awareness of technologies available in Maryland federal laboratories, improve Maryland companies' technical skills, increase product development and prototyping for early-stage product development, and strengthen Maryland's economy. The program allows companies to reduce costs of technical assistance from the federal laboratories. TEDCO sponsored several conferences and tradeshows which were of value to DoD laboratories:

    - "Emerging Technologies and Opportunities: Bioscience, Health, and Medical Technologies" were the theme of the Army Research Laboratory". On March 26, 2003, this showcase was hosted by the Aberdeen Proving Grounds (APG) a featured presentation from five of the APG tenants (CHPPM) US Army Medical Research and Material Command, ARL, MRICD, and Edgewood Chemical and Biological Command. Some of the specifics outcomes are:

        - There are 19 articles in the local media related to the showcase
        - 114 industry contacts
        - Ten companies contacts that have led to negotiations for partnerships and agreements:
        - One company moved to Maryland to be closer to APG for collaboration (Clear Energy).
        - One purchase order from Army to a company to develop technology for the Army.
        - One CRADA in place and another in final signature process
        - One awaiting a licensing opportunity and CRADA.
        - One company leased office space in Harford County.
        - One MOA in place between APG BDO and Emerging Technology Center (ETC) Incubator.

    - "Expand Your Horizons: Commercial Success with Department of Defense Technologies" was the theme of the Indian Head Technology showcase. This was held in May 22 at the Indian Head Pavilion. This was an all-day event with an opportunity for private industry and others in government to receive an up close look into the IHDIV technologies

at capabilities with the express interest of working with IHDIV or transitioning it technologies into commercial applications. Some of the specifics showcases are:

  - Over 100 attendees
  - 63 industry concepts
  - Three company contacts that have led to negotiation for partnerships agreements.

- The Army Edgewood Chemical Biological Center (ECBC), the Naval Surface Warfare Center's Carderock Division, and the Naval Air Systems Command Paxtuxent River and Lakehurst Divisions have also participated in and benefited from technology showcases sponsored by TEDCO.

- Multi-state regional initiatives such as Strengthening the Mid-Atlantic Region for Tomorrow (SMART) continue to surface as concepts for partnerships and collaborations between the government labs, universities and industries. Many of the DoD laboratories in the mid-Atlantic region participated in the Delaware Tech Trends 2003 meeting sponsored by SMART. Although some relevant working groups exist in SMART, as with all conferences, participation is under review on annual basis.

- The Office of Naval Research (ONR) sponsored the Naval-Industry R&D Partnership Conference in August 2003. Their focus is to: expand understanding of Naval transformational capabilities and initiatives, learn about technological needs of today's Navy and Marine Corps, acquire insight into the Naval transformational technologies, network with key stakeholders in the Discovery to Deployment Process, hear about the "best-of-the best" ONR-sponsored technologies, gain knowledge of some of the innovative business practices on-going and planned with the DoD and Department of the Navy, and increase the prospective for matching commercial technology with emerging Naval needs. A pre-conference workshop, entitled, "Doing Business with the Navy 101", introduced various means of working with the Navy. Topics included were: contracts, grants, other transactions, security processes, CRADAs, Commercial Service Agreements, PLAs, Navy Acquisition, Research and Development Center (NARDIC), and opportunities for small business through the SBIR/STTR program and the Small Disadvantaged Business Utilization Office. A video of the session is included in the conference proceedings CD-ROM set.

- The Office of Naval Research-Pearl Harbor, the FLC Far West and Mid-Continent regions, the Pacific International Center for High Technology Research, and the State of Hawaii Department of Business, Economic Development and Tourism teamed for the TechEnterprise 2003 conference. This collaboration offered the opportunity to explore Hawaii's technology

programs and companies, to become familiar with ONR's vast fields of expertise and resources, and to expose opportunities available within the federal laboratories.

- The Air Force participated in a wide variety of conferences, some of which were to promote technology transfer, and some were to remain current in a technical area. Here are samples of these conferences: World Aviation Congress, 19th National Space Symposium, Global Air & Space, National Aerospace and Technology Conference, SAMPE International Symposium & Exhibition, SAMPE Technical Conference, Air Force Association Technology Exposition, AeroMat 2003, 7th Joint FAA/DoD/NASA Conference on Aging Aircraft, National Center for Manufacturing Sciences (NCMS/CTMA) and the U.S. DoD partnership Conference National Aeronautical Systems and Technology Conference, Manufacturing Conference, and the National Space & Missile Material Symposium.

3. Technical Assistance to Local and Small Businesses

DoD activities have worked with a variety of partners in seeking to transfer technology for both military and commercial use. We have worked with other Government Department laboratories; small, medium, and large private sector entities; and with the academic communities across the United States. We have found that to be most effective, some "hand-holding" is required to ensure small and medium businesses can get full value from the technology we are transferring. Therefore, we have undertaken specific technical assistance activities in support of transferring the technology. Some of these activities are:

- Lakehurst has employed 10 USC 2667 out-leasing authority to create a partnering agreement with Ocean County Vocational – Technical School, Career and Technical Institute. The following are examples of the success of this partnering agreement:
    - The vacated "temporary" building that was used as a Child Development Center is now used for a nursing program.
    - The abandoned Officer's Club is now used for a Culinary Arts Program which offers specially prepared meals to base personnel.
    - A newly renovated 43,000 square feet of hanger space for classrooms.
- The Army Aviation and Missile Research, Development, and Engineering Command's RD&E Center is a participant in the National Institute of Standards and Technology's Manufacturing Extension Partnership (MEP) Program in the State of Alabama as a technology resource. This allows the MEP Center to draw on technical assistance for local, small manufacturing firms.

- The Naval Undersea Warfare Center Division Newport (NUWCDIVNPT) has an umbrella CRADA with the Slater Center for Marine and Environmental Technologies (formerly the Slater Center for Ocean Technology). The Slater Center interacts with companies in Rhode Island and the northeast providing business development information and grants. Under this CRADA, the Division is able to give technical assistance to Rhode Island companies. NUWCDIVNPT works with the State of Rhode Island economic policy and technology councils to further assist the development and growth of the Rhode Island technology business base through CRADAs, technical assistance, and PLAs. NUWCDIVNPT also provides technical assistance to businesses in Connecticut and Massachusetts.
- As an example of day-to-day interaction, the Air Force Research Laboratory (AFRL) Material and Manufacturing Directorate received over 741 contacts via phone or e-mail in FY 2003 requesting technical assistance. These are primary calls to the technology transfer personnel who then directed the request to the appropriate personnel within the laboratory for assistance.
- The Naval Surface Warfare Center Dahlgren Division, both the Dahlgren site in Virginia and the Coastal Systems Station in Florida, provide technical assistance in response to state and local government requests.

- The Missile Defense Agency (MDA) has organized two specific technical assistance activities to ensure the new technologies have the best opportunity for use.

    - MDA Business Focus Workshops (BFWs) help technology entrepreneurs with Phase I MDA Small Business Innovation Research (SBIR) contracts to: (1) think through the process of transforming a technical development into product revenue. (2) place the SBIR project objectives in context with the company's business objectives, (3) make a credible business case, and (4) get realistic and supportive feedback on how to proceed. The BFW is an intensive, one-day meeting. After an introductory session with the entire group, each SBIR company is teamed with an NTTC commercialization engineer and a business consultant. Each team works independently for about four hours, covering a detailed topic list of business development issues. After this session, the company prepares a four-chart presentation that concisely summarizes the business case for their technology. The day concludes with each company presenting the charts to the entire group and receiving targeted feedback. The number of BFWs this year increased significantly as allowed by the Program budget and the increased number of Phase I awardees. Since January 2003, MDA sponsored seven BFWs regions held in Alexandria, VA; Phoenix, AZ; and Los Angeles, CA. At these meetings, in total, 74 companies were assisted.

- MDA Technology Applications Reviews. Technology Applications (TA) reviews is held two to five times each year to help MDA-funded researchers with innovations in the prototype stage of development commercialize their technologies. At these reviews, inventors present their technology from a commercialization perspective in a forum approach. A panel of 15 to 20 volunteer reviewers, expert in areas such as venture capital, intellectual property, and strategic partnerships, provide advice and business contacts. Unique to these reviews is the caliber of "advisors" who participate without compensation. The combined business acumen and collective technical experience of this group is essentially a "board of advisors for a day," a board that neither these companies could afford nor could the government provide from internal resources. Reviews are held regionally throughout the United States. In FY 2003, MDA sponsored three TA reviews that assisted 16 MDA-funded research efforts. Reviews were held in Arlington, VA; Alexandria, VA: and San Diego, CA.

4. Use of IR&D Information for R&D Partnering

Review of the IR&D database is required by DoD entities seeking to start new research projects. This is required to reduce potential R&D costs when industry may be doing research in a specific area or have completed research on the topic of interest. Searching the IR&D database also allows our scientists and engineers to begin thinking in a mode that will seek out collaborative relationships and leverage resources. Use of the IR&D database is becoming more prevalent in the search for partners in R&D within DoD. As one laboratory explained, "The IR&D program is also a contributor to technology transfer activities as it serves to inform government technologists about the progress and relevance of industry-initiated efforts that [could] support the DoD." Here are some specific examples:

- RDECOM CERDEC conducted 17 technical interchange meetings with private industry in FY 2003 and found them to be an excellent technology leveraging opportunity between government and private industry. One success story is with General Dynamic C4Systems: a technical interchange meeting resulted in a CRADA covering communications, command and control, and homeland security. One successful outcome is the establishment of a joint group between RDECOM CERDEC and General Dynamics to work S&T initiatives weekly with meetings between engineers.

- The U.S. Army's Benet Labs/Watervliet Arsenal in New York and Picatinny Arsenal in New Jersey as well as the Naval Air Warfare Center Aircraft Division Lakehurst have worked with the local community to establish business and technology partnership Centers on site. These are not-for-

profit organizations with a mission to transform the site into a center for technological and business excellence. These partnerships provide assistance with: location services, interface with the military organization, economic development assistance, and problem solving. In searching for companies to partner with for these Centers, the military organizations have searched the IR&D database to find companies with similar research interests to that occurring within the local military activity and approached them about these joint efforts. Both military and local, civilian needs are satisfied within these Centers.

5. TechLink and other Partnership Intermediaries

For the past several years, this annual report has discussed the usefulness of partnership intermediaries and has highlighted the DoD partnership intermediary, TechLink. This report continues this trend because TechLink is an integral part of the way DoD conducts its technology transfer efforts and because TechLink uses a "technology pull" approach in seeking technology transfer opportunities. We are including information on a few other partnership intermediaries this year in addition to a discussion on TechLink.

TechLink

TechLink has been highly effective at identifying prospective licensees for DoD-developed technologies and at facilitating PLAs between DoD labs and companies for these technologies. One major reason for this success is TechLink's "technology pull" or "market pull" approach.

Many technology transfer centers employ "technology push," in which they market their sponsoring organization's intellectual property by posting licensing opportunities on their web sites, staffing booths at trade shows, convening "industry days" that feature their technologies, or engaging in direct mail campaigns. By contrast to this technology-push approach, TechLink begins by identifying industry needs. This is done in two ways:

(1) In the Northwestern United States, TechLink makes a concerted effort to understand the key technology needs of specific companies. Then it seeks DoD technology to satisfy these company needs. This involves mining the entire DoD patent database to find suitable licensable technology. Alternatively, TechLink seeks the desired technology in DoD labs that have widely recognized strengths in the relevant technology fields. In essence, TechLink "pulls" technology out of the DoD lab system to meet specific industry needs. This effort is enhanced by TechLink's specialized expertise in nine different industry areas.

(2) TechLink also evaluates new licensable DoD technology for innovativeness, stage of development, and commercial potential (which is recognized, in part, by staff's familiarity with regional industry needs). When

TechLink has identified technology that is unusually strong in all three areas, it conducts extensive research nationally to identify the most promising commercialization partners. Prior to contacting each potential licensee, it develops a business case for the technology, focusing on how licensing this technology would help the company to achieve its business goals.

If TechLink staff members cannot find a match between company needs and DoD technology, they register the relevant data in a proprietary database and continue scouting. This database assists TechLink in matching technology needs with technology availability in the future. TechLink seeks to develop trusted relationships with both DoD labs and industry that lead to repeat patent-licensing opportunities.

In summary, TechLink's technology-pull approach is market-focused. While this approach to licensing DoD-developed technology is labor-intensive, it is effective because it is based on meeting key technology needs of specific companies.

Other partnership intermediaries supporting DoD technology transfer efforts are:

- The Defense MicroElectronics Activity ORTA works closely with the Sacramento based Federal Technology Center (FTC) in Sacramento, California, which is a non-profit California Corporation established to benefit the public by facilitating federal technology transfer and technology-based economic development in the Sacramento Region. The FTC serves as an intermediary between DMEA and local businesses and educational institutions to facilitate and maintain technology transfer and small business partnerships. The mission of The Federal Technology Center (The FTC) is to promote economic development by facilitating technology transfer between government and the private sector, and by helping small businesses successfully compete for government contracts. Major General Alice Astefan (Air Force, retired) is CEO of the FTC.

- A Partnership Intermediary and cooperative relationship has been established between the Navy Indian Head Division (IHDIV) and TEDCO to develop a more effective outreach program for small businesses, state agencies, and academic institutions to expand inter-utilization of technology and facilities of IHDIV. TEDCO will direct efforts to identify and solicit appropriate CRADA partners, from among the state small businesses and academic community, for direct collaboration with IHDIV. IHDIV will provide technical research, development, testing, and engineering activities, under a CRADA, with Maryland small business firms and educational institutions.

- IHDIV has a partnership intermediary agreement with the Municipality of Indian Head, Maryland. Under this PIA, IHDIV will identify to the

Municipality of Indian Head its inventions that are available for licensing. The Municipality of Indian Head, with the assistance of appropriate State organizations such as the Maryland Department of Business and Economic Development, will attempt to locate and identify to IHDIV small businesses within its area of responsibility that have an interest in licensing IHDIV Inventions. IHDIV will engage in discussions with these interested businesses with a view toward reaching a Patent License Agreement. Such discussions and any resulting Patent License Agreement will be accomplished in full accordance with all applicable Federal laws and regulations. The Municipality of Indian Head may choose to provide such other assistance to interested small business as is consistent with its enabling legislation and municipal ordinances. All the efforts by both Parties are ultimately directed toward new business development opportunities, and the creation of new jobs.

- The Air Force Research Laboratory's Information Directorate at Rome, New York, has a partnership intermediary, New York State Technology Enterprise Corporation (NYSTEC), to assist in determining market demand for highly marketable technologies and to assist in licensing opportunities. The interface between AFRL/IF and NYSTEC provides one avenue to work with the NY state Office for Technology and the state Emergency Management office for homeland defense/security applications of AFRL/IF technologies.

- The Air Force Research Laboratory's Space Vehicle and Directed Energy Directorates at Kirtland Air Force Base in Albuquerque, New Mexico, utilize the New Mexico Institute of Mining and Technology (Tech) as its' Partnership Intermediary. Tech, under a joint powers agreement with the New Mexico State Department of Economic Development, was designated as the lead agency for technology transfer conversion for all public and private sector organizations within the state. This partnership intermediary brings to the ORTA an outside professional economic development perspective with over 125 man-years of economic development and technology commercialization experience to tech transfer that includes:

    - Assessing the financial viability of potential CRADA partners and patent licensees;
    - Reviewing, in conjunction with the ORTA, the necessary documentation required relative to CRADAs, patent disclosures, applications and licensing of patents with public and private sector organizations;
    - Identifying, in conjunction with the ORTA, other technology transfer objectives, that may be incorporated into the technology transfer plan;

- Screening technical assistance requests from businesses to VS for referral to appropriate national, regional, state and local government organizations involved in fostering business development; and
- Supporting the development and implementation of the business and marketing plan to aggressively find matching funds for the marketing and promotion of AFRL/VS programs and activities.

6. Transferring Technology in Support of Homeland Security Needs

This report is on the activities of the Office of Technology Transition and documents some of the programs in transferring technology both to the private sector and for military application. This section does not provide the totality of what is happening in the Department of Defense to support the Department of Homeland Security nor specific activities in assisting local communities respond to emergencies. Rather, this section provides some examples of what is happening across the Department to support first responder use of DoD technologies and make capabilities available at the local first responder level. Here are some of these examples:

- The Army's Edgewood Chemical and Biological Command (ECBC) maintain a number of relationships with other Government Agencies (OGAs), federal and state, which involve the exchange of technological expertise and capabilities. Such relationships are administered through different types of documents, including Memorandum of Agreement (MOA), Memorandum of Understanding (MOU), Interagency Agreement (IAA), and Inter-Service Support Agreement (ISSA). Eighteen new agreements with OGAs were initiated in FY 2003, with 11 additional agreements active. While these agreements are not traditionally considered the venue for the technology transfer program, significant results were obtained in transferring technologies developed by ECBC for military defense applications to the new homeland security objectives, thus resulting in both enhanced public safety and savings.

- The U.S. Army Space and Missile Defense Command (USASMDC), located in Huntsville, Alabama, signed a Memorandum of Understanding with the City of Huntsville to facilitate potential transfer of USASMDC-developed technologies for homeland security applications.

- The USASMDC Battle Lab is working under a CRADA with Quantum Research, Inc., to develop a prototype rapid disaster response civil communications and coordination capability. This agreement also will be used to transfer technological innovations to specific disaster response and homeland security applications outside DoD.

- The U.S. Army's Natick Soldier Center's National Protection Center (NPC) has been an integral part of a CRADA with the Oklahoma City Memorial

Institute for the Prevention on Terrorism (MIPT). The effort addresses research and development of thermoelectric cooling and battery technologies for future integration into a cooling garment for public safety and emergency response operations. The NPC is serving as MIPT's Technical Program Manager for a contract being awarded by MIPT to a team lead by Oklahoma State University. NSC subject matter experts provide technical support and expertise to this team. Additional benefits include ongoing NSC protective clothing and equipment research and development programs are leveraged by this effort.

- The Naval Air Systems Command Weapons Division Point Mugu is working with Capital Broadcasting Corporation via a CRADA to investigate coordination of communication with state and local governments, private industry, and the public about threats (terrorism), natural disasters, and preparedness when practical.

- The Navy Clothing and Textile Research Facility are supporting our ability to make available new products for homeland security needs. They are working with private sector companies to test a variety of capabilities, including evaluation of the Wireless Firefighter Ensemble and testing to establish data to be used as a heat stress predictive model.

- The Naval War College technology transfer activities during 2003 have focused again on national security issues, specifically homeland defense. Through the use of various facilities, expertise, and technologies, the War Gaming Department (WGD) has established a reputation for assisting state and local government agencies by applying military thought processes to the understanding, analysis, and improvement of domestic preparedness plans. Agencies have been subjected to simulated events that stress the implementation and mechanics of their plans. In turn, the Department has benefited by increased awareness of issues confronting agencies in their efforts to prevent or respond to acts of terrorism against the United States. WGD military partners include the Navy, the joint community (e.g. JFCOM, MSC), as well as the other Services. WGD non-military partners are principally civilian homeland security and defense agencies at the municipal, state, and federal levels. The example include:

    - Federal Emergency Management Agency (FEMA) Region I5
    - National Guards of the Northeast states
    - Rhode Island and New York City Emergency Management Agencies
    - The senior elected leadership, specifically the Mayors, of Providence and New York
    - Municipal first responders, e.g. fire and the police departments.

- Engineers at the Air Force Research Laboratory Materials & Manufacturing Directorate have developed a deployable, lightweight vehicle that provides crash and rescue firefighting capability in a variety of mission profiles. The First Response Expeditionary (FRE) Fire Vehicle, developed to meet Air Combat Command and Civil Engineering requirements, has already established its value during Operation Iraqi Freedom, when several of the units were deployed to protect helicopters, aircraft, tent cities, and other bare base operations. (See Appendix D for photograph and additional information)

- The AFRL Space Vehicles Directorate has a CRADA with KOB-TV for the Pinpoint WeatherNet Project (PWN). PWN provides high quality weather stations for New Mexico middle schools. In FY 2002, PWN became part of the Homeland Security WeatherNet Network, a partnership between the National Weather Service and Automated Weather Source.

Other Ongoing Activities in FY 2003

Ongoing activities in which DoD worked in FY 2003 and are continuing into FY 2004 include the following groups, projects, and systems.

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. Two of the areas addressed this year are:

- First Responder Technology Transfer Initiative
- General Accounting Office data collection

DoD Technology Transfer Integrated Planning Team (TTIPT) Workshop

The seventh DoD TTIPT Workshop was held in November 2002. Over one hundred technology transfer professionals gathered to discuss joint projects, best practices, lessons learned, and to hear about new legislation and information sources that will affect current technology transfer efforts. Each Military Department provided an update on its technology transfer program implementation. The DoD partnership intermediary (TechLink) discussed how they are supporting technology transfer activities. Also highlighted were the use of Small Business Development Centers, a discussion on the changing role of technology transfer as it supports acquisition, training sessions on technology transfer basics and mechanisms, best practices in valuation, structuring licenses, marketing, and commercialization strategies, and legal issues. Additionally, roundtable discussions were held on three topics: the role of the ORTA, and

what the position description should contain, patent office fees and other legal issues, and evolving DoD policy in technology transfer.

Interagency Working Group on Technology Transfer (IAWG/TT)

The three Military Services and DoD continue to participate with the other Federal Departments and 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. The IAWG/TT has proven to be an effective mechanism for discussions among the Federal Departments and Agencies and for identifying ways to showcase success in technology transfer activities.

Federal Laboratory Consortium for Technology Transfer (FLC)

The Military Departments and Defense Agencies have been participating in the 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 benefit DoD.

The FY 2002 DoD financial payment for the operation of the FLC as specified in 15 USC 3710(e)(7)(A) was $702,696 and in FY 2003, DoD's contribution was $752,038. We are working closely with the FLC to ensure DoD obtains value for this investment.

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 2002 Department of Defense winners of the Award for Excellence in Technology Transfer are identified along with a description of their technology in Appendix E. Additionally, Appendix E identifies the Laboratory Director of the Year, Mr. Brian Simmons, from the U.S. Army Developmental Test Command; the FLC Service Award winners (all from DoD): Harold Metcalf Award for sustained significant service to the FLC, Mr. Richard Dimmick; Representative of the Year for the most significant contribution to the FLC program, Mr. Patrick Rodriguez; and the Outstanding Service Award for notable contribution, Ms. Mary Weiss. A new award was given in FY 2002, the FLC Innovative Partnership Award was presented to Dr. John Dinan from the U.S. Army Communication-Electronics Command, Research, Development and Engineering Center for showing the greatest commitment to the long-term results of technology transfer.

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 DoD personnel hold positions in the FLC in FY 2003:

FLC Position	Name/Organization
FLC Chair Chair, Planning and Policy Committee Chair, Nominating Committee	Ed Linsenmeyer, Naval Surface Warfare Center, Coastal Systems Station
Chair, Program Committee	Norma Cammarata, Army Research Laboratory
Chair, Legal Issues Committee	Robert Charles, Army Medical Research & Materiel Command
Recording Secretary	Geoff Phillips, Defense MicroElectronics Activity
Coordinator, Northeast Region	Hans Kohler, Naval Air Warfare Center, Aircraft Division, Lakehurst
Coordinator, Mid-Atlantic Region	Dr. J. Scott Deiter, Naval Surface Warfare Center, Indian Head Division
Coordinator, Southeast Region	Kelly McGuire, Army Aviation and Missile Command RD&E Center
Coordinator, Far West Region	Kurt Buehler, Naval Facilities Engineering Service Center
Deputy Coordinator, Northeast Region	Hans Kohler, Naval Air Warfare Center, Aircraft Division
Deputy Coordinator, Mid-Atlantic Region	Henry Strunk, Naval Surface Warfare Center, Carderock Division
FLC Executive Board Member-At-Large	Sharon Borland, Army Cold Regions Research and Engineering Laboratory
FLC Executive Board Member-At-Large	Soheir Ibrahim, Army Yuma Proving Grounds
FLC Executive Board Member-At-Large	Mary Weiss, Defense Technical Information Center

In addition to the above positions, Mr. John Todaro, Director, Office of Technology Transition, Office of the Deputy Under Secretary of Defense (Advanced Systems and Concepts) is serving on the National Advisor's Board to the FLC.

Websites

Each of the Military Services, Defense Agencies, and Office of the Secretary of Defense maintain technology transfer websites to inform the public and make available general information on this program. These websites provide information on how to contact the ORTA for technology transfer opportunities, training, success stories, and mechanisms and agreement examples to facilitate joint research and development efforts and transfer technology to the private sector. These websites are:

http://www.dtic.mil/techtransi
http://www.arl.army/tto/adtt/
http://www.onr.navy.mil/sci_tech/industrial/tech_tran/how_help.htm
http://www.afrl.af.mil/techtran/index.htm
http://www.acq.osd.mil/bmdo/bmdolink/html/transfer.html
http://www.nsa.gov/programs/tech/index.html

In addition, the Office of Naval Research has launched Phase I of a new website, http://www.navytechmatch.com to promote interactions between the Navy, industry, and academia. Developed in collaboration with the West Virginia High Technology Consortium Foundation, the site includes Navy patents available for licensing and Navy facilities in a concise searchable format. The next phase will bring in opportunities to work with the Navy and successful partnerships. Our future plans are to expand the site to include the other Military Services and Defense Agencies.

FY 2004 Plan for Conducting Technology Transfer

Technology transfer is more than giving industry access to DoD's technologies. It includes working with industry to ensure the transfer occurs in a way that makes the technology usable and is available in the future to meet DoD needs. Part of the success of DoD technology transfer efforts is the need to review lessons learned and apply them as we move forward. In our last report, we identified specific lessons learned and we used these to improve our technology transfer activities.

Key Lessons Learned in FY 2002 and FY 2003

We review technology transfer activities at least annually to find what is working well, both from a process and procedural as well as technical capability standpoint. Some of the lessons learned are:

- We need to more carefully review the credentials and technical capabilities of companies seeking to enter into partnering agreements, especially small businesses and foreign entities to ensure they are capable of performing at the necessary level.
- Cooperative research can leverage the private sector work in technologies that are the key to Transformation.
- CRADAs should not be written so broadly that intellectual property can be lost.
- Technology transfer should be used strategically versus tactically in the organization's overall investment strategy. We need to integrate technology transfer activities into the entire business and laboratory processes.
- Technology transfer programs need to be integrated into technical activity roadmaps to bridge resource gaps, to leverage available resources, and to assist in identifying commercial applications for the technology. Multiple uses of a technology build an industrial base that should lower the acquisition cost for military applications.
- The ORTA must be familiar with lab technologies as well as commercial businesses to fully understand the potential for Technologies—only then can successful leveraging occur.

- Coordination of Intellectual Property through the ORTA is slowly improving.
- Analysis of the patent portfolio should be a continual process.
- There is a need to affirm IP protection as a priority (e.g. disclose first—publish after) philosophy is to replace publish or perish mentality. Patents should have at least equal status with publishing. IP is critical to most past, current, and future technology transfer and dual use activity.
- In reviewing quality indicators for this program, looking at revenue from the technology transfer agreements does not take into account the in-kind R&D services and "spin-on" technologies thus obtained by the Government through these collaborations, but it does provide an objective metric.
- Operational tempo for many of our laboratories/technical activities continues to be exceedingly high; therefore, information and processes associated with technology transfer must be succinct, targeted, effective and efficient.
- There must be a clear linkage between every technical effort and user requirements. Increasingly technology transfer programs are integrated into the technology roadmap and resource gaps are readily apparent. Senior leaders and experienced program managers are increasingly savvy about the potential for T2 tools such as CRADAS, partnerships, etc., as a means of bridging these gaps.
- The Office of Naval Research sponsored an Innovation Intellectual Property Training Project at the Naval Surface Warfare Center Carderock Division in FY 2003. Innovation Business Partners, Inc. facilitated four teams in deploying commercial business practices to solve naval technical problems. By defining and following a set of procedures to leverage intellectual property in the U.S. Patent and Trademark Office, the teams produced nine invention disclosures and one product acceptance plan to test the viability of an existing commercial solution. All of this in the two month span of this short-term pilot.

As we seek to include these lessons learned into our activities, we continue to pursue joint efforts with the private sector. Part of this effort to work jointly is an awareness campaign. There are private sector opportunities but, because the laboratory capabilities are not known, these opportunities don't occur. And, there are opportunities from within the laboratories/technical activities that do not occur because many of our scientists, engineers, and other employees are not aware of the tools available to facilitate these joint efforts. We are actively performing outreach and in reach activities -- out to the private sector and into our staff. These outreach and in reach activities include:

- To the private sector: newly patented technologies are advertised in a variety of publications, including the "Federal Business Opportunities" for potential licensing. Information packets on many of these technologies also are mailed to companies identified as having potential interest in specific technologies.
- To the laboratories and technical activities: we will provide training sessions to technicians, technologists, engineers, scientists, and management.

Future

We plan to continue seeking to make technology transfer an integral part of the planning process so we can maximize the effectiveness of our S&T program. We intend to deliberately participate in value-based, mission-related technology transfer activities that derive value to the Department and for our partners. We are seeking to ensure every DoD activity uses technology transfer mechanisms strategically to manage field level R&D. Leveraging resources is a key benefit of technology transfer activities within DoD.

We anticipate submittal of our report and plan on patenting and licensing DoD inventions with an emphasis on increasing the royalty income and to be more aggressive in marketing DoD-owned IP as requested by the FY 2003 Senate Armed Services Committee Report accompanying the Defense Authorization Act for FY 2003.

Cooperative activities with other federal departments, the private sector, and Congress are ongoing within DoD. We anticipate these efforts continuing, including participation in the conferences and tradeshows discussed above.

A new effort in FY 2004 is partnering with the Department of Commerce (DoC) Manufacturing Extension Partnership (MEP) program under the leadership of the National Institute of Standards and Technology. We believe this offers a significant opportunity to provide support to small businesses developing manufacturing capabilities around DoD technologies as well as the capability to assist these companies provide new products to DoD. The main objectives of the Memorandum of Understanding (MoU) between DoD and DoC will be to accelerate the transition of technology to the commercial industrial base, establish a rapid response defense manufacturing supply chain, reduce manufacturing costs, and expand the supplier base for surge requirements. Leveraging DoD's expertise and MEP's national service delivery network will more efficiently use U.S. tax dollars to advance defense capabilities and strengthen the U.S. economy.

Increasingly, we're doing technology transfer not because it is legislatively mandated, but because it enables the mission and are a good business practice. We note that, in support to our warfighters, many times technologies that are

currently being deployed were developed using technology transfer mechanisms. Here are a few examples:

- The U.S. Army Tank Automotive Research and Development Center (TARDEC) Mobile Parts Hospital employs technology originally developed under a CRADA and have been deployed to Kuwait for fabricating and repairing automotive and other parts that have been lost or damaged.

- The U.S. Army's Electronic Proving Ground developed the Modular Covert Remote Electronic Warfare Simulator (MCREWS) which now has interest from the other Military Services. It was developed as a developmental test tool but is now being applied to the training needs of the U.S. Marine Corps.

- Under a CRADA with American Ordnance LLC, IHDIV develops explosives, explosive processing methods and explosive loads for Navy weapons systems. American Ordnance has a contract with the Army to run government owned explosive production facilities and will be setting up a cast-PBX explosive loading capability for the development and deployment of insensitive explosive loads for the DoD. IHDIV will assist American Ordnance in setting and proving out the new capability.

We anticipate these focused efforts to enhance our transfer opportunities and provide increased technical capabilities available for the warfighter – the ultimate customer of DoD's technology investments.

C. Independent Research and Development Program

Independent Research and Development is R&D initiated and conducted by defense contractors' independent of DoD control and without direct DoD funding. IR&D includes: basic research, applied research, development, systems and concept formulation studies. IR&D does not include R&D performed under a grant or a contract from the Government, and does not include technical effort to support bid or proposal activities. DoD Components are required to consider work and accomplishments of contractor IR&D program when planning, programming and budgeting for DoD-funded R&D. DoD policy encourages contactors to undertake IR&D activities that may further national security in a broad sense, may lead to a superior military capability, or may lower the cost and time required for providing that capability. IR&D costs are recognized as necessary for doing business, particularly in a high-technology environment, and are recoverable as "indirect expenses" on contracts covered by DoD cost accounting standards (CAS). Policy on IR&D can be found in 10 USC § 2372 and DoD Directive 3204.1.

Major Defense contractors spend about $3 billion annually on IR&D activities. About half of this amount ($1.5 billion) is recovered from DoD as an indirect expense on contracts subject to CAS. Summaries of contractor IR&D projects are voluntarily submitted to DoD and included in the IR&D database. Changes to IR&D law in the early 1990s caused a major change in DoD's visibility of contractor IR&D. Prior to these changes, major defense contractors were required to submit IR&D plans for DoD review and approval, and ceilings were established on the amount of IR&D costs each contractor could recover as indirect expenses under defense contracts. The current IR&D law, enacted in 1991, phased out the DoD approval requirement and the reimbursement ceilings. While applauding these changes, contractors have expressed concerns about decreased feedback on their IR&D activities. While contractors are no longer required to report IR&D plans and accomplishments to DoD, they do advertise their technical capabilities to potential DoD customers. Most major contractors provide information to DoD about their IR&D activities through technical interchange meetings (TIMs) with DoD representatives and with IR&D project descriptions submitted to the Defense Technical Information Center (DTIC) for inclusion in the IR&D Database. DoD influences IR&D decision making by providing contractors with information about DoD-funded R&D and defense technological needs through documents, conferences, and meetings.

DTIC collects and maintains thousands of IR&D project summaries submitted by defense contractors in a restricted-access database. The IR&D Database can be accessed by registered DoD users over a secure internet link and is used to

identify technological capabilities applicable to defense needs and to avoid duplication of contractor IR&D activities by R&D funded directly by DoD.

During the past year, DoD initiated a marketing campaign to educate DoD scientists and engineers about the process for accessing IR&D data online. A memorandum reiterating DoD policy on the use of IR&D data was issued and an IR&D exhibit was set up at several technical conferences. IR&D data were included in Defense Technology Search, a search engine for locating defense related research and development and metrics were established to periodically track IR&D database usage. During the coming year, the DoD IR&D program will continue to focus on educating DoD scientists and engineers about the availability of IR&D data. The program will also work to improve the way DoD's technological needs are communicated to industry.

D. DoD Manufacturing Technology Program

DoD's Manufacturing Technology (ManTech) Program develops and matures key manufacturing processes to accelerate technology improvements in the acquisition and sustainment of DoD weapon systems and components. Ensuring that technology is affordable and producible remains imperative to make our forces more agile, deployable, sustainable, lethal, and dominant anywhere in the world. The Program addresses process technology issues early in the design process, in development, in production, and into sustainment. ManTech investments enable industry to develop and provide defense-essential, affordable, low-risk manufacturing processes that effectively transition technology into new and existing equipment for the warfighter. Teaming with industry, ManTech provides the crucial links from technology invention to production of defense-critical needs that are beyond the normal investment risk of industry. ManTech improvements generally translate into affordability improvements or cycle time reduction. 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, robust processes and capabilities for metals, composites, electronics, and energetic and munitions critical to defense applications over the full life cycle. These projects create improvements to manufacturing processes on the shop floor and in repair and maintenance facilitates (depots, logistics centers, and shipyards).
- *Advanced Manufacturing Enterprise* activities accelerate defense industrial enterprise progress toward implementation of world-class industrial practices as well as advanced design and information systems that support weapon system development, production, and sustainment.
- *Sustainment* projects coordinate common DoD requirements for maintenance, repair and overhaul technologies and advancements to affordably facilitate the use of current weapon systems far beyond their intended operational life.

Although the requirement to submit a Five-year Plan for the ManTech Program has been repealed with the deletion of 10 U.S.C. Section 2521(e), the Department continues to monitor the status of transition and implementation. The most recent Plan is available on the Internet at:

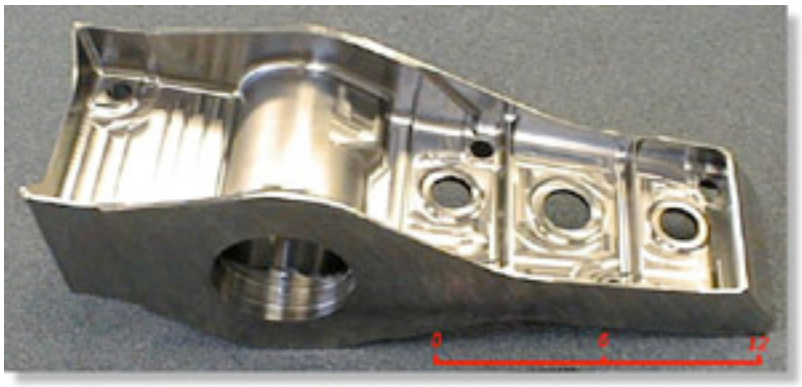
http://www.dodmantech.com/pubs/pubs.shtml.

Technology Transfer & Dual Use

ManTech program success is measured by the transitioning of advanced technology from research and development to implementation into new or existing systems. ManTech works with the commercial industrial base as early in the process as possible, by either adopting its best practices or transferring results of military processes to the commercial arena.

Here are examples of the two projects that received the 2003 Defense Manufacturing Technology Achievement Award presented on December 2, 2003, at the Defense Manufacturing Conference, Washington, DC. Award recipients included government and industry technologists responsible for the success of the Laser Additive Manufacturing project, and the Laser Shock Peening Initiative.

The Laser Additive Manufacturing project was a joint Army/Air Force/DLA project that contributed to an entirely new manufacturing process for titanium structure fabrication. This process was recently applied to aluminum F-15 Strike Eagle pylon ribs that were failing prematurely. Action in the Iraq war had depleted the inventory. Ship sets made from titanium replaced the failed components in only two months and have a life extension of five times that of aluminum, thereby significantly increasing the safety of the structure and increasing the mission availability of the aircraft. Awards were presented to team members from the Army Research Laboratory; the Air Force Research Laboratory; the Defense Logistics Agency; Pratt & Whitney; AeroMet Corporation; Lockheed Martin Corporation; The Boeing Company; the Office of Naval Research; Northrop Grumman Corporation; and MTS.



LaserAdditive Manufacturing (LAM) is based on a stereo lithography approach to manufacturing. Using software to convert a CAD file to a sliced format, parts with properties in the class of forgings are built one layer at a time, making LAM a true manufacturing-on-demand process. Cycle time is reduced by up to 80%; the cost of many components is reduced by 10% to 30%; and the process is environmentally friendly and provides tremendous surge capability.

This project also exemplifies the “jointness” aspect of the ManTech Program, demonstrating the impact that can be realized through joint investment. The Army funded the development of the production system for LAM. The Air

Force funded the refinement of the process and the development of aviation applications. The Navy provided funding for application to F/A-18 components. DLA funding is supporting full qualification of weapon system applications from all services and the development of a next generation capability. And, finally, most of the work was cost shared by the companies involved.

The Air Force ManTech Program, working with General Electric Aircraft Engines and LSP Technologies, Inc., developed an emerging technology, laser shock peening, as a potential solution to increase the durability of titanium fan blades and decrease the sensitivity to foreign object damage. Laser shock peening uses a high-energy laser pulse to impart an intense shock wave into the surface of metal parts. The shock wave creates deep compressive residual stresses, greatly improving fatigue properties and toughness.

For the Air Force, application of laser peening to the engine blades of the B-1B Lancer, F-16 Falcon, and F/A-22 Raptor has already avoided over $59 million in costs through reduced turbine engine airfoil failures, blade replacement costs, and reduced secondary damage engine repair costs. Aircraft crew safety and mission readiness have been vastly enhanced.

The Laser Shock Peening process is being evaluated for a number of other DoD weapon system applications such as transmission gears in the CH-47 helicopter, turbine engine blades in tanks and other ground vehicles, and aircraft landing gear components.

Recent Management Initiatives & Accomplishments

The annual Defense Manufacturing Conference continues to be a premier event for DoD, other government agencies, and industry to network and share achievements in technology transition and manufacturing programs. The 2003 conference was held in Washington, DC and drew more than 600 attendees. This year's session focused on gaining senior leader participation across industry and the Department, with the conduct of several panel sessions, concurrent

forums, and high-level keynote addresses promoting the exchange of technical information. Congressional representatives highlighted issues involving the ongoing debate on the health of US manufacturing and the industrial base, the impact to DoD, and actions underway across the government to promote attention and visibility to the issues. Over 110 exhibits and poster sessions provided a showcase for the latest manufacturing technologies.

E. Title III of the Defense Production Act

The Defense Production Act (DPA) (50 U.S.C. App. 2061 *et seq*). is the primary legislation for ensuring domestic availability of industrial resources and critical technology items that are essential for national defense. Title III Program provides a vehicle to create, maintain, modernize, or expand domestic production capability for technology items, components, and resources essential for national defense and for which there is insufficient production capacity to meet these needs. A key objective of the Title III Program is to accelerate the transition of technologies from the R&D arena to affordable production and insertion into defense systems. The Title III stimulates investments in key production resources to increase the supply, improve the quality, and reduce the cost of advanced technology. IT reduces U.S. dependency on foreign sources of supply for critical materials and technologies, and strengthens the economic and technological competitiveness of the U.S. defense industrial base.

In the calendar year 2003, the Title III Program had eight projects underway.

Radiation Hardened Microelectronics Capital Expansion (CAPEX) This project is making substantial capital investments to establish a capability for production of 0.15µm feature size microelectronic devices with strategic levels of radiation hardening. The project is using commercially available microelectronics equipment modified for radiation hardened production. Radiation hardened electronics enable spacecraft to operate in the extreme radiation environments resulting from nuclear threats and exposure to long-term natural radiation. Numerous defense programs require strategic radiation hardened microelectronics. Without Title III support, these programs will have difficulty achieving their goals and meeting insertion schedules. The Title III effort is part of an overall Radiation Hardened Microelectronics Accelerated Technology Development program initiated in 2001. The industrial capability will provide substantially higher electronic operating speeds and will lower the power/size of electronics in spacecraft. The smaller size and higher performance made possible by the Title III CAPEX equipment, combined with the advances in radiation hardened process technology will generate highly leveraged savings for spacecraft in terms of size, weight, reliability, and launch costs. Significant equipment purchases and qualification testing have been completed to date.

Radiation Hardened Microprocessors – This Title III project is scaling up production capacities for high performance radiation hardened microprocessors. The much higher clock rates will lead to significant cost and weight savings for space systems. Higher performance means greater on-orbit processing capabilities and lower ground support requirements. Radiation

hardened microprocessors will enable spacecraft to operate in the extreme radiation environments of nuclear threats and long term natural radiation.

Silicon Carbide (SiC) Substrates – The goals of this project are to establish efficient and affordable domestic sources of high-quality silicon carbide semiconductor substrates and to facilitate the transition and insertion of this advanced semiconductor material into defense applications. This Title III project has increased material availability, improved quality, reduced cost, and enabled the transition to full scale manufacturing by establishing the capability to produce 75mm diameter SiC substrates for device fabrication.

The fruits of the Title III SiC program have resulted in early insertion into DARPA programs such as the Wide Bandgap Semiconductor Technology Initiative, which is making use of improved substrates to demonstrate devices for military systems. Use of SiC semiconductor substrates will result in smaller, lower-weight, lower-cost, and higher-performance equipment. This effort is expected to generate savings in defense costs that are many times the projected Title III expenditure while also strengthening the position of the U.S. industrial base with respect to a critical state-of-the-art technology.

Laser Eye Protection (LEP) – The objective of this project is to establish a viable, highly responsive, and affordable production capacity for thin film dielectric coatings on polycarbonate substrates, which will be used to make laser eye protection spectacles and goggles. Thin film dielectric technologies are expensive and worldwide production capacity is limited. At the start of the project, the world's sole production facility was located in Great Britain and had an annual capacity of only 3,000 units per year. The project established a viable domestic source with sufficient production capacity to satisfy all projected Air Force and Navy demand for affordable thin film dielectric coatings. The remaining project tasks will demonstrate devices that meet the Army's unique requirements.

Microwave Power Tube Materials and Components – The objectives of this project are to improve the quality and reduce the production lead-time for microwave power tube materials and components. It will also reduce the production and life cycle costs of microwave power tubes. The project has begun to foster consistent, quality driven process and material improvements in the supply chain for microwave power tube production. This effort will complement ongoing Defense R&D and ManTech efforts to improve microwave power tube design and production processes.

Yttrium Barium Copper Oxide (YBCO) High-Temperature Superconducting Coated Conductors – The objective of this Title III program is to establish high volume, high quality, affordable, domestic production capacity for YBCO High Temperature Superconducting (HTS) conductors. An initial phase of the project has begun with two domestic U.S. companies using Title III

funding and additional funding through a Memorandum of Agreement with the U.S. Department of Energy. The DoE will also participate with several technical/industrial experts on the Title III Integrated Product Team. Industry cost share will match Government funding on a dollar-for-dollar basis.

Wireless Vibration Sensors – This project will enable the timely production and fielding of affordable smart sensors that will make Condition-Based Maintenance (CBM) possible. CBM is a critical enabling tool to lower asset lifecycle cost by providing online measurement and quantification of an asset's condition and maintenance needs (e.g. an aircraft engine). Incorporation of this technology in defense systems will enable more effective maintenance strategies. CBM holds the promise of substantial reductions in maintenance costs as well as increased readiness across a variety of defense systems.

Rigid-Rod Polymeric Materials – This project will initiate the transition of rigid rod, ultra-high strength polymer material from a small scale, R&D batch process to a limited production capability. The project is focusing on lowering manufacturing costs to make the material more affordable. Rigid-rod, ultra-high strength polymeric materials can be used as metal substitutes for a variety of applications. The material offers significant weight savings potential and is being explored for lightweight munitions, lightweight tactical system components, lightweight pistols and rifles, lightweight personal armor, and high strength structural foams.

APPENDIX A

10 United States Code 2515, Office of Technology Transition

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) BIENNIAL Report[1] – (1) The Secretary of Defense shall submit to the congressional committees specified in paragraph (2) a biennial report on the activities of the Office. The report shall be submitted each even-numbered year at the same time that the budget is submitted to Congress by the President

[1]This is in accordance with the FY 2004 Defense Authorization Act Sec 1031(a) (23) which states the report shall be submitted each even-numbered year at the same time that the budget is submitted to Congress by the President pursuant to Section 1105 of title 31.

pursuant to section 1105 of title 31. The report shall contain a discussion of the accomplishments of the Office during the two fiscal years 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 1998 thru FY 2003

Number of Reported Active Technology Transfer Mechanisms by Laboratory/Center
FY 1998 thru FY 2003

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
ABERDEEN TEST CENTER ABERDEEN PROVING GROUND MD	2	2	3	3	4	**4**
AERONAUTICAL SYSTEMS CENTER WRIGHT-PATTERSON AFB OH	6	3	4	3	3	**1**
AIR FORCE ACADEMY COLORADO SPRINGS CO			1			
AIR FORCE DEVELOPMENT TEST CENTER EGLIN AFB FL	3	3	4	6	6	**1**
AIR FORCE FLIGHT TEST CENTER EDWARDS AFB CA	13	15	22	18	8	
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH		7	9	10	9	**5**
AIR FORCE MATERIEL COMMAND WRIGHT-PATTERSON AFB OH	72	14	11	4	4	**4**
AIR FORCE RESEARCH LAB EGLIN AFB FL		8	9	10	10	**10**
AIR FORCE RESEARCH LAB KIRTLAND AFB NM		32	40	39	44	**26**
AIR FORCE RESEARCH LAB ROME NY	9	27	33	41	39	**45**
AIR FORCE RESEARCH LAB WRIGHT-PATTERSON AFB OH		110	117	123	133	**120**
AIR FORCE WEATHER AGENCY OFFUTT AFB NE			1	1	1	
AIR INTELLIGENCE AGENCY SAN ANTONIO TX	2	12	4	3	2	**1**
AIR UNIV MAXWELL AFB AL			2			**1**
ARMED FORCES INST OF PATHOLOGY WASHINGTON DC					1	**2**
ARMSTRONG LAB BROOKS AFB TX		1	1			
ARMY AEROMEDICAL RESEARCH LAB FORT RUCKER AL	20	30	28	36	39	**42**
ARMY ARMAMENT RESEARCH DEVELOPMENT AND ENGINEERING CENTER	40	47	52	55	62	**72**
ARMY AVIATION RESEARCH AND TECHNOLOGY ACTIVITY FORT EUSTIS		21	27	28	32	**34**
ARMY AVIATION RESEARCH AND TECHNOLOGY ACTIVITY MOFFETT FIELD		34	36	32	32	**31**
ARMY AVIATION RESEARCH DEVELOPMENT AND ENGINEERING CENTER	2	5	4	4		
ARMY CECOM INTELLIGENCE AND ELECTRONIC WARFARE DIRECTORATE	11	12	13	11	11	**11**
ARMY CECOM RESEARCH DEVELOPMENT AND ENGINEERING CENTER	34	44	40	40	48	**51**
ARMY COMMUNICATIONS-ELECTRONICS COMMAND FORT BELVOIR VA	11	18	25	32	35	**37**
ARMY ELECTRONIC PROVING GROUND FORT HUACHUCA AZ	1	1	1	2	2	**2**
ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS	56	105	103	109	127	**135**
ARMY INST FOR SURGICAL RESEARCH FORT SAM HOUSTON TX	4	6	7	10	16	**16**
ARMY MEDICAL RESEARCH AND MATERIEL COMMAND FORT DETRICK MD	6	17	18	21	24	**25**
ARMY MEDICAL RESEARCH INST OF CHEMICAL DEFENSE ABERDEEN PG	1	11	10	11	16	**17**
ARMY MEDICAL RESEARCH INST OF INFECTIOUS DISEASES FORT DETRICK	70	103	101	103	123	**208**
ARMY MISSILE RESEARCH DEVELOPMENT AND ENGINEERING CENTER	15	27	32	39	44	**49**
ARMY NATICK RESEARCH DEVELOPMENT AND ENGINEERING CENTER MA	39	56	61	67	67	**57**
ARMY RESEARCH INST FOR THE BEHAVIORAL AND SOCIAL SCIENCES ALEXANDRIA VA	6	6	7	7	7	**7**
ARMY RESEARCH INST OF ENVIRONMENTAL MEDICINE NATICK MA	11	26	29	27	23	**21**
ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD		68	62	61	60	**63**
ARMY RESEARCH LAB ADELPHI MD		62	64	59	150	**149**
ARMY RESEARCH LAB CLEVELAND OH		1	1	1	1	**1**
ARMY RESEARCH LAB FORT MONMOUTH NJ		96	97	96	3	**2**
ARMY RESEARCH LAB HAMPTON VA		31	27	26	25	**22**

Number of Reported Active Technology Transfer Mechanisms by Laboratory/Center
FY 1998 thru FY 2003

ARMY RESEARCH LAB WHITE SANDS MISSILE RANGE NM		5	5	5	5	**5**
ARMY RESEARCH OFFICE RESEARCH TRIANGLE PARK NC	1	1	1	1	1	**1**
ARMY SIMULATION TRAINING AND INSTRUMENTATION COMMAND ORLANDO FL				2	2	**3**
ARMY SPACE AND STRATEGIC DEFENSE COMMAND HUNTSVILLE AL	1	1	7	7	7	**7**
ARMY TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT ACTIVITY REDSTONE ARSENAL AL		1	1	1	1	**1**
ARMY TOPOGRAPHIC ENGINEERING CENTER ALEXANDRIA VA	4	6	5	5	5	**6**
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AFS TN				2	2	**3**
BALLISTIC MISSILE DEFENSE ORGANIZATION WASHINGTON DC					1	
CENTER FOR HEALTHCARE EDUCATION AND STUDIES FORT SAM HOUSTON TX	1	2	2	2	2	**2**
CLINICAL INVESTIGATION REGULATORY OFFICE FORT SAM HOUSTON TX	95	179	256	325	412	**494**
COLD REGIONS RESEARCH AND ENGINEERING LAB HANOVER NH	34	89	95	104	110	**115**
CONSTRUCTION ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL	48	73	78	77	82	**80**
DEFENSE LANGUAGE INST MONTEREY CA	3	4	4	4	5	**5**
DEFENSE NUCLEAR AGENCY ALBUQUERQUE NM		1	1	1	1	**1**
DEFENSE NUCLEAR AGENCY ALEXANDRIA VA		5	5	5	5	**5**
DTTIS CBE FORT BEVOIR VA					1	
EDGEWOOD RESEARCH DEVELOPMENT AND ENGINEERING CENTER ABERDEEN PG MD	21	27	28	35	53	**67**
ELECTRONIC SYSTEMS CENTER HANSCOM AFB MA	25	13	13	13	6	
HUMAN SYSTEMS CENTER BROOKS AFB TX		1	1	4	4	**3**
HYDROLOGIC ENGINEERING CENTER DAVIS CA		1	1	1	1	
JOINT TRAINING ANALYSIS AND SIMULATION CENTER SUFFOLK VA	1	1	1	1	1	
MARINE CORPS COMBAT DEVELOPMENT COMMAND QUANTICO VA			1			
NATIONAL GEOSPATIAL INTELLIGENCE AGENCY		10	10	7	6	**6**
NAVAL AIR WARFARE CENTER AIRCRAFT DIV LAKEHURST NJ		1	1	2	2	**1**
NAVAL AIR WARFARE CENTER AIRCRAFT DIV PATUXENT RIVER MD		16	14	9	10	**21**
NAVAL AIR WARFARE CENTER TRAINING SYSTEMS DIV ORLANDO FL	7	9	7	8	9	**7**
NAVAL AIR WARFARE CENTER WEAPONS DIV CHINA LAKE CA	43	51	51	55	49	**60**
NAVAL AIR WARFARE CENTER WEAPONS DIV POINT MUGU CA	9	10	15	11	9	**6**
NAVAL CMD CNTL AND OCEAN SURVEILLANCE CTR IN-SERVICE ENGRING SAN DIEGO CA		1	2	4	5	**5**
NAVAL EXPLOSIVE ORDNANCE DISPOSAL TECHNOLOGY CENTER INDIAN HEAD MD		4	4	4	4	**4**
NAVAL FACILITIES ENGINEERING SERVICE CENTER PORT HUENEME CA	2	1	1	1	1	**3**
NAVAL MEDICAL CENTER PORTSMOUTH VA			6	10	13	**19**
NAVAL MEDICAL CENTER SAN DIEGO CA	4	10	14	24	29	**25**
NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND BETHESDA MD	45	71	103	183	212	**228**
NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND STENNIS SPACE CTR MS	3	4	3	3	8	**6**
NAVAL OBSERVATORY WASHINGTON DC	1	1	1	1	1	**1**
NAVAL POSTGRADUATE SCHOOL MONTEREY CA	9	6	11	12	16	**26**
NAVAL RESEARCH LAB STENNIS SPACE CENTER MS		3	3	1	2	**1**
NAVAL RESEARCH LAB WASHINGTON DC		106	101	91	83	**79**
NAVAL SEA SYSTEMS COMMAND WASHINGTON DC		1	1	1	1	**1**
NAVAL SURFACE WARFARE CENTER PORT HUENEME CA	2	2	2			
NAVAL SURFACE WARFARE CENTER CARDEROCK DIV BETHESDA MD	18	25	20	23	21	**21**
NAVAL SURFACE WARFARE CENTER CRANE DIV IN	10	7	7	6	6	**3**

Number of Reported Active Technology Transfer Mechanisms by Laboratory/Center
FY 1998 thru FY 2003

NAVAL SURFACE WARFARE CENTER DAHLGREN DIV VA	18	36	36	36	35	**30**
NAVAL SURFACE WARFARE CENTER INDIAN HEAD DIV MD	14	13	15	21	29	**32**
NAVAL UNDERSEA WARFARE CENTER NEWPORT DIV RI	25	3	18	29	39	**25**
NAVY CLOTHING AND TEXTILE RESEARCH FACILITY NATICK MA	2	28	3	2	2	**2**
NAVY EXPERIMENTAL DIVING UNIT PANAMA CITY FL	1	2	1	1		
OFFICE OF NAVAL RESEARCH ARLINGTON VA	45	1	1		45	
OFFICE OF THE SURGEON GENERAL (AIR FORCE) FALLS CHURCH VA					2	**1**
OGDEN AIR LOGISTICS CENTER HILL AFB UT	12	6	2	4	1	
OKLAHOMA CITY AIR LOGISTICS CENTER TINKER AFB OK					2	
PHILLIPS LAB EDWARDS AFB CA		12	3	1	1	**1**
PORTSMOUTH NAVAL SHIPYARD NH					1	
ROME LAB ROME NY		11	8			
SPACE AND NAVAL WARFARE SYSTEMS CENTER SAN DIEGO CA					20	**20**
TACOM RESEARCH DEVELOPMENT AND ENGINEERING CENTER WARREN MI	37	67	71	68	70	**75**
TRADOC ANALYSIS CENTER FORT LEAVENWORTH KS	1	1	1	2	3	**3**
UNIFORMED SERVICES UNIV OF THE HEALTH SCIENCES BETHESDA MD	2	3	3	3	3	**3**
WALTER REED ARMY INST OF RESEARCH WASHINGTON DC	104	179	199	206	221	**233**
WARNER ROBINS AIR LOGISTICS CENTER ROBINS AFB GA	13	11	6	3	2	
WATERVLIET ARSENAL NY	13	23	30	31	38	**37**
WHITE SANDS MISSILE RANGE NM	1	1	1			
WRIGHT LAB WRIGHT-PATTERSON AFB OH	22	5	2	1	1	**1**
YUMA PROVING GROUND AZ	4	5	6	7	7	**6**

TECHNOLOGY TRANSFER COMMERCIALIZATION ACT (TTCA) of 2000
DoD ACTIVITY PERFORMANCE MEASURES for FY 2003

AGENCY	COLLABORATIVE RELATIONSHIPS						INTELLECTUAL PROPERTY MAN		
	Cooperative Research and Development Agreements (CRADAs)						Invention Disclosures and Patents		
	Total		Non-Traditional****		Other Types		Invention Disclosures	Patent Applications	Patent Issued
	Active	New	Active	New	Active	New*			
Air Force	311	46	0	0	262	61	131	67	76
Army	1,188	367	0	0	0	0	387	253	163
Navy	527	195	0	0	0	0	776	457	351
DISA	11	11	0	0	0	0	0	0	0
DMEA	8	0	0	0	5	0	0	0	0
NGA	8	1	0	0	0	0	0	0	0
NSA	68	7	0	0	0	0	23	9	21
USUHS	13	3	344	46	0	0	15	24	8
Total	2,134	630	344	46	267	61	1,332	810	619

NOTES

* For the Air Force 40 of the New "Other Types" Agreements are EPAs
** The Air Force total covers only those AF activities for which data was available at reporting deadline
USUHS the "Non-Traditional" CRADAs are Material Transfer Agreements and the "patent applications" include 14 provisional (P) applications and 13 regular (R) applications

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Other IP Active Licenses***
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APPENDIX D

Highlights of the DoD Technology Transfer Program in FY 2002 and FY 2003

Highlights of the DoD Technology Transfer Program in FY 2002

PRIMARY/SECONDARY CONTAINMENT SYSTEM COMBINATION SYSTEM
The Chemical Biological Explosives Containment System/Workshelter combination is a system designed for the containment and mitigation of chemical explosive terrorist devices and/or small munitions.

CBECS. The primary system, Chemical Biological Explosives Containment System or CBECS, is a pneumatic structure supporting a Kevlar tent with a filling sock for aqueous foam. It is approximately 7 feet in diameter at the base and tapers to about 4 feet in diameter at the top. Once inflated, it is designed to be placed over the device/munitions and filled with blast suppressive aqueous foam. This component will contain/mitigate approximately 70-100% of the blast overpressure, fireball, agent dissemination, and fragments of the device/munitions.

WORKSHELTER. The secondary containment shelter is also an airframe, which is easily inflated and placed over the primary containment system or CBECS. It is approximately 13-feet wide, 10-feet long, and has a height of 8 feet. The workshelter is designed to contain/mitigate the residual effects, primarily escaping fragments and vapors/aerosols from the primary containment system, associated with the detonation of the device/munitions.

MANUFACTURER. ECBC entered into a patent licensing agreement with ZUMRO, Inc., a leader in the life safety industry, to market CBECS to commercial customers. Both the primary and secondary systems were jointly designed by the Chemical/Biological Counterterrorism Team and ZUMRO Inc. and fabricated by ZUMRO, Inc. The company is located in Willow Grove, PA, and can be contacted at (800) 932-6003.

Further information can be obtained by directing your inquiries to Technical Director, U.S. Army Edgewood Chemical Biological Center, ATTN: AMSSB-REN-HD-T/Mr.

James A. Genovese, Aberdeen Proving Ground, MD 21010-5424, by telephone at (410) 436-1915or DSN584-1915,or email mail to jmgenove@apgea.army.mil.

SYSTEM AND METHOD FOR ENHANCED VISUALIZATION OF SUBCUTANEOUS STRUCTURES

Scientists in the Air Force Research Laboratory Materials and Manufacturing Directorate developed a medical breakthrough in the technology to locate veins and arteries in wounded soldiers on the battlefield. The Vein Viewer is a system and method for enhancing visualization of veins, arteries or other subcutaneous natural or foreign structures of the body and for facilitating intravenous insertion or extraction of fluids, medication or the like in the administration of medical treatment to human or animal subjects. The Viewer is comprised of a light source for illuminating or transilluminating the corresponding portion of the body with light of selected wavelengths and a low-level light detector; such as an image intensifier tube (including night vision goggles), a photomultiplier tube, photodiode or charge coupled device for generating an image of the illuminated body portion, and optical filter(s) of selected spectral transmittance which can be located at the light source(s), detector, or both.

The primary medical application for this new technology is locating veins and arteries. During initial experiments, the research team used only tools that were available—a television remote control infrared light source and standard military NVGs—to clearly see the network of veins in fingers, hands, lower arms, and feet. They performed additional experiments using various light sources and filters to determine the optimum imaging characteristics of the device and to verify that a needle inserted beneath the skin was clearly visible since metal also blocks infrared light. This capability will also help doctors locate foreign objects, such as bullets or shrapnel, under the skin.

In addition to its military battlefield uses, the breadth of the Vein Viewer's technological achievement encompasses a broad range of civilian applications including emergency medical services, trauma centers, blood banks, pediatric and geriatric care facilities, and a variety of surgical procedures. The research

team successfully demonstrated a prototype of the Vein Viewer at hospitals in Ohio—Wright-Patterson Medical Center, Cincinnati Children's Hospital Medical Center, and Columbus Children's Hospital. Many physicians commented that this technology will alleviate a great deal of patient suffering, especially in small infants who must sometimes undergo painful medical procedures requiring access to veins such as drawing blood and IV insertions. Vein Viewer technology should greatly improve medical treatment for premature babies whose veins are often too small to access using conventional procedures. The new technology also allows quick access to arteries for blood gas analysis used to measure oxygen flow from the lungs.

Infrared Imaging Systems (IRIS). IRIS is a start-up company located in Columbus, OH, specifically founded to exploit this technology. The Air Force currently has an exclusive license with them on the original patent and a follow-on CRADA for further developmental work.

Inventors: Robert L. Crane, Byron P. Edmonds, Charles C. Lovett, and Walter E. Johnson, Materials and Manufacturing Directorate, Wright-Patterson AFB OH *(US Patent No. 6,230,046)*

Other Highlights

Army

The U.S. Army's Cold Regions Research and Engineering Laboratory is the only Federal laboratory with a primary focus on Arctic and cold regions problems and is internationally recognized as a center of excellence in Arctic research. While its research program is designed to be responsive to the needs of the military, a majority of the research and engineering results also benefit the civilian sector.

The U.S. Army's Edgewood Chemical and Biological Command has initiated several MoU/MoA/IAA/ISSA with other Government Agencies and found that while these agreements are not traditionally considered the venue for the Technology Transfer program, significant results were obtained in transferring technologies developed by ECBC for military defense applications to the new Homeland Security objectives, thus resulting in both enhanced public safety and savings.

The Army's NATICK Soldier Center's National Protection Center worked with MIPT for R&D of thermoelectric cooling and battery technologies for future integration into a cooling garment for public safety & emergency response operations.

The U.S. Army's Medical Research Material Command signed a patent license agreement (PLA) for potentially widespread civilian use. The PLA allows for the commercial development by a medium sized US pharmaceutical firm of a topical skin protectant cream for nursing home & hospital prescription use. This cream,

developed initially by U.S. Army Medical Research ICD for protection against chemical weapons exposure, is expected to have additional nonmilitary uses including skin protection against harsh chemicals in the home and in industrial settings, and for protection against such irritants as poison ivy.

Air Force

The Air Force Research Laboratory Directed Energy Directorate (AFRL/DE) signed a CRADA in which Raytheon Company's objective was a joint research effort with AFRL/DE to focus on determining the effects of High-Power lasers on various assets and defining the parameters of a High Energy Laser (HEL) System for tactical platforms. This joint research agreement defines a twenty-four month joint study effort that results in a detailed analysis of asset response to High Power lasers and the suitability of using lasers on tactical platforms to defeat this class of asset. The agreement also studies the system aspects and what it will take in the areas of: Mission Analysis, Laser Technology, Tactical Beam Control, Laser/Target Interaction Modeling, and Effects. Both the Air Force and the Raytheon Company expect to benefit from the relationship and the resulting shared data. The Results of this research will be used as a point of departure for expanding the utility of High Power lasers on various platforms and augmenting the warfighter's capability.

The objective of Lockheed Martin Aeronautics System's CRADA with AFRL/DE was to study, design, and test high power laser weapons and including required power (electrical) on the F-16, F-22, and the Joint Strike Fighter (JSF), Fighter Demonstrator Aircraft, and other aircraft presently manufactured by Lockheed Martin Aeronautics System (LMAS). LMAS is a global enterprise principally engaged in the research, design, development, manufacture and integration of advanced technology systems, products, and services. In addition, they have been conducting independent studies with R&D funds on the use of both lasers and microwave weapons on fighter aircrafts. The Government will obtain valuable F-16, F-22, and other aircraft design details, thermal analysis, and aircraft performance critical to installation of laser weapons on a war fighting aircraft. LMAS will obtain valuable laser weapons technology and information on its applications/efforts to integrate HEL of tactical platforms to advance warfigher's capabilities in the 21st Century.

AFRL/Human Engineering (HE) Directorate signed a CRADA with Veridian Engineering, Inc., for commercial use of the AFRL Manikin Integration Research Laboratory at Wright-Patterson AFB. Veridian Engineering, Inc, has reported revenues for use of specialized manikins and, in accordance with the CRADA, 5% is being contributed by Veridian to upgrade and maintain the AFRL facilities.

AFRL/HE has a second CRADA with Veridian Engineering, Inc., for the commercial use of the AFRL Bioacoustics Facilities at Wright-Patterson AFB. Veridian Engineering, Inc, has reported revenues for the use of specialized acoustic facilities. 10% of this revenue will be contributed by Veridian to upgrade and maintain the AFRL facilities.

The Air Force Research Laboratory Directed Energy and Space Vehicles Directorates have an Office of Technology Transfer for Education (OTTE). OTTE has developed a project on weather service. Pinpoint WeatherNet (PWN) Project is a CRADA with KOB-TV, which provides high quality weather stations for NM middle schools. In FY02, 48 schools participated. AFRL has reached over $6.2M in promotional airtime. In FY02, PWN became part of the Homeland Security WeatherNet Network, a partnership between the National Weather Service and Automated Weather Source.

Navy

The U.S. Navy's Naval Underwater Weapons Center, at Newport, Rhode Island, signed two patent license agreements in FY 01 with Predictive Technology, Inc. (PTI), a small Massachusetts company formed to commercialize the use of non-linear signal processing techniques to diagnose or monitor sleep breathing disorders. An issued patent was licensed by PTI which covered the basic concept. An additional patent application was licensed which expanded the concept to a test while a patient is awake. The invention makes it possible to reduce medical and insurance costs by allowing a patient to be diagnosed for sleep apnea in a doctor's office while awake in a 20-30 minute test instead of having to undergo an all night stay at a sleep clinic.

National Security Agency

The National Security Agency has licensed to the Raytheon Company the SilentRunner® product and technology which continuously monitors and analyzes network activity and security performance. SilentRunner® passively gathers data about a network, its structure, its traffic and its users by analyzing raw network packets. The raw packets are assembled and organized in a knowledgebase that provides a detailed activity display of the network. Not only does SilentRunner® provide information on MAC and IP connections, it analyzes the protocols transversing the network, the applications being used (along with the users), website activity and displays an ontological map for easy information access. This level of analysis enables you to assess real-time data for assessing security risks and network vulnerabilities, identifying what is really on your network, and where security breaches might occur. Additionally, SilentRunner® provides 3D visualization capability for viewing very large network diagrams in detail. With the aid of a 6 Degree of Freedom input device you can "fly" through the virtual network looking for anomalous behavior.

Highlights of the DoD Technology Transfer Program in FY 2003

BIOLOGICAL SAMPLING KIT (BiSKit)

Responding to challenges presented by anthrax contamination at the Hart Senate Office Building, Brentwood Post Office, and other sites, molecular biologist Peter Emanuel and engineers Mark Schlein, Kevin Wallace, and Peter Schlitzkus of the U.S. Army Edgewood Chemical Biological Center (ECBC) developed and rapidly produced a new biological sampling kit. The "BiSKit" is a self contained, portable, and disposable biological sampling kit. It provides significant improvement over present methods of collecting samples.

The BiSKit is a single-use kit made of a specially designed two-piece plastic container with a sampling sponge fastened to the lid and a separate dropper attachment. A small vial containing sterile buffer solution attaches to the bottom of the unit to wet the sponge for sampling. The BiSKit allows sampling teams to take multiple samples in rapid succession, while minimizing the potential for exposure to hazardous biological threat agents. The kit has been thoroughly tested and shown to be compatible with chain-of-custody procedures and current biological analysis techniques. A unique feature of the BiSKit is its sample extraction means, whereby the simple process of screwing the lid back onto the container after collecting a sample causes the sponge to be both compressed and scraped against built-in ridges, thus extracting the sample, which flows back into the vial.

Using computer-aided design and rapid prototyping systems, the inventors produced a series of prototypes, each improving upon the other. Arriving at a design that provided significant improvements in biological field sampling, the Invention Evaluation Committee (IEC) review and patent protection process was accelerated. The IEC and patent legal team of John Biffoni and Vicki Upchurch worked concurrently to make patent protection of the BiSKit a high priority and expeditiously file a patent application. With a solid patent application filed, the technology transfer team of Donna Cannella and Christina Frain assisted with the non-exclusive licensing in April 2003 of the BiSKit to QuickSilver Analytics, Inc. (QS). Patti Riggs and Rodney Hudson negotiated the licensing for QS. QS is a small business with over 4 years of experience in the manufacture, marketing, and sale of the FAC^{2} Chemical/Biological Sampling Kit developed by ECBC. QS is teamed with Dave Wheatley of D. Wheatley Enterprises, another small business, for the manufacturing of the BiSKit body. QS is taking the bodies and completing the assembly, sterilization, market distribution, sale, and technical expertise in the different fields of use for the invention. These fields include the Homeland Security sector as well as the traditional food and environmental inspection industries. The QS team has produced several prototype BiSKits and is currently

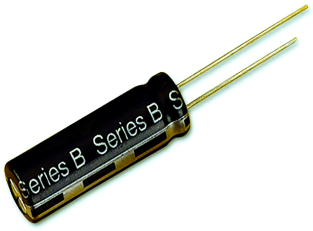
in full-scale manufacturing to provide 3,000 kits for Homeland Security purposes by various first responder and Governmental entities.

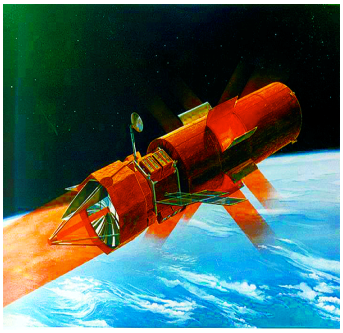
The result is a product that has been transferred to the civilian sector to be produced in large quantities at an affordable price, while meeting strict quality assurance standards required for forensic evidence and scientific merit. The public will benefit from this technology transfer through enhanced public safety and confidence in the results of field sampling for biological agents. The cost savings from avoiding unnecessary closures of public or private buildings and the avoidance of injury or loss of life due to inadequate or unvalidated sampling equipment and techniques are not easily quantified, but clearly immense. This technology, successfully transferred from a Federal Laboratory to the civilian sector in April 2003, provides a critical tool for achieving this critical public safety objective.

GEL-COR, Specialized Ballistic Rubber Media

The Army's Engineer Research and Development Center's Geotechnical and Structures Laboratory (GSL) continued a 2002 CRADA with Super Trap, Inc., of Corona, CA, to improve existing firing range design and materials technology. Super Trap, Inc., a privately held, veteran owned small business, is a leading designer and developer of rifle and pistol shooting range backstops, ballistic baffles, clearing boxes and tactical targets. The CRADA resulted in a joint invention of a specialized ballistic rubber media called GEL-COR. The CRADA granted Super Trap, Inc., a field of use license to GSL's patented SACON® shock absorbing concrete technology and provides for GSL's technical assistance in efforts to introduce the technology into construction of firing ranges. The new bullet traps will offer environmentally friendly and cost-saving alternatives for both civilian and military firing ranges. In 2003, Super Trap, Inc. signed an exclusive field of use license with GSL to this joint invention of GEL-COR for firing range applications. Trap designs have been developed for use in both indoor and outdoor ranges. They will accommodate not only lead ammunition of all small arms calibers up to .50 caliber, they can also handle lead alternatives such as tungsten or copper based-frangible rounds. Even the Army's "steel penetrator" ammunition can be used with the new trap designs.

PowerStor Aerogel Capacitor





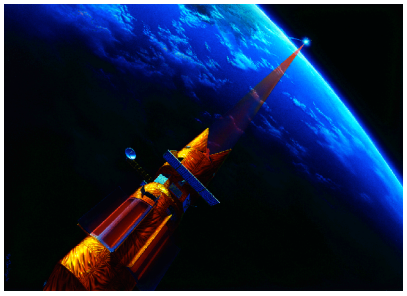
The PowerStor aerogel capacitor offers big electrical storage capabilities in a small package. The capacitor has extremely fast discharge capabilities and low equivalent series resistance, which make it ideal for pulsed power applications. The device has high energy density (100 times greater than electrolytic capacitors) and high power (10 to 100 times greater than conventional lithium batteries). Because there are no chemical reactions, it can be recharged hundreds of thousands of times without degradation. Other advantages include small size, low cost, and reliable operation over a wide temperature range.

The PowerStor aerogel capacitor is based on a novel material called carbon aerogel. Carbon aerogels consist of interconnected nanometer-sized particles with small pores. This monolithic structure leads to very high surface area (the equivalent surface area of 10 football fields) and high electrical conductivity. Capacitors can be made using thin-film carbon aerogel paper as both the positive and negative electrodes. A microporous separator is placed between the two electrodes, creating a sandwich that is wound in “jellyroll” fashion and housed in an aluminum or steel can. The can is then filled with electrolyte and sealed, with protruding leads. When the capacitor is charged, positive and negative ions are oriented along the surfaces of the oppositely charged electrodes. As energy is released, this orientation relaxes back to a disorganized state.

More than 10 million of PowerStor’s devices have been sold in Asia, Europe, and the United States, with new applications emerging monthly. One notable customer, Microsoft, uses the capacitor to power the clock in its new X-Box™ gaming console system. Several aviation equipment manufacturers install the device in their aircraft displays to maintain continuous voltage when switching from one electrical bus to another. Other applications include low-tech toys, valve actuators, and insulin pumps. A full line of aerogel capacitors has been designed for memory backup, pulsed power, and main-power applications. Prices range from $0.25 to $30 depending on the type and quantity desired.

Cooper Electronic Technologies is selling these devices. The company acquired this technology by purchasing PowerStor, a subsidiary of the now-defunct PolyStor Corporation. PolyStor licensed the aerogel capacitor technology from Lawrence Livermore National Laboratory (LLNL), which originally developed the technology.

Escape Mask Now on Market



A low-cost escape mask is now on the market that uses microfibrous filter technology previously funded by the Ballistic Missile Defense Organization (BMDO; MDA's predecessor) for ballistic missile defense purposes. In its new application for homeland defense, the filter traps toxins and irritants ranging from sarin and anthrax to pollen and dust mites. It is lightweight, foldable, and fits inside a shirt pocket. Small and compact, it can be easily carried and distributed by the hundreds to protect people from harmful air threats. Unlike today's gas masks, the escape mask offers a lower pressure drop so it makes breathing easier—a must for the elderly or young children. The microfibrous technology can be tailored to anticipated threats such as a "cocktail" attack with a combination of chemical agents. It can be recharged simply by being reheated.

The carbon-metal composite used in the microfibrous filter technology originally was developed by Auburn University's Space Power Institute with funding from BMDO's Innovative Science & Technology program. The material would be ideal for use in developing advanced capacitors to power lasers, railguns, and other weapon systems. Fuel cells and batteries made from the material also could provide power for space-based platforms.

The microfibrous filter technology contains sorbent materials in a mesh of carbon-metal composite and cellulose wood fibers that, under a microscope, resembles a wad of chicken wire. This matrix has high electrical conductivity and high surface area (about 1,000 square meters per gram). The fibers are then put through a paper machine on a roll, and the resulting sheets are sent through a furnace at 1,000°C, which melts the fibers and fuses them together. The sheets are then cut into strips and placed in canisters for use in the escape masks.

The escape mask is now available. Initially, it will be distributed to the first-responder market for use in emergency situations, such as terrorist attacks or building fires. Additional microfibrous filter products are being developed. Air security products include a chemical/biological filter for commercial and government facilities. The first air-quality product will be a replacement filter for home use. The target price of the escape amask is less than $150. Other types of escape masks currently on the market cost more.

The innovator is IntraMicron, Inc. Formed in 2001, the company develops filter products for personal and facility protection, as well as for air quality assurance. It has an exclusive worldwide license for the microfibrous filter technology from Auburn University, where Dr. Bruce Tatarchuk invented the technology. The company recently secured more than $1 million in early-stage venture funding. It employs seven people and occupies 2,000 square feet of office space in Birmingham, Alabama. A new 14,000 square foot manufacturing facility with office space in Gahanna, Ohio, also has been leased. The company moved into this facility in mid-2003.

Combined Wedge-Flap for Improved Ship Powering: Winner of the Admiral Bowen Award

Naval Surface Warfare Center, Carderock Division

The DDG 51 combination wedge-flap design program was initiated in 1996, when it was rationalized that the design of a stern flap, to be installed behind a transom with a stern wedge, might prove beneficial. This program represented the initial evaluation of a wedge and flap combination, the two being previously viewed as exclusive devices. It was shown, first through model testing, that a stern flap, installed in addition to the hull's existing wedge, could further reduce the powering requirements. The destroyer USS *RAMAGE* (DDG 61) was then retrofit, in 2000, with a prototype stern flap installed behind its existing wedge. At trials, the stern flap reduced powering in the range of 5 to 15%, increased top speed by nearly 1 knot, and produced annual fuel savings of $195,000.

The U.S. Navy is now making a concerted effort to retrofit (back-fit) stern flaps on many of its existing combatants, and to forward-fit them on new construction classes. There are a total of 89 U.S. Navy ships with stern flaps installed, 78 completed as retrofits, and 11 completed as new construction items. Current U.S. Navy schedules indicate an additional 59 stern flap retrofits and new construction installations. A total of 148 stern flaps will be installed on seven U.S. Navy ship classes. In all, these seven classes' total 178 active ships, indicating that there remain an additional 30 ships eligible, but not yet scheduled, for stern flap installations.

The Coast Guard currently has scheduled 34 *ISLAND* Class patrol boats for stern flap retrofits, and is planning for all forty-nine boats in this class to eventually receive flaps. One stern flap has been retrofit to a *HAMILTON* Class cutter, with recently completed at-sea trials. The U.S. Navy and U.S. Coast Guard commitments, as of this writing, brings the total number of scheduled stern flap installations to 183 units in the U.S. Current annual fuel cost savings derived from 89 U.S. Navy stern flap units now deployed is $11.9 million / year. Cumulated U.S. Navy fuel cost savings as of this date is $29.8 million. Potential annual fuel cost savings for 148 scheduled stern flap units is estimated to be $19

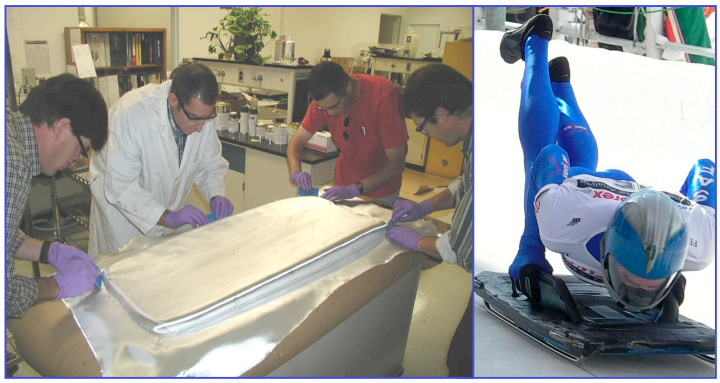
million / year. Potential life-cycle fuel cost savings for the 148 scheduled stern flap units is estimated at $546 million.

Stern flap performance improvements increase mission capabilities and survivability. Due to the stern flap: the maximum ship speed is increased (0.3 to 2.0 knots); the reduced fuel consumption results in increased endurance and range; the reduced propeller loading results in reduced propeller cavitations and erosion damage, reduced vibration, reduced signature noise levels, and improved habitability. A reduced power and fuel consumption is due to the stern flap which also results directly in reduced exhaust pollutants released into the atmosphere by these ships. Installation of a stern flap on a ship promotes reductions in the emission of carbon dioxide (CO_2), a “greenhouse” gas, which has become increasingly important due to concerns over global warming; nitrogen oxides (NOx), which have been targeted in order to limit the formation of ground-level ozone, a major component of smog; sulfurous oxides (SOx), regulated by the enforcement of maximum sulfur content in fuels; and particulate matter (PM), a human carcinogen.

Engineers Develop First Response Expeditionary (FRE) Fire Vehicle

Engineers at the Air Force Research Laboratory Materials and Manufacturing Directorate have developed a deployable, lightweight vehicle that provides crash and rescue firefighting capability in a variety of mission profiles. The First Response Expeditionary (FRE) Fire Vehicle, developed to meet Air Combat Command and Civil Engineering requirements, has already established its value during Operation Iraqi Freedom, when several of the units were deployed to protect helicopters, aircraft, tent cities, and other bare base operations. The First Response Expeditionary Fire Vehicle, developed to bridge the gap between flight line fire extinguishers and full-sized crash and rescue fire trucks, is ideal for small aircraft and helicopter crashes, for hot pit refueling, and for tent city or deployed base fire protection. It is designed to provide firefighters with the quick-reaction capability to extinguish small aircraft or structural fires before they become uncontrollable. The vehicle can be operated with minimal training or experience, is virtually maintenance free, and is adaptable to a wide variety of mission profiles and vehicle platforms. In addition, the FRE vehicle is sized to occupy minimal pallet space on a cargo aircraft, and offers reduced water requirements and equipment weight.

Advanced Composites Carry Olympic Hopeful to National Sled Racing Title



Engineers at the Air Force Research Laboratory's Materials and Manufacturing Directorate redesigned the aerodynamic component of skeleton racing sleds raced by world class Air Force athletes envying for positions on the U.S. men's Winter Olympic team. One of the racers, Maj. Brady Canfield, has since won a bronze medal at the World Championships in Japan and the 2003 U.S. Men's National Skeleton Championship. The redesign effort provided hands-on computer aided design, three-dimensional modeling experience for new engineers at the directorate's Advanced Composites Office (ACO) and resulted in improved lay-up techniques.

ACO engineers used the techniques learned and perfected during redesign of the skeleton sleds to build a horizontal tail advanced technology demonstrator, several elevator skin prototypes for the A-10, and sub-scale composite spars for composite design and manufacturing classes.

New Environmental Control Unit Aids the Warfighter

A new Environmental Control Unit (ECU) has been developed that will provide comfort for US troops and keep vital equipment running smoothly. The new ECU is a field-deployable tent cooler designed to heat or cool military tents under the most extreme conditions. During Operation Iraqi Freedom, tent coolers were used to relieve troops from the 125°F heat of the Iraqi desert, and they were also used in tents where military equipment is stored to protect it from harsh weather conditions that could degrade performance. The new ECU design came to fruition through a Cooperative Research and Development Agreement (CRADA) between the Propulsion Directorate and Mainstream Engineering Corp, Rockledge, Florida. The unit was successfully tested at Fort Drum, New York, during the Patriot Exercise in June 2003. This ECU is a second-generation prototype and was designed to operate in Nuclear, Biological, or Chemical (NBC) mode or non-NBC mode. The ECU can act as either a heater or an air conditioner and can be operated by a remote control. Compared to previous models that took up to 10% of the airbase deployment weight, the current ECU weighs only 600 lbs. The current design features improved

maintainability, performance, and cost, and the training required to maintain and operate the unit has been simplified. The unit also uses standard commercial parts, and simplicity was emphasized during the design to enhance maintainability and reliability. Moreover, there are no exotic components or materials in the new ECU, and since the unit uses Puron (R-410A) refrigerant, the tent cooler has been deemed environmentally-friendly with no ozone-depletion potential. The ECU is shown on test at the Patriot Exercise.

Aircraft Snow Removal System

For proper aerodynamics and flight safety, snow and ice must be removed from airplanes prior to takeoff. Ethylene glycol and propylene glycol, potentially harmful chemicals, have been used to de-ice airplanes for many years. However, these chemicals, after being sprayed onto the aircraft, typically escape onto the pavement and may run into streams or ground water. Each year in the United States a very large quantity of ethylene glycol is introduced into the environment as a result of aircraft de-icing. In surface waters ethylene and propylene glycol can harm wildlife. Consequently, the Environmental Protection Agency has established limits for these materials in surface water. Airports must retain and dispose of this glycol runoff. Some cities are installing multi-million-dollar catch basins to contain glycol runoff that must then be disposed of properly.

An Air Vehicles Directorate (AFRL/VA) scientist and an independent inventor, Lee Williams, developed a high efficiency forced air snow remover. Under a CRADA, Dr. Keith Numbers (AFRL/VA) perfected the nozzle design, assisted in the optimization of the overall system design and was awarded a U.S. patent for his inventive results. A second patent was later awarded to Dr. Numbers and Lee Williams as a result of their collaboration. An exclusive license for both Air Force patents was then awarded to Lee Williams, president of Aviation Environmental Compliance, Inc. and, in turn, sublicenses were awarded to Global Ground Support, LLC, and FMC Airport Systems, Inc. These two companies now have competing forced air de-icing vehicles in the marketplace.

Global has also been awarded a multi-year contract by the Air Force for forced air de-icing vehicles.

This system uses compressed air to blow snow and unattached ice off of airplane wings. It then puts a thin film of heated glycol on the cleaned wing to melt any residual ice. Often, the new, forced air technology cleans a wing in a single step, without using any glycol. Even when glycol is required to complete the snow removal process, the amount needed, can be 70 percent less than when heated glycol alone is utilized.

The blower's cost saving impacts every aspect of the glycol life cycle: acquisition, storage, heating, collection, recovery and disposal. Such cost reductions are significant, as glycol sells for $4 to $5 per gallon, while it's associated life cycle costs total between $15 and $20 per gallon. Removing six inches of snow with just glycol, from one airplane can cost more than $30,000.

To date, 138 military de-icing vehicles have been delivered to the Air Force, and 40 commercial vehicles have been delivered by Global to the airline industry. All 178 of the Global vehicles use Navistar trucks built in Springfield, Ohio. FMC reports deliveries of 31 vehicles. These deliveries total 209 vehicles.

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APPENDIX E

FY 2002 Federal Laboratory Consortium Awards to the Department of Defense

FY 2002 FLC Awards to the Department of Defense

2002 Laboratory Director of the Year: Brian Simmons

Brian Simmons is both the Technical Director of the U.S. Army Developmental Test Command (DTC) and the Chair for the Aberdeen Proving Ground (APG) Science and Technology (S&T) Board. Within the DTC, he has established a full-time ORTA position that interacts on a weekly basis with the FLC Mid-Atlantic Regional Representative on a wide variety of technology transfer issues affecting APG.

As APG S&T Chair, Simmons established a High Technology subcommittee to focus on a number of technologies including biotechnology, nanomaterials, environmental, automotive and robotics, and firefighting technologies. He also established a Higher Education Subcommittee to focus on educational issues, and a Marketing and Publicity subcommittee to ensure that APG is recognized in the media. These subcommittees have played very active roles in support of technology related events on the proving ground and for shaping the growth of technology transfer activities.

Under the direction of Simmons, the APG established the Team APG Business Development Office (BDO). This office serves as the single point of contact for the business community to access APG. To date, the BDO has generated many CRADAs and is recognized by the business, government and academic community as a vital resource for future development plans.

Simmons has played an active role in the Harford County and Army Alliance Science and Math Magnet School initiative at Aberdeen High School. The DTC hosts two teachers as part of a summer teacher intern program. The purpose of these ventures is to impart knowledge of the APG to the school system and to permit the use of laboratory facilities to teachers and students.

The activities sponsored by the BDO have served to bridge gaps and enhance industry outreach for the combined benefit of APG and the private sector. Two major outreach activities for industry were held at APG under Simmons' leadership. The first, a Biotechnology Showcase, resulted in 135 industry attendees from a four-state region. The second, a two-day Technology Showcase, resulted in over 200 attendees representing industry, academia, local and state government as well as Federal officials and members of Congress.

Among Simmons' other technology transfer accomplishments is forging alliances with Maryland economic organizations including the Technology Development Corporation, Maryland Department of Business and Economic Development, and the four-state Mid-Atlantic Research Consortium. And under his direction, the APG S&T Board and the Ben Franklin Technology Partners of Pennsylvania signed a Memorandum of Agreement to commence a cooperative relationship between the two entities.

U.S. Army

The Biological Detection Kit

Seated: Dorothea Paterno; Standing, from left: Dr. Peter Stopa, Maurice Milton, Philip Coon, Alan Seitzinger, James Genovese; not pictured: Darlene Tieman.

Increased awareness of the potential use of biological agents as weapons of terror and mass destruction underscores the importance of finding a means to sample and detect agents in a rapid and effective manner. The Biological Detection Kit (BDK) consists of sampling and detection equipment for biological agents including large area surfaces, small solid samples, liquid samples, and air samples. The kit is integrated into a single package that can analyze samples for the presence of DNA, protein, and bacteria. The BDK takes techniques borrowed from food safety, personal air monitoring and other arenas, and integrates them with new approaches to create a technology that can be very easily used in the field.

The technology transfer effort from the BDK team took several forms. A cooperative research and development agreement (CRADA) was established with New Horizons Diagnostics, Inc. to package the kit. EAI Corporation served as another CRADA partner to further refine and market the BDK. Other vendors,

including Turner Designs, Inc., Molecular Probes, Inc.; and Chemmetrics, Inc. are providing the BDK team with supplies, reagents and specialized expertise. In addition, an Information Exchange Agreement was established with the Military Institute of Hygiene and Epidemiology in Poland that enabled joint development of the spore luminescence protocol of the kit.

The effort behind the BDK has resulted in the development of the BioHaz™, a system that provides users with the capability to sample and detect biological materials in suspect samples. This product is currently being marketed by the response Equipment Corporation, a subsidiary of EAI Corporation. The kit is also being marketed as the SWIPE™ sampling and spore luminescence kit by New Horizons Diagnostics, Inc. This technology has been used by Hazmat teams in several cities, including Washington, DC and Virginia Beach, Virginia, in response to recent incidents involving anthrax.

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Edgewood Chemical Biological Center

Integrated Virus Detection System

Dr. Charles Wick

The Integrated Virus Detection System (IVDS) represents a fundamentally new method for detecting and identifying viruses and nanoparticles. Capitalizing upon the physical properties of size and density allows viruses to be counted and identified without the use of biochemical reactions. Dr. Charles Wick invented and developed the IVDS and transferred the technology to Virus Detection Company, LLC (VSDC) through an exclusive license. Analysis and identification through the use of the patented IVDS has led to a wide range of new discoveries including the ability of some viruses to pass through filters, change easily, live a long time under harsh environments, and live in soil and water. Recent outbreaks such as the West Nile virus, other alphaviruses, influenza and Foot in Mouth disease make this technology extremely useful and timely. The IVDS technology transfer effort is producing tangible results in terms of the creation of capital and jobs within the U.S. through the creation of VSDC. Several industries will benefit directly from the development of the IVDS. The bioprocessing industry will be able to use this technology to develop new products including vaccines, as well as expanding into new regions of science and technology. Materials technology will use IVDS to refine its nanoparticle based creations that can have applications in a number of areas, including paints, coatings, and transparent films used as computer monitors and television screens. The computer industry will be able to produce

newer and more complex computing devices with improved nanometer sized separations and tolerances. Lastly, the IVDS has provided a new standard of measurement on the nanometer scale that relies upon such instruments as electronmicrography and light scattering.

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U.S. Navy

Plasma Arc Waste Destruction System

Jon Cofield

For almost a decade, researchers at the Carderock Division, Naval Surface Warfare Center have been investigating plasma arc technology as a method to destroy shipboard combustible solid waste. Dr. Eugene Nolting and Jon Cofield developed the Plasma Arc Waste Destruction System (PAWDS), which offers a small size, rapid and efficient operation, and the ability to incinerate a wide variety of garbage. Forming an electric arc in a gas—a process that generates temperatures hotter than the sun's surface ----

Dr. Eugene Nolting

creates the plasma used in the system. This allows operation at such an extremely high temperature that combusting materials release very few pollutants to the environment. The team was able to move this patented technology forward through both a Cooperative Research and Development Agreement (CRADA) and a licensing agreement with PyroGenesis, Inc., a privately owned company that develops and commercializes customized thermal plasma technologies. PyroGenesis plans to manufacture and install PAWDS on commercial cruise liners The primary beneficiary of PAWDS is the cruise industry, which is subject to stringent pollution control regulations. International law prohibits ships from indiscriminately dumping trash at sea, so much of the waste must be burned in conventional incinerators or stored for later removal. Because the incinerators cannot burn plastic, the garbage is spread out on a table and hand sorted. PAWDS eliminates the need to hand sort garbage and store contaminated plastic. Not only are labor costs lowered by the use of PAWDS, but its smaller size results in additional room, which often is used as cabin space by paying customers. Because ships have limited space, this benefit is very important. In addition, the technology produces a waste gas stream that is so clean it can be operated during the daytime without impacting passengers' quality of life.

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Carderock Division, Naval Surface Warfare Center

Advanced Nontoxic Fouling Release Coatings

Dr. Joanne Jones-Meehan

Dr. Joanne Jones-Meehan of the Naval Research Laboratory (NRL) has worked to develop and commercialize an environmentally safe coating system for ship hulls and pipeline applications, such as power plant water intakes. This patented coating system reduces the problem of biofouling (the undesired growth of barnacles, mussels, algae, etc.) without the use of toxic metals and biocides. Rather the coating provides a surface to which organisms find it difficult to adhere. There is a pressing need for an environmentally safe method for controlling biofouling to replace current methods that involve metals and other chemicals that are potentially harmful to aquatic life and workers alike.

Smart Surfaces, LLC of Annapolis, Maryland entered into a licensing agreement with NRL to bring Dr. Meehan-Jones' technology to the marketplace. Also during the technology transfer process, Dr. Jones-Meehan was involved with testing the product on 10 ships and at three power plants, as well as application and inspection of the test coatings.

The coating system, as licensed by Smart Surfaces, will be used on commercial, private and Government owned ships, as well as on power plant water intake systems. Benefits will be realized in a number of areas as workers will be no longer be exposed to potentially harmful chemicals of antifouling paints; the electric power generating industry will save up to $5 billion a year by avoiding water intake cleanup; and the aquaculture and fishing industries will see a significant reduction in the number of lost lines, nets and other equipment from biofouling.

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Carderock Division, Naval Surface Warfare Center

High Speed, Ultrastable, Fiber-Optic Communications Laser

Dr. Thomas Carruthers

Irl Duling

Michael Dennis

A team at the Naval Research Laboratory (NRL) has developed and advanced fiber-optic laser that is capable of generating ultrashort pulses of light. Because pulsed laser light is used to carry digital information, the ultrastable, ultrafast NRL fiber laser technology enables—among other things—development of next-generation communications systems. In addition, this patented technology can be used for radar systems and for other applications such as navigation and surveillance.

The team has been successful in transferring the laser by establishing licensing partnerships with two companies, PriTel, Inc. and Calmar Optcom. The primary results of the technology transfer efforts are the numerous products that are being manufactured and sold under the NRL licensing agreements. To date four models of optical clocks, three optical transmitters, and two high power polarization maintaining fiber amplifiers are on the market.

Advances in communication via telephone, local networks or the Internet via this technology will benefit any business or activity that relies on exchange of information, including banks and financial service providers, hospitals, government agencies, distance education programs, and the military.

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Naval Research Laboratory

Digital Image Enhancement

Michael Duarte

A sailor trying to find mines in a cluttered underwater environment faces the same challenges as a physician looking for microcalcifications in a mammogram of dense beast tissue. Both of these searches can benefit from digital image enhancement. Michael Duarte of the Naval Undersea Warfare Center (NUWC) Division, Newport developed a digital image enhancement technology which uses wavelets and mathematical functions, which serve as building blocks to represent data. Applying the digital image enhancement allows small objects to be found in a large, complex area. This patented technology as applied to breast cancer screening would improve the physician's ability to detect microcalcifications on a mammogram, thus catching the cancer at an earlier stage than previously possible. The early detection would improve the patient's chance of survival and allow less invasive treatment options.

James Kasischke

Duarte, a digital signal processing expert, noted the similarities between underwater mine-hunting sonar and the problems of detecting small lesions in mammograms. Under Dual Use funding, he began working on mammogram digital image enhancement, using NUWC's state-of-the-art technical facilities. Duarte then worked with James Kasischke, a NUWC patent attorney, to identify business and patent opportunities that led to cooperative research and development agreements (CRADAs) with Advanced Image Enhancement, Inc. (AIE); and the Slater Center for Interactive Technologies. A licensing agreement has also been established with AIE.

Thanks to Duarte, the Navy has successfully transferred undersea mine-hunting technology to the medical community. Digital Image Enhancement will enable doctors to have greater success in detecting early stage breast cancer. Women will benefit from the early detection, resulting in the saving of thousands of lives.

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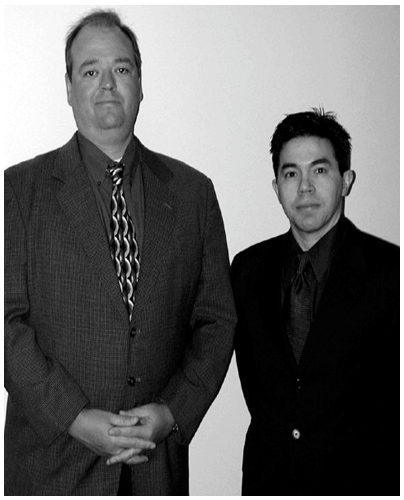
Naval Undersea Warfare Center Division, Newport

U.S. Air Force

Lightweight, Carbon Composite Cages for Low-Heat Generation Bearings



Dr. Nelson Forester and Lewis Rosado

Wei Shih

A team at the Air Force Research Laboratory/Propulsion Directorate (AFRL/PR) developed a composite cage for rolling element bearings. The lightweight, carbon-carbon (C-C) and carbon-phenolic (C-Ph) composite cages enable rolling element bearings to operate at a higher speed with significantly less frictional heat generation than bearings fitted with traditional steel and cotton-based phenolic cages. This technology has proven to be helpful in solving critical heat generation problems in advanced demonstrator engines for cruise missile applications.

The partner of the AFRL/PR team in this technology transfer effort is Allcomp, Inc. Their arrangement took the forms of an exclusive patent licensing agreement and a cooperative research and development agreement (CRADA). Allcomp was responsible for manufacturing the composite bearing cages; AFRL/PR handled the cage/design specifications, conducted validation testing, and transitioned the technology to military programs.

Beneficiaries of the composite bearing cage technology include domestic bearing manufacturers, as well as users of rotating equipment and turbomachinery. Uses subject to extreme operating conditions and poor marginal lubrication conditions will find the composite cages of great value. Specific examples include aircraft and power generation gas turbine engines, automotive turbochargers, machine tool spindles, medical X-ray machines, and rotating devices in satellites.

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Air Force Research Laboratory, Propulsion Directorate

FLC Outstanding Service Award – Mary Weiss

Through her years of involvement with the FLC, Mary Weiss has made a significant impact on this organization though her extensive knowledge of technology transfer and her tireless commitment to promote the Consortium's mission.

Ms. Weiss has spent the last 10 years working in the Department of Defense (DoD) technology transfer arena. Since 1998, she has been involved with the Office of Research and Technology Applications for the Defense Technical Information Center (DTIC). In this capacity Ms. Weiss has assisted in the preparation of the DoD's annual report to Congress on technology transfer. In supporting that effort and technology transfer in the DoD, she helped define the requirements and plan for implementation of the Defense Technology Transfer Information System (DTTIS). In response to the needs expressed by many small companies Ms. Weiss has helped them understand how to use the government's scientific information assets as part of DTIC's technology transfer mission.

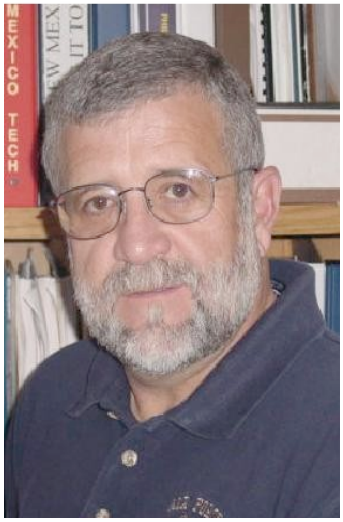
The commitment to the FLC that Ms. Weiss has demonstrated stems from her belief that the FLC is an important gateway for information and cooperation for both the laboratories and the public. She was instrumental in the completion of the FLC's Federal Technology Transfer Legislation and Policy, also known as The Green Book. Ms. Weiss conducted extensive research on public domain material for inclusion in the book. The end result of her work in this area resulted in the development of an updatable professional index. She was also responsible for coordinating the review of a draft version of the Green Book with FLC members.

In another FLC project Ms. Weiss worked with DTIC and the National Institute of Standards and Technology (NIST) to compile data and compose letters to be sent to federal laboratories about contributions they could make to advance the technology transfer effort.

Ms. Weiss has also held several positions in the FLC, including Alternate Laboratory Representative for DTIC as well as Member-at-Large. She is also a member of the Marketing Committee, where she is involved in the revamp of the FLC web site's design and content.

Ms. Weiss has proven to be a valuable asset to the FLC and should be considered for the 2002 Outstanding Service Award.

FLC Representative of the Year Award – Patrick Rodriguez



Mr. Rodriguez has been an FLC member for over 18 years. He has been Regional Coordinator for the Mid Continent Region, Chair of the State and local Government Committee, and has participated in the Awards and Training Program, and Marketing Committees. Mr. Rodriguez was the first full-time ORTA within the Air Force and is now the alternate lab representative for the Air Force Research Laboratory (AFRL) – Directed Energy Directorate at the Phillips Research Site.

Mr. Rodriguez has created and championed the Tech Transfer for Education (TTE) Program as a priority activity within the Air Force Tech Transfer Program. Mr. Rodriguez was responsible for building the AFRL at KAFB TTE Program. In 1992, five schools from the Albuquerque area were involved in two education outreach projects sponsored by Phillips Laboratory (now the AFRL at KAFB). Mr. Rodriguez took over the leadership for the education outreach projects in 1994. Under his supervision, the AFRL at KAFB TTE Program has grown to six K-12 projects that currently involve 140 schools and have had over 49,000 students participate to date through the State of New Mexico. These projects utilize the expertise of mentors from the AFRL and at least 23 other organizations such as Sandia National Laboratory, Space Missile System Center, Aerospace Corporation and Unisys. Currently 62 of the schools involved in the AFRL at KAFB TTE Program are from rural communities.

As the Program Manager for the AFRL at KAFB TTE Program, Mr. Rodriguez was involved with the implementation of the first Educational Partnership Agreement (EPA) within the Department of Defense (DoD) to donate computers to schools. Donations of equipment to educational institutions under the Technology Transfer Act, 15 USC 3710(i) have been a key component of the education partnering activities for the AFRL at KAFB.

One of the teams involved in the SPACE Project from Albuquerque Public Schools, Eldorado High School, received an official patent, #6409564, in August of 2000 for their project development of an electromagnetic sliding satellite door. The team, which included 7 students, their teacher and 2 mentors, also received national recognition for their project. The SPACE team from Manzano High School, which was a joint project, placed second in the 1999-2000 Adventures in Supercomputing Competition sponsored by Sandia National Laboratories. Another SPACE team from Bernalillo Public Schools won first place in the paper competition for their 1999-2000 SPACE Final Report. Students participating in the March 2000 Mars Missions Link-Up Day were featured on the Kids Network, a national cable channel.

APPENDIX F

By 2003 Federal Laboratory Consortium (FLC) Awards to the Department of Defense

FY 2003 FLC Awards to the Department of Defense

2003 Laboratory Director of the Year: Jim Zarzycki

Mr. Jim Zarzycki is Director of the U.S. Army's Edgewood Chemical Biological Center (ECBC). Mr. Zarzycki has made technology transfer a high priority at ECBC, encouraging scientists, engineers, managers, and staff to actively participate in and support the program. As a result, technology transfer activities have evolved from a single ORTA to a Business Development Team of ten highly motivated individuals working collectively to develop new business opportunities, strengthen relationships with industrial and academic partners, and reach out to state and local communities. To ensure technology transfer agreements are consistent with the Center's goals, mission, and applicable regulatory requirements, Mr. Zarzycki directed the ECBC to institute a robust, highly responsive, review process for technology transfer agreements.

An illustration of Mr. Zarzycki's personal involvement in support of technology transfer is the internal funding and visibility he gives such projects. One recent example, the Biological Sampling Kit (BiSKit), was submitted for this year's FLC Excellence in Technology Transfer Award along with two other nominations. Mr. Zarzycki not only encouraged the nominations, but provided internal laboratory funds critical for the technology to reach a stage of development suitable for transfer to a commercial partner/licensee. Last year, Mr. Zarzycki submitted two winning Excellence in Technology Transfer Awards.

Additional impact internal to the laboratory includes an on-going technology transfer training program available to all ECBC personnel; a technology transfer section in each CB QUARTERLY publication, which is widely read both internally and externally to ECBC; the frequent appearance of technology transfer accomplishments in ECBC weekly highlights; and CRADA/PLA signing ceremonies in which Mr. Zarzycki discusses the results that will be achieved by the technology transfer. The technology transfer program at ECBC has grown from 11 active CRADAs in 1998 when Jim Zarzycki assumed the position as Director, to 43 active CRADAs, 11 patent license agreements, 24 new test service agreements, and 26 agreements with Other Government Agencies.

Mr. Zarzycki participates in several external organizations involved in technology transfer, including the Federal Laboratory Consortium, Northeast Maryland Technology Council, Aberdeen Proving Ground Science & Technology Board and its Business Development Office, and the Maryland Technology Development Corporation.

Under Mr. Zarzycki's leadership, ECBC has transferred technology to state/local government and industry. For example, the Department of Justice (DOJ) and ECBC have worked closely since 1998 to leverage the technical expertise available at ECBC. With support from ECBC under an Interagency Agreement, DOJ's Center for Domestic Preparedness (CDP) has trained over 11,000 emergency responders to effectively recognize and respond to terrorist incidents involving chemical and biological agents and to enhance the capabilities of state and local jurisdictions.

FY 2002 was a unique year for technology transfer at ECBC due to the tragic events of 9/11/01 and the war on terrorism. ECBC, under the leadership of Mr. Jim Zarzycki, utilized its technology transfer program to meet some of the challenges presented. Technologies developed to protect soldiers on the battlefield were transferred to other government agencies and industry partners for the protection of private citizens. Mr. Zarzycki enhanced the technology transfer program at ECBC to meet this unprecedented challenge, while continuing to support other commercial applications of ECBC technologies, thus serving as a vital partner to industry in numerous collaborations.

U.S. Army

Edgewood Chemical Biological Center

Design, Development, Training, Fielding, and Continued Consultation for Mobile Laboratories

In the event of a chemical, biological or radiological terrorism attack, first responders, military leaders, and federal agencies need tools that will allow them to sample and analyze materials in and precise and uniform manner. A team from the Edgewood Chemical Biological Center (ECBC) has been active in all aspects of improving mobile laboratories and providing solutions for efficient and accurate field analysis of chemical and biological materials. The technologies developed by this team include the development of turn-key capabilities that integrate and standardize field sampling, as well as analysis tools that support its users. Additionally, the technologies address regulatory issues concerning transportation, environmental law and safety compliance.

Numerous partnerships using cooperative research and development agreements (CRADAs), patents, license agreements, and transfer mechanisms contributed to the success of the project. Often one successful effort precipitated work with another partner. To date, those partners have included Purified MicroEnvironments, Quick Silver Analytics, Inc., the Federal Bureau of Investigation (FBI), and the Food and Drug Administration (FDA).

Both the public and private sectors have directly benefited from ECBC's mobile laboratory technologies. This team has provided improved strategies that will ultimately enhance law enforcement efforts to protect the U.S. against terrorism and the threat of weapons of mass destruction.

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Antibody Engineering for Expression in Insect Cells and Larvae

This technology addresses an advanced method for manufacturing recombinant proteins in insect cells and larvae. It consists of genes for a recombinant antibody that binds a biological warfare agent (botulinum toxin). The genes were cloned in a way that makes it possible to produce the antibody in insect larvae. Antibodies are currently deployed as the recognition component of sensors that detect biological threat agents.

The Edgewood Chemical Biological Center (ECBC) team is transferring this technology through a partnership with Chesapeake PERL (C-PERL), a company based in College Park, Maryland. By way of a cooperative research and development agreement (CRADA), C-PERL scientists are pioneering a technology that transforms the insect larvae into miniature protein factories. This is the latest attempt to manufacture biological material for use in a new generation of medicines and diagnostic tests.

The CRADA has proven to be successful for both ECBC and C-PERL. In particular, the partnership enabled C-PERL to more than double the size of its staff. Last year, the company won the Maryland Biotech/Life Sciences Incubator Company of the Year Award, and was featured in over 20 news articles—including *Fortune Magazine's* "Coolest Companies of 2002."

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U.S. Army Natick Soldier Center
Small-scale Cogeneration of Heat and Electric Power

The first practical small-scale cogenerator, developed by the team of Don Pickard and Frank Dileo, efficiently provides the energy needs of a battalion level field kitchen. Cogenerators produce heat and electric power from one process 80 percent more efficiently than separate heaters and generators. Instead of using dry saturated or superheated steam as in a conventional Rankine cycle, a high temperature two-phase mixture of steam and water is injected into an expander. The alternator coupled to the expander produces electrical power, while the remaining heat is used for cooking and sanitation.

The Natick Soldier Center team has been involved in the discovery and exploitation of cogeneration for the past five years. They joined forces with engineers at Yankee Scientific, a Medfield, Massachusetts-based company, to adapt the liquid injection cogeneration (LIC) process to field kitchens. The resulting prototype was a success, leading to the two largest home HVAC manufacturers to express an interest in the cogenerator. The technology was formally transferred when Yankee Scientific and ECR International formed a joint venture called Climate Energy LLC to develop and market the technology. In 2001 the technology was fully developed and tested with kitchen appliances, and integrated into a fully functioning kitchen in 2002.

Electric Power generation using small-scale cogenerators offer significant environmental advantages and other benefits when compared to conventional power plants as lees fuel is burned, the fuel burned is cleaner, and the fuel is burned over a broad area unlike the concentrated pollution produced by power plants.
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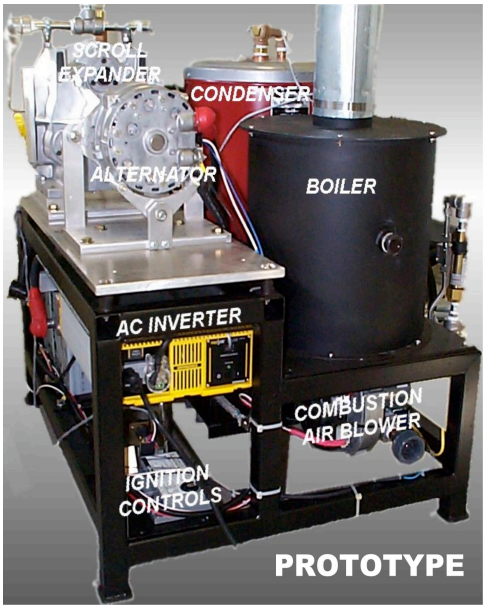

U.S. Navy

Naval Research Laboratory
Optical Real-Time Adaptive Spectral Identification System

The Optical Real-Time Adaptive Spectral Identification System (ORASIS) is a software application for the analysis and compression of hyperspectral images based on a patented algorithm from the Naval Research Laboratory (NRL). Hyperspectral images are composite images, made up of multiple pictures of a "scene" taken at different wavelengths. This technology mathematically identifies constituent components and maps their abundances within the image.
Through the efforts of Dr. Jeffrey Bowles, ORASIS has been transferred to Advanced Power Technology, Incorporated (APTI) under the terms of a nonexclusive license with NRL. Using the technology, the licensee is selling value-added earth image analysis products and services, such as customized maps, and systems for remote sensing data collection and analysis.

The earth image products from ORASIS will be used for oil, gas, and mineral exploration; environmental assessment; crop analysis for optimizing irrigation and fertilization; and military remote sensing. Based on the array of areas in which the technology can be applied, the individuals, businesses, agencies, etc. that will benefit ranges from doctors and patients to farmers, manufacturers and oil companies.

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Harold Metcalf Award – Dr. Michael Sullivan

Dr. Sullivan is the Head of the Technology Development Projects Office and the Office of Research and Technology Applications (ORTA) for the Naval Air Warfare Center Weapons Division at Point Mugu. He also is serving in the following capacities: FLC Far West Deputy Regional Coordinator and Member at Large, the FLC Executive Board, Department of Defense (DoD) Technology Transfer Policy Committee Chair, and DoD Technology Transfer Integrated Planning Team (TTIPT) committee member. Additionally, he has served as a member of the FLC Executive Committee and led the Far West Region as the Deputy and Regional Coordinator. Dr. Sullivan has been a member of the FLC Planning and Policy,

Finance, Program, Training, and Legal Committees.

Dr. Sullivan's contributions to the FLC are as diverse as his participation. Within the Far West Region, Dr. Sullivan has facilitated partnerships by focusing on the business needs of companies. Working with the economic and twelve academic members of the CORE 21 (Connecting Research & Economic Development for the 21st Century), and coordinating with the Department of Commerce (DoC), Bureau of Export Administration's Federal Resource Access Partnership (FRAP) program, businesses near the CORE 21 members were surveyed. The business needs identified by the responses were then matched to the technologies, intellectual property, unique facilities, and human resources at the region's member laboratories and college members of CORE 21. As a result, the FLC Far West Region successfully initiated memoranda of understanding with several counties to support regional technology transfer efforts.

Using this process and partnering with Manufacturing Extension Centers and the DoC BXA, additional "Industry Needs Surveys" were completed for businesses in Los Angeles, Seattle, San Diego, San Francisco, Phoenix, and Tucson, and their metropolitan areas. The business needs identified by these responses were then matched to eighteen technology areas, including transportation, medical devices, environmental, and manufacturing, thus enabling the Far West Region federal laboratories to present solutions to specific company needs. Dr. Sullivan has worked with the Small Business Development Centers (SBDCs) within the Los Angeles, Ventura, and Santa Barbara counties to help companies both introduce their technologies to the Federal laboratories and use the Federal laboratories to develop company technologies and commercialize their products. Dr. Sullivan also promoted technology transfer outreach as describe below:

- Appeared on the program "Technology 2000", which aired on the Discovery channel, allowing promotion of the unique technologies available at Point Mugu and throughout the Far West Region.
- Established a dynamic web site for the Far West Region to assist all Regional members to meet the 21st Century challenges of the global marketplace by presenting their capabilities on the internet.
- Established an interactive roundtable on the internet for the Far West Region to share practices and lessons learned in a timely manner.
- Coordinated the contents and production of a promotional CD-ROM business card highlighting technologies, patents available for licensing and commercialization, and unique regional facilities of the laboratories and technical activities in the Far West Region.
- Sponsored, coordinated, and presented environmental technologies jointly with other FLC Regions at national environmental meetings with a leading university.

In summary, Dr. Sullivan's major contributions to the FLC demonstrate his commitment to technology transfer and the need for individual, active

participation to strengthen the FLC. His effort goes unequaled in improving and promoting the FLC and goals.