

# COMMERCIALIZATION BROCHURE





**The Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs are key bridges that allow the U.S. Army research, development, and engineering community and the small businesses to work together and mutually benefit from the programs to equip Soldiers.**

The close technical connection between the government and small business ensures rapid and technically-focused solutions essential to our warfighters. Small businesses are valuable partners from the time they respond to Army topics until they transition technologies into the hands of Soldiers. They are a driving force that helps equip our Soldiers with agile, high-technology innovations that allow them to dominate the battlefield.

The SBIR and STTR programs are the nation's largest source of early stage technology funding and have allowed many small businesses to successfully market their ideas. Through these two programs, the Army has been able to assist with opportunities for commercialization and provide critical funding to more than 13,000 small businesses. Small businesses have been able to invent technologies that meet Army capability gaps and give Soldiers the tools they need.

*This U.S. Army SBIR and STTR Commercialization Brochure illustrates the success of small businesses that have benefitted from the programs, and transitioned their research and development into operational capabilities for the Army or to the commercial market.*



## THE SBIR AND STTR PROGRAMS

Congress established the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs to provide opportunities to participate in government sponsored research and development (R&D).

While STTR has the same objectives as SBIR regarding the involvement of small businesses in federal R&D and the commercialization of their innovative technologies, the STTR Program requires participation by universities, federally funded research and development centers (FFRDCs), and other non-profit research institutions.

Both the SBIR and STTR programs use a three-phase program structure that reflects the technical risk involved in developing and commercializing cutting-edge technologies.

- ▶ **Phase I** is a feasibility study that determines the scientific, technical, and commercial merit and feasibility of selected concepts. Phase I projects are competitively selected from proposals submitted against solicitation topics seeking specific solutions to stated government needs.
- ▶ **Phase II** represents a major R&D effort, culminating in a well-defined deliverable prototype (i.e., a technology, product, or service).
- ▶ **Phase III** expects the small business or research institute to obtain funding from the private sector and/or non-SBIR/STTR government sources to develop the prototype into a viable product or service for sale in government or private sector markets.

### *The goals of the SBIR and STTR Programs are to:*

1. Stimulate technological innovation;
2. Use small business to meet federal R&D needs;
3. Foster and encourage participation in technological innovation; by socially and economically disadvantaged small business concerns (SBCs), and by SBCs that are 51 percent owned and controlled by women.
4. Increase private sector commercialization of innovations derived from federal R&D thereby increasing competition, productivity, and economic growth.

|                         | SBIR   | STTR                             |
|-------------------------|--|----------------------------------|
| <b>Phase I</b>          | 6 Months; \$100,000 max  | 6 Months; \$150,000 max          |
| <b>Phase I (Option)</b> | 4 Month option (government's discretion); \$50,000 max, to fund Interim Phase II efforts | No option                        |
| <b>Phase II</b>         | 2 Years; \$1,000,000 max   | 2 Years; \$1,000,000 max         |
| <b>Phase III</b>        | Unlimited time; non-SBIR funding   | Unlimited time; non-STTR funding |

## SBIR AND STTR ELIGIBILITY REQUIREMENTS

**To qualify for the SBIR and STTR programs, a firm must meet the following criteria:**

- ▶ **Organized for profit**, with a place of business located in the United States, which operates primarily within the United States or which makes a significant contribution to the United States economy through payment of taxes or use of American products, materials or labor;
- ▶ **In the legal form** of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except where the form is a joint venture, there can be no more than 49 percent participation by business entities in the joint venture;
- ▶ **At least 51 percent** owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States, or it must be a for-profit business concern that is at least 51 percent owned and controlled by another for-profit business concern that is at least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States — (except in the case of a joint venture);
- ▶ **Has, including its affiliates, no more than 500 employees.** The small business may subcontract a portion of its work, as long as the small business “prime” performs at least two-thirds of the Phase I work and half of the Phase II work. For the purposes of determining compliance, percent of work is usually measured by both direct and indirect costs; however, the actual method of measurement will be verified during contract negotiations.

The STTR Program is open to any team consisting of a small business, as defined previously, and a research institution. The research institution may be any U.S.-based nonprofit research institution, federally funded research and development center (FFRDC), or university or college. The small business must perform at least 40 percent of the Phase I and Phase II work. The research institution must perform at least 30 percent of the Phase I and Phase II work. Any part of the remaining 30 percent of the work may be subcontracted. For the SBIR Program Phase I and II efforts, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the proposed effort. Primary employment means that more than one-half of the principal investigator’s time is spent with the small business. For STTR Program Phase I and II efforts, the principal investigator may be primarily employed with either the small business or the research institution.

In both programs, Phase I and Phase II work must be performed in the United States, to include the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.



## PHASE III AND COMMERCIALIZATION

A goal of the SBIR and STTR programs is to increase private sector commercialization of innovations derived from federal R&D, thereby increasing competition, productivity and economic growth.

Phase III represents the successful culmination of an SBIR/STTR project. SBIR Phase III refers to work that derives from, extends or logically concludes efforts performed under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented toward commercialization of SBIR/STTR-developed research or technology. While Phase II success is measured by whether the prototype product or service developed by the small business can meet an Army need, Phase III success can be indicated by the small business marketing and selling the products or services outside the SBIR/STTR programs. Sales can include cash revenue from the government or private sale of new products or non-R&D services embodying the specific technology and/or spin-off technology. Commercialization can also include additional investments in activities that further the development and/or commercialization of the specific technology.

***The Army has instituted several programs to facilitate the transition of Phase II projects to Phase III.***

**The following pages discuss each of these in detail:**

- ▶ Technical Assistance
- ▶ Transition Support



## TECHNICAL ASSISTANCE

In accordance with the SBIR Reauthorization Act of 2000, Public Law 106-554, and the National Defense Authorization Act of 2012, Public Law 112-81, of the Small Business Act (15 U.S.C 638), the Army provides technical assistance services to small businesses engaged in SBIR projects through a network of scientists and engineers working in a wide range of technologies. The objective is to increase Army SBIR technology transition and commercialization success; thereby accelerating the fielding of capabilities to Soldiers and to benefit the nation through stimulated technological innovation, improved manufacturing capability, increased competition, productivity, and economic growth. The Army SBIR Program has strategically placed Technical Assistance Advocates (TAAs) in nine regions across the Army to provide technical assistance to small businesses that have Phase I and Phase II projects with participating organizations within their regions.

### ***Each TAA provides:***

- ▶ **Expert advice and analysis to SBIR awardees** to assist the firm with: a) improving technical decisions; b) solving technical problems that arise during the performance on a project; c) minimizing technical risks associated with the project; and d) developing and commercializing new commercial products and processes resulting from the project.
- ▶ **Expert advice and analysis to the government** regarding technology transition planning and development of technology integration roadmaps through participation in Program Executive Office (PEO) requirements development, technology assessment, and technology transition planning and management activities that facilitate relevant and timely technical advice to supported small business concerns regarding integration of SBIR-derived technologies into DoD programs.
- ▶ **In coordination with the government research manager**, SBIR awardee, and any potential stakeholders, the TAA assists in formulating Phase III plans for Phase II projects. The Phase III plan must document the strategy, requirements and resources to transition the SBIR project to Phase III and into an acquisition program, larger science and technology effort, or a stand-alone product or service.



## TRANSITION SUPPORT

**Army SBIR currently provides transition support to companies within Phase II of the program to Phase III through the Phase II Enhancement Program.**

The Army is currently structuring a permanent SBIR Commercialization Readiness Program (CRP) to incorporate best practices from the past seven years under the Commercialization Pilot Program, and to address Congressional intent as defined by the SBIR Reauthorization language. Once implemented, the Army SBIR Program will administer the CRP to increase SBIR technology transition and commercialization success. The CRP is still in transition, so Phase II companies interested in securing additional support and funding for transition of their technology during this transition period should follow the process established for Phase II Enhancements. Companies interested in pursuing Phase II Enhancement consideration are encouraged to contact their Contracting Officer's Representative (COR) or their Technical Assistance Advocate (TAA) for additional information and assistance.

### ***Phase II Enhancement:***

The Army SBIR Phase II Enhancement Program provides funding to small businesses that require additional funding during their Phase II contract period. Instances where more funding may be required during Phase II should initially be identified by the project's Contracting Officer's Representative (COR). The COR, in conjunction with the Technical Assistance Advocate (TAA) and the organization's SBIR Program Coordinator (PC) will compile the needed documentation and forward it to the Army SBIR Program Management Office (PMO) no later than six months prior to the end of the Phase II period of performance. The PMO will review and adjudicate all transition funding requests. Businesses that graduate from the SBIR small business definition or are acquired by a larger business that would not qualify during their Phase II contract will not be considered for Phase II Enhancement funding. SBIR Phase II Enhancement and CRP combined funding will not exceed \$500,000 per request and is provided depending upon availability and is subject to a deliberate approval process. Small businesses interested in Phase II Enhancements and CRP should contact their COR.



## PHASE II ENHANCEMENT DOCUMENTATION

### *Consists of the following:*

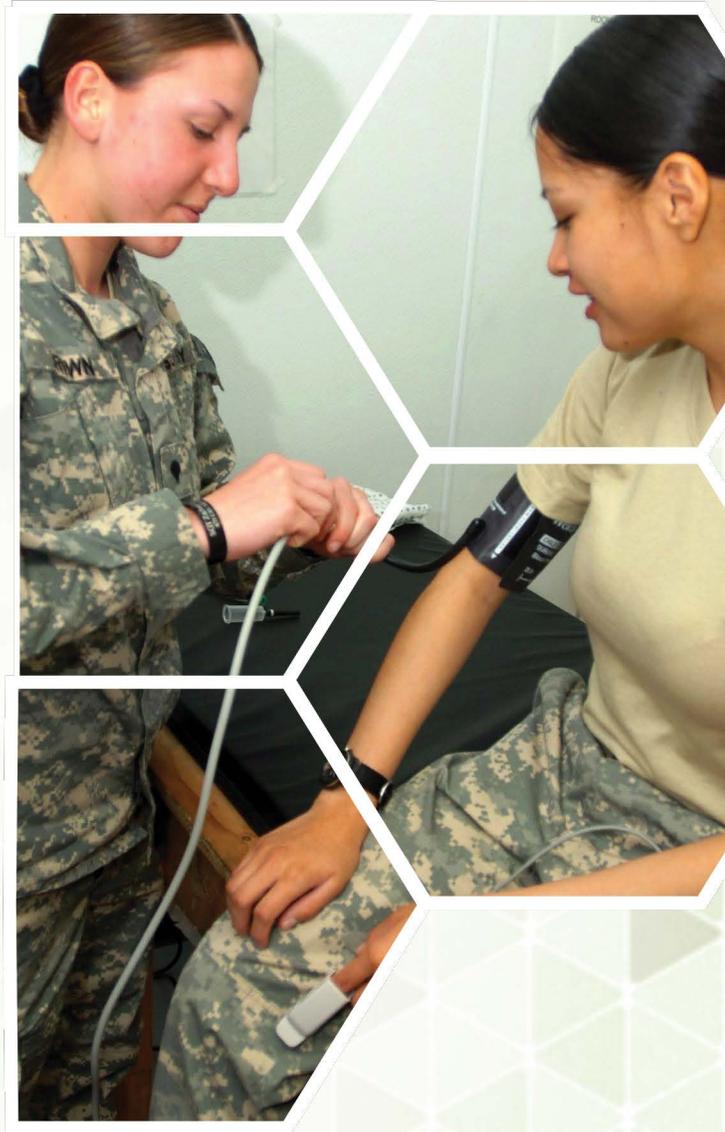
- ▶ **A memorandum from the participating organization's Technical Director**, Program Executive Office, or a designated representative to PM, Army SBIR providing a compelling reason for the additional funding.
- ▶ **A concise statement of work** for the additional effort to be executed with the SBIR Phase II Enhancement funds. The statement of work should contain adequate detail to be included in any contract modification.
- ▶ **A detailed cost proposal** for the Phase II Enhancement. Matching funds are not required, but if available, include the amount and source in the cost estimate. Note that matching funds represent a commitment on the part of the transition partner and weigh favorably toward approval.
- ▶ **Letters of interest or supporting documents** should be provided from potential customers of the SBIR-developed technology. Ideally, this would include a Technology Transition Agreement or a similar document that details how the SBIR technology will be used by the accepting organization.



Any resources provided for Phase II Enhancement will only be used for continuation of the Phase II effort. These funds are intended to support transition of the SBIR technology by means of enhancing capability, providing additional prototypes, addressing additional proof of concept, or similar areas of technology demonstration. They are not designed to supplement system development efforts, nor are they intended to provide capital equipment to develop a production capability of the SBIR technology. Once approved, all awards are subject to the successful completion of negotiations.

# SBIR - SUCCESS STORIES

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# SBIR

*Small Business Innovation Research*



# SBIR - SUCCESS STORIES

## NEW AND IMPROVED PRIMARY LITHIUM/CARBON MONOFLUORIDE 20-YEAR BACKUP BATTERY

American Energy Technologies Co. (AETC) has made use of new materials, either available on the battery market and/or manufactured in-house, and introduced a number of significant upgrades into the design of conventional Lithium/Carbon Monofluoride (Li/CFx) battery technology. Li/CFx batteries have not seen major improvements since mid-1980s and AETC has taken a fresh look at this renowned battery chemistry as part of this initiative.

The modifications AETC implemented have resulted in functional prototypes of Li/CFx batteries with a calendar life of 20 years. Primary batteries of Li/CFx chemistry are among the most attractive for application in zero maintenance energy-hungry electronics, due to their theoretical specific energy of up to 2,160 Wh/kg. AETC batteries which were created as part of this initiative feature the actual values of specific energy on the order of 540 Wh/kg and energy density—on the order of 1,100 Wh/L. By way of comparison, the Lithium polymer battery typically possesses a specific energy on the order of 150 Wh/kg, while most thermal batteries deliver only 12 Wh/kg.

## AMERICAN ENERGY TECHNOLOGIES CO.



Arlington Heights, IL | [www.usaenergytech.com](http://www.usaenergytech.com)

U.S. Army Aviation and Missile Research,  
Development & Engineering Center - Missiles



## TECHNOLOGY TRANSITION:

**Direct sales of the outcomes of this project to date exceed \$200K, with more orders on the books. In addition, the Phase III investments received in support of this technology has exceeded \$1M to date.**

The primary military market for this battery is zero-maintenance over the shelf life power source for the on-board health monitoring devices in missiles. AETC's Lithium/Carbon Monofluoride-based cells and full size batteries are currently being tailored for the specialty high power needs of another Army customer, representing AMRDEC's Small Organic Precision Munition (SOPM) technology platform. In addition, a satellite product of this development became a metal-free, anti-corrosion, thermally conductive paint.

In the civilian markets, AETC batteries are being qualified as a primary power source in zero-maintenance, remote location, integrated circuits, and in the unmanned active Radio Frequency Identification (RFID) tags. Also, AETC's back-up battery, operating within an unusually narrow temperature range of  $14 \pm 2^\circ\text{C}$ , is being considered as part of a reliability enhancement design in the battery-powered cache memory hardware RAID controllers in large computers, including servers that support supercomputers. In addition, AETC's 20-year battery, capable of operation in a temperature range from  $-40$  to  $85^\circ\text{C}$ , is being evaluated as a low-maintenance, cost-reducing technology in the new generation utility water meters with electronic data collection encoders that record, store, and transmits water usage data.



**WET-VACUUM SAMPLER FOR SURFACE BIOCONTAMINATION DETECTION**

Testing of equipment, materials and operational procedures to assess the quantity of contamination/decontamination on surfaces requires reliable sampling methods. The M-Vac (Microbial-Vacuum) uses innovative wet vacuum technology to efficiently collect microorganisms from virtually any surface. The M-Vac sprays a sterile Surface Rinse Solution (SRS), under low pressure, onto any surface while simultaneously vacuuming it up along with detached and suspended microbes. The microbes and SRS accumulate in the removable collection bottle for processing. The wet vacuum action of the M-Vac excels at safe surface pathogen/bio-threat agent collection and containment while also minimizing re-aerosolization of surface particulates. The M-Vac enables sampling of much larger surface areas with high collection efficiency. Improved sampling increases the likelihood of capturing microbes of interest and reduces the chance of false negatives.

Application of this system by military or civilian personnel will allow faster and more efficient counter activities against biological warfare and bioterrorist attacks, as well as routine health monitoring of biological surface pathogens. Additional commercial applications will include the monitoring of biocontaminates in air supplies, on mail and medical facility surfaces, plus general sample collection of biofilms and crime scene evidence.

**M-VAC SYSTEMS, INC.**



Sandy, UT | [www.m-vac.com](http://www.m-vac.com)

U.S. Army Test and Evaluation Command



**TECHNOLOGY TRANSITION:**

**M-Vac Systems has received over \$9M in Phase III funding, which enabled it to move through development, commercialization and proof of concept.**

MSI initially had some success using their wet-vacuum microbial sampling system in USDA inspected facilities and was awarded the USDA's Letter of No Objection in 2010. The M-Vac was also recognized by the International Association for Food Protection and was awarded the Food Safety Innovation Award in 2008. However, the most successful application has been the collection of forensic DNA material by crime labs and policing agencies. The M-Vac system has been shown to be up to 200 times more effective at collecting DNA material than other traditionally used methods and has been successfully used to gather DNA samples during forensic investigations. The instrument was the key to solving an 18 year-old cold murder case in Utah in 2013, and has been used in a number of other heinous crime investigations including rapes and homicides. It also won the "Most Innovative Product" award from the Utah Valley Entrepreneurial Forum in December 2013. M-Vac Systems continues to market the system to US law enforcement agencies and crime labs throughout the country, and has also introduced this new forensic DNA collection method to a number of international agencies.



# SBIR - SUCCESS STORIES

## **URBAN MAPPING AND POSITIONING SYSTEM (UMAPS) WITH WARFIGHTER LOCALIZATION (WARLOC™)**

During certain missions, individuals may not know the location of others in their team. Present systems to solve this problem are either inaccurate or prohibitively expensive. UMAPS remedies this problem by providing superior localization of both personnel and manned/unmanned vehicles via a low-cost solution with suitable size, weight, and power.

The UMAPS program created GPS-denied enabler technology for use with manned and unmanned systems and personnel to enable accurate geo-locations of targets in GPS-denied environments. Human-based systems provide superior localization and basic situational awareness tools that interface with the Leader Effects Tool Suite (that captures video, sends pictures or text messaging). Vehicle-based systems provide localization and improved situational awareness tools: live video, 3D mapping, or payload sensors data transfer.

## **ROBOTIC RESEARCH, LLC**



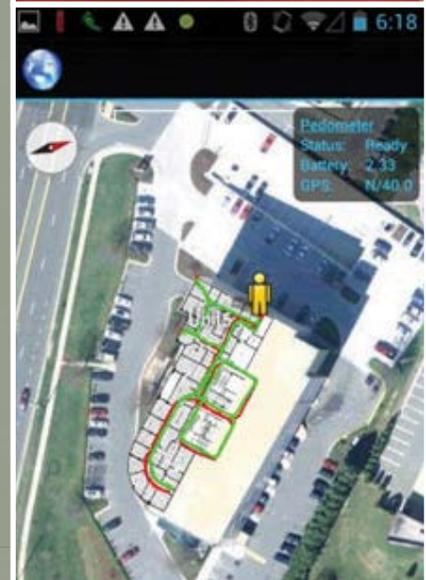
Gaithersburg, MD | [www.roboticresearch.com](http://www.roboticresearch.com)

U.S. Army Armament Research,  
Development & Engineering Center



## **TECHNOLOGY TRANSITION:**

**WarLoc™ is Robotic Research's low-cost, human-worn sensor capable of high quality localization of Warfighters.** The WarLoc™ sensor was tested by a variety of programs, including the Army's Autonomous Navigation System and SOURCE programs. Boston Dynamics uses WarLoc™ for the LS3 robot (Defense Advanced Research Projects Agency/United States Marine Corps program). QinetiQ-NA is testing WarLoc™ for various programs. The Special Operations Command TALOS program asked for WarLoc™ to be demonstrated at their showcase event. A lower-cost version is of interest to Program Executive Office Soldier. During February 2014 Joint Interagency Field Exercises (JIFX), various Department of Homeland Security divisions were interested in first responder applications for GPS-denied technology. Vehicle-based capability modules are relevant for both manned and unmanned vehicles. This type of capability is especially important in areas where unknown and dangerous factors exist (e.g., chemical and biological contaminants, radiation, Improvised Explosive Device/Explosive Ordnance Disposal applications, traps, structural integrity and unsafe breathing conditions). To date, Robotic Research has received \$1M in commercial sales, and \$4.1M in a Phase III contract for the U.S. Army Armament Research, Development & Engineering Center.



**DIODE LASER TECHNOLOGY FOR DIRECTED MATERIAL DEPOSITION (DMD) PROCESSES**

Directed Material Deposition (DMD)<sup>™</sup> is a break-through process that fabricates fully-dense metal “from the ground up,” using powdered metal and a focused laser. It is the enabling technology behind DM3D’s full line of time and money saving products. Using DMD, highly accurate functional parts can be fabricated with extremely short lead times, and repairs and alterations can be made without the problems associated with traditional welding processes. The successful deployment of mobile battlefield repair for an agile army requires fast diagnosis and repair and/or replacement of damaged parts. Significant time compression and a compact footprint will be needed for mobile repair to serve in the field. The DMD is promising due to its closed loop control of the dimension; however, the build rate or deposition rate has to be enhanced. Deposition rate enhancement for a machine with this limited foot print is a challenge since it limits the type, size and power of the laser energy source. Diode laser technology offers a solution due to its high power efficiency and small foot print, in comparison to carbon dioxide (CO2) and other systems.

**DM3D TECHNOLOGY, LLC**



Auburn Hills, MI | [www.dm3dtech.com](http://www.dm3dtech.com)

U.S. Army Tank, Automotive Research, Development & Engineering Center

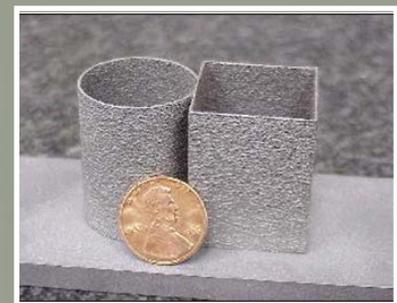


**TECHNOLOGY TRANSITION:**

In January 2013, DM3D Technology LLC completed the asset purchase of The POM Group Inc., which was the original inventor of the DMD technology. DM3D is a newly formed company which specializes in utilizing laser based direct metal deposition technology to provide part hard facing, wear part repair/reclamation, and form functional metal parts directly from 3D CAD data.

DM3D has received \$6.6M in Phase III funding. As a result of this SBIR project, a diode laser based DMD system was ready for commercialization that accepted higher powered diode lasers as they become commercially available, and its performance will be fully understood at those higher laser power levels. High power diode laser DMD technology will enable the introduction of DMD to the high volume manufacturing environment. POM is developing an engine application for the U.S. automotive industry that is designed to reduce complexity and cost, while improving the performance of the engine. This is the first target commercial application for diode laser DMD technology.

Commercial application of the process would enable high volume manufacturing of components with enhanced wear-resistant and corrosion-resistant surfaces, such as engine blocks, automotive drive train components and turbine blades. Also, table top, direct metal rapid prototype machines could be manufactured, enabling the creation of fully functional metal prototypes, having the full range of mechanical properties as the finished product.



# SBIR - SUCCESS STORIES

## LONG LASTING INSECTICIDE-IMPREGNATED BED NETS

Bed nets provide excellent protection against insect-borne diseases such as malaria, Japanese encephalitis, dengue, and yellow fever viruses. Currently deployed bed nets have a variety of limitations, and are not impregnated with more than one insecticide. U.S. Army Medical Research and Materiel Command (USAMRMC) required an improved bed net that Soldiers would be willing to use on a routine basis. The enhanced bed net should protect against all biting insects, should have a mesh large enough to permit air flow (lack of air-flow is a major reason why Soldiers will not use insect bed nets), and should be designed to encourage long-term use.

Triton Systems, Inc. (TSI) developed an innovative dual-insecticide treated bed net utilizing novel polymer coating chemistry and fabric plasma treatment technology. This technology is integrated with medical entomology to produce a long lasting insecticide treated bed net: able to repel, block, and kill mosquitoes, sand flies, and crawling pests, and to protect Soldiers in regions indigenous to insect-borne diseases.

The Egret bed net consists of insecticide treated netting and a floor. The bed net mesh is coated with a unique insecticide formulation on the surface of the fabric to ensure long lasting residual concentration on the bed net after washing or exposure to other environmental factors. The bed net has larger mesh openings for improved air flow; is lightweight at 3.69 lbs.; is durable; easy to assemble; and can be attached to a Soldier's backpack. The Egret is designed to be free standing, fully enclose an Army cot, store personal effects, and have room for one Soldier to sit and sleep. TSI's technology uses less insecticide than current commercial applications and this insecticide binds well with the mesh. This reduces up to 90% of the insecticide that typically arises out of bed net fabrics, minimizing environmental impacts.

## TRITON SYSTEMS, INC.



Chelmsford, MA | [www.tritonsys.com](http://www.tritonsys.com)

U.S. Army Medical Research  
and Materiel Command



## TECHNOLOGY TRANSITION:

Following the completion of a Phase II Enhancement, TSI received Phase III funding from USAMRMC in the amount of \$1.5M to transition into advanced development.

The TSI Egret bed net is currently undergoing EPA testing for registration. Following EPA registration, the Egret will be evaluated for approval by the Armed Forces Pest Management Board to receive a National Stock Number, so that it may be procured. The combined military and recreational annual market size is estimated to be in the range of \$100 million to \$150 million. The humanitarian relief market size is estimated to be an additional \$30 million annually in treated cloth sales and licensing.



**PORTABLE MINI-GAS CHROMATOGRAPH**

To address the need for high sensitivity and fast detection, Seacoast Science leveraged all three phases of the Army SBIR program to develop an innovative “sniffing” device for the detection of drug/narcotics. The system included the ability to separate chemicals based on their physical properties and a chemical sensor array that is selective and sensitive to the volatile chemicals commonly used in drug synthesis. This formed the basis of our Mini Gas Chromatograph (Mini GC).

Seacoast’s Mini-Gas Chromatograph features an oven-less heating technology with fast heat up and fast cool down times. Sensing is performed by the proprietary polymer absorption based sensor array technology and integrated platform. The Mini GC system was designed to be low cost, easy to use without any formal training, and requires no carrier gases – reducing the need and cost of consumables.

**SEACOAST SCIENCE, INC.**



Carlsbad, CA | [www.seacoastscience.com](http://www.seacoastscience.com)

U.S. Army Research Laboratory



**TECHNOLOGY TRANSITION:**

**Seacoast Science was awarded Phase III funding in the amount of \$1.8M from Army Research Laboratories and over \$2.7M from commercial investors to further the development of the Mini GC.** In 2009, Seacoast entered into a co-branded distribution agreement with Vernier Software and Technology of Beaverton, Ore., to distribute this device to the education market. Thousands of Vernier Mini GCs are currently used by colleges and universities to teach general chemistry principles as part of the laboratory curriculum. In 2011, the Mini GC was picked for the Editor’s Choice award for analytical devices at the Pittsburgh Conference (PittCon), the world’s largest annual premier conference and exposition on laboratory science.

In late 2012, Seacoast further developed their polymer-based absorptive sensors by developing a new sensor platform based on resistive measurements. These new sensors can detect hydrocarbon vapors and spills in a variety of adverse environmental conditions. This includes complete submersion in water and ice, which was independently validated as a major finding of Pipeline Research Council International Project IM 2-3. Seacoast has since created a spinoff called Leek Detection; dedicated to pursuing the expansion of our new sensor line into new vertically integrated digital oil field markets in order to materialize on the greater opportunity that includes real-time monitoring of petroleum storage tanks and transportation pipelines for leaks.



# SBIR - SUCCESS STORIES

## **SUPER-OLEPHOBIC/HYDROPHOBIC COATINGS FOR NON-STICK, SELF-CLEANING TEXTILES**

Luna was contracted by the U.S. Army to develop a self-cleaning textile for military uniforms that maintains the characteristics of the current fabrics (e.g. lightweight, flexible, durable, abrasion resistant, and breathable). The challenge was to develop a cost-effective material and application process that surpasses current durable water repellents with respect to water/oil repellency and laundering durability. An additional hurdle was that the new material had to meet the standards established in the 2010/2015 Perfluorooctanoic acid Stewardship Program for the elimination of 'C8' based fluorochemicals.

Luna developed a nanotechnology treatment, now called Ultra-Ever Shield™ that produces a durable “omniphobic” surface that is resistant to all fluids including water, food, dirt, blood, oil, and fuel and can be applied to any natural or synthetic fabric. Ultra-Ever Shield™ is a water-based fabric treatment solution employing alternative chemistry meeting the highest standards of environmental responsibility.

Ultra-Ever Shield™ combines the use of low surface tension polymers with hierarchical roughness that reduces the adhesion forces that can occur between the fabric and a liquid on its surface. The treatment is conformal to the individual fibers, such that there is no loss of breathability so that thermal comfort is maintained for the wearer. The fabric finish is also exceptionally durable by maintaining repellency after significant abrasion and laundering. Luna’s omniphobic textiles are cost effective, simple to apply, and environmentally responsible leading to successful transition of the technology to commercial reality to provide superior protection to the military, as well as for consumer clothing, medical textiles, portable shelters, etc.

## **LUNA INNOVATIONS, INC.**

# LUNA

Blacksburg, VA | [www.lunainc.com](http://www.lunainc.com)

U.S. Army Natick Soldier Research, Development and Engineering Center



## **TECHNOLOGY TRANSITION:**

**The Phase II Enhancement program received matching funds totaling \$400K from the US Air Force, the Defense Threat Reduction Agency, and the Army.**

In addition, Phase III funding was received in the amount of \$60K from non-SBIR government sources and \$150K from various commercial sources.

The technology has been transitioned from the laboratory to manufacturing equipment with the recent production of over 3,000 linear yards of prototype treated textiles for extensive physical testing and prototype clothing production. These treated textiles were used to produce a series of Army Combat Uniforms and Emergency Medical Services uniforms to evaluate user acceptance in actual live scenarios. Luna received the top commendation for this demonstration in military uniforms – the Outstanding Warfighting Transition Award. On Oct. 24, 2013, an exclusive licensing agreement was officially executed between Luna and UltraTech International for the commercialization and production of Luna’s fluid resistant textile treatment under the trade name Ultra-Ever Shield™.



**“FOLLOW ME” ROBOT FOR SUPPORT OF TROOPS IN DISMOUNTED MISSION ON UNIMPROVED ROUTES**

The 5D Behavior Engine software provides behaviors for robot navigation, avoidance of obstacles and reliable following of any Soldier carrying a special Ultra-wideband (UWB) tag while traversing rugged, complex terrain. These robot systems leverage the use of the Adaptive Mission Payload—a cross-cutting mission payload capability developed and proven under the SBIR Intelligent Vehicle Payload project (Topic A11-048).

**5D ROBOTICS, INC.**



Carlsbad, CA | [www.5drobotics.com](http://www.5drobotics.com)

Program Executive Office Ammunition



**TECHNOLOGY TRANSITION:**

5D Robotics was awarded a \$2.2M Phase III contract to deliver six robots to the Rapid Equipping Force for test and evaluation in the application of lightening the Soldier’s load to carry Counter Radio Electronic Warfare (CREW) systems and other Counter Improvised Explosive Device capabilities.

The Phase III SBIR program tested and matured the robot’s “follow-me” behavior on the cost effective Segway robot platform to showcase its value in lightening the load and supporting CREW capabilities while on the move (Figure 1). The Phase III effort tests and improves the behaviors while carrying payloads for up to 12 miles to support dismounted operations on narrow, unimproved routes. Ultimately, the robot can be equipped with a toolkit of sensors to enable the identification and subsequent defeat of in-path hazards as well as drop additional UWB tags to effectively mark areas which have been determined to be safe or unsafe for passage.



# SBIR - SUCCESS STORIES

## **RAPID DETECTION OF ACETYLCHOLINESTERASE-INHIBITING PESTICIDES IN WATER USING HANDHELD ASSAY AND READER**

U.S. government regulatory agencies such as the Environmental Protection Agency have limited or banned domestic application of environmentally and physiologically insidious pesticides. However, such regulations often do not exist or fail to be enforced in many potential overseas theaters of operation where U.S.-banned or controlled pesticides still find widespread and indiscriminate use. Local water sources in these areas may contain not only dangerous levels of infectious microorganisms, but also toxic levels of chemical residues. As part of a research program to identify environmental hazards to Soldiers resulting from exposure to toxic industrial chemicals, the U.S. Army Center for Environmental Health Research and the Joint Service Agent Water Monitor Program at the U.S. Army Research, Development & Engineering Command are seeking new methods for rapidly identifying toxic levels of acetylcholinesterase-inhibiting pesticides in water samples.

ANP Technologies created a simple, easy-to-use, rapid on-site test system for the detection of acetylcholinesterase inhibitors in water.

This test system has been successfully designed and developed to a production-ready unit. Reagents are projected to have at least one-year stability at room temperature. The system can detect a range of carbamate and organophosphate pesticides at concentrations between the Military Exposure Guideline level and the Human Lethal Concentration for each of these compounds. Because these tickets have an on-board negative control reaction well, they are self-calibrating and unaffected by temperature or other environmental conditions. A prototype reader was developed during Phase II for the measurement of the fluorescent substrate product on test tickets. A ruggedized production-ready unit was developed during Phase III to be fielded to Army preventive medicine units in FY15.

## **ANP TECHNOLOGIES, INC.**



Newark, DE | [www.anptinc.com](http://www.anptinc.com)

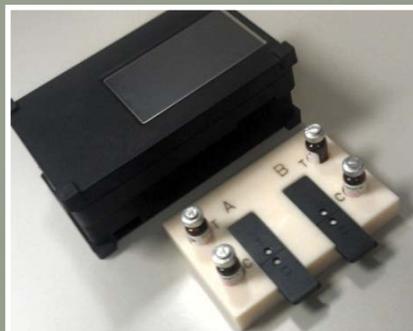
U.S. Army Medical Research  
and Materiel Command



## **TECHNOLOGY TRANSITION:**

**ANP Technologies has received Phase III \$2.4M from U.S. Army Medical Research and Materiel Command.**

The reader is now part of the Environmental Sentinel Biomonitor system. As a result of this project and other projects with the U.S. Army, ANP Technologies received a Tibbetts Award from the Small Business Administration in 2011.



**INSENSITIVE MUNITIONS MODELING AND SIMULATION**

Insensitive munitions (IM) design and testing for propulsion systems is hindered both by high test costs and the complexity of propellant responses to IM stimuli. Modeling and simulation tools are under development for predictions of IM hazards that characterize many of the pertinent phenomena, including damage sensitization to reaction and delayed-onset detonation. Such tools can provide many benefits to the development of IM propulsion systems. The modeling and simulation technology developed through this SBIR project will be used to assess system performance against bullet and fragment impacts from the beginning of the design process and provide insight to unexpected test results to greatly reduce the cost and schedule associated with IM compliance. The innovation will be a streamlined process for using existing model frameworks in propulsion system IM assessments.

A numerical test bed methodology tool set will have a broad range of applicability to analyzing the consequences of unintended stimuli to reactive materials.

An obvious extension is to the transportation of explosives and fuel by both the military and commercial companies. By developing the numerical test bed, Corvid offers substantial cost savings to any industry concerned with energetic materials safety, including civilian spaceflight and mining. With appropriate material characterization, the numerical test bed could become the fundamental tool for a Center of Excellence for computational evaluation of energetic material safety and regulatory compliance.

**CORVID TECHNOLOGIES, INC.**



Mooresville, NC | [www.corvidtec.com](http://www.corvidtec.com)

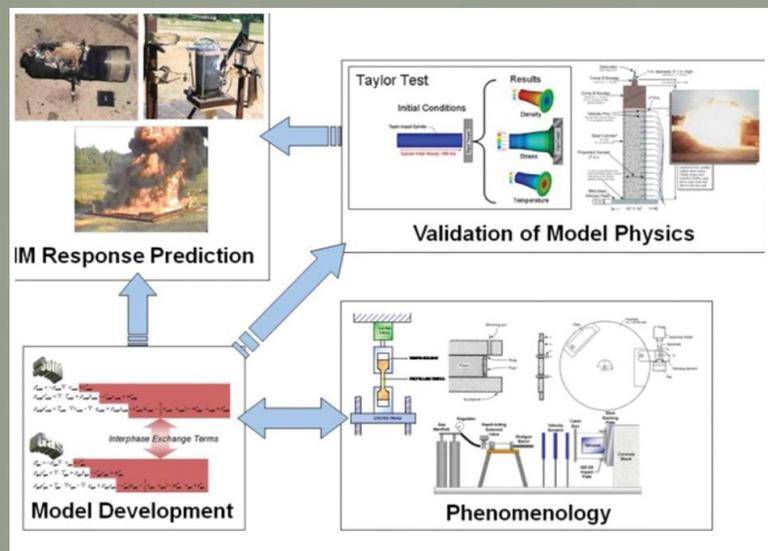
Program Executive Office Missiles and Space



**TECHNOLOGY TRANSITION:**

Corvid has received more than \$2.5M in Phase III funding from various sources for sales and investments for further development of this product.

Corvid continues to work with the U.S. Navy Program Executive Office, Integrated Warfare Systems and Raytheon to support Standard Missile and future system development. Corvid also continues to expand support for other primes, including Lockheed Martin and Northrop Grumman.



# SBIR - SUCCESS STORIES

## **SOLAR POWERED REFRIGERATED CONTAINER**

The Army's Natick Soldier Systems Center Combat Feeding Directorate Equipment and Energy Technology Team identified the potential merits of using renewable energy to power refrigerated military 20-foot ISO containers. The cost of transporting fuel and providing service to diesel-fueled electricity generator sets located in remote parts of the world is very high, and thus creates an opportunity to consider the use of renewable energy systems that will significantly reduce both fuel use and the maintenance logistics burden for these systems.

In developing the solar-ready refrigeration system, SunDanzer systematically optimized numerous subsystems of the refrigeration units previously deployed, to achieve a 27 percent reduction in fuel consumption. Innovations tailored for the military environment were implemented in the following areas of the Multi-Temperature Refrigerated Container System (MTRCS):

- A power management system including custom electronics and microprocessor control to achieve the "Hybrid Solar/Conventional Power" technology.
- Electronic pulse-width-modulated expansion valves were optimized for superior superheat control of dual compartment (multi-temperature) systems like the MTRCS. Compartments can be operated as freezers or refrigerators with minimized efficiency loss and accurate temperature control.
- Ruggedized packaging of a two-stage compressor for use in the MTRCS off-road application was achieved. And oil return is excellent even during variable-speed operation.
- A low-voltage power system for brushless, variable-speed fan and blower operation enables accurate compartment temperature monitoring during "generator off" operation for extended periods, and it greatly reduced power consumption under light refrigeration loads.

## **SUNDANZER DEVELOPMENT, INC.**

SunDanzer<sup>DC-Powered Refrigeration</sup>

Tucson, AZ | [www.sundanzer.com](http://www.sundanzer.com)

U.S. Army Natick Soldier Research,  
Development and Engineering Center



## **TECHNOLOGY TRANSITION:**

**SunDanzer has commercialized the Solar-Powered Refrigerated Container technology with the product introduced to the market in January 2014.**

The first units are being provided to the U.S. Fish and Wildlife Service for use at Midway Atoll. Besides \$349K sales to the U.S. Fish and Wildlife Service, SunDanzer has additional quotations outstanding that total \$399K in sales to various U.S. Government agencies.



The customer, Product Manager Force Sustainment Systems and the Combined Arms Support Command, is planning for insertion of the modification technology into production, with the intended target being the Multi-Temperature Refrigerated Container System (MTRCS). The MTRCS is the Army's preeminent 20' food-storage asset, specifically designed with capabilities necessary for today's field-feeding methodologies, situations, and interoperability.

**MICROSTRUCTURE-BASED FATIGUE LIFE PREDICTION TOOL FOR ROTORCRAFT GEARBOX SPIRAL BEVEL GEARS**

It is time consuming and expensive to design, develop, and test rotorcraft gearbox components considering all possible combinations of configuration, manufacturing processes, surface treatments and duty cycles. Helicopter Original Equipment Manufacturers have measured this life extension and performance savings as 20 percent of their operator’s cost per flight hour – for current block and Joint Multi-Role platforms. This issue is prevalent for high-performance, high cost, high demand drivetrain components, such as the spiral bevel gears (SBG) used in virtually every rotorcraft driveline. Therefore the Army has identified the need for a new high fidelity computational analytical capability for the prediction of fatigue life of critical dynamic and static components to better analyze gearbox designs through a prediction driven microstructure-based life approach considering multi-body-dynamics and material process-structure-property relationships. The goal is to understand the impacts that specific operations and maneuvers have on component lives, new gearbox innovations to enable the extension of their operational lives to enhance readiness, safety and reduce operational, sustainment costs and associated risk factors while reducing the time and costs of physical testing and qualification.

Sentient has developed a universal DigitalClone virtual simulator to computationally model SBG under this SBIR and in the future with more funding other components on aircraft, using a patent-pending process which enables rapid assessment of gearbox systems across their lifecycle – from early requirements and conceptualization through design-manufacturing, field operation and reuse of the models for Condition Based Maintenance (CBM) and Prognostics Health Management (PHM), and remanufacturing. This simulation tool combines finite element, mixed-elastohydrodynamic lubrication, microstructure, and fatigue damage modeling, all within a probabilistic framework. The technology includes computational material modeling to predict the effects of design, surface treatments and usage on gearbox performance. The DigitalClone technology developed under this SBIR supports ADS-50 and other defense specifications.

**SENTIENT SCIENCE**



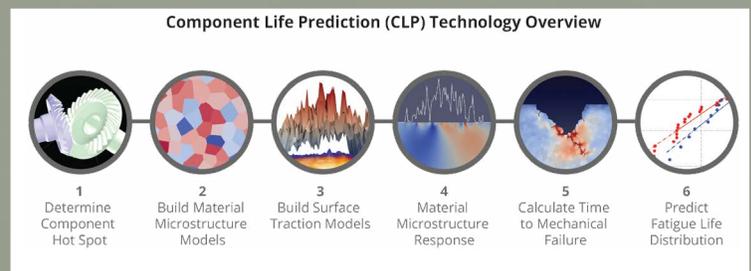
Idaho Falls, ID | [www.sentientscience.com](http://www.sentientscience.com)

Program Executive Office Aviation



**TECHNOLOGY TRANSITION:**

Sentient was presented the prestigious Tibbetts R&D Award for this DigitalClone® technology. Sentient’s DigitalClone software has \$1M of Phase III sales including Boeing and Sikorsky who have directly funded development work. The resulting models are now commercially deployed extending the life of over 1GW of GE and Clipper Wind Turbines, lowering their operational costs by one cent per kw/hr. The technology is TRL 6 (various types of gears and bearings, and we hope to expand the universal simulator to other critical dynamic and static components under future awards). The software includes direct applications in ships, aerospace, ground vehicle, industrial equipment, energy, and biomedical markets.



# SBIR - SUCCESS STORIES

## **TECHNOLOGY FOR THE DETECTION OF CHEMICALS IN EXTREME ENVIRONMENTAL CONDITIONS**

The Chameleon is the only hands-free, power-free, chemical detection for gases and vapors in air, allowing Army, Navy, Marine Corps, Coast Guard and first responders to detect the presence of hazardous chemicals. No liquid sample is required. Unlike current colorimetric detection, the Chameleon is designed for use in a wide variety of operating environments; desert heat, arctic cold, tropical conditions; even immersed in water! Made from impact-resistant engineered plastic, the Chameleon is designed for use in the real world. It detects gases and vapors in air where many other technologies only detect hazards in liquid or aerosol form. For toxic chemicals, the gas form is the most likely danger to first responders and military personnel.

The Chameleon armband holds up to 10 chemical cassettes to detect 10 different chemicals or families of chemicals. The armband is reusable, while each cassette is disposable after its 24-hour service life. The stretchable, adjustable armband fits easily over a range of clothing, including Level A suits and turn-out gear. The chemical sensor in the cassette shows an easy-to-see color change. Such ease-of-use minimizes the need for training, making the Chameleon ideal for first responder organizations with limited training budgets.

The Chameleon offers the Army a low-cost, rapidly deployable armband sensor that immediately responds to gases and vapors. The addition of the hydrazine, hydrogen fluoride, diborane, hydrogen cyanide and nitrogen dioxide cassettes further improves the capability to detect the high risk Toxic Industrial Chemical threats. The combination of ease-of-use and non-obstructive profile makes the Chameleon an ideal device to detect exposure to toxic chemicals and presents a significant improvement over current chemical detection devices for use by the individual warfighter and first responder. An ideal application is the use by the sensitive site assessment and sensitive site exploitation groups. The field configurability of the device allows rapid deployability and the cost effective disposable technology eliminates decon issues. The addition of the hydrazine, hydrogen fluoride, diborane, hydrogen cyanide and nitrogen dioxide cassettes offers increased information about chemical threats across the battlespace.

## **MORPHIX TECHNOLOGIES**



Virginia Beach, VA | [www.morphitec.com](http://www.morphitec.com)

U.S. Army Research Laboratory



## **TECHNOLOGY TRANSITION:**

**The Chameleon has received more than \$240K from the Army Commercialization Pilot Program and total DoD investments of more than \$1.9M to date.** Project revenue for the addition of chemical detection cassettes is more than \$115K, with total revenue for the Chameleon at more than \$2.8M. The primary markets for this product includes both first responders and military organizations, with particular interest from military customers.



**FIELD DEPLOYABLE DIAGNOSTIC TEST FOR ACTIVE CUTANEOUS LEISHMANIA AND A TEST FOR LATENT INFECTION**

Cutaneous Leishmaniasis (CL), a parasitic skin ulcer disease transmitted by sand flies, is a pervasive risk for Soldiers stationed in areas of the tropics, subtropics, and southern Europe. Different Leishmania species cause Old World versus New World (American) CL. U.S. Army Medical Research and Materiel Command (USAMRMC) sought a small, user-friendly field diagnostic device able to detect CL rapidly in skin lesions. To detect CL in military operational environments, technicians currently use microscopes to identify parasites within infected tissues or send samples back to the Leishmania Diagnostic Laboratory at Walter Reed Army Institute of Research. This process is both time-consuming and dependent on the presence of parasites in a given tissue sample. It can also require risky and unnecessary air transport of the patient away from the combat theater. Currently, no FDA-cleared CL assays are currently available that meet the Army's requirements. The majority of rapid diagnostic manufacturers are creating products only for high-prevalence diseases in the developed world. Of those with CL diagnostics, none have expressed a strong interest in pursuing Federal Drug Administration (FDA) clearance. While non-FDA approved skin test antigens have become available to civilian medical caregivers in developing countries, a high quality, FDA-approved diagnostic would give combat casualty medics the ability to diagnose CL accurately on the ground.

To address USAMRMC's requirements, a Leishmania Rapid Diagnostic Device (LRDD) was developed by InBios International, Inc., under the brand name CL Detect™ Rapid Test. This disposable dipstick test detects parasites directly from skin lesions within 30 minutes in a field environment, facilitating rapid treatment without requiring special training. InBios will seek FDA clearance for the device for both Old World and New World CL.

**INBIOS INTERNATIONAL, INC.**



Seattle, WA | [www.inbios.com](http://www.inbios.com)

U.S. Army Medical Research and Materiel Command



**TECHNOLOGY TRANSITION:**

InBios was awarded more than \$2.4M in Phase III funding from USAMRMC to assist the company in moving through the FDA regulatory path. Trials are currently underway. Following regulatory clearance, the Army plans to procure the device, and to field it for combat support hospitals. Early CL diagnosis in Soldiers will enable them to be monitored for complications of the disease, which can become life-threatening if left untreated.



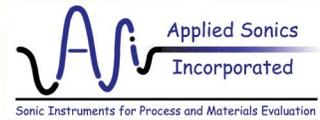
# SBIR - SUCCESS STORIES

## **ULTRASONIC PROBE FOR QUALITY MEASUREMENT OF EXPLOSIVES MANUFACTURING**

The Army has been dealing with high rework rates with energetic materials such as RDX and HMX at various points in the manufacturing process. Part of the problem is that there is no feedback during the manufacturing process, meaning that many processes are performed blind. Applied Sonics, Inc. (ASI) took on the challenge to develop probes that can be used to measure a variety of critical manufacturing parameters in an explosives slurry, resulting in the development of ultrasonic probes that can provide real time feedback during various manufacturing processes.

These Ultrasonic probes will eventually result in a cost savings of roughly \$5-10M annually for the Army by eliminating rework rates in a number of processes. Manufacturing of energetic materials will be done much more safely and throughput rates will be considerably higher. Moreover, the environmental footprint of manufacturing energetic materials will be reduced considerably. The Warfighter will enjoy more reliable, safer munitions as a result of this technology. This means future transitions of novel energetic materials will be more straightforward, and further efficiencies can be implemented in the manufacturing process.

## **APPLIED SONICS, INC.**



Denver, CO | [www.appliedsonics.com](http://www.appliedsonics.com)

U.S. Army Armament Research, Development and Engineering Center



## **TECHNOLOGY TRANSITION:**

**ASI was awarded a \$495K Phase II Enhancement to continue development of the ultrasonic probes, which several U.S. based companies have already expressed interest in.** Additionally, ASI received \$480K from PM Joint Services to take the ultrasonic probes developed under the Army SBIR Program and implement them in various manufacturing processes at BAE Holston. A related probe will be developed and implemented to analyze the composition of piped slurries.



**VIRTUAL METADATA CATALOG (vMDC)**

Intelligence sharing – among the DoD, coalition partners and intelligence agencies – is vital to success in missions ranging from the War on Terror to Humanitarian Assistance and Disaster Relief. The Distributed Common Ground/Surface Systems (DCGS) Integration Backbone (DIB) is designed to help interconnect previously stove-piped systems, enabling intelligence to be identified, tagged and shared. Participating in the DCGS Enterprise; however, is costly for intelligence producers.

Modus Operandi developed a solution called the Virtual Metadata Catalog (vMDC) that consists of an easy-to-configure DIB software adapter, an integration and test toolkit, and reference applications. The vMDC’s virtual approach to producing the metacards that allow DCGS users to find published products has two distinct advantages for intelligence producers. The first is cost savings. The vMDC costs less than standing up a traditional DIB Metadata Catalog that stores metacards in a database. The second is timeliness. When products are created or updated at a rapid tempo, the metacards can get stale very quickly. The vMDC approach avoids staleness by producing metacards on the fly, in response to a query, instead of storing them.

The Army is a major producer of intelligence products in the DCGS Enterprise. As a consumer, the Army desires access to timely sensor data and products from other sources within the DoD and the Intelligence Community. By lowering the cost of entry, the vMDC encourages broader participation.

**MODUS OPERANDI**



Melbourne, FL | [www.modusoperandi.com](http://www.modusoperandi.com)

U.S. Army Communications-Electronics Research, Development and Engineering Center



**TECHNOLOGY TRANSITION:**

The DCGS Multi-Execution Team (MET) Office (DMO) liked the vMDC approach so much that they wanted to include it in the official DIB baseline, and sponsored Modus Operandi’s transition effort. The vMDC is now distributed by the DMO as part of the DIB 4.0.2.

Modus Operandi has received funding from U.S. Special Operations Command (USSOCOM) to apply the vMDC so that Special Operations Forces intelligence analysts can retrieve relevant intelligence products from across the Defense Intelligence Information Enterprise (DI2E) and intelligence community cloud services. Modus Operandi has also received funding from the Air Force for vMDC-enabled publication of customized alert reports for intelligence analysts on the DCGS Enterprise and for rapid integration of new data sources.



# SBIR - SUCCESS STORIES

## CRASHWORTHY BALLISTIC TOLERANT FUEL TANK WEIGHT REDUCTION

The pressure to reduce weight while maintaining performance and safety is a significant driver in aviation technology development programs. This is particularly true for fuel and auxiliary equipment, which are major contributors to aircraft weight. While fuel capacity is dictated by mission profile, the weight of auxiliary equipment (including fuel cells, fittings, access panels, and support structures) is dictated by design requirements to (i) integrate the fuel cell into the aircraft structure, (ii) facilitate access and maintenance, and most importantly (iii) protect the warfighter in the event of a crash or assault.

Fuel bladders are a significant weight contributor to fuel system and aircraft weight, providing an obvious target for weight reduction programs, especially since aircrafts typically contain multiple fuel bladders, and the basic design and construction of the fuel bladders has not changed significantly in modern times. The specific objective of this SBIR Program effort is to develop and qualify a lightweight fuel cell design that is 50 percent lighter than current constructions, yet remains compliant with all MIL-DTL-27422 requirements for flexible crash-resistant, ballistic-tolerant fuel tanks (Type I, Class A).

Current fuel cell constructions consist of three major components: (i) an inner fuel containment section; (ii) a self-sealing core for gunfire resistance; and (iii) a series of fabric reinforced rubber plies for crash impact performance. Research and development efforts conducted by METSS have demonstrated the ability to achieve a 30 percent reduction in weight for MIL-DTL-27422 fuel bladder designs (based on a Phase I test cube construction meeting Class A, Type I, Protection Level A requirements) using a flexible, high strength, yet lightweight 'exoskeleton' to facilitate a 50 percent reduction in the number of reinforcement plies required to meet MIL-DTL-27422 crash impact requirements (i.e., a 65 ft. drop under full fuel load). The exoskeleton acts to absorb and redistribute impact loads (crash or hydrodynamic). Ongoing efforts seek to achieve additional weight reduction by replacing the natural gum rubber sealant used in the current fuel cell design with a lighter weight sealant that has been specifically developed for fuel protection systems.

## TECHNOLOGY TRANSITION:

Having demonstrated compliance with MIL-DTL-27422 Phase I Design Verification Testing, METSS was awarded a Phase II Enhancement in the amount of \$500K to fully qualify the lightweight fuel cell design, with additional funding of more than \$795K from the Joint Aircraft Survivability Program Office.

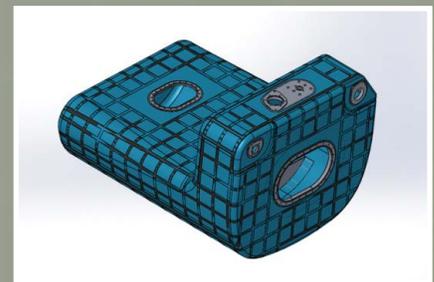
The initial target application for the lightweight exoskeleton construction is the AH-64 (Apache) helicopter. The joint program activities include the development of a Design and Procurement Specification for the lightweight fuel bladder construction, technology integration and manufacturing scale-up, the production of full-scale AH-64 bladders (forward and aft), and full Phase II Qualification Testing as provided in MIL-DTL-27422, including gunfire and crash impact testing. The basic design concept being demonstrated on the AH-64 can be readily extended to other aircraft systems to decrease weight while maintaining performance and personnel safety.

## METSS CORPORATION



Westerville, OH | [www.metss.com](http://www.metss.com)

U.S. Army Aviation and Missile Research,  
Development and Engineering Center - Aviation



**PHARMACOLOGICAL STRATEGIES FOR PREVENTION AND TREATMENT OF NOISE-INDUCED HEARING LOSS**

In order to see first, understand first, act first, and finish decisively, the Soldier has to hear first. Noise-induced hearing loss (NIHL) is a major contributor to decreased operational effectiveness. Existing barrier technologies are inadequate to reduce noise levels from modern weapon systems to levels that do not cause NIHL. These barriers can also impede mission success. Non-traditional solutions must be found to protect the Soldier from the noise from his own weapons. Recent advances in the understanding of the cochlear biomechanics, hair cell mechanobiology and metabolic biochemistry resulted in the discovery of pharmacological agents, called otoprotectants, which can protect and treat the effects of NIHL. A pharmacological strategy for the prevention of and treatment of NIHL is essential for operational effectiveness, survivability, sustainability, and retention of a fit Future Force.

CFD Research Corporation (CFDRC) has developed physiology-based pharmacokinetics (PBPK) and models to enable both local and systemic delivery of otoprotectants to the inner ear and evaluation of their protective effects. The company has demonstrated a novel computational framework for evaluating pharmacological strategies of NIHL prevention and treatment, providing powerful tools able to investigate Pharmacokinetics (PK) and Pharmacodynamics (PD) simultaneously at multiple scales. CFDRC's product development work has also resulted in the invention of a novel hypothermia device and significant discoveries on inhalation delivery routes of otoprotectants and closely related neuroprotectants.

**CFD RESEARCH CORPORATION**



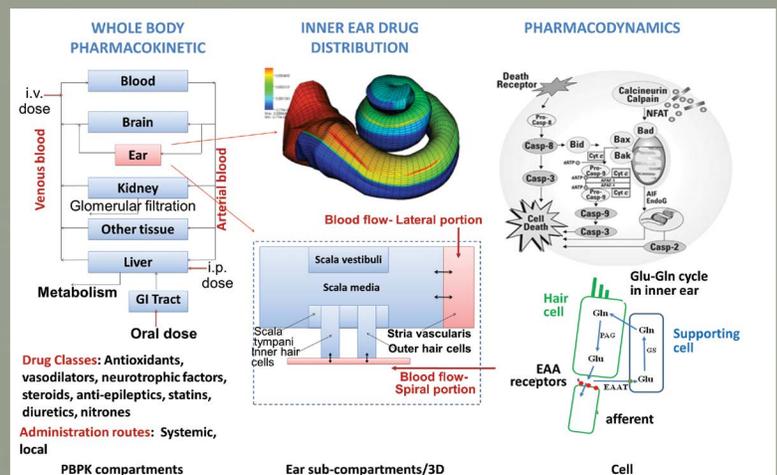
Huntsville, AL | www.cfsrc.com

U.S. Army Medical Research and Materiel Command



**TECHNOLOGY TRANSITION:**

CFD Research Corporation's CoBi software is designed to model the effect routes of administration and dose of otoprotective drugs in the inner ear. The primary customer is expected to be Department of Defense /U.S. Army Medical Corps. Pharmaceutical companies seeking novel prophylactic and treatment strategies for blast and noise induced hearing loss and brain injury, have expressed interest in the project. The company's further creation of validated tools and approaches to calculate robust and effective PK/PD numbers for the inner ear will stimulate the use and the search for effective medical countermeasures against ototoxic and neurotoxic events. CFDRC has received over \$3M in Phase III funding from the Department of Defense including: an NIHL project with Office of Naval Research (~\$1.2M), Congressionally Directed Medical Research Programs Neuropharmacology project (\$950K), a Defense Advanced Research Project Agency Microphysiology project to evaluate drug efficacy and toxicity (\$1.2M) and others. CFDRC has also obtained commercial funding from U.S. Pharma Industry for over \$500K.



# STTR - SUCCESS STORIES

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Pranalytica, Inc. ....32  
Innovatek.....33



# STTR

## *Small Business Technology Transfer*



# STTR - SUCCESS STORIES

## FIRST MULTI-WATT QUANTUM CASCADE LASER

Mid-wave infrared (MWIR) and long-wave infrared (LWIR) spectral regions, collectively covering wavelength ranges from three to twelve microns, are of utmost importance for a number of critical military applications. Light with wavelength in either of these spectral regions propagates through the atmosphere with very low loss. As a consequence, infrared laser sources are widely employed in situations when free space light propagation over long distances is required. Such applications include infrared beacons for search and rescue missions, target designators for covert operations and infrared countermeasures for protection of aircraft from man-portable air-defense systems. In addition, the LWIR spectral region covers spectral features of most chemical warfare agents and explosives, making LWIR lasers the cornerstone in improvised explosive device (IED) sensors.

Large size, low efficiency, and low reliability of available infrared laser sources severely limit their use by the Army. Quantum cascade lasers (QCLs), a novel type of semiconductor laser, are considered to be the most promising technology to address these pressing needs. QCLs are ultra-compact primary lasers that efficiently convert electrical energy into infrared laser radiation. This STTR program is dedicated to development of a new generation of QCLs with radically improved characteristics. Using its revolutionary laser design approach, Pranalytica has developed first multi-watt QCLs, dramatically improving state-of-the-art QCL performance. Reliability of over 3,000 hours has been demonstrated for fully packaged lasers with a characteristic package dimension of less than one cubic inch.

## PRANALYTICA, INC.



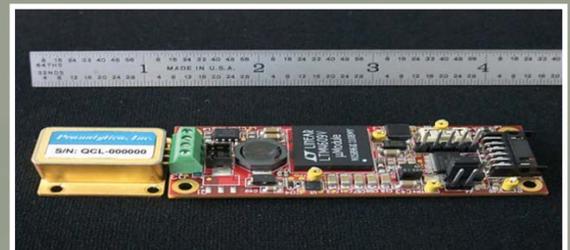
Santa Monica, CA | [www.pranalytica.com](http://www.pranalytica.com)

U.S. Army Research Laboratory



## TECHNOLOGY TRANSITION:

**To date, commercialization of the developed QCLs has generated over \$10M for Pranalytica.** In a strategic alliance with Northrop Grumman Laser Systems division, Pranalytica has demonstrated double-digit power level QCL systems with very high beam quality, needed for the next generation of infrared countermeasures systems. This collaboration resulted in a 10-watt QCL module with a footprint comparable to that of a smart phone. Pranalytica is also actively working with Oak Ridge National Laboratory on development of QCL-based stand-off sensors for IED detection. Pranalytica is seeking ManTech funding to establish large throughput production capability to address the emerging applications and drive laser cost below \$1,000.



**Miniaturization: Battery Operated, 3 W Output**  
Collimated Beam; 5 mm dia (not focused)



**INNOVAGEN® FUEL PROCESSOR: RENEWABLE HYDROGEN FOR PORTABLE POWER**

The quiet operation and high efficiency of fuel cells provide an ideal solution for portable electric power generation for a wide range of military and commercial applications. However, until the development of the InnovaGen® fuel processor the supply of hydrogen gas to the fuel cell at the point of use was a problem. The InnovaGen® butanol reforming subsystem for Proton Exchange Membrane (PEM) fuel cells offers customers improved safety and efficiencies that support longer run times per unit of fuel consumed, compared to existing fuel cell or battery power devices. In addition to improved energy performance, it has the added benefit of fuel flexibility, including operation on renewable biofuels. The fuel reforming reactor is based on novel catalysts and microchannel reactor design that enhances catalyst durability and provides sufficient heat and mass transfer in a compact device.

The U.S. Army requires a portable high energy source that offers a reduced weight burden and improved supply logistics for the dismounted soldier, while providing longer mission time than batteries. The InnovaGen® can help the Army with this requirement.



Richland, WA | [www.innovatek.com](http://www.innovatek.com)

U.S. Army Research Laboratory



**TECHNOLOGY TRANSITION:**

**When integrated with a fuel cell, the InnovaGen® fuel processor provides a more efficient and logistically supportable source for propulsion and auxiliary power.** It also eliminates the need for battery recharging and off-board power sources, thereby reducing life-cycle costs and logistical support. In addition to serving the military’s portable and auxiliary power needs, this technology provides an alternative to batteries where long duration performance is desired. The advanced fuel cell power technology that is made possible by this project can be used by the military and commercial sectors to extend mission endurance on many platforms from hours to days to weeks.

Innovatek has received an additional \$25K investment from a subcontract with UltraCell under an AF SBIR Project for an unmanned aerial vehicle power source. Additionally, Innovatek submitted a \$3M proposal under the DoD Rapid Innovation Fund to use the InnovaGen® technology to produce a fuel cell power source for Man Transportable Robotic Systems (MTRS) with iRobot. It will deliver prime power for 17 hours continuous MTRS operation, more than 3 times the endurance of current systems.



# OUTREACH AND SOURCES OF INFORMATION

## ARMY SBIR/STTR WEBSITE

[www.armysbir.army.mil](http://www.armysbir.army.mil)

The Army SBIR /STTR Programs conduct an aggressive outreach program to increase small business awareness of broad opportunities provided by the Army. Army SBIR/STTR personnel participate in national, regional, and local conferences across the country. This provides small businesses face-to-face contact with people who are knowledgeable about Army needs and the SBIR/STTR process. The Army SBIR/STTR Website identifies upcoming events at which the Army will be participating.

### General SBIR/STTR Information

- ▶ Changes and new program requirements
- ▶ Points of Contact and links to other Army programs
- ▶ Proposal submission procedures
- ▶ Recent Army SBIR/STTR awards
- ▶ Searchable database of past awards
- ▶ Phase III Success Stories

**ARMY SBIR**  
SMALL BUSINESS INNOVATION RESEARCH

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**WHAT DOES ARMY SBIR DO FOR OUR SOLDIERS?**

**OUR MISSION**  
Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs allow small, high-tech U.S. businesses (less than 500 employees) and academia the opportunity to provide innovative research and development solutions in response to critical Army needs. By capturing the tremendous and agile talents of the U.S. small business community, the SBIR and STTR programs benefit the Department of Defense (DoD), the private sector, and our national economy. This portal provides all the information necessary to participate in these programs.

**ANNOUNCEMENTS**  
The scheduled maintenance period for the Army SBIR Small Business Portal has been suspended until a date TBD.

**14 (C) PHASE II SCHEDULE**  
14 (c) Selections Announced: 17 Sept 2014  
14.2 PHASE I SCHEDULE  
14.2 Selections Announced: 10 Sept 2014  
14.3 PHASE I SCHEDULE  
14.3 Solicitation Pre-Release: 21 Aug 2014  
14.3 Solicitation Opens: 22 Sept 2014

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**ARMY SBIR**  
SMALL BUSINESS INNOVATION RESEARCH

HOME GENERAL INFORMATION TRANSITION ASSISTANCE

**SBIR PROGRAM**

- The Small Business Innovation Research (SBIR) program is a Congressionally-mandated program which was established in 1982 (with subsequent reauthorizations in 1995, 1998, and 2000 and 2005) to increase the participation of small businesses in federal research and development (R & D).
- The goal of the dual-use SBIR program is to tap into the innovativeness and creativity of the small business community to help meet government R & D objectives. At the same time, these small commercial-developer technologies, products, and services which may do their commercial debut through SBIR in the private sector to SBIR to the government.
- Each participating government agency with an operational R & D budget of at least \$10M must reserve 2.5% of its operational R & D budget for competitively selected SBIR awards to small businesses. The Army participates with the Army Air Force, Defense Advanced Research Projects Agency (DARPA), Special Operations Command (SOCOM), Defense Threat Reduction Agency (DTRA), Defense Science Agency (DSA), National Aeronautics and Space Administration (NASA), and the Chemical Biological Defense Program under the overall DOD SBIR program. Besides, the Army program performs solicitations that seeks to support Army-specific goals within the framework of the DOD SBIR program.

Mission and Pic  
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**ARMY SBIR**  
SMALL BUSINESS INNOVATION RESEARCH

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**STTR PROGRAM**

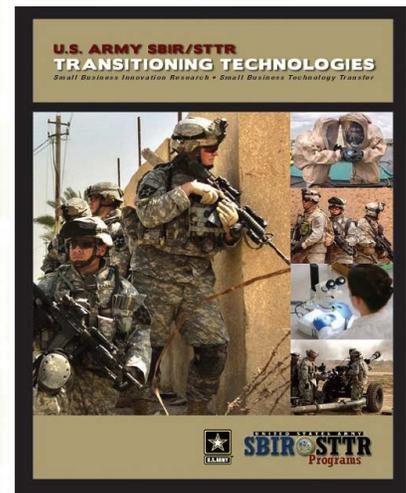
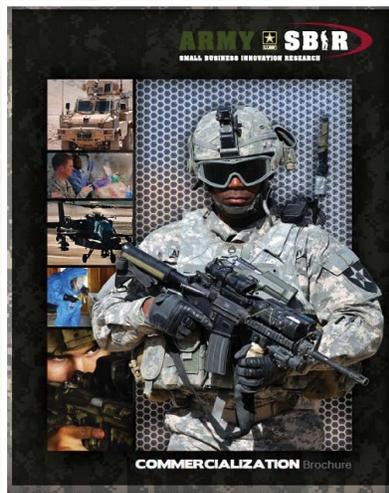
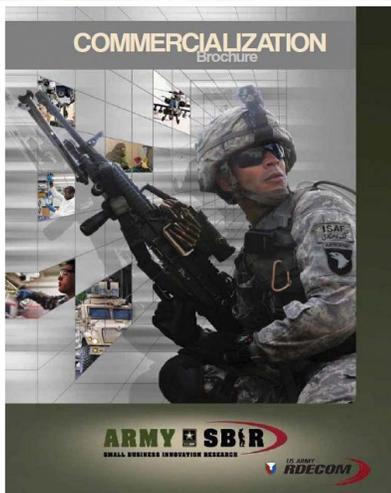
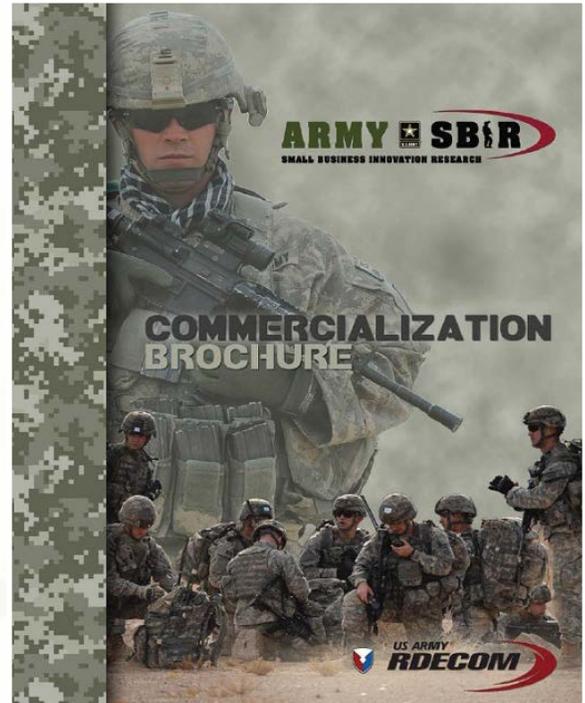
- The Small Business Technology Transfer (STTR) program, the SBIR, is a government-wide program, mandated by the Small Business Research and Development Enhancement Act of 1992, PL 102-554. STTR was established in FY94 as a three-year pilot program and has been reauthorized through fiscal year (FY) 2011. The 2012 STTR budget is determined by a set-aside of 2.5% of the Army's operational R&D budget; this set-aside percentage is due to increase by 25% every two years until FY17. STTR was established as a companion program to the SBIR program, and it resulted in research by the same manner. However, there are subtle differences.
- While STTR has the same objectives as SBIR regarding the involvement of small businesses in federal R&D and the commercialization of their innovative technologies, the STTR program requires participation by universities, federally funded research and development centers (FFRDC), and other non-profit research institutions.
- Each STTR proposal must be submitted by a team, which includes a small business (as the prime contractor for contracting purposes) and at least one research institution. The proposal must include a plan that the small business performs at least 50% of the work and the research institution(s) performs at least 20% of the work. The remainder of the work may be performed by either party or a third party.

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Past Commercialization Brochures – [www.armysbir.army.mil/Commercialization/PhaseIIIBrochures.aspx](http://www.armysbir.army.mil/Commercialization/PhaseIIIBrochures.aspx)

For more information, the past Commercialization Brochures can be found on the Army SBIR/STTR website for download.





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