

**Department of Defense**  
**Small Business Innovation Research**  
**&**  
**Small Business Technology Transfer Programs**



**Fiscal Year 2006 Annual Report Submission**

**on**

***Executive Order 13329:  
Encouraging Innovation in Manufacturing***

**September 2007**

## Table of Contents

<b>Manufacturing-Related Topic and Award Statistics.....</b>	<b>3</b>
<b>I. Examples of DoD Manufacturing-Related SBIR/STTR Projects.....</b>	<b>5</b>
<b>II. Procedures and Mechanisms DoD Has Used to Date to Give Priority to ManufacturingRelated Projects .....</b>	<b>17</b>
<b>III. Actions DoD Has Taken Toward Promoting And Supporting Manufacturing-Related Research Projects.....</b>	<b>22</b>

**Department of Defense  
Fiscal Year 2006 Annual Reporting on  
Executive Order 13329 – Encouraging Innovation in Manufacturing**

**Manufacturing-Related Topics and Awards Statistics**

In Fiscal Year 2006 (FY06), 35% of Defense SBIR/STTR topics were manufacturing-related (based on the current Manufacturing-Related Research and Development (R&D) Search Terms list from the Office of Science & Technology Policy (OSTP)). This equals the percentage achieved in FY05. The percentage of manufacturing-related contract awards was 19.8% in FY06, an increase from 18.5% in FY05. The number of manufacturing-related topics and the number of awards and total award amounts by DoD Component are provided below. Note that most of the Phase II awards made in FY06 were from topics developed or solicited in FY04.

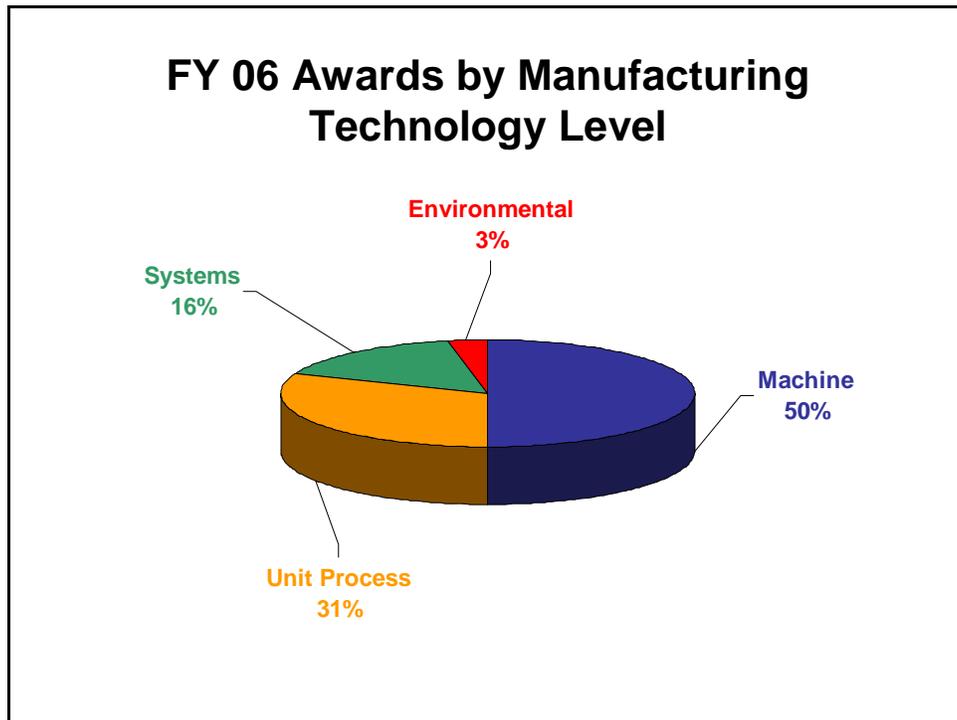
Manufacturing Topics Summary by DoD Component for FY06:

<b>Agency</b>	<b>SBIR</b>	<b>STTR</b>	<b>SBIR &amp; STTR</b>
<b>Air Force</b>	117	11	128
<b>Army</b>	96	13	109
<b>CBD</b>	0	0	0
<b>DARPA</b>	7	1	8
<b>DLA</b>	0	0	0
<b>DMEA</b>	0	0	0
<b>DTRA</b>	0	0	0
<b>MDA</b>	28	3	31
<b>Navy</b>	47	16	63
<b>NGA</b>	0	0	0
<b>OSD</b>	13	3	16
<b>SOCOM</b>	4	0	4
<b>Totals</b>	312	47	359

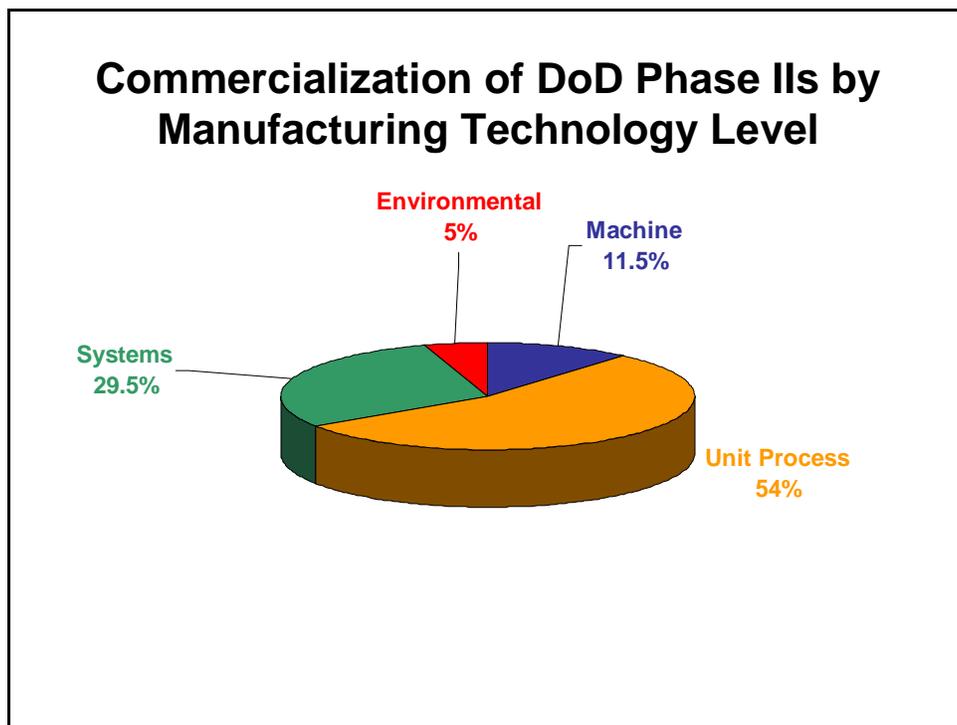
Manufacturing Awards Summary by Agency for FY06:

Agency	SBIR				STTR				SBIR & STTR			
	Phase I		Phase II		Phase I		Phase II		Phase I		Phase II	
<b>AF</b>	11,362,184	114	34,331,707	47	1,599,381	16	6,737,973	9	12,961,565	130	41,069,680	56
<b>Army</b>	4,773,722	65	56,783,743	78	799,593	8	5,247,655	7	5,573,315	73	62,031,398	85
<b>CBD</b>	139,916	2	3,729,727	5	0	0	0	0	139,916	2	3,729,727	5
<b>DARPA</b>	494,728	5	2,181,775	4	99,000	1	0	0	593,728	6	2,181,775	4
<b>DLA</b>	0	0	0	0	0	0	0	0	0	0	0	0
<b>DMEA</b>	0	0	0	0	0	0	0	0	0	0	0	0
<b>DTRA</b>	99,996	1	1,805,474	4	0	0	0	0	99,996	1	1,805,474	4
<b>MDA</b>	3,989,332	40	21,289,998	29	599,772	6	2,250,000	3	4,589,104	46	23,539,998	32
<b>Navy</b>	7,367,876	91	29,922,064	48	3,702,466	53	6,934,360	14	11,070,342	144	36,856,424	62
<b>NGA</b>	0	0	0	0	0	0	0	0	0	0	0	0
<b>OSD</b>	3,669,778	37	4,488,937	6	299,999	3	0	0	3,969,777	40	4,488,937	6
<b>SOCOM</b>	199,941	2	1,818,348	1	0	0	0	0	199,941	2	1,818,348	1
<b>Totals</b>	32,097,473	357	156,351,773	222	7,100,211	87	21,169,988	33	78,395,368	444	177,521,761	255

Again based on OSTP characterizing guidance, FY06 DoD SBIR contract awards are somewhat concentrated on machine-level manufacturing, versus unit process, systems and environmental levels, as shown below.



Additionally, in response to EO 13329, the Department began asking participating firms to characterize reported commercialization resulting from Phase II awards relative to manufacturing. To date, 22% of DoD Phase II awards reported in the DoD SBIR/STTR Commercialization Database are identified as manufacturing-related (from awards made in 1983 through 2006). The majority of this commercialization is in unit process level technologies (see chart below). Of these manufacturing-related projects, 61% have sales and/or additional follow-on investment. Total Commercialization resulting from DoD SBIR/STTR Phase II manufacturing-related projects reported to date by firms participating in the DoD SBIR/STTR programs is \$4,947,198,902 (\$3,593,779,126 in sales and \$1,353,419,776 in investment).



#### **I. Examples of DoD Manufacturing-Related SBIR/STTR Projects**

Examples of DoD manufacturing-related SBIR/STTR projects are described on the pages that follow. More are available upon request, and several are featured on DoD and DoD Component web pages as success stories.

<b>Firm name</b>	<b>Story</b>	<b>Agency</b>
Hittite Microwave Corporation	Joint Tactical Radio System (JTRS) Handheld Manpack and Small form fit (HMS) Core Transceiver Power Amplifier (PA)	Army
Universal Display Corporation	Flexible and Conformal Environmental Barrier Technology for Displays	Army
Tanner Research	Integrated Composite Energetics Packaging System (ICEPS(tm))	Army
INTER Materials LLC	Low Cost Manufacturing of Ballistic Helmets	Army
Materials Research & Design	Ceramic Matrix Composites	Navy
Technology Systems Inc.	Laser Fabrication of Ship Structures	Navy
Polyshok, Inc.	Law Enforcement (L/E) 12 Gauge Anti-Personnel Round	SOCOM
Sensorcon, Inc.	Novel Low-Cost Methods for Fabricating Compact, Vertically Integrated MicoElectroMechanical Systems (MEMs)	DARPA
BryCoat	CVD TiC Coating on Precision Bearing Balls	MDA
Vanguard Composites Group, Inc. and V System Composites, Inc, both wholly owned subsidiaries of DR Technologies, Inc.	Hybrid Composites for Beryllium Substitute Materials	MDA
Silicon Space Technology's	Radiation Hard Electronic Components	MDA
2Phase Technologies, Inc.	Rapid, Low-Cost, Reformable Tooling for Prototyping and Short-run Manufacturing of Advanced Composite Structures	MDA
RVM Scientific	Low Power Gas Chromatograph Column Technology	CBD

## **Army**

Hittite Microwave Corporation. The Hittite Microwave Corporation's project "Joint Tactical Radio System (JTRS) Handheld Manpack and Small form fit (HMS) Core Transceiver Power Amplifier (PA)" is one example of a successful manufacturing related SBIR. Hittite has been working on the Affordable Software Defined Radio (SDR) Components for JTRS Army Technology Objective - Manufacturing (ATO-M) as well as the SBIR. Hittite enhances and develops the manufacturing techniques to reliably and cost-effectively manufacture Gallium Nitride (GaN) Monolithic Microwave Integrated Circuits (MMIC) for the core transceiver PA that will potentially be transitioned into the JTRS HMS Core Radio 2 system. This PA will provide a 96% reduction in size, 23% reduction in power consumption and a 70% reduction in UPC over the standard COTS parts that are currently being used in the JTRS system. GaN MMICs are currently widely used in the commercial world and this is the first major manufacturing development addressing this technology area. Finally, this PA that Hittite Microwave Corporation is developing has a great deal of potential as a commercial product in the cellular industry and the manufacturing improvements provided under the ATO-M and this SBIR are greatly contributing to GaN MMIC's viability in the commercial as well as military arenas.

Proposal #: A2-2372

Contract#: W15P7T-06-C-P243

Award Amount: has received 1st Phase II increment of \$364,576.96 out of \$729,305

Organization: U.S. Army Communications-Electronics Research, Development, and Engineering Center (RDECOM-CERDEC)

ManTech Organization POC: Ms. Lisa Rulli, (732) 427-4646  
SBIR Organization POC: Ms. Suzanne Weeks, (732) 427-3275

Universal Display Corporation. In this program, entitled “Flexible and Conformal Environmental Barrier Technology for Displays,” and leveraged with the Army Technology Objective – Manufacturing (ATO-M) titled Flexible Display Manufacturing Technology, Universal Display Corporation implemented a new approach to encapsulate a long-lived, Active-Matrix Organic Light Emitting Device (AMOLED) display prototype built on flexible metal foil. A low-cost, high performance thin-film oxygen and moisture permeation barrier remains a critical issue to be solved for the successful development and commercialization of flexible Organic Light Emitting Device’s (OLED) displays. In this SBIR Manufacturing Related project, Universal Display Corporation developed a novel technology by which alternating layers of Polymerized Hexamethyl Disiloxane (PHMDSO) and silicon oxide SiO<sub>x</sub> or silicon Oxycarbide (SiO<sub>x</sub>-xCy) films are deposited in a single chamber Plasma-Enhanced Chemical Vapor Deposition (PECVD) system. The goal of this project is to apply this multilayer encapsulation technology to low power consumption phosphorescent OLED (PHOLED) technology to enable the low cost manufacture of flexible encapsulate a long-lived, AMOLED displays on either plastic or metal foil substrates non-existent anywhere in the world.

Proposal #: A2-2502  
Contract#: W911QX-06-C-0134  
Award Amount: \$730,000 / \$2.2M Phase III  
Organization: U.S. Army Research Laboratory (RDECOM-ARL)  
ManTech Organization POC: Dr. David Morton, (301) 394-1916  
SBIR Organization POC: Mr. John Goon, (301) 394-4288

Tanner Research. Tanner Research has developed a low-cost Integrated Composite Energetics Packaging System (ICEPS(tm)) for use as a component layer within the US Army RDECOM-ARDEC designed Micro Electro-Mechanical Systems (MEMS)-based Safe and Arm (S&A) Device. The innovation is that a tiny bridge and explosive lead element can be confined to an initiator board for the purpose of starting the micro scale firetrain in this “smart” detonator. The MEMS S&A contains a series of micro-scale energetic components required for run up and leading to a reliable munition fuse function. From this very successful start in an important gun-launched munitions application, ICEPS(tm) may be the only methodology immediately available to cost-effectively implement the exploding foil initiators (EFI) required to initiate emerging insensitive munitions (IM) energetics. The EFI currently available to munitions and rocket motor developers cost about \$125 each while Tanner's objective, albeit aggressive, is to provide \$10 to \$20 EFI devices, based on large quantity orders. The EFI will be mass fabricated by Special Devices, Inc. for multifunctional low-cost use as initiator/ igniter devices in legacy and IM applications. These advanced manufacturing technologies will enable the production of rugged, smoothly operating mechanisms that will fully meet all of the functional performance requirements for the MEMS Safety and Arming Army Technology Objective - Manufacturing (ATO-M).

Proposal#: A2-1618  
Contract#: W15QKN-04-C-1130

Award Amount: \$1,729,978 (\$1,229,978 SBIR and \$500,000 outside investor – Special Devices, Inc.)

Organization: U.S. Army Armaments Research, Development and Engineering Center (RDECOM-ARDEC)

ManTech Organization POC: Mr. Camilo Sanchez, (973) 724-5495

SBIR Organization POC: Ms. Carol L’Hommedieu, (973) 724-4029

INTER Materials, LLC. INTER Materials, LLC’s manufacturing-related SBIR, entitled “Low Cost Manufacturing of Ballistic Helmets”, enables the development and demonstration of process technologies that offer an inexpensive approach to manufacture ballistic helmets and other hard armor components from new advanced thermoplastic composite materials in a volume production environment. The use of a thermoplastic matrix material for ballistic helmets and other personnel protection products offers several unique advantages over the current phenolic resin-based systems. These include: improved ballistic performance, enhanced toughness, better low temperature ballistic performance, infinite shelf life, environmentally friendly systems (e.g. these materials can be recycled to injection molding materials), and enabling of welding technology to join interior parts to helmet shell. The development of this technology is intended to impact enhanced ACH helmet production using Thermoplastic Composite (TPC) materials. INTER Materials, LLC has been successful in developing a novel, high pressure method for consolidating thermoplastics – a key process parameter, especially for ultra high molecular weight polyethelene (UHMWPE) systems like Dyneema and Spectra. Work performed under the SBIR has provided not only a new manufacturing method for TPC materials and helmets, but it has provided an independent “shop floor” relevant environment to enable assessment and comparison with the large Army Technology Objective – Manufacturing (ATO-M) titled “Low Cost Manufacturing of Materials for Improved Warfighter Protection”. The ATO-M program is much larger in scope, but the SBIR has been highly successful in producing both process data and ballistic data that have helped mature the technology readiness of the materials and manufacturing readiness of the processes.

Proposal #: A2-2625

Contract#: W911QX-07-C-0033

Award Amount: has received 1st Phase II increment of \$ 424,549 out of \$730,000

Organization: U.S. Army Research Laboratory (RDECOM-ARL)

Organization POC: Dr. Shawn Walsh, (410) 306-0815

SBIR Organization POC: Mr. John Goon, (301) 394-4288

Redondo Optics Inc. Under an ARMY-CBD sponsored SBIR program, Contract No. W911NF-06-c-0047, Redondo Optics Inc. (ROI), a world leader in engineering and manufacturing of leading-edge nano-materials, optical sensors, and advanced photonics instrumentation is developing, for the first time, the concept of an etchless, deep-UV, continuously variable attenuated-phase-shifted mask (ConvaPSM™) technology to enable ultra-high resolution, optical nanolithography techniques for the cost effective production of integrated terahertz-frequency spectroscopic chemical and biological sensor platforms.

The final product at the completion of the Phase II project, a ConvaPSM™ photomask technology to enable the cost effective manufacturing of THz-frequency spectroscopic nanofluidic sensor biochips used for the label-less detection and identification of chemical and biological agents is expected to find wide usage in bio-medical, environmental, and security applications for the military, government, and commercial sectors around the world. The unique capability of the ConvaPSM™ technology makes it an extremely powerful tool in the production of nanoscale-size features needed across a multi-diversified field of applications from the semiconductor industry, to biomedical and sensing industry, and the optics, security, and aerospace markets.

Anticipated Commercial Products and Targeted Market - Virtually all biological substance detection, identification, and analysis applications will be able to make use of the THz spectroscopy nucleic acid array biochip sensing technology. According to analysts at the Fredonia Group (Cleveland, OH) the U.S. demand for biochip products and services will continue to grow at a rate of 20% annually to \$2.1 billion in 2008. This means that the potential market for the sales of THz nucleic acid biochip technology includes applications in: 1) biotechnology, 2) medical diagnosis, 3) clinical therapy, 4) pharmaceuticals, 5) agricultural biotechnology, 6) transportation security, 7) facilities security, 8) environmental monitoring, 9) academic and government research centers, and 10) military and homeland security chemical biological agent detection and identification.

Customers - Redondo Optics strategy is to establish the THz nucleic acid array biochip technology as our customer's platform of choice in the investigation and analysis of complex genetic information, and to capitalize in this leadership in the DNA array field by initially marketing the technology to customers based on three central applications: 1) biological agent detection and identification, 2) gene expression monitoring, and 3) DNA variation detection.

Manufacturing - Redondo Optics will manufacture the nucleic acid array biochips, THz read-out system, fluidics stations, instrument control software, and certain reagents in-house, as well as through contracts with third-party suppliers. The nucleic acid probe arrays manufacturing process involves wafer preparation, lithography and etching wafer process, dicing of synthesized wafers into chips, packaging of chips and quality control.

Business Development Plans and Milestones - The keys to commercialization are effective marketing and timely product development. The key commercialization milestones include: (i) performing market research and preparing a business plan (3 months from Phase II start); (ii) pilot production of nucleic acid array biochip products (12 months); (iii) pilot production of THz biochip readout instrumentation (24-months); (iv) testing and performance verification by customers (36 months); (v) establish full-scale production of the THz nucleic acid array biochip technology (48 months).

## **Navy**

For several years, the Navy SBIR and STTR Programs have sought technology innovations related to manufacturing processes, machine-level technologies, use of advanced materials in manufacturing, manufacturing of electronics hardware and ship signature reduction materials,

etc. A number of the related success stories have been published in four volumes: the Black Book (1999), the Blue Book (2001), the Red Book (2004), and the Gold Book (2007). These books can be accessed by reaching the Navy SBIR/STTR Website, [www.navysbir.com](http://www.navysbir.com), and selecting "What's New". Note that the Gold Book has just been compiled; it will be available on the above Website at the end of September 2007. A listing of success stories from these four books is provided in the preceding table.

Following are short narratives for two exemplary technologies, developed by Materials Research & Design and Technology Systems, Inc.

Materials Research & Design. Materials Research & Design (MR&D) provides research and design services to the advanced materials community, specializing in the areas of composite materials for the aerospace industry. Due to SBIR funding, MR&D's total annual sales revenue for 2005 jumped from \$710,785 to \$3,008,728, and the number of employees increased from 8 to 25. The technology developed under this SBIR program helped MR&D win a series of contracts under the NASA Next Generation Launch Technology Program, which contributed \$8.4 million in total revenue.

The Navy has an immediate need for an alternative to the metallic blast shield currently being used on the AV-8B Harrier aircraft. The blast shield protects the fuselage from the harsh exhaust environment, but the existing component exhibits severe degradation due to the high thermal and acoustic loads. Blackglas™ Ceramic Matrix Composites (CMCs) have been identified as potential replacement for existing steel blast shields that require significant maintenance because of thermal and acoustic loads. However, the composites cannot be employed in the fleet until further testing, development, and repair procedures have been established. Materials Research & Design (MR&D) has developed ceramic matrix composites, which can be used to manufacture replacement parts for certain Navy jet and helicopter metal components. MR&D's test data demonstrated that the repaired panel restored 95 percent of the load-carrying capability of the baseline composite. In addition, a micromechanical model and a thermal/acoustic finite element model were created to evaluate the effects of damage and design repairs on ceramic matrix composites. These models help MR&D to further develop repairs that arise from normal wear, abuse, and battle damage. MR&D received funding to develop analytical models and perform experiments to understand the effects of the operating environment (temperature, chemical species) on the structural properties of the CMC nozzle components in the AV-8B Joint Strike Fighter. MR&D has also received a contract from NAVSEA to design and analyze CMC components that have been successfully ground tested in the divert and attitude control system Standard Missile-3 Trident.

MR&D's ceramic matrix composites increase the cycle life and reduce repair costs of wing metal components on Naval jets and helicopters, such as AV-8B. Ceramic matrix composite materials tolerate a higher operating temperature in power turbines, which increases their efficiency and reduces the amount of oil needed for their operation.

## Applications

Naval Air Systems Command (NAVAIR)

- AV-8B Joint Strike Fighter - Design and
- Firescout unmanned aerial vehicle design, analysis, fabrication, and flight test

#### Naval Sea Systems Command (NAVSEA)

- Standard Missile-3 Trident- Develop analytical models and performing experiments for CMC nozzle components
- Commercial sector: Land-based turbines, power generation equipment

Technology Systems, Inc. Since 1981, Technology Systems, Inc. (TSI) has been a pioneer in a variety of technology areas. The company helped launch the PC industry, broke new ground in the development of network protocols, and has fueled technical innovations. TSI received the initial SBIR, and partnered with ATS to develop the control system to affordably manufacture steel shapes and structures. In 2005, TSI and ATS created a spin-off company, Precision Light Systems, dedicated to commercializing laser manufacturing capability. Precision Light Systems ([www.plsystems.us](http://www.plsystems.us)) has now grown to 4 full-time and 6 part-time employees.

TSI, along with its partner Applied Thermal Sciences (ATS), has developed a laser-welding process control system, using both autogenous laser and hybrid (laser and gas metal arc) welding technology, that provides for high-speed, precision, low distortion, and affordable fabricated structures. The application of industrial lasers in producing structural shapes for shipbuilding creates enormous savings and results in higher quality products than those produced by present methods. Components fabricated from plate steel are inherently more precise and of lower weight than those produced from traditional rolled steel. The process control system is designed to automate categorization, nesting, and handling of steel plates used in the fabrication of structural shapes such as I-beams and T-beams. The system includes a quality-assurance capability that provides in-process weld pool monitoring and after-weld inspection. The controller is referred to as the Process Control/Quality Assurance system. Initially developed to fabricate stiffeners for ship construction, the technology has allowed for the development of high strength-to-weight ratio sandwich panels, which is appropriate for a number of shipboard applications such as decks, bulkheads, and system platforms. The technology is going through certification of applications on the CVN and DDG 1000 platforms.

The TSI/ATS program has enabled the Navy and shipbuilders to produce better ships at substantially lower cost. In addition, leveraging Federal funding with state and private investments has enabled Precision Light Systems, a joint venture between TSI and ATS, to achieve world-wide recognition as a leader in laser fabrication development, both in the military shipbuilding community and in commercial markets as well.

#### Applications

- NAVSEA: PEO Carriers, PEO Ships, DDG 1000, CVN-78, Stiffeners, bulkheads, decks, and system platforms
- Commercial construction – Walls, ceilings, floors and roofs, stadium and parking lot decks, bridges, truck trailers, rail cars, ships and off-shore oil rigs

#### **Defense Advanced Research Projects (DARPA)**

Sensorcon, Inc. DARPA and the U.S. Army awarded a contract to Sensorcon, Inc. for “Novel Low-Cost Methods for Fabricating Compact, Vertically Integrated MicoElectroMechanical Systems (MEMs).” Sensorcon developed a new micro electrochemical sensor device or MECS for monitoring toxic gases such as nitrogen dioxide (NO<sub>2</sub>). Its Small Business Innovation Research (SBIR) work demonstrated the feasibility of fabricating 3D, vertically integrated MEMS, or VI-MEMS devices with low cost processing protocols. The 3D nature of the VI-MEMS process enables the fabrication of MECS devices that contain no moving parts and use less power than existing MEMS gas sensors. MECS combined the advantages of a proven gas sensing technology with a low cost, compact design. Sensorcon and its packaging partners developed complete toxic gas monitoring solutions for numerous applications in a growing market, presently valued at greater than \$1 billion.

The military will use the device for monitoring gas and chemical leakages in a range of scenarios, including transportation, storage, and various facilities monitoring applications. MECS offers a potential cost savings of up to 90% over existing sensors. The new packaging and integration techniques developed dramatically reduced sensor system size and costs.

### **Missile Defense Agency (MDA)**

BryCoat - CVD TiC Coating on Precision Bearing Balls. Instrument bearings with TiC-Coated Bearing Balls are critical to the performance of inertial guidance systems and space mechanisms. They allow for unfailing use in high temperature and changing temperature situations. They also perform in vacuum, space, and boundary lubrication regimes. The coating can also help in situations requiring long-term storage followed by “can’t fail” performance when needed. The novel coating technology for the TiC-coated balls was developed by a Swiss R&D house. When they announced plans to shut down the operation, defense suppliers identified and supported BryCoat in an effort to develop a US source for this critical capability. With encouragement from the defense community, BryCoat purchased the technology and equipment. In addition the Missile Defense Agency provided SBIR funding to BryCoat to facilitate re-qualification of the process for fielded defense applications and development of process improvements. MDA relies on the TiC coating technology in the THAAD missile seeker. Brycoat is now producing and selling TiC bearings using the novel CVD-based vacuum coating process supported by the MDA SBIR program to achieve unmatched coating properties and adhesion. Industry support has been strong as evidenced by the following statements.

Supplier BAE has stated, “BAE considers TiC coating of bearing balls to be a vital technology for performance of the THAAD missile Seeker. The coating enables the bearings to meet challenging environments. ...the TiC coating prevents micro-welding, preserving bearing performance even in the absence of lubricant”.

Raytheon also voiced their support for a domestic source for this technology. “TiC balls have slowly spread into other applications including scanners and gimbals. Raytheon wishes to voice support for continued development of domestic supply of TiC coated balls. The availability of TiC coated balls is the technology enabler of high performance bearings which make continued design content a reality. ... Current commitments to RAM, Bradley FVS, M1 CIV, AMRAAM

and several other current and proposed defense systems, make continued support of TiC coated balls a critical instrument bearing supply issue.”

BryCoat is looking for additional applications for this niche defense technology to expand into other markets. Opportunities exist in commercial satellites, aerospace and high value medical equipment.

Vanguard/V System Composites: Hybrid Composites for Beryllium Substitute Materials. A missile interceptor recently installed at Fort Greely, AK, now carries hardware developed by Vanguard Composites Group, Inc. (San Diego, CA), and V System Composites, Inc. (Anaheim, CA), both wholly owned subsidiaries of DR Technologies, Inc. (San Diego, CA), who co-developed an advanced composite aft flange design. The aft flange mounts the “fly away” interceptor—consisting of a main structure, divert maneuvering system, sensor, and electronic components—to the interface of the Boeing-manufactured booster. The divert assembly includes thrusters and associated “plumbing” used to maneuver the interceptor’s Exoatmospheric Kill Vehicle (EKV)—the actual “hit to kill” portion of the interceptor that maneuvers to collide with the hostile threat during intercept.

The Vanguard/V System Composites aft flange was incorporated into the EKV architecture to satisfy Raytheon’s requirement for a lightweight, stiff structure manufactured from space-qualified material—that could meet tight delivery requirements to support the Initial Operational Capability mandate issued by President Bush for an operational missile defense system by September 2004.

Vanguard continues to perform qualification testing on the three emerging components, all of which have strong MDA SBIR legacies. In each case, SBIR funding was key to development of those technologies. The companies already have two manufacturing patents related to their MDA-funded technologies. Even though the military application is the prime target for the technologies, they could be applied to commercial uses as well. For example, makers of enclosures for commercial satellites and aircraft could find the technologies useful. Also, the composites being developed by the companies could prove ideal for the automotive industry, which might use the materials to create multifunctional automobile structures or possibly embedded manifolds.

Silicon Space Technology - Radiation Hard Electronic Components. Silicon Space Technology’s (SST) strategy is to introduce its proprietary radiation hard (RH) technology first into the critical-need Space/Military/Aero memory market using the fabless manufacturing business model with our foundry supplier. Propelled by SST’s “RH Client Process” capability and the manufacturing prowess of a commercial foundry, they fully expect to become the de-facto radiation-hardening standard for next-generation RH circuits in the broader high-reliability marketplace. Further proliferation, via technology licensing opportunities, is envisioned in the low-power implanted medical device market, other high-reliability industrial IC markets, and future scaled commercial integrated circuit (IC) markets.

SST is currently creating demand for its technology by working closely with several aerospace and defense contractor market segments. These contractors, who already utilize older generation

radiation-hardened IC products, have a fundamental need for new leading-edge enhanced RH IC products -and- hardened versions of the legacy IC products. SST's scalable technology enables such a wide spectrum to be realized. With a proven straightforward engineering approach, it becomes possible to adapt existing IC standard products and cell libraries with "Hardening by Isolation" so that literally thousands of high-performance "rad soft" commercial circuits could be made radiation hard. As a result, the world's most advanced digital signal processing family and many other digital circuits used in wireless mass communications for terrestrial (non-RH) applications could be radiation-hardened.

Rapid, Low-Cost, Reformable Tooling for Prototyping and Short-run Manufacturing of Advanced Composite Structures: 2Phase Technologies, Inc. (Dayton, NV), has developed a reconfigurable tooling system (RTS™) that enables composite shops to quickly mold and replicate many tools and even parts on one platform at a fraction of the cost incurred when using conventional tooling approaches.

Their PH I and PH II contracts focused on the manufacture, modification, and redesign of rocket motor casings using 2Phase's reconfigurable tooling approaches. The result was a tooling solution that allowed a motor case with precision-located features to be manufactured quickly and inexpensively over a lightweight mandrel that could be removed quickly and simply after the fabrication was complete. 2Phase's system has advantages in cost, speed, and scalability over competing rapid-tooling approaches. The company expects the overall manufacturing cost of a generic 4' x 4' rapid tool to decrease 10-fold from \$5,000 to \$500 while providing improved tool performance. Using a unique replication process to create tools from a master model or original part is the key to the cost savings. Speed is also a factor, with the total turnaround time from master to mold to finished product being one to two days, as compared with the several weeks to months required to fabricate tooling for composites using conventional methods. Scalability is also key, as the RTS can make use of large tool beds—which can vary in size depending on the customer needs—currently ranging from roughly 2' x 3' to 6' x 9'. The company already has built concept tool beds that can handle the fabrication or replication of parts more than 65 feet long. For the U.S. Army, it also has designed tool beds that have successfully replicated the hood of an M35 truck and the cargo-bay door of a Black Hawk helicopter.

### **Special Operations Command (SOCOM)**

Polyshok, Inc. Polyshok, Inc. is tasked by USSOCOM under its SBIR Program to develop a 12 gauge shotgun door breaching round with performance beyond anything currently available to the US Military. Concurrent with the development of the ammunition is a task to develop the technology to manufacture to door breacher using modern high speed commercial loading equipment.

By nature, 12 gauge door breaching ammunition is complex with many more components than conventional shogun rounds. In addition, all door breaching rounds carry a unique payload designed to defeat locksets and door hinges. These payloads usually consist of compressed metal powders or metal impregnated wax slugs. The complexity of a large number of components and unique payloads have, to date, required door breaching ammunition be hand loaded. This greatly increases the cost of the ammunition while making it problematic with

respect to quality and reliability. Polyshok's development of the technology to manufacture this type of ammunition using high speed commercial loading equipment will solve these problems.

Polyshok, Inc. manufactures a patented Law Enforcement (L/E) 12 gauge anti-personnel round that essentially eliminates the potential for collateral damage. The door breacher uses a modified version of this patented technology. The payload of the door breacher ammunition is a fine, hard steel powder. This payload is carried to the target in an enclosed projectile body at almost 2000 feet per second. Upon impact with the door, the projectile penetrates the door and then expands radically using a device which diverts the steel powder at 90 degrees to the direction of travel. This process is similar to that of a shape charge. This is a very different approach to door breaching that is not only extremely effective against door hardware but also a missed shot that penetrates the door becomes non-lethal within a few feet. This limits unintended collateral damage which is a major problem with current door breaching ammunition.

This fine steel powder has a Rockwell Hardness of 55 and is approximately 0.017 inches in diameter. Commercial loading equipment obviously has many moving parts. Two of the primary parts are slider bars which move back and forth on top of each other as they carry the round to each component loading station. The size and hardness of the steel powder would not only cause the loading machine to seize up if it got between the slider bars but would severely damage the machine and shut down production. Consequently, Polyshok has designed and built a pre-loading system which loads and seals the steel powder into the projectile body prior to being carried to the commercial loading machine. This pneumatically operated and computer controlled device is designed so that any spilled steel powder does not effect its function. An additional requirement given to Polyshok regarding the manufacturing technology development is that it meets Six Sigma quality standards. No commercial shotgun ammunition of any type has ever been required to meet these strict quality standards. To this end, Polyshok has integrated sensors into each individual component loading station on the machine as well as the pre-loader device. These sensors feed information to a computer which allows every round to be monitored for quality during each step of the loading process. This enables quality control and tracking of not only each individual completed round of ammunition but for each step of the loading process. This will be unique to the entire small arms ammunition industry. The loading system will be capable of producing up to two million door breaching rounds per year.

During Phases I and II of this SBIR contract Polyshok has used not only its own in-house expertise but also a team of five sub-contractors. Each sub-contractor has special skills required to help accomplish the assigned tasks. It is critical that small businesses attempting a large, highly sophisticated development put together a competent team covering all areas of the development process. Polyshok and its team have expertise in terminal ballistics, ammunition loading, machine design, plastics molding, custom high speed manufacturing, coating of parts to meet environmental hazards and government contracting.

This team effort has resulted in several additional new patent pending technologies. The new round will be pressure proof to a depth of 70 feet of sea water and a new hull coating process will insure its resistance to multiple chemical contaminants as well as salt corrosion.

Several government agencies have also assisted in this development. Mil Tech, which is a DOD pilot program to assist small business with financial models as well as technical support, has been deeply involved. They have provided grant funding to assist in the development and have produced a sustainability model which demonstrates to the government the price structure and quantities required to be purchased to keep the product viable for Polyshok. Mil Tech also has provided technical assistance in finding government certified test laboratories which can independently perform some special Design Verification Testing of the production ammunition.

Georgia Institute of Technology, Center for Manufacturing Excellence, in conjunction with a grant from "One Georgia" (a state grant program for small businesses), has completely developed the Six Sigma Quality Assurance Program, assisted in developing the Defense Contract Management Agency (DCMA) Quality Assurance and Safety logistic programs and will be instrumental in assisting with Design Verification Testing Data Management and Analysis.

This highly coordinated technical effort by Polyshok, Inc. will provide the US War Fighter, as well as US L/E agencies, with effective, reliable and high quality ammunition.

### **Joint Science and Technology Office for Chemical and Biological Defense (CBD)**

A specific case study from CBD is RVM Scientific from Santa Barbara, CA under the topic Low Power Gas Chromatograph Column Technology.

RVM Scientific, Inc. Gas Chromatography (GC) is a universally accepted analytical instrument used for the separation and identification of chemical compounds. Commercial gas chromatographs have been used for over half a century with tens of thousands routinely used on a daily basis. The device has a large power requirement due to many heated zones typically reaching temperatures in excess of 300 degrees Centigrade. Originating from a Small Business Innovation Research topic, RVM Scientific, Incorporated was selected to develop an improved Valveless, Low Power Pre-concentrator for Field Instrumentation. As an off-shoot of the resulting research and development, an innovative approach to heating the gas chromatography column was identified. RVM Scientific was successful in designing and developing miniature, high efficiency low thermal mass (LTM™) column assemblies. LTM™ GC technology combines conventional commercially available capillary GC columns with a special manufacturing process to create a GC module that provides rapid heating and cooling. The approach essentially reverses the method by which GC columns are typically heated -- the capillary column is combined in the RVM manufacturing process to incorporate heating and temperature sensing components using a design that heats and cools very efficiently, and at the same time substantially reduces analysis time achieving high sample throughput. The Low Thermal Mass column technology results in rapid heating with low power demand.

The most unique aspect of the commercially developed product is the ease of retrofitting existing gas chromatograph instruments, permitting users to simply swap the removable OEM GC oven door with an RVM manufactured replacement door that incorporated up to four column modules with simultaneous and independent temperature programming achieved by one GC instrument. Incorporated into the new door are the column/heater modules; the same software, injectors,

detectors, and GC column choices remain unchanged. The RVM column module is attached to a transfer line module with chromatography unions for making connections within the host GC oven that no longer requires heating.

RVM Scientific is currently selling LTM™ column assemblies to both fixed and mobile laboratories that currently use gas chromatography technology. It is important to note that the RVM achievement took at least six years from the initiation of the SBIR Phase I proof-of-concept study to reach manufacturing and commercialization success.

## **II. Procedures and Mechanisms Used to Date to Give Priority to Manufacturing Related Projects**

The Department has taken many steps to give priority to manufacturing-related projects, including the following:

- Added a section to its internal DoD SBIR/STTR Program Managers website addressing EO13329 Manufacturing Innovation to make DoD efforts in support of the EO available to all participating laboratories, centers, and other SBIR/STTR personnel. At this website, the Executive Order 13329, the Department of Commerce “Manufacturing in America” document, statistics, success stories and other items are maintained and updated with the most current information. It is anticipated that additional success stories will be identified as attention is generated for manufacturing-related technologies. Further, these efforts will represent successes across the entire spectrum of DoD SBIR/STTR funded activities and reflective of the various technologies being pursued in support of the initiatives of the Department.
- Encouraged Components, as well as their participating laboratories and centers, to develop manufacturing related topics and/or to emphasize the linkage to manufacturing innovation.
- Expanded the note in the SBIR and STTR solicitations to include the four main areas included under the EO that the DoD is looking for innovative methods of manufacture that reduce cost and increase efficiencies in producing the item/process identified in the topic.
- Encouraged Components to develop and test pilot programs aimed to increase manufacturing innovation R&D within their mission.
- Encouraged each Component to outline any unique aspects of manufacturing or manufacturing-related topics in their own instruction sections as part of each solicitation.

Specific DoD component procedures and mechanisms follow:

### **Army**

1. In response to Executive Order 13329, Army SBIR/STTR PMO established a closer collaborative relationship with the U.S. Army Manufacturing Technology (ManTech) Program. Our initial efforts to gather manufacturing-related data began with the 06.2 Topics, and continued with the 07.2 and 08.1 Topics, where we asked the topic authors to designate whether the written topic supported Manufacturing Technology. The Army ManTech Program Office and

the individual Army Technology Objective - Manufacturing (ATO-M) Managers reviewed, evaluated, and provided an endorsement of the 06.2 topics, with the intention of facilitating the possible integration and alignment of SBIR efforts directly into ATO-M projects. As was done with the 06.2 Topics, the Army ManTech Program Office and the ATO-Ms reviewed all of the 07.2 and 08.1 Topics for manufacturing-relatedness against the following categories:

- a. Core Manufacturing Innovation Topic
  - Addresses manufacturing process, technique or innovation as the primary objective of the topic
  - Topic addresses the development and application of advanced technologies for manufacturing processes, tools, and equipment
  - Targets manufacturers of manufacturing equipment or applicable to the manufacture of many systems or production lines (i.e., pervasive)
  - Addresses the affordability, producibility or manufacturability of a demonstrated technology
- b. Research Topic with Significant Manufacturing-related Innovation (Shared Objective)
  - Research for a process or product that has significant manufacturing implications, although not the sole purpose of the topic
  - Topic addresses the development or application of advanced technologies for manufacturing processes, tools, and equipment
  - Topic includes manufacturing issues associated with technology under development
- c. Research Topic that has Product or System Focus, Addressing Manufacturing Aspects of that Product
  - Primary objective of topic is to develop a system or weapon-specific capability
  - Manufacturing, producibility, cost and yield are referenced but not the primary objective of the task
  - Manufacturing-related activities may be part of Phase II
- d. Topic with No Direct Manufacturing Innovation, but Potential to Apply Techniques Developed to Manufacturing
  - Research topic may include a process or product that has manufacturing implications or could apply to a manufacturing process as a secondary application, even if not stated in the topic description, may include manufacturing-related activities as part of Phase II
- e. Topic with Some Indirect Manufacturing Applications
  - Topic does not address any manufacturing process or product, but may indirectly improve the manufacturing base through training, protection of domestic manufacturing capability or other methods of strengthening the manufacturing base

2. Comments and endorsements provided by the Army ManTech Program Office and the ATO-Ms were forwarded to the Army SBIR Source Selection Board and were used in their analysis and recommendations of the 07.2 and 08.1 Topics submitted to the Office of the Secretary of Defense, Office of the Director, Defense Research and Engineering, USD (ATL) for final approval.

3. In May 2006, the Army SBIR program incorporated the Army ManTech Program Office and the ATO-M Managers into both the Phase I and Phase II source selection process. The intent was to use the ManTech review and comments of the proposals as a discriminator by the source selection board and to facilitate the possible integration and alignment of SBIR efforts directly into ATO-M projects. The Army employs the use of manufacturing related as a tiebreaker in the evaluation process to the maximum extent possible without adversely impacting other critical mission areas.

## **Navy**

- In 2004 the Navy published in its SBIR/STTR Website the guidance related to EO 13329.
- In 2005 the Navy introduced and maintained through 2006 its focus on manufacturing-related topics by adding a special section in the topic submission format. This format requires the author to address the topic's relevance to manufacturing and manufacturability.
- In 2005, the Navy solicitation for SBIR/STTR proposals introduced an emphasis on EO 13329 by encouraging firms to address the manufacturing needs in the Defense sector. This practice continued in 2006.
- In connection with the Navy's current emphasis on affordability and with a focus on innovation in affordable manufacturing, the SBIR/STTR Program Office has maintained constant coordination with the Navy's major acquisition programs, viz., the Littoral Combat Ship, Aircraft Carrier, Destroyer, and the Virginia Class submarine programs.
- In each solicitation for SBIR/STTR proposals, the Navy has continued its emphasis on EO 13329 by encouraging the firms to address the manufacturing needs in the Defense sector.

## **Air Force**

- Air Force has added manufacturing technology as a tie-breaker in our solicitations. "AIR FORCE PROPOSAL EVALUATIONS." Evaluation of the primary research effort and the proposal will be based on the scientific review criteria factors (i.e., technical merit, principal investigator (and team), and commercialization plan). Please note that where technical evaluations are essentially equal in merit, and as cost and/or price is a substantial factor, cost to the government will be considered in determining the successful offeror. The Air Force anticipates that pricing will be based on adequate price

competition. The next tie-breaker on essentially equal proposals will be the inclusion of manufacturing technology considerations.”

- Air Force has set aside additional topics for special manufacturing technology topics. In Solicitation 2006.3, Air Force had its first special topic focused upon remote robotic drilling. Once successfully demonstrated, this robot will go through Title IX certification and will then be incorporated by the JSF production line. This is a specialized multi-million dollar phase II effort that combines technologies from 5 separate small businesses into one prototype robot.
- Air Force has manufacturing topics in Solicitation 2007.3 and 2008.1. They expect at least one more special topic (multi-million dollar phase II effort) in Solicitation 2008.2.

## **DARPA**

- In the FY 2007.2 solicitation, 11 out of 45 topics were related to manufacturing. These topics were reviewed by the Defense Sciences Office, to ensure that manufacturing emphasis and DARPA applications were appropriate.

## **MDA**

Background. The Missile Defense Agency stood up a Manufacturing and Producibility Technology Program that addresses manufacturing-related research and development (R&D) beginning in FY02. This Program continues to be the focal point for implementation of E.O. 13329. The Missile Defense Agency, in standing up the Manufacturing and Producibility Technology Program, recognized the importance of manufacturing-related research and development (R&D) to the success of the Agency mission.

Response: The Manufacturing and Producibility Directorate (DEP) is the Missile Defense Agency’s primary organization for assessing manufacturing and producibility issues and problems across the Ballistic Missile Defense System and determining investment strategies to solve these issues/problems. Since FY02, DEP has been participating in the MDA SBIR/STTR program through the development of SBIR/STTR topics, the recommendation of Phase I and Phase II SBIR/STTR awards and the SBIR/STTR Phase II Transition Program that cover manufacturing in the following areas: Advanced Materials and Structures, Propulsion, Energy and Power Systems, Electro-optics, RF Devices/Sensors, Radiation Hard Components, and Advanced Manufacturing Processes. DEP began addressing Anti-Tamper issues in FY04. The topics, while different in scope, address common themes such as innovative processes that reduce cost, reduce manufacturing cycle time, and improve performance, and/or reliability.

Through broadly defined SBIR topics directed toward manufacturing capability, DEP has identified numerous companies and awarded Phase I and Phase II projects to these companies. These companies have been identified by diligent research and analysis of U. S. industrial capability and identification of areas where innovative solutions are needed. On-site visits and correlation with BMDS and military manufacturing needs has resulted in identifying those small

companies whose manufacturing capabilities can be brought forward to enhance the U.S. industrial base.

Currently, DEP consists of 24 full-time equivalent government and contract individuals. DEP has integrated the SBIR/STTR activity into their overall investment strategy. Virtually every individual within DEP is involved to some extent with the SBIR/STTR program (on average 16% of their time). This involvement is greater than \$500K per year, which does not include the support of the various Army, Navy, and Air Force field activities.

In FY08, DEP is a stakeholder in 26% of the total MDA topics (14 of 53). The intent is to look for Manufacturing and Producibility issues across relevant areas. DEP is directly responsible for 13% of the FY08 topics and participates in an additional 13%. The FY08 DEP topics support 9 of the 10 Program Elements.

### **Office of the Secretary of Defense (OSD)**

The Office of the Secretary of Defense SBIR and STTR Programs, managed by the Office of the Director of Defense Research and Engineering, solicited 8 Manufacturing Technology topics resulting in 34 Phase I awards totaling \$3,352,130, all funded in 2006. The program is in the process of reviewing, evaluating and selecting the Phase II follow on contracts having budgeted \$6,000,000 for these projects in FY 2007.

### **SOCOM**

- During Topic Generation and Award Selection Processes, SOCOM increased Manufacturing Innovation in their SBIR program by requiring the topic authors to consider / investigate manufacturing improvements for each topic as well as to ensure they use applicable manufacturing keywords in the topic descriptions.
- Developed future data (using SBA-issued keywords) to monitor innovative manufacturing awards and funding.
- SOCOM emphasized new opportunities for Manufacturing Related Research and increased Manufacturing Innovation in their SBIR program by requiring the topic authors to consider / investigate manufacturing improvements for each topic as well as to ensure they use applicable manufacturing keywords in the topic descriptions.
- Proposals that included innovative technology improvements could become a “tie-breaker” during the award selection process when appropriate.

### **CBD**

In FY07, sixteen (16) new topics were included in the FY07.1 CBD SBIR solicitation. Six of the 16 topics include, as part of the overall project, potential for manufacturing innovation. These include the following Phase I topics:

TOPIC	PHASE I PROPOSAL TITLE
CBD07-102	Immediate Bio-decontamination System
CBD07-103	Generic Adsorptive Carbon Residual Life Indicator

- CBD07-110 Self-Sanitizing Thin Films Using Discrete Toxicant/Germinant Surface Features
- CBD07-111 Carbon Nanotubes-Based Filters for Aerosol Sample Collection
- CBD07-113 Development of a Field-Ready Antimicrobial Wound Dressing for the Treatment of Vesicant Burns
- CBD07-115 Lightweight, Efficient Blower for Personal Air Ventilation System

There was an emphasis in FY07 to transition a greater percentage of CBD topics from Phase I proof-of-concept/feasibility studies to Phase II pre-production prototype development. Therefore, in FY07 there were a total of 27 Phase II projects in progress consisting of 17 ‘new starts’ and 10 ongoing (Year 2 period of performance).

Also during FY07, seven (7) CBD SBIR Phase I projects did include manufacturing or manufacturing practices that successfully transitioned to Phase II contract awards. The manufacturing innovation, as a portion of the overall development effort, may lead to competitive and cost effective manufacturing practices should the Phase II pre-production prototype prove advantageous. A list of Phase II projects that include aspects of improved manufacturability or incorporate innovative processes or products having future manufacturing implications follows:

TOPIC	PHASE II PROPOSAL TITLE
CBD04-111	Passive Chemical/Biological Protection for Crew Tents
CBD05-104	New Materials for Smart Fabric Chemical Agent Sensors
CBD05-108	Portable System for Immediate Decontamination of Interior Spaces
CBD05-124	Flexible Composite Chemical, Biological, Radiological, and Nuclear Barrier for the Joint Expeditionary Collective Protection System
CBD06-105	Unique Conducting Polymer-Coated, Metallized Microporous Membranes with High Electro-Osmotic Function for Chemical and Biological Protection
CBD06-109	Residue-Free Decontamination Wipes with Reactive Nanoparticles
CBD06-108	Self-Detoxifying, Disposable Protective Garments

Results of these efforts will be highlighted in future reports addressing the compliance with EO13329.

**National Geospatial-Intelligence Agency (NGA)**

NGA has not implemented procedures to give priority to manufacturing-related projects. All topics are evaluated to identify the highest return for the Agency's mission.

**III. Actions DoD Has Taken Toward Promoting And Supporting Manufacturing-Related Research Projects**

The Department has taken many steps to promote and support manufacturing-related projects, including the following:

- Maintained EO 13329 and the Department of Commerce “Manufacturing in America” document on DoD SBIR/STTR website.
- Published information about EO 13329 in SBIR and STTR solicitations.
- Educated small businesses on the Executive Order at regional and national SBIR/STTR conferences.
- Continued to have a presence supporting manufacturing innovation in DoD at the annual MANTECH (Defense Manufacturing) Conference through attendance, exhibits, and conference sessions.

Specific DoD component actions follow:

### **Army**

The Army focuses many efforts on promoting manufacturing-related projects. These efforts include the Army SBIR and STTR website, the Army SBIR and STTR Quality Awards, and the annual Commercialization Brochure. One of the most successful methods of promoting manufacturing-related projects is through the Army SBIR and STTR website. This website brings together the small business community, Army researchers, Army Programs of Record and prime contractors, and the ManTech community for possible collaboration on new and ongoing SBIR projects.

PM, Army SBIR tracks and reports SBIR and STTR success stories through the annual Commercialization Brochure. The Army Commercialization Brochure is an excellent opportunity for Army organizations and Small Businesses to share information about their SBIR and STTR projects and the success of their projects. The brochure is distributed at Army, Defense, and National conferences providing exposure to these exceptional SBIR and STTR projects.

In 2006, for the first time, PM, Army SBIR participated in the Defense Manufacturing Conference (DMC) and will continue to attend in the future as a way to promote the SBIR program within the manufacturing community.

PM, Army SBIR will continue to incorporate the Army ManTech program in topic writing and the Phase I and Phase II source selection processes. This closer collaboration should stimulate opportunities to transition successful manufacturing-related SBIR projects in the future.

### **Navy**

- Since 2004, at all SBIR/STTR conferences, the Navy has coordinated with other SBIR/STTR agencies to emphasize a joint focus on EO 13329.
- Since 2004, in the SBIR/STTR National Conferences, the Navy has promoted to the industry the importance of manufacturing-related innovations in research.

- Since 2004 the Navy adopted policy of tracking and compiling manufacturing-related success stories for reporting to the OSD Office of Small Business Programs (OSBP).
- The Navy has maintained outreach efforts with prime contractors utilizing available opportunities, e.g., at the Navy's SBIR/STTR Forum and other conferences, towards their partnership with the SBIR/STTR firms.
- As part of DoD data compilation, the Navy continually tracks SBIR/STTR manufacturing-related awards by searching for abstracts containing the SBA-issued manufacturing-related terms.

### **Air Force**

- The Air Force manufacturing technology office has established a lead SBIR manager.
- The lead SBIR manager has participated in the AF Small Business efforts such as the Manufacturing Technical Assistance Production Program (MTAPP) - assists in increasing and enhancing the competitiveness of small manufacturing firms in support of the Air Force, Department of Defense, and their major Prime Contractors.
- The Air Force has added a hotlink to the AF manufacturing technology program (<http://www.ml.af.mil/mlm/default.html>) on the AF SBIR/STTR Shopping Mall ([www.sbirsttrmall.com](http://www.sbirsttrmall.com)) to help small businesses obtain information directly from our MANTECH office.

### **DARPA**

The DARPA SBIR/Small Business Technology Transfer (STTR) Program Manager speaks at a multitude of SBIR/STTR workshops and conferences. Manufacturing is emphasized at these meetings. DARPA has a grant with the Foundation for Enterprise Development to interview SBIR/STTR companies and develop success stories. Specific emphasis is on manufacturing-related companies. The DARPA SBIR/STTR Office has a grant with the Virginia Center for Innovative Technology (CIT), Virginia's economic development organization. CIT mentors Virginia SBIR companies and links them to Virginia manufacturing organizations including university manufacturing capabilities.

### **MDA**

- Referenced and established a link to EO 13329 on the main page of the Missile Defense Agency SBIR/STTR website (<http://www.winmda.com>).
- Starting in 2003, DEP developed a process to bring many small businesses face-to-face with prime contractors. Dubbed "Industry Days", these forums are intended to provide various small businesses an opportunity to present their manufacturing capability directly to the users: the Prime Contractors and manufacturers of major military weapons

systems. In 2003 and 2004, a total of 34 companies were represented during a total of 12 events. DEP's most recent event occurred 14 Aug 2007, at Lockheed Martin Missiles and Fire Control in Dallas, TX, with 15 companies represented.

- All SBIR/STTR Phase I and Phase II awardees are offered, free of charge, the services of the National Technology Transfer Center (NTTC). The services provide individualized business assistance through regional workshops funded by MDA. The NTTC leverages the expertise of technology and business experts to accelerate the maturation and commercialization of technology. The NTTC collects and maintains extensive data on MDA technology developments and their uses. The NTTC provides wide and highly positive exposure for technology developments, and their benefits to MDA and the country through a high traffic web site and award winning publications.
- Conducted several planning meetings with representatives from the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP). Should MDA participate in the commercialization pilot program in FY08, NIST MEP may be funded to provide focus efforts to DEP SBIR awardees.

## **OSD**

As discussed above, the Office of the Secretary of Defense SBIR and STTR Programs, managed by the Office of the Director of Defense Research and Engineering, solicited 8 Manufacturing Technology topics resulting in 34 Phase I awards totaling \$3,352,130, all funded in 2006. The program is in the process of reviewing, evaluating and selecting the Phase II follow on contracts having budgeted \$6,000,000 for these projects in FY 2007.

## **SOCOM**

- Emphasized the need for innovative manufacturing in all USSOCOM SBIR/Small Business briefings and placed E.O. 13329 on USSOCOM's website.
- Coordinated with other SBIR agencies prior to attending national SBIR conferences to develop a dedicated session on manufacturing opportunities for the small business community.
- Utilized SBA funded state services provided under the Federal and State Technology Transfer Program (FAST) for Manufacturing Innovation outreach to small companies.
- Described the purpose of E.O. 13329 in all briefings to small businesses and at all SBIR conferences.

## **CBD**

The CBD SBIR program continues to participate at the semi-annual National SBIR conferences, in addition to a number of regional SBIR public venues. In FY06, the CBD SBIR program overview was presented at the two National SBIR venues. At each of these venues, one-on-one discussions were conducted between SBIR program personnel and the small business representatives. Encouraging innovation in manufacturing is one aspect of the message conveyed to small businesses.

CBD SBIR topics, where applicable, are developed to address EO 13329 requirements. The intent is to develop, approve, and publish those topics that will likely improve opportunities for future commercialization and manufacturing by conducting research for a process or product that has significant manufacturing implications, although not the sole objective of the topic. The topics may also include manufacturing issues associated with technology under development. Of specific concern to the Chemical and Biological Defense Program is unit cost of technologies that have the potential for distribution to warfighters. Therefore, SBIR topics that address the affordability, producibility or manufacturability of an innovative technology are of particular importance.

Specifically addressing manufacturing in the topic generation process, CBD SBIR candidate topics are assigned to one of the following categories:

- a. Research Topic with Significant Manufacturing-related Innovation
  - o Research for a process or product that has significant manufacturing implications, although not the sole purpose of the topic
  - o Topic addresses the development or application of advanced technologies for manufacturing processes, tools, and equipment
  - o Topic includes manufacturing issues associated with technology under development
- b. Research Topic that has Product or System Focus, Addressing Manufacturing Aspects of that Product
  - o Primary objective of topic is to develop a system or weapon-specific capability
  - o Manufacturing, producibility, cost and yield are referenced but not the primary objective of the task
  - o Manufacturing-related activities may be part of Phase II
- c. Topic with No Direct Manufacturing Innovation, but Potential to Apply Techniques Developed to Manufacturing
  - o Research topic may include a process or product that has manufacturing implications or could apply to a manufacturing process as a secondary application, even if not stated in the topic description, may include manufacturing-related activities as part of Phase II
- d. Topic with Some Indirect Manufacturing Applications
  - o Topic does not address any manufacturing process or product, but may indirectly improve the manufacturing base through training, protection of domestic manufacturing capability or other methods to strengthen the manufacturing base

## NGA

The NGA SBIR Program Guidance web page <http://www.nga.mil/sbir> links to the Executive Order, and encourages Phase I and Phase II proposals to address the development of innovative manufacturing methods and processes when applicable to the topics.