U.S. ARMY SBIR/STTR
TRANSITIONING TECHNOLOGIES

Small Business Innovation Research • Small Business Technology Transfer

U.S. ARMY

UNITED STATES ARMY SBIR STTR Programs

"The vision of the Army SBIR and STTR programs is to be the Army's premier source of innovative technology solutions, providing direct access to America's high-tech small business research and development community..."

Peter N. Fuller
Brigadier General, US Army
Deputy Commanding General for Systems of Systems Integration

The Army is very proud of the success of the SBIR and STTR programs. As our Nation's largest source of early stage technology financing, this billion-dollar program enables hundreds of small businesses to move ideas from drawing boards to the marketplace. Through SBIR and STTR, we now know that the best ideas don't necessarily come from the labs of large corporations or even our government labs. Most often, innovative technologies are invented by creative individuals at small, entrepreneurial companies.

The U.S. Army SBIR/STTR Commercialization Brochure is published annually and PM, Army SBIR distributes this brochure within the Army and Department of Defense community and to the private sector at a number of conferences and other venues across the country. These brochures are meant to highlight program successes and to provide visibility to the positive impacts made by small businesses that have successfully transitioned their SBIR/STTR research into operational capabilities or to the commercial marketplace.

Peter N. Fuller
Brigadier General, US Army
Deputy Commanding General for Systems of Systems Integration
Research, Development and Engineering Command

The SBIR and STTR Programs

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

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 by socially and economically disadvantaged small business concerns (SBCs), and by SBCs that are 51 percent owned and controlled by women, in technological innovation; and (4) increase private sector commercialization of innovations derived from Federal R&D, thereby increasing competition, productivity, and economic growth.

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, reflecting the high degree of 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 a selected concept. 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).
- In Phase III, the small business or research institute is expected 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.

	SBIR	STTR
PHASE I	6 months $70,000 max	6-12 months $100,000 max
PHASE I Option	4-Month option (Government's discretion) $50,000 max, to fund Interim Phase II efforts	No option
PHASE II	2 years $730,000 max	2 years $750,000 max
PHASE III	Unlimited time Non-SBIR funding	Unlimited time Non-STTR funding

PM, Army SBIR has initiated two new initiatives to facilitate commercialization this year:

- **Technical Assistance Advocates**
  The Army has begun its initiative to provide technical assistance services to small businesses engaged in SBIR projects through a network of Technical Assistance Advocates, who will work closely with small businesses, Army scientists and technologists, and SBIR stakeholders. Ultimately, the Army expects to see SBIR technologies developed into a viable product or service for sale in the government or private sector markets. The Army understands that, for many small businesses and their potential customers, the path to successful transition can be extremely difficult and is therefore providing technical assistance to help.
- **2008 Commercialization Pilot Program**
  In accordance with the 2006 National Defense Authorization Act, the Army has engaged MILCOM Venture Partners (MILCOM) to implement the Commercialization Pilot Program (CPP). The CPP consists of two distinct phases conducted over a single year. The initial phase involves the identification of a focused group of CPP participants from the pool of active Army SBIR Phase II projects that: 1) address high priority Army technology needs, 2) exhibit a roadmap for rapidly transitioning to Soldiers, and 3) have the potential for commercial use in the private sector. The second phase involves guidance and support from MILCOM to assist in the development of business plans, technology transition plans, market research, and customer collaboration.

"Orbital Research's MCAS provides the Army with the capability to pursue mobile targets with high precision using a low-cost continuous course correction system."

US ARMY RDECOM

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

Miniature Control Actuation System (MCAS) for Munition Steering

Orbital Research, Inc.
Cleveland, OH
www.orbitalresearch.com
corporate@orbitalresearch.com

Increasing the effectiveness, lethality, and affordability of future munitions is a top priority of the Army armament community. Orbital Research Inc. (ORI), in close collaboration with U. S. Army Armaments Research, Development, and Engineering Center (ARDEC) engineers and the University of Toledo, developed an innovative, hinge-less Miniature Control Actuation System (MCAS) for continuous course correction of gun-fired munitions.

The MCAS employs Active Flow Control-based mechanical microactuators instead of conventional servo-based hinged surfaces to steer the munition. The miniature control devices in MCAS are placed in optimal locations on the projectile's body to generate on-demand control forces for steering. When not in use, these devices are stowed inside the weapon and consume no power. Advantages of MCAS over traditional systems include increased maneuverability, payload capacity (hence lethality), and range.

ORI's MCAS addresses a critical and strategic military need for low-cost intelligent munitions with high precision capability under the Future Combat System (FCS) requirements. The main feature of ORI's MCAS that sets it apart from other systems is its "continuous" in-flight course correction capability. This provides a significant improvement in the weapons' precision strike capability and lethality.

The success of ORI's MCAS SBIR effort is attributed to the expertise and teamwork between the ORI and ARDEC teams in all phases of the technical work. The Army expects the MCAS technology to significantly reduce production costs of guided munitions and to be utilized in various next generation munition concepts.

Phase III Impacts:

Orbital Research Inc. received $1.17M in investments for further development of MCAS from the Department of Defense and a prime contractor. In 2007, Orbital was the proud recipient of a Tibbetts Award, which annually recognizes the very best in SBIR achievement.

US ARMY RDECOM

U.S. Army Research Office

Diode Laser Technology

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sales@nlight.net

High power eye-safe lasers are crucial for many military and industrial applications. Erbium-doped lasers offer the potential for direct laser operation at 1.5 microns, thereby reducing the size and cost and improving the efficiency of today's frequency converted one-micron lasers. Under SBIR, nLIGHT Corporation developed high power, high efficiency diode sources for pumping solid-state lasers and for direct diode applications. Based on InP semiconductor technology, these devices operate at eye-safe wavelengths around 1.5μm. The measured continuous output power at room temperature is in excess of 100W per laser bar, which is an industry record at this wavelength.

This achievement benefits military and commercial applications that depend on eye-safe laser technology. One product example is a package capable of emitting a highly collimated laser beam at 1.5μm, useful for direct diode range-finding.

Another example is a diode laser technology capable of being packaged in actively and passively cooled packages for flash LADAR (Laser Radar) and directed energy applications. Additionally, this technology will result in kilowatt class laser diode stacks operating at 1470-nm. These laser diodes will find important applications in high power eye-safe military laser systems as well as in emerging dermatology and material processing markets.

Phase III Impacts:

Initial sales of these lasers to DoD contractors have exceeded $1.46M. Prototype laser bars have been delivered to DoD agencies, University researchers (e.g., University of Notre Dame, Johns Hopkins Applied Physics Laboratory, and Hampton University); and private industry (e.g., Fibertek) to promote advanced laser systems development.

To date, nLIGHT has not received direct Phase III investment from DoD agencies; however, these devices are components that require integration into other systems by prime contractors before acquisition by the DoD. nLight sales are dominated by commercial transactions.

"These laser diodes will find important applications in high power eye-safe military laser systems as well as in emerging dermatology and material processing markets."

"TRS's high energy density shock discharge elements enable a 2 to 3 times performance improvement in pulse power munitions."

U.S. Army Space and Missile Defense Command

High Energy Density Shock Discharge Ceramic

TRS Technologies, Inc.
State College, PA
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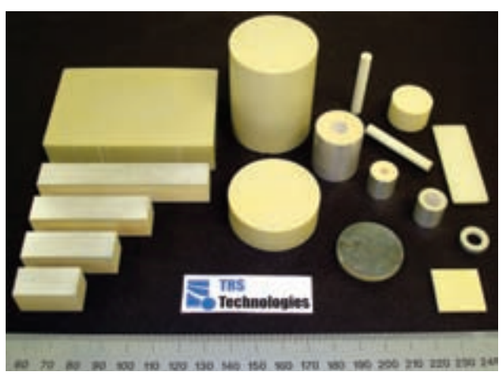
wes@trstechnologies.com

TRS Technologies created and tested a high energy density shock discharge ceramic developed for use in ferroelectric generators (FEG) to dramatically reduce the size of detonation systems designed around multipoint Explosive Foil Initiators (EFI). The Army is currently developing these devices for advanced munitions. The materials and component fabrication processes developed by TRS have resulted in a 2 to 3 times improvement in FEG performance over what can be obtained by conventional energy storage ceramics. As a result, advanced munitions powered by FEGs can, for the first time, move from the laboratory into field testing.

FEGs and capacitive discharge units (CDUs) in both single- and multi-point detonation systems have a wide range of DoD and commercial applications. These components can be used in advanced munitions, and smart bomb technologies and are greatly enhancing the lethality and accuracy of tactical weaponry while reducing the potential for collateral damage. Of particular interest are the "near miss" systems in which distributed, multipoint fuzing can be used to provide directionality to exploding ordnance, and multiple kill vehicles in which explosive generators can launch multiple, high-speed rockets from a larger missile warhead or spacecraft.



Examples of High Energy Density FEG Elements

TRS has delivered over 500 prototype FEG elements to the Space and Missile Defense Command contractors and DoD research laboratories, and production of several thousand parts for field testing is anticipated throughout 2008. Multiple element formats were developed to accommodate a broad range of munition designs and sizes. TRS is actively increasing production of FEG elements in order to supply this technology to large volume munition systems.

Phase III Impacts:

TRS received over $120K for the delivery of FEG prototypes in 2007. Additionally, TRS anticipates substantial sales to the Army, Navy, and their contractors in 2008. TRS is actively seeking investment for production ramp-up scheduled in 2009.

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

Speech Control of Unmanned Ground Vehicles

Think-A-Move, Ltd.
Beachwood, OH
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info@think-a-move.com

Improving situational and operational awareness during the operation of Unmanned Ground Vehicles (UGVs) has been identified as a capability gap that Think-A-Move's (TAM) hands-free technology addresses. Controlling a UGV requires the operator to focus on the operator control unit (OCU), resulting in decreased situational awareness and increased operator vulnerability. Previous attempts to use speech control have not been successful because systems have not performed well in noisy environments.

TAM's technology captures speech in the ear canal and uses it to control devices and communications. This technology generates a very clear signal, even under extreme external noise levels, enabling UGV operators to use speech controls as a supplement to the OCU. This facilitates heads-up and hands-free operation, with increased situational awareness, decreased training time, and improved man-machine interface.

The TAM system consists of an earpiece, connected via wire to the OCU, containing a microphone and speaker pointed into the ear. TAM's software, running on the OCU, then processes the voice message, removing remaining external noise and enhancing the quality of the voice message. TAM's speech recognition software converts the spoken words into commands and sends those commands via the OCU to the UGV.

TAM's hands-free, heads-up speech control systems allow Soldiers operating UGV's significantly increased situational awareness and effectiveness and decrease their vulnerability. In addition, the sytems will enable them to more easily control UGVs and will assist in decreasing the time required for mission completion.

Phase III Impacts:

Under a $340K Phase III contract that Think-A-Move received from the Army, TAM is integrating its system with iRobot's Operator Control Unit. In addition, Think-A-Move was selected for the U.S. Army's Commercialization Pilot Program (CPP) and awarded a $600K contract to develop a field-testable prototype of its speech control technology for the iRobot PackBot. The State of Ohio also awarded Think-A-Move a grant for $350K to support its efforts to commercialize this technology and bring it to market.

"Think-A-Move's hands-free, heads-up speech control systems allow Soldiers operating UGV's significantly increased situational awareness and effectiveness and decreases their vulnerability."

"NanoScale's FAST-ACT allows responders to actively and immediately neutralize chemical hazards."

U.S. Army Research Office

Enhanced Chemical Decontamination

NanoScale Corporation
Manhattan, KS
www.NanoScaleCorp.com
custserv@NanoScaleCorp.com

Each day, field and laboratory personnel are faced with potential toxic hazards. To reduce this threat, NanoScale developed the FAST-ACT® formulation – an immediate chemical hazard containment and neutralization system, offering protection from liquid and vapor chemical spills and releases from known or unknown origin. FAST-ACT®, which received an Army's Top Ten Greatest Invention nomination in 2004, is effective against a broad array of chemicals, including chemical warfare agents (CWA). This level of response can protect personnel in potentially deadly situations involving chemical releases; can aid First Responders in HAZMAT situations; and can be used in commercial laboratories and manufacturing facilities for toxic industrial chemical (TIC) spills. FAST-ACT® is a safe, non-toxic, non-corrosive, non-flammable, dry powder formulation that is deployed in easy-to-use, portable systems that are effective over a wide range of environmental conditions. Additionally, FAST-ACT® requires minimal training to use and has no logistical burden, allowing expanded utility for many safety response applications.

In addition to all of the first response applications for FAST-ACT®, the technology is being further developed for decontamination wipes and residue-free wipes, and is currently utilized in commercial odor elimination products such as OdorKlenz™ and NanoZorb™. The commercial impact of the technology behind FAST-ACT® reaches numerous markets and applications, including real estate, service industry, odor control, air quality, and environmental remediation.

The primary market for the system is for the detection and identification of chemical warfare agents following their use in military or terrorist situations, with the Department of Defense (DoD) and the Department of Homeland Security (DHS) being the primary customers. However, additional civilian applications of the proposed system are easy to foresee, to include environmental monitoring, detection of toxic compound releases, and various forensic uses. Customers for these civilian applications will include both Government and private organizations.

Phase III Impacts:

NanoScale received $10M from various DoD programs to further develop and verify its technology including spin-off products and applications. Expanding the technology to commercial markets should result in $15M in revenue by the end of 2008.

Edgewood Chemical Biological Center

Isolating and Identifying Bio-Warfare Agents

Microchip Biotechnologies, Inc.
Dublin, CA
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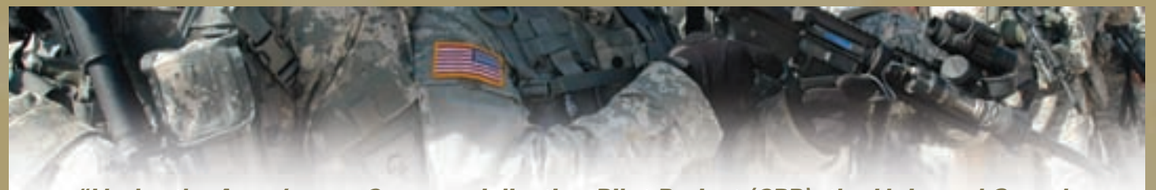
bizdev@microchipbiotech.com

The Army has an urgent requirement to reduce the possibility of disease in the event of either bio-weapon attacks and/or non-battle injuries (DNBI). The Army's current bio-warfare agent detection systems are becoming more effective, but have large power requirements that limit remote use and require highly trained operators. In addition, bio-warfare agent samples come from diverse sources, including surface swabs, biological tissues or rinses, soil, water, and aerosols. These samples often contain contaminants that can inhibit downstream analysis. Another complicating factor is that sample volumes can be as much as 20 mL whereas the final analytical volumes can range from 1 to 100 microliters. So there is a mismatch in the amount of sample that can be analyzed (without concentration); this can impact sensitivity and reduce the likelihood of detecting bio-warfare agents.

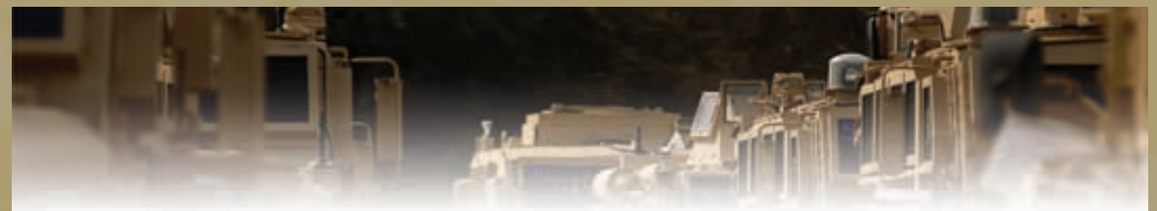
To address these factors, Microchip Biotechnologies Inc. (MBI) is developing a prototype Universal Sample Preparation Module (USPM) based on an integrated microfluidic chip-based technology that will overcome many of the disadvantages of current systems. Under the Army's new Commercialization Pilot Project (CPP), the USPM will be developed to enhance the capabilities of the Army's current detection systems. The USPM will fully automate the isolation, purification, and concentration of the bio-warfare agent from samples, and will be highly compact and use minimal power. The USPM employs paramagnetic bead technology that enables volume reduction and purification simultaneously and can target specific bio-warfare agents from complex mixtures. The device will selectively capture and purify bio-warfare agents including toxins for subsequent immunoassay analyses on other platforms, and viruses and bacteria whose nucleic acids will be isolated for analysis using methods such as the quantitative polymerase chain reaction. Ultimately, the same microfluidic platform will also be capable of processing medical diagnostic samples and performing downstream assays and detection using the quantitative polymerase chain reaction on microchips. This will lead to next-generation, portable, and fully automated systems to support the Warfighter.

Phase III Impacts:

MBI projects commercial sales of the USPM in excess of $105M in the next four years. MBI's target markets for automated sample preparation technology include biodefense, forensics, food and agricultural analysis, genomics, and molecular diagnostics.



"Under the Army's new Commercialization Pilot Project (CPP), the Universal Sample Preparation Module will be developed to enhance the capabilities of the Army's current detection systems."



"M Cubed has developed durable, ceramic composite, low cost, lightweight, high performance personnel armor ballistic protective inserts for small arms protection."

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

Improved Body Armor Plates

M Cubed Technologies, Inc.
Monroe, CT
www.mmmt.com
holmes@mmmt.com

The Army's need for rapid deployment capabilities and the increasing loads on the Infantry Soldier have created the demand for lightweight armor systems. The current ballistic protection offered against small arms rounds is based on ceramic with fiber-reinforced composite backing. The Army requires a decrease in the weight of the current armor systems, with an increase in durability, multi-hit performance, and a development of systems for the defeat of more aggressive threats. The goal of the SBIR Phase II was the development of a ceramic composite tile with improved features, including better durability and multi-hit protection, improved ballistic performance, and lower cost.

To meet this requirement, M Cubed developed durable, ceramic composite, low cost, lightweight, high performance, personnel armor ballistic protective inserts for small arms protection. A primary component of the insert is a multi-curved ceramic tile designed to damage the projectile such that the high strength polymer backing catches any debris. Through the use of novel additives and controlled thermal cycles, all unwanted chemical reactions between the different phases are prevented, yielding fully dense, high hardness composite bodies. In addition, durability and multi-hit performance were enhanced due to multi-phase toughening provided by composite microstructures.

Phase III Impacts:

M Cubed Technologies has received an additional funding of roughly $600K in investments from the Army to improve their product. 98,735 tiles were manufactured and delivered in 2007, resulting in sales over $24M. Current sales as of July 2008 reflect 72,949 tiles shipped, resulting in sales of $18M.

A follow-on CPP program was obtained in March 2008 $300K committed, with an additional $300K option available based on performance. The aim of this program is to develop a reaction bonded "ceramic composite" for the next generation personnel armor specification.

U.S. Army Research Laboratory

New Material Shaping Process

Materials Processing, Inc.
Fort Worth, TX
www.mpi-pim.com
information@mpi-pim.com

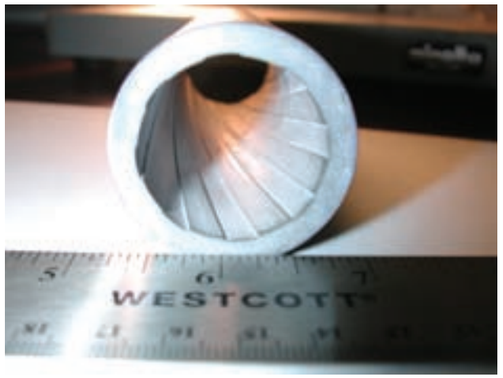
The Army has a need for the development of rifled gun barrel liners from advanced ceramic materials because new more powerful propellants are creating greater stress on steel-based gun barrels. To address this need, Materials Processing, Inc. (MPI) designed and tested Power Injection Molding (PIM) for large military components. PIM, a relatively new material shaping process, uses the shaping advantages of plastic injection molding, but expands the application to numerous advanced engineering materials such as metals and alloys, ceramics, intermetallic compounds, and composites. A number of these advanced materials have potential applications both in the military and commercial sector.

An excellent example of PIM advances is MPI's development of ceramic rifled gun barrel tubes. Ceramic gun barrels are extremely attractive compared to their metallic counterpart as they have the potential to increase the barrel life and reduce weight, especially in small caliber systems. Most projectiles coming out of the guns are spin stabilized for aerodynamic flight stability. This spin is imparted by a rifling pattern (lands and grooves) in the inner surface of the gun barrel.

The successes of this project will provide the DoD with a novel environmentally friendly technology for fabricating moderate to large complex near net-shaped components in an economic manner using inexpensive tooling and powder. The fast and environmentally benign debinding process will have tremendous impact in the commercial PIM sector. The use of low/medium pressure injection molding will allow the use of low cost tooling and enable the PIM industry to economically compete with low volume (numbers), complex, and near net-shaped products (both large and small). These advantages will be extensively used by both the defense and commercial sectors.

Phase III Impacts:

More than $750K in private funds have been invested for development of MPI's commercial PIM facility. MPI currently has an established commercial program in the PIM area and is supplying PIM hardened metal parts to aerospace, oil and gas, and consumer goods sectors. Licensing of this innovative technology is expected.



A powder injection molded 25-mm ceramic rifling tube showing the internal rifling pattern.

"Ceramic gun barrels are extremely attractive compared to their metallic counterpart as they have the potential to increase the barrel life and reduce weight, especially in small caliber systems."

"The ACE™ active noise reduction earplug significantly reduces helicopter noise that reaches the ear, thereby reducing fatigue and allowing pilots to hear radio communications more clearly and at lower decibel levels."

U.S. Army Medical Research and Materiel Command

Active Noise Reduction Earplug for Pilots

Sound Innovations Incorporated
White River Junction, VT
www.sound-innovations.net
cpearson@sound-innovations.net

U.S. Army pilots have a vital need to effectively communicate with every member of their flight team while undertaking dangerous and technically demanding missions. To address this need, Sound Innovations Inc. designed and tested the ACE™ Active Noise Reduction (ANR) communication earplug. This earplug provides greater sound attenuation, robust hearing protection, and high fidelity communications for Army helicopter crews.

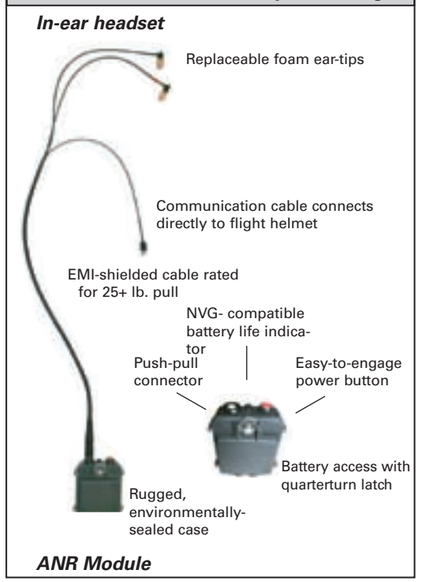
A helicopter presents a challenging noise environment in which total noise levels can reach over 110 decibels (dB), which impairs radio intelligibility, is fatiguing for the helicopter occupants, and ultimately can lead to hearing loss. The ACE™ significantly reduces the helicopter noise that reaches the ear, thereby reducing fatigue and allowing pilots to hear radio communications more clearly and at lower decibel levels. Additionally, it incorporates Sound Innovations' patented Feedforward ANR system with a low weight communication earplug and a shallow-fit conformal foam ear tip.

Fielding of this technology will improve productivity, performance, and hearing conservation, while enhancing Soldier performance and preventing deleterious effects of noise-induced hearing loss for our Soldiers. The development of this technology by Sound Innovations shows promising improvements for not only the Army's air crews, but also other military vehicle crews and ground force applications as well. The first ANR headset product is now undergoing Air Force qualification testing and is expected to achieve Safe to Fly certification in the second half of 2008. Once this is achieved, it can be sold to the aircrew market.

Phase III Impacts:

In 2007, Sound Innovations won a $1.5 million contract from the Air Force Materiel Command to design and test an Aircrew Helmet Noise Reduction (AHNR) system. The ACE™ has passed Design Verification Testing, and flight testing begins in August of 2008. Sound Innovations expects to receive Safe to Fly certification for the ACE™ in the first half of 2009.

Sound Innovations' AHNR System Design



US ARMY RDECOM

U.S. Army Research Laboratory

High Brightness Chip-based Laser Technology

QPC Lasers, Inc.
Sylmar, CA
www.qpclasers.com
info@qpclasers.com

The Army has a need for spectrally tailored high-efficiency long wave pumps for lasers that generate an output near 1550 nm, which is at least 5 orders of magnitude less harmful to the eye. In response to this need, QPC Lasers, Inc. developed a patented and proprietary high-brightness chip-based laser technology with the potential to reduce the size, cost, and weight of lasers by as much as ten times, while significantly improving their energy efficiency and portability.

Current lasers can be pumped by short-wave diodes but generate too much wasted power in the laser crystal due to the large quantum defect. These lasers can also be pumped using conventional long-wavelength pumps; however, these pumps produce an output with low power, short broad line width, poor brightness, and only wall-plug efficiency. To circumvent the serious shortcomings of conventional long-wave pump diodes for eye-safe laser use, QPC designed and implemented laser diode technologies that enable the long wave pumps to attain the performance of high slope efficiency at high power and spectrally narrowed high power emission.

Currently, QPC's lasers are being used globally in the development of next generation laser-based HD-TV, cancer treatment, and laser weapons. QPC believes its technology will permit it to capture significant market shares in these multi-billion dollar markets in the coming years. These technologies have been successfully applied to the design of several QPC commercial products for pumping eye-safe lasers that emit radiation with much less serious ocular hazards. Products include BrightLock Ultra-100 at 1532 nm, BrightLock Ultra-500 at 1532 nm, and BrightLock Stacked Arrays.

Phase III Impacts:

QPC receives significant revenues from defense contracts and defense customers. Various defense prime contractors and Army Research Laboratory have purchased the 1532-nm fiber-coupled modules and micro-channel cooled stacks for pumping eye-safe solid-state lasers. These fiber-coupled modules and stacked arrays increase pumping efficiency, reduce thermal requirements of systems, and eliminate costly external optical components for pumping high energy eye-safe lasers. There has been over $430K in commercial sales of these products.

"QPC's high-brightness, high-power semiconductor laser technology is enabling new applications in various markets, allowing the end user to achieve high brightness and enjoy all the benefits of traditional diodes. The applications are endless."

"Kutta's technology will give minimally trained Soldiers in the field the ability to request information and action from the Shadow UAV."

US ARMY RDECOM

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

UAV Bi Directional Remote Video Terminal

Kutta Technologies, Inc.
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www.KuttaTech.com
Info@kuttatech.com

Soldiers in combat often need access to real-time overhead imagery from Unmanned Aerial Vehicles (UAVs). Very few, however, are trained UAV operators or sensor controllers. Under the Dismounted Small UAV Associate SBIR program, Kutta Technologies created an innovative STANAG4586 compliant, hand-held, Ground Control Station (GCS) for UAVs. Kutta's controller provides the dismounted soldier with the ability to easily control, efficiently task, manage, and gain battlefield situation awareness. Through Kutta's unified Graphical User Interface (GUI), the application offers features such as 2D and 3D flight planning, real-time auto-routing, autonomous point and follow modes, real-time MPEG 2 and MPEG 4 video storage, and the ability to control a gimbaled camera. The system intelligently monitors vital UAV and GCS systems and informs the user when parameters exceed defined limits. An OS platform abstraction allows the software application to run on Windows CE, Windows XP, and Linux,. Furthermore, the innovative touch-screen GUI architecture allows the application to flow seamlessly from a rugged PDA to a rugged tablet PC, or a Laptop. The Kutta GCS has successfully controlled a fixed wing UAV (ACR Silver Fox, 10/05) and rotary wing UAV (NRI Auto-copter, 9/06) in flight tests from a rugged PDA controller.

Under this SBIR program, PM Unmanned Aircraft Systems (PM UAS) has funded Kutta Technologies to work with AAI Corporation to integrate their Intelligent UAV Controller technologies onto the Army's One System Remote Video Terminal (OS RVT) and create a Bi-Directional Remote Video Terminal (BD RVT).

Kutta's technology will give minimally trained Soldiers in the field the ability to control the UAV's payload and autonomously track fixed and moving targets. With an experienced One System Ground Control Station (OS GCS) Operator in continuous oversight, the software on the UAV navigates the air vehicle and manages the payload to perform the requested BDRVT commands in a safe and effective manner.

Phase III Impacts:

The PM anticipates ultimately deploying the system as a series of software-only upgrades to the Shadow UAV, OS GCS, and OS RVT. To date, this effort has received funding in excess of $4.7M in SBIR Phase II and Phase III awards. Most recently, Kutta was awarded an additional $600K from the Army's Commercialization Pilot Program to conduct a user evaluation and enhance functionality.

CERDEC US ARMY RDECOM

Communications-Electronics Research, Development and Engineering Center

Digital Media Exploitation Device

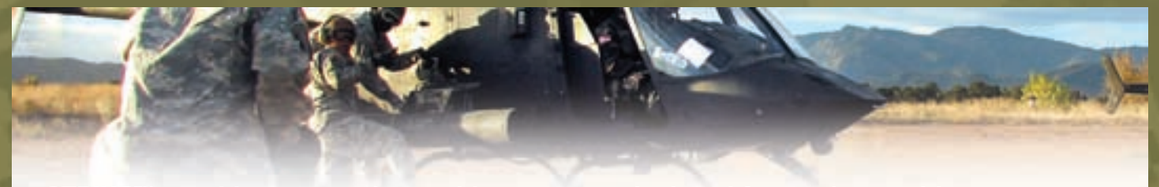
I.D.E.A.L. Technology Corporation
Orlando, FL
www.idealcorp.com
info@idealcorp.com

Soldiers and investigators are facing a growing challenge as an increasing number of digital devices and media are being seized during operations and there is limited time to process and analyze this digital evidence to determine relevance. Computers and other devices have become the backbone of both conventional and unconventional forces, including data on operations, logistics, finances, and intent. Currently, the information contained on a captured computer is normally extracted and analyzed in a removed digital forensics laboratory. While this meets strategic intelligence requirements, it does not provide timely and useful information to the tactical force. In response to this requirement, I.D.E.A.L. Technology Corporation developed a cutting-edge, digital forensics product for counter-terrorism, intelligence gathering, and criminal investigations called the System for TRIaging Key Evidence (STRIKE™).

STRIKE™ is a rugged, portable, and easy-to-use digital media exploitation tool designed to determine if electronic data contains information critical to the success of an operation. This "triage" tool enables operators to flag the computers that must be prioritized immediately for detailed analysis in a full-fledged digital forensics laboratory or strategic analysis center. By providing a means to quickly extract data and analyze information in real time, the STRIKE™ supports a wide range of tactical operations against a variety of file systems, file formats and storage media. STRIKE™ is the only tactical evidence capture and triage device of its kind – designed for speed and simplicity, providing intelligence that can be acted upon within minutes.

Phase III Impacts:

I.D.E.A.L. Technology has received over $2M in additional non-SBIR research and development funding from DoD adapt the STRIKE for specific military contingency operations. As of January 2008, 214 STRIKE kits have been delivered to various government organizations resulting in sales of over $2.25M.



STRIKE™ provides a rugged, portable system to deployed forces that enables operators to quickly and easily assess if a captured computer or other digital media contains information critical to the success of their operation and act upon it in real-time."

"Fairchild Imaging has developed a small, lightweight, low-power, solid-state TV camera with low light level imaging capability in the near infrared band from 0.4 – 1.1microns."

CERDEC US ARMY RDECOM

Communications-Electronics Research, Development and Engineering Center

Monolithic Complementary Metal–Oxide Semiconductor (CMOS) Imaging Sensors for Low-Light Imagery

Fairchild Imaging
Milpitas, CA
www.fairchildimaging.com
sales@fcimg.com

Soldiers need a solid-state silicon imaging camera that is equal to or exceeds the passive low light level performance of the current Gen III image intensifier (I2) man-portable imaging systems. Additionally, current I2 technology is bulky in size and weight and does not lend itself to be fused with other solid-state sensors. Because of this, the Army requires more advanced technology that is also smaller in size.

In response to this Army requirement, Fairchild Imaging developed a small, lightweight, low-power, solid-state video sensor with low light level imaging capability in the visible and near infrared band from 0.4 – 1.1microns. Fairchild Imaging has developed this technology in conjunction with the U.S. Army Night Vision Electronic Sensors Directorate (NVESD) to address a critical need for a solid-state, low light level solution.

The core of this technology is Fairchild Imaging's Low Light Level Monolithic Complementary Metal-oxide Semiconductor (CMOS) Image Sensor (L3CIS). The sensor provides low noise, low power, and high sensitivity in the near infrared band and incorporates advanced built-in architecture such as active pixel, pinned photodiodes, and dual amplifiers and analog to digital converters that provide the high dynamic range (< 84db) and high resolution (5M pixel) required for continuous day and night applications. Because L3CIS is completely solid-state with no vacuum or cooling requirements, manufacturing and reliability advantages will be apparent.

With this technology, the Army can replace two separate imaging channels with one camera for continuous day and night operation. The L3CIS technology is targeted to be used on many Army platforms, including the Bradley

Fighting Vehicle System and the Armed Reconnaissance Helicopter. Other military programs where L3CIS technology has benefits are Common Sensor, Close Surveillance Support System (CS3), Sniper Night Sights, and the Apache EO Upgrade program. The first camera introduced, the Harrier 2051™, provides high-performance, low-light level digital imaging for applications demanding high-resolution low light performance at video frame rates.

Phase III Impacts:

Fairchild Imaging received $500K from Army Program Manager Night Vision / Reconnaissance, Surveillance and Target Acquisition (PM NV/RSTA) and $750K from the SBIR Commercialization Pilot Program. DoD prime contractors are developing systems that will incorporate the L3CIS into their manned and unmanned imaging applications. Fairchild Imaging also received $2M through spin-off L3CIS technology from commercial customers (primarily scientific markets – fluorescence microscopy) and anticipates strong sales of the L3CIS technology to industry leaders in both the commercial and military markets

ARL US ARMY RDECOM

U.S. Army Research Laboratory

Hazard Analysis in the Field

Envimetrics, LLC.
Pluckemin, NJ
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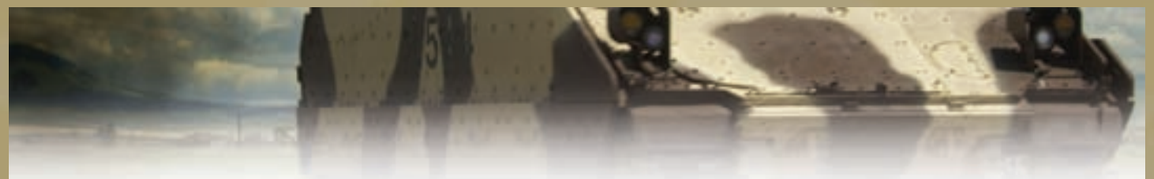
Envimetrics@verizon.net

Laser Induced Breakdown Spectroscopy (LIBS) is a major new field-sensor technology with unprecedented performance attributes including real-time response and high sensitivity. LIBS can detect chemical and biological agents, explosives, and toxic industrial compounds. Currently, the Army is developing a field-portable (backpack) LIBS sensor with a handheld laser and broadband spectrometer. Current technology lacks the ability to measure sensitive signals, which could prevent critical hazardous warning signals from reaching the Soldier.

Envimetrics developed a spectroscopic enhancement technology to make the laser analysis technique significantly more sensitive. This enhanced LIBS technique can obtain parts per billion sensitivity and can also be configured so that it does not impart an imprint to surfaces. The man-portable unit, weighing less than ten pounds, will provide civilian and military first responders improved sensitivity so LIBS can provide instantaneous non-contact sampling and analysis of potential chemical, explosive, and biological hazards. The enhanced technique has reduced laser energy requirements and allows the technique to work with ultraviolet lasers that will reduce issues and make it more acceptable for field use.

Phase III Impacts:

Envimetrics has teamed with Ocean Optics, LLC to commercialize a LIBS system for desktop analysis of materials. Envimetrics has also teamed with A3 Technologies to enhance A3 man-portable and robotics-mounted LIBS systems. Yearly revenues from both military and commercial uses of this technology are expected to be $20 million within five years.



"Sensitivity enhancement of Laser Induced Breakdown Spectroscopy (LIBS) will make it the analysis technique of choice for portable, desktop, and instantaneous measurement of materials and hazards."

"HARV can be used in many areas where situational awareness is difficult. This is a great solution for a variety of systems from armored vehicles, night vision systems, and Explosive Ordnance Disposal robots, to remotely operated heavy equipment."

US ARMY RDECOM

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

Head-Aimed Remote Viewer (HARV)

Chatten Associates, Inc.
W. Conshohocken, PA
www.chattenassociates.com

Explosive Ordnance Disposal Soldiers remotely operate robots to disarm explosive ordnance from safe distances. Maintaining good situational awareness and effectiveness is extremely difficult. Soldiers operating at night are often restricted by having to stop completely before looking left or right.

Chatten Associates, Inc. created a low cost Head-Aimed Remote Viewer (HARV), which more than doubles the mission performance of remote operations. The HARV lets remote operators look around as though they were sitting on the robot. Wherever the operator looks, the camera "looks". A HARV can be controlled by either a joystick or an operator's head motions.

The HARV provides excellent visual options: during the day, operators see the scene in full color; at night, the gimbal carries either an ultra-low-light camera, which can operate in most night conditions without illumination, or a thermal imager. The gimbal has both infrared and white light illuminators to be used when needed as well as visible and infrared laser pointers, and stereo audio microphones. For armored and up-armored vehicles, a HARV lets a completely enclosed crewmember look around as though his head was out of the hatch. The HARV's thermal imager looks left, right, and straight ahead – all in perfect sync with the driver's head motions.

The HARV is especially valuable to Soldiers as it enables them to recover the situational awareness lost when they operate closed-hatch with a remote weapons station. Currently, Army researchers are evaluating the effectiveness of the HARV by having EOD and Special Operations Command (SOCOM) troops in Iraq and Afghanistan test its capabilities.

Phase III Impacts:

Chatten Associates secured $664K from the SBIR Commercialization Pilot Program. Less than two years from the start date of SBIR Phase II, HARV sales the Army and its Prime Contractors; SOCOM; Idaho National Laboratory; Foster Miller; John Deere; and others have amounted to over $500K.

CERDEC

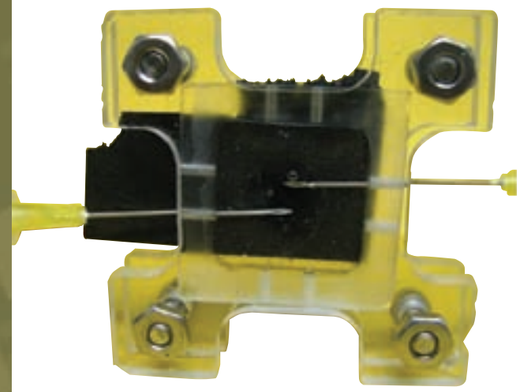
US ARMY RDECOM

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

Biobattery System

Computational Fluid Dynamics Research Corporation (CFDRC)
Huntsville, AL
www.cfdrc.com
info@cfdrc.com

The need for a renewable micropower source has long been recognized, and is increasingly relevant in today's mobile, energy hungry world. Computational Fluid Dynamics Research Corporation (CFDRC) has developed a Biobattery system to harvest energy from biological fuels (such as sugars) directly into electrical energy. The Biobattery system contains high efficiency electrodes that use a unique combination of biological catalysts, carbon nanotubes and nanoparticles for effective extraction of electrical energy. The system offers several advantages such as operation at ambient temperature, neutral pH, low manufacturing cost, superior selectivity, and renewability. The availability of fuel (glucose) in the Army supply chain also makes the use of the Biobattery logistically favorable.



The primary outcome of this project will be a working Biobattery system that can power applications for both military and civilian needs. Military applications include power sources for the Warfighter Physiological Status Monitor device, as well as wireless sensor networks used for monitoring physical or environmental conditions, sniper tracking, battlefield surveillance, healthcare monitoring, and motion detection. An autonomous power source in inaccessible areas (e.g. in hostile territory) would eliminate the need for battery changes. Civilian applications in the microelectronics industry include Biobattery-based trickle-charging of Lithium-ion batteries used in cell phones and PDAs. Conservative estimates of the power market (based on microelectronics needs alone) exceed several hundred million dollars. Applications in the life science area are also foreseen with implanatable monitors and therapeutic/drug delivery systems.

Phase III Impacts:

CFDRC has received nearly $2M in additional funding from the U.S. Army to adapt the Biobattery system for specific Army applications. This is supplemented by nearly $1M in funding for development of spin-off technologies from the Biobattery effort.

""CFDRC's Biobattery prototype has shown a 25-fold increase in power density during the course of Phase II, sufficient to power an electronic LED Circuit."

"The goal of the Situational Understanding Army Technology Objective is to enhance Soldier situational understanding by determining the optimum modality for displaying critical information to the Soldier."

US ARMY RDECOM

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

Improved Soldier Situational Awareness and Understanding

21st Century Systems, Inc.
Omaha, NE
www.21csi.com
info@21csi.com

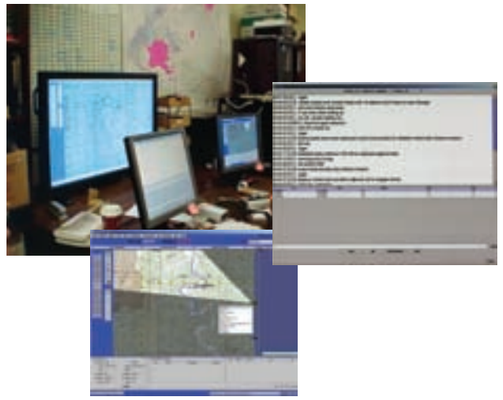
Successful Soldier performance depends on situational awareness and understanding. To address this issue, an Army Technology Objective (ATO) entitled "Situational Understanding as an Enabler for Unit of Action Maneuver Team Soldiers" (SU) was developed. The goal of the SU ATO is to enhance Soldier situational understanding by determining the optimum modality for displaying critical information to the Soldier. To accomplish this goal, a simulation platform was needed; after reviewing existing simulation platforms, it was determined that the M-Body Agent Enabled Decision Group Environment (M-Body AEDGE®) system developed by 21st Century Systems, Inc. provided the required capability.

The M-Body AEDGE simulation platform derived from the Scoot and Shoot Assistant (SASA), an Army SBIR Phase II effort. SASA, originally developed as a tactical decision aid based on the AEDGE open architecture intelligent agent framework, was modified to fit program requirements and to represent the functionality that was necessary to simulate platoon leading operations. Additionally, the M-Body AEDGE® application provides three unique capabilities to the Soldier. First, it generates specific audio, visual, and tactile cues for attention management, as well as an option for either unimodal or multimodal presentation. Next, it provides a data collection capability that considers the command and control decision-making aspects for Platoon Leaders, allowing capture of extensive simulation events and human interactions. Lastly, it provides the capability to modify mission scenarios based on the situation.

Future U.S Infantry capabilities, coupled with network-centric warfare, will drive large advancements in information distribution and display, and will provide a combat advantage. Utilizing other human senses such as audition and touch to convey information may help Soldiers manage information, thereby enhancing their performance on the battlefield.

Phase III Impacts:

The overall results of these studies suggest that both unimodal and multimodal alerts may be effective information management tools for platoon leaders, leading to a reduction in their mental workload and improvement in overall performance. More specifically, decision cycle time (measured as response time) was reduced by as much as 63% when multimodal alerts were presented. To date, 21st Century Systems, Inc. has received over $87K in PH III funding from the U.S. Army Research Laboratory (ARL) for software in support of ARL research efforts.



US ARMY RDECOM

U.S. Army Research Office

Chemical Warfare Agent Sensors

ICx-Agentase
Pittsburgh, PA
www.chemdetection.icxt.com
info@agentase.com

Despite the range of chemical warfare agent (CWA) detection systems, few combine high sensitivity, stability, and ease of use. Typical enzyme assay systems are particularly sensitive to their environments, which limits activity and ease of use. ICx-Agentase developed a buffered enzymatic system that can be incorporated into materials and is capable of detecting a variety of CWAs. Agentase, through STTR support from the Army Research Office (ARO), developed a colored chemical wipe for the detection of nerve agents. The wipe uses a pH balancing coupled enzyme system to maintain the appropriate pH in diverse environments. The presence of cholinesterase inhibiting nerve agents disrupts the coupled enzyme system, yielding a change in pH responsible for the color change. Further STTR-sponsored research enabled Agentase to develop a kit with a broad spectrum of sensing capabilities.

ICx-Agentase's Chemical Agent Detection (CAD) Kit offers a sensitive, stable, ease of use, no-power, low cost sensing capability in a system of five sensor pens for the detection of nerve, blood, and blister agents. This technology has been expanded to the detection of toxic industrial chemicals (TICs). The sensors have been fielded by the Defense Intelligence Agency (DIA) and the Department of Homeland Security (DHS). The sensor was selected as one of the 2003 Army's Top Ten Greatest Inventions.

In addition to the CAD Kit, this enzyme technology for the detection of CWAs and TICs has been expanded to other sensing applications including real-time air monitoring, water monitoring, and agent disclosure sprays. Further support from the Defense Threat Reduction Agency has led to the development of a badge that Soldiers can wear to indicate when a chemical threat is present. Support from the National Science Foundation and the ARO has been leveraged to develop a water monitor for real-time analysis for the presence of chemical warfare agents in drinking water.

Phase III Impacts:

The sensor is actively being used in DoD operations and by DHS. To date, there has been over $29M in Phase III funding, with $4M from DTRA and $25M from another Federal Agency. The ease of sampling surfaces is a new and significant capability that this sensor brings to the field and the Soldier. Tens of thousands of sensing kits are being used by DHS in training first responders from around the country. STTR support to Agentase facilitated development of a new technology and laid the foundation for this company, now part of a new, multinational corporation, ICx. ICx is a leading security technology corporation in the Defense and Homeland Security market.

SBIR CBD
The Chemical and Biological Defense SBIR Program

US ARMY RDECOM

U.S. Army Research Office

Immediate Bio-decontamination System

TDA Research, Inc.
Wheat Ridge, CO
Research@tda.com
www.tda.com

TDA Research, Inc. (TDA) is developing a water-based solution to decontaminate equipment contaminated with chemical warfare (CW) and biological warfare (BW) agents. This battery-powered portable system for military and first responders uses an electrolytic cell to produce the active species: chlorine dioxide (ClO2) and hypobromite ion (BrO 1). The electrochemical decon elegantly resolves the longstanding problem in decontamination: how to provide a very reactive decon solution that is at the same time stable enough that it lasts for years and is safe enough (unreactive) to store and transport without special permits or precautions. The extremely active species are generated only when and where they are needed. The active species is highly reactive, so it finishes its task quickly, then degrades and does not persist in the environment. The system is stable in storage for up to 10 years with suitable batteries and readily transportable, including shipment on commercial aircraft. The electrochemical decon system rapidly detoxifies the CW agents. It is also active against biological threats including vegetative bacteria, viruses and bacterial spores. Tests according to DoD guidelines have confirmed that the solution is compatible with materials in military equipment, including painted steel and a range of polymers and elastomers.

When used with a battery-powered backpack, the system has the capability to decontaminate a vehicle up to the size of a light truck or High Mobility Multipurpose Wheeled Vehicle (HMMWV); a smaller, handheld unit has also been tested. The system is capable of cold weather operation, including operating in below freezing temperatures. TDA is currently working to carry out tests that will verify efficacy against the BW agent anthrax (Bacillus anthracis). TDA plans to apply for EPA registration of the solution as a sporicide effective against anthrax.

Phase III Impacts:

This system proposes to be used by the U.S. military and first responders for immediate bio-decontamination of vehicles or equipment contaminated with BW or CW agents. The technology developed will greatly benefit the armed forces by detoxifying chemical agents on contact. The technology TDA Research has developed is a candidate for the Joint Portable Decontamination System (JPDS). To date, roughly $1.5M in DoD funding has been received for expanded research and development.

Field test with the EC Decon solution applied to a truck tailgate.

U.S. ARMY SBIR/STTR TRANSITIONING TECHNOLOGIES

OUTREACH AND SOURCES OF INFORMATION

ARMY SBIR/STTR WEB SITE -www.armysbir.com

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

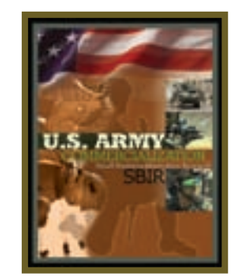
COMMERCIALIZATION BROCHURE

The U.S. Army SBIR/STTR Commercialization Brochure is published annually. This brochure is distributed within the Army, DoD, and small business community at a number of conferences and other venues across the country.

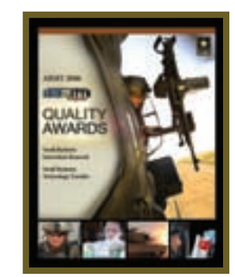
PAST COMMERCIALIZATION BROCHURES

2003

2004



2005



2006

Photos courtesy of the U.S. Army and:

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US ARMY RDECOM

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