

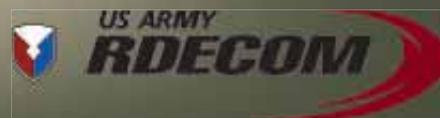
COMMERCIALIZATION

Brochure



ARMY  **SBIR**

SMALL BUSINESS INNOVATION RESEARCH





The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs allow small, high-tech U.S. businesses 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.

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 million-dollar program enables hundreds of small businesses to move technology from a concept to a prototype and ultimately into the hands of our Soldiers. Through SBIR and STTR, we now know that the best ideas don't necessarily come from the laboratories of large corporations or even our government laboratories. Most often innovative technologies come from creative individuals at small, entrepreneurial companies.

The U.S. Army SBIR/STTR Commercialization Brochure is published annually and distributed 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.



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).
- 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.

	SBIR	STTR
PHASE I	6 Months \$100,000 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 \$1,000,000 max*	2 years \$750,000 max
PHASE III	Unlimited time; non-SBIR funding	Unlimited time; non-STTR funding

* Phase II efforts following an SBIR Phase I award resulting from the 11.1 and subsequent Solicitations will have a maximum dollar amount of \$1,000,000. Phase II efforts following an SBIR Phase I award prior to the 11.1 Solicitation will continue to have a maximum dollar amount of \$750,000.

SBIR AND STTR ELIGIBILITY REQUIREMENTS

To qualify for the SBIR and STTR Program, 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% owned and controlled by another for-profit business concern that is at least 51% 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% of the Phase I and Phase II work. The research institution must perform at least 30% of the Phase I and Phase II work. Any part of the remaining 30% 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 the 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, the 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.



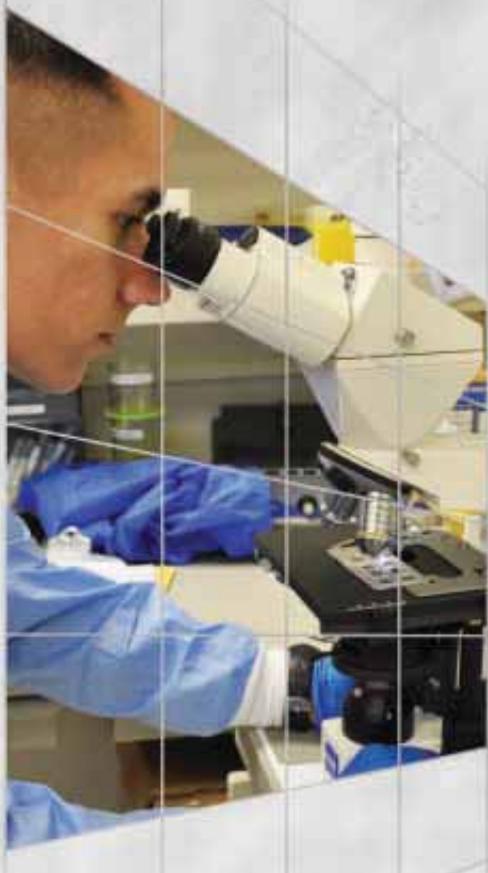
CHEMICAL AND BIOLOGICAL DEFENSE (CBD) SBIR PROGRAM

The Chemical and Biological Defense (CBD) Program was established by the Department of Defense (DoD) to provide state-of-the-art defense capabilities to allow military forces of the United States to operate and successfully complete missions in chemical and biological warfare environments. This requires the availability of the most effective products to detect and protect to ensure sustained operations. The overall objective of the CBD Small Business Innovation Research (SBIR) Program is to elicit innovative solutions from the small business community that address chemical and biological defense technology gaps confronting DoD and to include technologies that will also have high commercialization potential in the private sector.

The Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD) provides the management for the Science and Technology component of the Chemical and Biological Defense program. Technologies developed under the SBIR program have the potential to transition to the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) if the appropriate level of technology maturity has been demonstrated. The JSTO-CBD Science & Technology programs and initiatives are improving defensive capabilities against Chemical and Biological Weapons.

SBIR topics are developed in each of the following program areas to address both chemical and biological threats.

- Detection and Identification — analytical techniques for both stand-off and point detection of chemical and biological agents; measurements conducted in air, water, soil and other complex matrices
- Modeling & Simulation — techniques to provide information associated with specific chemical and biological threat materials
- Protection — all areas of individual and collective protection
- Decontamination — processes and materials to be employed on facilities, equipment, and personnel
- Medical Technology — Pre- & Post-treatments to protect warfighters from exposure; Therapeutics to mitigate the effects of chemical and biological threats; and Diagnostics to detect and identify biological or chemical threats in warfighters



PHASE III AND COMMERCIALIZATION

A goal of the SBIR/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 effort(s) performed under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented towards commercialization of SBIR 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 also be indicated by the small business marketing and selling the products or services outside of 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:

- Fast Track
- Technical Assistance
- Phase II Enhancement
- Commercialization Pilot Program



FAST TRACK

Fast Track is a process for SBIR/STTR Phase I projects that attract outside investors who will match Phase II funding, in cash, contingent on the project's selection for Phase II award. Projects that obtain this outside investment and qualify for the Fast Track will (subject to qualifications described in the solicitation):

- Receive interim funding of \$30,000 to \$50,000 between Phases I and II where applicable;
- Be evaluated for Phase II award under a separate, expedited process; and
- Be selected for Phase II award provided they meet or exceed a threshold of "technically sufficient" and have substantially met their Phase I technical goals.

Toward the end of the Phase I project, the small business and the investor submit a Fast Track application through the DoD Submission Website at www.dodsbir.net/submission. The application must be submitted within 150 days after the effective date of the Phase I contract, and the company must submit its Phase II proposal within 180 days after the effective date of its Phase I contract. The small business is encouraged to discuss the application with its Phase I Contracting Officer Representative (COR); however, an invitation from the COR to submit either a Fast Track application or a Fast Track Phase II proposal is not required. The small business should contact the Phase I COR for further instructions and guidance.

The Army will notify each Fast Track company, generally within 10 weeks after the completion of the Phase I, whether it has been selected for the Phase II award. Once notified, the company and investor must certify within 45 days that the entire amount of the matching funds from the outside investor has been transferred to the company.

To learn more about Fast Tracks, visit the DoD SBIR Website at www.dodsbir.net/ft-ph2/default.html.



TECHNICAL ASSISTANCE

In accordance with the SBIR Reauthorization Act of 2000, Public Law 106-554, amendment of Section 9 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 of this effort 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, and increased competition, productivity, and economic growth.

The Army SBIR Program has stationed Technical Assistance Advocates (TAAs) in six regions across the Army to provide technical assistance to small businesses that have Phase I and Phase II projects with the participating organizations within their regions.



Each TAA provides:

- Expert advice and analysis to Phase I SBIR projects selected annually for the purpose of assisting in: a) making better technical decisions concerning such projects; b) solving technical problems which arise during the conduct of such projects; c) minimizing technical risks associated with such projects; and d) developing and commercializing new commercial products and processes resulting from such projects.
- 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, specifically to facilitate the provision of 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, Phase III plans for Phase I projects selected for Phase II award. The Phase III plan must document the strategy, requirements, and resources to transition the SBIR project to Phase III and from research into an acquisition program, larger science & technology effort, or stand-alone product or service.

PHASE II ENHANCEMENT

The Army SBIR Phase II Enhancement Program provides Phase II SBIR funding to small businesses that require additional funding during their Phase II contract period. Instances where more funding may be required on a Phase II should initially be identified by the project's Contracting Officer Representative (COR). The COR, in conjunction with the Technical Assistance Advocate (TAA) and the organization's SBIR Program Coordinator (PC) will compile the documentation needed to make a determination. Documentation should be forwarded to the Army SBIR Program Management office no later than 6 months prior to the end of the Phase II period of performance. 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. Generally SBIR Phase II Enhancement funding will not exceed \$500,000 per request and funding is subject to availability and a deliberate approval process. Projects already recommended for funding under the Commercialization Pilot Program are not permitted to apply for Phase II Enhancement program funding. Small Businesses interested in Phase II Enhancements should contact their COR.

Phase II Enhancement documentation consists of the following:

- A memorandum from the participating organization's Technical Director, PEO, or a designated representative to PM, Army SBIR providing a compelling reason for the additional funding.
- A concise statement of work (SOW) for the additional effort to be executed with the SBIR Phase II Enhancement funds. The SOW 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 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.

COMMERCIALIZATION PILOT PROGRAM (CPP)

The U.S. Army established its SBIR Commercialization Pilot Program (CPP) in response to the 2006 National Defense Authorization Act, with the purpose of increasing SBIR technology transition and commercialization success. The Army selected MILCOM Venture Partners (MILCOM) to help manage the CPP. MILCOM assists the government with: 1) identifying a focused set of ongoing SBIR Phase II participants for inclusion in the CPP and 2) recommending the amount of additional funding from the annual anticipated \$15 million allocation to support the participants' commercialization plans developed under the CPP.

While technology transition to Army acquisition activities is the program's primary focus, the civilian marketplace and commercialization opportunities are not ignored. The Army can gain significant value through commercializing dual-use products.

The first critical step in the CPP participant identification process is to understand each active Phase II project's potential for rapid transition and commercialization. MILCOM executes this activity through a series of progressive screening processes to ultimately identify and recommend a limited set of CPP participants. The initial data collection efforts involve an electronic commercialization assessment form that is delivered to active Phase II projects.

It is anticipated that up to twenty five participants will ultimately participate in the CPP each year. MILCOM provides these participants with guidance and assistance with commercialization and transition activities, including assistance with the production of a business plan, a transition plan and matching technologies with potential government and/or industry customers. Projects participating in the CPP must have the potential for rapid transitioning to Phase III and into the acquisition process and also be expected to meet high priority Army requirements. Additionally, each project must have the potential for commercial use in the private sector that offers a significant financial return.



SUCCESS STORIES

Phase III represents the successful culmination of an SBIR project. The following Success Stories represent the best in Phase III commercialization efforts by participating small businesses and equates to over \$200M return on SBIR investment.



Small Robot Toolkit

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



also allowing operators to perform their missions more efficiently and effectively.

Technology Transition

RE2 is licensing the SRT to Northrop Grumman Corporation subsidiary Remotec Inc., which will use the tool-change technology to upgrade the manipulation capabilities of up to 173 Andros HD-1 robots. The U.S. Air Force Air Combat Command recently awarded Remotec a contract of \$11.2 million during the first year to upgrade its fleet of Andros HD-1 robots to help counter evolving threats from IEDs. RE2 developed the end segment of the upgraded Andros HD-1 manipulator arm, which features a powerful rolling wrist and gripper that is able to lift and maneuver heavy objects up to 125 pounds, such as a 155mm shell. The manipulator arm's end segment also features RE2's Quick Release technology, which allows tools to be manually changed in the field.

The robotic arms on currently fielded ground robots are typically limited to using a single and fixed two-finger gripper, restricting the types of tasks and missions that these robots can perform. RE2's Quick Release™ mechanisms, developed under a Phase II SBIR entitled "Small Robot Toolkit (SRT)" allow the tools at the end of a robotic arm to be interchanged. RE2's Quick Release design provides a rigid, durable connection that is able to supply over 2000W of power to tools. Market research and in-depth interviews with users of robotic platforms aided RE2 in successfully designing and transitioning a manually operated Quick Release along with new, innovative tools. Under the ongoing Commercialization Pilot Program, RE2 continues to harden the automatically operated Quick Release for both technology transition and transfer. The automatic Quick Release allows robot operators to automatically change-out tools with just a button click on their robots' operator control units. An unmanned ground vehicle can be loaded with a magazine of tools so that they can be easily hot-swapped while performing a mission, keeping Soldiers out of harm's way. The SRT technology increases the capability of unmanned ground robots, while



RE2, Inc.

Pittsburgh, PA
www.resquared.com



Short-Pulse Laser for 2-D and 3-D Sensing

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



Target identification is a key component of Soldier situational awareness to see, understand, and act first. Active two-dimensional (2-D) and three-dimensional (3-D) Reconnaissance, Surveillance, and Target Acquisition (RSTA) sensors are being developed to improve target identification capability. Identifying targets heavily obscured by foliage or camouflage using 3-D laser radar is a key objective while active 2-D imaging in the short wave infrared (SWIR) waveband is being employed to improve target identification range beyond the enemy's detection range.

During the course of SBIR Phase I and II and a subsequent Phase II Enhancement, Areté Associates developed two diode pumped solid state lasers that are ideal for laser radar and SWIR imaging military applications as well as many others. The Nd:YAG (neodymium-doped yttrium aluminium garnet) based Tactical Illuminator Designator (TID) and A-TID lasers couple a novel, compact resonator design with a monolithic Optical Parametric Oscillator (OPO) to produce high energy, short duration pulses in compact packages. The A-TID design leverages the TID resonator and OPO design but incorporates an optical amplifier to boost the output energies. The compact

designs include the laser power supply and all electronics. The only user inputs required are 28 V DC and signals for triggering and command and control.

Technology Transition

The primary military market for the TID product family are laser range finders and transmitters for laser radar and SWIR imaging systems. Estimated annual worldwide market sizes are \$10, 20 and 40M U.S. respectively. To date Areté Associates has invested \$1.2M in TID production and two TID lasers have been sold and delivered to large defense prime contractors. An A-TID laser was delivered to U.S. Army Night Vision Laboratories. This represents approximately \$1M in delivered product. Areté has filed for and received a commodity jurisdiction from the U.S. Department of State for the TID and is planning for export to approved international customers.



Areté Associates

Longmont, CO
www.arete.com



Electro-Textiles

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



The material is light weight, and flexible.

Technology Transition

EY Technologies far exceeded the Army's expectations and is now commercializing the product under the Trade name *iCon*.

The product and process have already generated over \$260K, attracting both military and national scientific foundation contracts.

Another contract is pending for \$500K that will generate additional revenue by introducing advanced medical devices based on artificial muscles driven by conductive fibers. This product is also being tested for GPS driven clothing for the blind, bio-threat monitoring sensors, strain gauges for military parachutes, electro luminescent systems, iPhone/iPod compatible shirts, pressure monitoring hospital mattresses, and for many other smart garments. The process and products are patented worldwide and one patent is issued (Patent



EY Technologies

Fall River, MA

www.eytechnologies.com

number: 7,832,089B2) and few are pending. The product was also recognized as the "Quality Product of the Month" by "Textile World Magazine" in October 2010 and has been published in many Journals.



Electro textiles offer the next generation of military garments with integrated military devices such as body-borne antennas that map Soldiers' locations, components for Electro Magnetic Interference (EMI) shielding, wearable computers, data/power conduits, body mapping health/fatigue/wound monitoring systems, and electrically heated garments.

Alloys identified by EY Technologies satisfy the conductivity, cost, and toxicity requirements to develop a textile-like highly conductive fiber for incorporation into wearable electronics. The total encapsulation of molten metal in a polymer matrix has proven to be very effective in drawing micro-wires. When the molten polymer and metal are stretched, the encapsulated metal stretches with the polymeric fiber. As the fiber diameter decreases, the capillary action becomes dominant and assures the continuity of the metal core in the polymeric fiber. These innovative filaments are expected to be used in numerous intelligent military garments with improved durability, washability, and wearability. EY Technologies has developed a smart fiber for wearable textile fabrics, such as military uniforms, that would convey communication and data signals.

Fracture and Soft Tissue Injury Diagnosis

U.S. Army Medical Research and Materiel Command



Battlefield injuries require immediate triage under austere conditions to determine appropriate medical treatment. Imperium is developing a high-resolution C-scan ultrasound imaging device to investigate abnormalities on the bone surface such as subtle fractures and foreign objects in soft tissues. With SBIR funding from the Medical Research and Materiel Command (MRMC), a hand-held, portable, ultrasonic camcorder was developed. The key feature of this hand-held device is the ability to quickly produce ultrasound images that are easy for battlefield medics and non-radiologists to interpret. This technology provides immediate feedback on medical conditions such as fractures and foreign objects in soft tissue that assist caregivers with triage decisions. This capability not only reduces the need for warfighter evacuation by being able to quickly determine the severity of a battlefield wound, but it also optimizes the Army's assets, reduces medical costs, and allows for UGV imaging.

Technology Transition

Thus far the device has been deployed in non-clinical environments, specifically nondestructive testing, which has generated approximately \$1M in sales. Clinical trials and FDA approval are underway while MRMC will support demonstrations of the product at U.S. Army Medical Department (AMEDD) facilities to show efficacy and develop data to support a recommendation to Directorate of Combat and Doctrine Development to prescribe use.



Imperium, Inc.

Beltsville, MD
www.imperiuminc.com



Automated Armor Inspection System

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



The body armor plates that are inserted into the carrier vests that Soldiers are wearing for small-arms protection are ceramic and as a result, have the same properties as glass and are susceptible to cracking under the rigors of combat. Because this cracking degrades their ability to defeat a threat, a means to inspect and replace them on an ongoing basis is essential. Since there are hundreds of thousands of these armor plates in use, the need for very high inspection system throughput speed is essential. The objective of this program is to develop a turn-key, self-contained, mobile, X-ray based inspection system with the required throughput to support our deployed Soldiers.

The innovative Automated Armor Inspection System (AIS) developed by JDLL Inc. has a footprint about the size of a compact car and can be air transported into theater inside a standard hard-sided, mobile, temperature controlled container. It uses a low energy pulsed X-ray source, a digital detector panel with automated material handling, and custom Automated Defect Recognition (ADR) software to correctly identify and reject damaged ceramic plates. The AIS provides excellent performance results and can inspect a plate in

15 seconds with accuracy that is better and more consistent than inspections using trained and experienced radiographer personnel. In addition, it never gets fatigued and has near 100% availability. These AIS inspection systems allow the Soldier to be confident that the body armor they are wearing will perform as specified and when required.

Technology Transition

Under two consecutive contracts with a total option of over \$18M spanning the past three years, JDLL has delivered and installed 13 AIS systems for the Army, Marine Corps, Navy and Air Force around the world. Some are deployed for continuous use in Iraq and Afghanistan and have functioned flawlessly. To date, over two million

individual ceramic armor inserts have been inspected using JDLL's AIS system. This product has been transitioned through Program Executive Office, Soldier.



JDLL, Inc.

Midvale, UT
www.jdll.com



Outdoor and Indoor Locating Using Facility Lighting

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



Talking Lights LLC developed Smart Minefield Markers in collaboration with the Massachusetts Institute of Technology to identify and communicate location information to Soldiers, particularly in situations where interference and jamming of RF and GPS signals might occur. This system assists combat vehicles negotiate minefields, battle-damaged terrain and nuclear/biological/chemical release areas with no need for external operator viewing. Location information is encoded in the light from the minefield markers and then decoded by the user. The markers are networked to share information and account for network markers that are missing or destroyed.

Recently, this technology has been further developed and expanded to include indoor locating using existing facility lighting to give accurate location information while providing strong, non-flickering illumination. The system is an optically-based, multiple-use, context aware local area wireless system for data transmission that makes it possible to achieve GPS-like position identification and guidance indoors. The communications link is created by modulating the light from an ordinary light fixture to encode information. The light continues

to perform its original function of providing bright illumination without visible flicker while simultaneously establishing an information link for context-aware data transmission.

Technology Transition

This indoor locating system promises new independence and freedom of movement to people with cognitive disabilities. Applications for indoor locating include guidance and support in rehabilitation of Traumatic Brain Injury (TBI) patients, monitoring and caregiver support for Alzheimer's and dementia patients, guidance for persons who are blind, and personnel monitoring and tracking in secure facilities. These new capabilities were evaluated for use in the National Intrepid Center of Excellence to support Wounded Warriors from Iraq and Afghanistan recovering from TBI. This technology has been patented and was recently acquired by Philips Electronics, which will carry forward the commercialization of Talking Lights illumination-based location technology.



Talking Lights LLC

Boston, MA
www.talking-lights.com



Electronics Case Cooler

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



Overheating is the leading cause of electronics failure and effectively cooling vehicle mounted electronics operating in extreme temperature environments has proven especially difficult. To efficiently cool electronics, a refrigeration based environmental control unit for electronics enclosures needs to be developed with the capability to dissipate over 500 watts of heat while maintaining internal air temperatures at or below outside ambient levels. Additional objectives include a heating capability for cold start and the ability to seal the electronics from environmental contamination.

Command, Control, Communications and Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) systems have been using Commercial-Off-the-Shelf (COTS) rack mounted electronics that were originally designed for operation in air conditioned office buildings. These rack mounted systems are now deployed in transit cases that are exposed to rain, sand, and dust typical of a military environment and ambient temperatures exceeding 120°F. The environmental control unit, "ECU-CHILL" developed with Communications-Electronics Research, Development and

Engineering Center SBIR funding is a mission enabler for the fielding of COTS and high-end C4ISR electronics systems, by providing a clean, cool, sealed environment that helps ensure reliable operation in severe environments. ECU-CHILL is a vapor compression refrigeration system that consists of Aspen's unique, miniature rotary compressor, condenser, evaporator, fans, control system, expansion valve, heater, and refrigeration lines. A temperature sensor in the ECU monitors enclosure temperature and provides feedback to the ECU control system. Using this, the internal controls can vary the compressor speed to maintain desired enclosure temperatures. It maintains a sealed electronics enclosure at or below ambient temperatures, enabling C4ISR electronics to be safely and effectively used for computing and communications in extremely hot or cold environments.

Technology Transition

The SBIR program was combined with Phase III contracts to fully develop the ECU-CHILL system into a field-ready system. ECU-CHILL is now in production at Aspen's facility and is beginning to be used by a major Army program with ECU systems being procured for 2 different systems. The Special Operations Command is using the ECU-CHILL on



**Aspen
Systems, Inc.**

**Marlborough, MA
www.aspensystems.com**

its Mine Resistant Ambush Protected vehicles to cool command and control equipment. To date, Aspen has received over \$7.2M in production orders for ECU-CHILL.



Wide Span AirBeam™ Shelters

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



There is a continuing need within the U. S. Army and the Department of Defense for transportable, rapid deployment shelters for applications include billeting, Chemical Biological collective protection systems, field medical facilities, command posts, vehicle maintenance enclosures, and aviation maintenance shelters. For all of these applications, reducing the logistics burden and set up time, while providing a thermally efficient shelter able to withstand long-term use in severe environments is essential.

The patented AirBeam™ technology by HDT Engineered Technologies uses advanced high tenacity fibers to reinforce tubular arches that operate safely at high inflation pressure, and can withstand high wind and snow loads. These airbeams use at least one layer of braided fibers, which provides a seamless reinforcement of long, continuous fibers, a construction that has proven durable over numerous deploy-strike cycles. Another innovation is an independent gas barrier layer that keeps leakage to a minimum and is also repairable in the field if necessary. Typically, airbeams require inflation maintenance checks once per month and, often, no additional air is required.

These airbeams can be formed in a multitude of different shapes, allowing for many unique military, aerospace and commercial applications. Missions that require speed and agility have relied on HDT's modular designs that allow for total flexibility. HDT's AirBeam™ shelter is the most advanced tactical shelter of its kind.

Technology Transition

Through SBIR Phase III commercialization, numerous Army programs, including Force Provider, Deployable Medical Systems (DepMeds), and the Defense Logistic Agency's Defense Distribution Deployable Center (DDXX), have adopted HDT AirBeam™ shelters. AirBeam™ shelters in the thousands are currently supporting our deployed forces around the world and Soldiers particularly appreciate the ease of use and thermal efficiency



HDT Global

Santa Cruz, CA

www.hdtglobal.com

of these shelters. The U.S. Army selected it for Force Provider and the new 150-troop Expeditionary Base Camp because of its ease of use. Shelter widths of 20, 32, 40 and 86 feet are currently in production. Support to these and other programs have resulted in over \$50M in direct and GSA sales.



High Performance Personnel Armor Plates

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



There is a perpetual need in the Army for developing durable non-ceramic, low cost, lightweight personnel armor ballistic protective inserts for small arms protection. M Cubed, with BAE Systems and Rutgers University, developed a durable, ceramic composite with low cost, low weight, and high performance using the Army's SBIR program. A key innovation is the use of a multi-constituent material to inhibit crack propagation. This composite construction resulted in fracture toughness for the ceramic tile 50% above that of the currently fielded armor inserts. With reduced propensity for cracking, the product shows longer life in the field and provides enhanced multi-hit protection. Using the proper choice of constituents in the ceramic composite, raw material cost was reduced by 23%.

This novel composite has been successfully commercialized as a personnel armor ballistic protective insert to meet the requirements of the Army. Key thrusts of the current R&D are higher performance which allows reduced weight, development of flexible designs, and defeat of more aggressive threats. New products from these efforts are being launched in 2011, providing the Soldier with improved personnel armor systems. M Cubed

sells the ceramic composite tiles to armor integrators, such as BAE Systems, who in turn package the tile with ballistic fabric, yielding a personnel armor system for the military.

Technology Transition

To date, over 300,000 tiles, with a sales value of over \$70 million, have been sold. The successful program was acknowledged with a "2010 Army SBIR Achievement Award" at a May 2010 ceremony at the Pentagon, and with a "Commercialization Excellence Award" at the November 2010 SBIR National Conference in Oklahoma.



**M Cubed
Technologies, Inc.**

**Trumbull, CT
www.mmmt.com**



Inertial Igniters for Thermal Batteries

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



Thermal batteries have long been used in munitions and similar applications to provide large amounts of power during a relatively short period of time, mainly during the munitions flight. There is a need to develop highly reliable and miniaturized inertial igniters for thermal batteries that satisfy the strictest safety requirements, and can cover almost any all-fire and no-fire conditions for the entire range of artillery, mortars and medium caliber rounds and small rockets.

Omnitek Partners has developed novel miniature igniters which are simple in design and manufacture, highly reliable, occupy very small volume, and are purely mechanical. They contain no damping elements to ensure consistent operation and have a shelf life of over 20 years. These miniaturized mechanical igniters have made it possible to fabricate thermal batteries for applications that require very small sizes and where previously only electrical igniters could be used, which require other sources of power and sensory information for safe operation. The breakthrough technologies for the design of highly reliable miniature inertial igniters is based on the development of mechanical mechanisms and

components that make it possible to accurately predict the dynamic behavior of the various components of the igniter and almost entirely eliminate the possibility of jamming and other events that would otherwise reduce the operational reliability of the device.

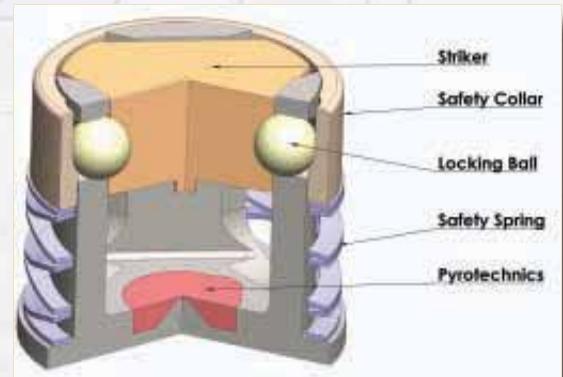
Technology Transition

This technology has received four patents with several pending for thermal battery and other similar military and commercial applications. Under a \$580K U.S. Army's Commercialization Pilot Program (CPP) award, Omnitek has performed reliability tests of one of its inertial igniters, demonstrating a reliability level of 99% at 95% confidence level. Omnitek's inertial igniters have been purchased by two defense contractors for thermal batteries to be used in Army and Navy munitions. Omnitek igniters are also being considered for integration into thermal batteries for at least four other Army and Navy munitions by defense contractors with sales value of up to \$2 million per year.



**Omnitek
Partners, LLC**

Ronkonkoma, NY
www.omnitekpartners.com



Power Conditioning for Radio Frequency Munitions

U.S. Army Space and Missile Defense Command



The Army has a need for power conditioning elements that enable advanced non-lethal weapons ranging from single-shot RF warheads to advanced multi-pulse RF systems that can be used for Improvised Explosive Devices (IED) detection, vehicle/vessel disablement, and impulse radar. The objective of Radiance's work is to develop compact power conditioning elements that can function in the megavolt and gigawatt range when integrated into RF impulse sources.

With initial SBIR funding from SMDC and NASA, unique power conditioning elements were developed that have many military applications. These elements enable a pulse generator technology that scales from single pulses at gigawatt power levels to high rep-rate multi-pulse systems operating with peak power of gigawatts and with average power levels in the several kW range. This unique quality has been used to demonstrate vehicle/vessel disablement, a direct strike undercarriage vehicle disabler, a broadband impulse UHF radar, a pre-ionizer for advanced space propulsion, a highly ionized plasma source that can be used for chemical processing, and a high power UHF transmitter that has been

shown to disrupt the electronics associated with IED surrogates typical of those found in Iraq and Afghanistan. Further, a laboratory demonstration of an explosive driven pulse generator is being evaluated for Electro Magnetic Pulse (EMP)-like warheads, and as a general laboratory pulse generator. The systems employ commonly available materials and are inexpensive to fabricate.

Technology Transition

Radiance has a significant revenue stream, to date totaling almost \$2.5M from the SBIR generated technologies. Customers for various devices employing the technology include Joint Improvised Explosive Device Defeat Organization, Naval Research Laboratory, the Joint Non-Lethal Weapons Directorate, the Naval Surface Warfare Center, the British Aerospace

Engineering Corporation, the University of Missouri, the University of Alabama, Huntsville, and the National Aeronautics and Space Administration.



**Radiance
Technologies, Inc.**

**Huntsville, AL
www.radiancetech.com**



CareGuide™ - Non-invasive Trauma Patient Monitor

U.S. Army Medical Research and Materiel Command



Hemorrhage is a major cause of Soldier death, particularly in the first hour after injury. To survive this “golden hour”, Soldier injuries must be accurately and quickly identified and appropriate resuscitation techniques applied under austere conditions. Quick response to hemorrhage is paramount to survival, as is applying timely and appropriate resuscitation techniques. Further, a Soldier’s care is often continued during evacuation from the battlefield, requiring constant monitoring to provide an early warning of delayed shock resulting from the initial casualty or insufficient resuscitation. To address this need, a prototype trauma monitor was first developed at the University of Massachusetts Medical School and, through STTR funding, further developed through a partnership with Reflectance Medical, Inc.

The CareGuide™ sensor non-invasively and continuously determines tissue metabolic status through the measurement of muscle oxygen saturation, pH (acidosis), and hematocrit. The easily applied body-worn sensor collects a complete near infrared absorbance spectrum from muscle tissue in either the arm or leg. Patented data processing algorithms first correct patient

spectra to remove variations related to skin color, fat thickness, and muscle structure. Each spectrum is then processed to calculate muscle oxygen saturation and pH along with blood hematocrit. The system offers real-time feedback to restore sufficient oxygen to all key organs of the body.

Technology Transition

Reflectance Medical Inc. was awarded \$5.6M from the Defense Health Program to complete animal and clinical testing necessary to submit an application to the Food and Drug Administration to gain clearance to market the CareGuide™ patient monitor and proceed with evaluation in a military-relevant operational environment. Recently, RMI received funding from the U.S. Army Combat Casualty Care Program to partner with two other small companies, Sotera Wireless and Flashback Technologies, to create an advanced, mobile vital sign monitor. RMI has also received funding from the Telemedicine and Advanced Technology Research Center, Medical Research and Materiel Command to partner with the U.S. Army Institute of Surgical Research



**Reflectance
Medical, Inc.**

Westborough, MA

www.reflectancemedical.com

and the Armed Forces Research Institute of Medical Sciences in Bangkok, Thailand. This consortium is investigating the application of advanced monitoring technologies, developed for trauma care, on patients with severe dengue hemorrhagic fever.



Soldier Micro-Climate Cooling System

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



Soldiers in hot climates suffer from high heat stress that is further aggravated by protective clothing that traps body heat resulting in loss of focus, performance, and injury even at low activity levels. The use of personal cooling has been shown to mitigate these effects, increasing cognitive performance and endurance. Current passive cooling products such as ice-base and air-blowing systems have practical limitations in size, weight, orientation, operating time. The current state-of-the-art systems are too heavy and consume too much power for use during dismounted operations.

RINI Technologies has successfully designed, developed, and tested the Micro-Climate Cooling System (MCCS). The unique and innovative MCCS meets military size, weight, and power requirements, while delivering much needed personal cooling in potentially life-threatening situations and environments. Each component of the system has been refined, resulting in reduced weight, volume, and an extended upper-end operating temperature of 140°F. Available technology requires a vehicle mount, is 462 in³ and weighs 13 lbs while the MCCS is only 92 in³, and weighs 6 lbs with the battery pack. The MCCS system design

includes: fan assembly, condenser, fluid routing, electrical controller box, water pump, evaporator, and compressor. The system has also been ruggedized to withstand harsh environmental conditions. Rini Technologies' MCCS is the smallest, lightest and most efficient personal cooling solution yet developed and will be a valuable asset to our Soldiers. The MCCS mitigates heat stress and health risk by managing core body temperatures and decreases the risk of dehydration. Rini's innovative microclimate cooling system will provide heat stress relief, improve operational performance and reduce water consumption for Soldiers working under hazardous conditions.

Technology Transition

Under a SBIR Phase III contract received from the U.S. Army, RINI Technologies will conduct and pass qualification testing and deliver five complete cooling systems to the Army for Soldier evaluations. RINI Technologies has also received \$220K in commercial sales and \$4.35M in Government investments from Natick Soldier Center and PM Air Warrior, PEO Soldier.



RINI Technologies

Oviedo, FL
www.rinitech.com



All Terrain System for IED Detection

Program Executive Office, Ammunition



Improvised Explosive Devices (IEDs) are the leading cause of loss of life and injury for our deployed Soldiers. By improving situational and operational awareness of Unmanned Ground Vehicles (UGVs) and Unmanned Aerial Vehicles (UAVs) the Army gains greater ability to detect IEDs before they can cause harm. One technology that has shown promise to detect IEDs and assist with situational awareness is the application of Ultra-Wide Band Radio Frequency (UWB RF).

TiaLinx has developed an innovative system based on UWB RF that provides superior detection capabilities to our Soldiers. The lightweight and agile Cougar mini-robot with tractable arm or highly sophisticated Phoenix mini-UAV with programmable way points, can mount TiaLinx's variety of sensors for extended standoff surveillance as well as detection of buried objects. Through software controlled interfaces, Cougar and Phoenix can be remotely guided at extended ranges to perform mission critical tasks. Integrated multiple cameras allow day and night visibility and operation for enhanced situational awareness. These remotely controlled systems will provide the warfighters with significantly increased situational

awareness and IED detection without exposure. This system has the capability to perform Sense-Through-The-Wall Imaging, IED Detection In-road and Off-Road, Tunnel and Culvert RF Mapping, and Imaging of an IED on a person. User friendly software enables rapid deployment of the light weight units and significantly reduces reaction time.

Technology Transition

TiaLinx has produced a family of detection systems, including a wearable version, under the sponsorship of multiple Department of Defense Agencies, with the Army as the lead. Many of these products have been selected for evaluation and potential rapid fielding. TiaLinx was provided with \$730K from the Army Commercialization Pilot Program and total DoD investments of \$4M to date. One of TiaLinx's



TiaLinx, Inc.

Newport Beach, CA
www.tialinx.com

systems, Eagle5-P Handheld Sense-through-a-wall Imager, won the Defense News Technology and Innovation Award. Projected revenues from the sales of these systems are expected to be \$40M near term.



High Power Density Electric Generator

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



Electrical power requirements for Army helicopters continue to grow as new electrical modules supporting needed functions are added, putting a strain on current generator systems. This limits the capabilities of Army helicopters and limits the potential for electrical system growth. This project focuses on improving the performance of the current AH-64 Apache helicopter generator in order to allow for this electrical system growth.

The High Power Density Electric Generator program objectives are to demonstrate an 80kVA generator, with a power/weight ratio greater than 1.25kVA/lb. To achieve this, several key design improvements were made to meet program objectives. These include cooling improvements to the generator by optimizing and adding cooling paths, introducing new materials, and implementing a powerful and efficient axial flow fan on the rotor shaft to provide forced air cooling. These improvements provide additional power capabilities over the current generator, as well as reducing the overall weight by about 10lbs per aircraft. In addition, the design is a 'drop-in' replacement, and has increased efficiency and reliability to provide reduced maintenance

costs.

Technology Transition

Demonstration testing of the improved generator was completed at the end of 2010 and ground and flight demonstration testing on an Apache helicopter is planned for 2011. The IPS design meets the program objectives by making several improvements to the current generator design. The AATD/IPS High Power Density Electric Generator program will provide increased performance and reduced weight. The transition of this technology to the Apache Block III will allow for the aircraft to meet the electrical power requirements of the aircraft as they continue to grow.



**Innovative Power
Solution, LLC**

**Eatontown, NJ
www.ips-llc.com**



Advanced High Efficiency Modular Refrigeration Units (MRUs)

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



Mainstream Engineering Corporation has developed a family of advanced, lightweight, compact, modular, green, high-efficiency vapor-compression thermal control units for cooling and refrigeration applications. These units support our Soldiers with improved reliability, simplified maintenance, reduced energy consumption and reliable operation at ambient temperatures above 130°F.

Mainstream's patent-pending configuration minimizes parts, reduces cost, and increases efficiency, while simplifying reliability and maintainability. The modular plumbing and electrical connections are of different sizes to prevent incorrect assembly. Every refrigerant loop component, including the compressor, condenser, evaporator, and filter-drier can be installed without brazing, requiring only two wrenches to tighten, resulting in improved coupling strength, fatigue resistance, and leak free joints. Subassemblies can be quickly exchanged to diagnose problems or upgrade capabilities. The control electronics are located in a single watertight control panel accessible from the outside, allowing quick and easy field swapping and the electronic

control boards can be field-bypassed, to provide emergency cooling or heating. A common troubleshooting procedure is used on all Mainstream electronic control (ECUs) units and refrigeration units (RUs) and is simplified by using diagnostics directly on the circuit boards. No soldering, brazing, or wire splicing is required to change any component. The configuration has been performance and life tested to achieve maximum cooling even in ambient temperatures exceeding 140°F. Using the high-efficiency, environmentally safe refrigerant, the MRU meets or exceeds all requirements for military container heating and cooling with a 20% reduction in power and 300% improvement in high temperature reliability.

Technology Transition

Mainstream has commercialized a family of modular high-efficiency RUs



Mainstream Engineering Corporation

Rockledge, FL
www.mainstream-engr.com

and ECUs, having been awarded a \$24M Quad Refrigerated Container System (QRCS) contract from the Natick Soldier Research, Development, and Engineering Center and a \$41 million Improved Environmental Control Unit (IECU) contract from the Communications-Electronics Command.



Agile Digital Effects Processor (ADEP™)

U.S. Army Research Laboratory



A Digital RF Memory (DRFM) system is designed to digitize an incoming radio frequency (RF) input signal at a frequency and bandwidth necessary to adequately represent the signal, and then reconstruct that RF signal when required. The most significant aspect of DRFM is that as a digital "duplicate" of the received signal, it is coherent with the source of the received signal. There is no signal degradation caused by continuously cycling the energy through a front-end amplifier which allows for greater range errors for reactive jamming and allows for predictive jamming. Effective countermeasure techniques to combat current and planned wide bandwidth radar with increasingly sophisticated modulation schemes require revolutionary upgrades to current DRFM capabilities.

SPEC's Agile Digital Effects Processor (ADEP™) Digital RF Memory is at the cutting edge of modern Electronics Warfare (EW) capability. SPEC's ADEP™ products provide revolutionary improvements to EW capabilities that effectively support countermeasure techniques to combat current and planned wide bandwidth radar with increasingly sophisticated modulation schemes with an architecture that can effectively and rapidly evolve with the threat. Unlike competing

systems based on traditional DRFM architectures, ADEP™ readily generates challenging digital effects as accurately-represented multiple crossing targets and extended range. SPEC's ADEP™ technology enables precise digital generation of RF signals, waveforms and images, without the typical artifacts and inaccuracies found in more traditional DRFMs. Feedback from multiple customers indicates that ADEP™ architecture is a major technology breakthrough, with unique high-performance features in an affordable, small-size and low-weight/power package.

Technology Transition

In addition to the tactical products, SPEC has also delivered ground-based ADEP™ systems to the Naval Research Laboratory and the Missile Defense Agency for use as coherent target generators.

SPEC

**Systems &
Processes
Engineering Corp**

**Austin, TX
www.spec.com**

These efforts have resulted in more than \$1 million in non-SBIR funded hardware sales. Additionally, SPEC was awarded a \$10M IDIQ program by the Army Research Laboratory Survivability Lethality Analysis Directorate as part of the ongoing effort to match DRFM capabilities with evolving operational needs.



Ultra-robust Monolithic Hybrid Lasers

U.S. Army Edgewood Chemical Biological Center



With financial support from the Army SBIR Program, Translume is developing a family of hybrid fiber-waveguide lasers. With new and emerging technologies, both private industry and the Department of Defense rely on an ever-growing assortment of lasers to serve a variety of functions. Lasers all share the undesirable propensity of being easily knocked out of alignment when subjected to environmental perturbations. Typically the more advanced the laser, which normally means more components in its fabrication, the higher its susceptibility to vibrations, shocks, and thermal transients. This unwanted effect can be addressed through careful engineering, heavy structural framework, and/or feedback systems. Translume's hybrid laser concept provides a simple, cost effective means to alleviate these shortcomings.

Translume's hybrid lasers are designed around a monolithic central hub which provides all of the functionality necessary to control the laser's operational parameters including wavelength, bandwidth, and synchronization. The only exception is the gain, which is provided by a doped fiber which is fused to the hub. The hub is formed from a single fused silica substrate into a subsurface network of

waveguide segments. This network of waveguides directs, controls, and shapes the light signal's propagation through the central hub. The end result is a simple and robust high-performance laser which, being monolithic, cannot go out of alignment. The device will be suited to deployment in harsh environments where conventional high-performance lasers would fail. To date Translume has demonstrated hybrid lasers operating at 1060-nm and 1550-nm and a narrow linewidth 100-mW near-infrared Raman hybrid laser source has also been demonstrated.

Technology Transition

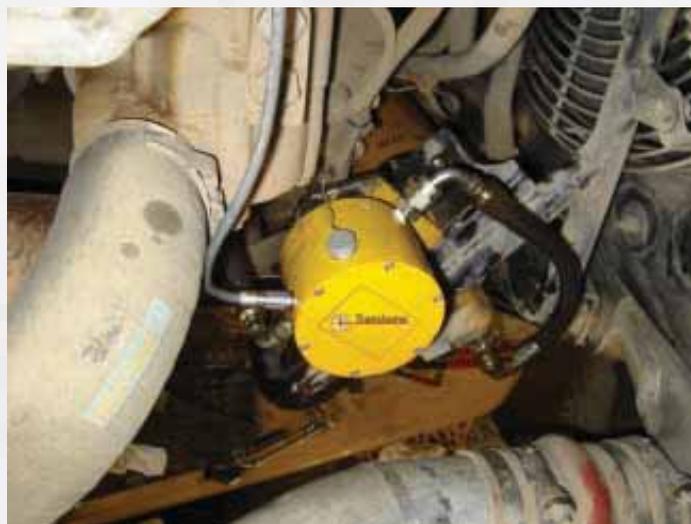
The hybrid laser concept is very general and can be applied to many laser designs. Further work to extend operation into the UV and to generate ultrashort pulses is envisioned; however Translume has



Translume Inc.

Ann Arbor, MI
www.translume.com

received a \$1.6M loan from the State of Michigan to increase production capability. Deployment of a small, light, inexpensive hybrid lasers on various robotic platforms for sensing purposes (spectroscopy) is currently being pursued. Successful multi-year deployments onboard terrestrial vehicles have been demonstrated. Deployments onboard an unmanned underwater platform, as well as on air vehicles are in progress.



ACHIEVEMENT AWARDS

The Army conducts an annual awards program to recognize Phase II efforts which exemplify the SBIR goal of bringing innovative technologies and products to the marketplace. All Army SBIR Phase II Small Businesses whose project concludes in a given fiscal year are eligible to compete for an Achievement Award. Winners are selected based on the following four criteria: originality and innovation of research; relevance of the research to the Army mission; immediate commercialization potential of the research, reflecting the primary goal of bringing technology and products to the marketplace; and overall quality performance of the project.

Each year, the Army selects the most exceptional Phase II projects and presents

awards at a formal awards ceremony, held at a suitably prestigious location in the Washington, DC area. A senior Army Science and Technology official presents the awards to the SBIR companies as well as to their sponsoring Army organization's Technical Director, SBIR Coordinator, and contract Technical Monitor.

The Achievement Awards Program is competitive. This year, 649 projects were eligible to compete of which 42 nominations were forwarded to the Selection Committee. Eleven projects were selected that represent the best in small business research and development.

The following stories reflect the successes of the 2011 Army SBIR Achievement Awardees.



The 2010 Achievement Awards winners

Dismounted Small Unmanned Air Vehicle Associate

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



Kutta Technologies, Inc.
Phoenix, AZ - www.kuttatech.com

Soldiers can only remotely view the video streaming from an Unmanned Aerial Vehicle (UAV) using the Army's One System Remote Video Terminal (OSRVT). Control of the UAV and its payload camera is performed by a highly-experienced Air Vehicle Operator (AVO) and Mission Payload Operator (MPO). However, in some situations the AVO and MPO are not directly

connected with the Soldier. This often results in the AVO and MPO directing the UAV to fly somewhere and look at something that is not pertinent to the needs of the warfighter. The Bi-Directional Remote Video Transceiver (BDRVT) changes all of this by providing the front-line warfighter with bi-directional control of the UAV and its payload. With the BDRVT technology, the user on the front-lines can select, annotate, track targets, survey convoy routes or areas, as well as command the UAV to follow himself during convoy or dismounted operations. The BDRVT will inherently change



the way the Army utilizes UAVs on the battlefield today and far into the future. The Army will demonstrate the BDRVT with the Shadow, Gray Eagle and Hunter systems in its upcoming Manned-Unmanned System Integration Concept (MUSIC) demonstration.

High-Speed Non-Intrusive Measurement

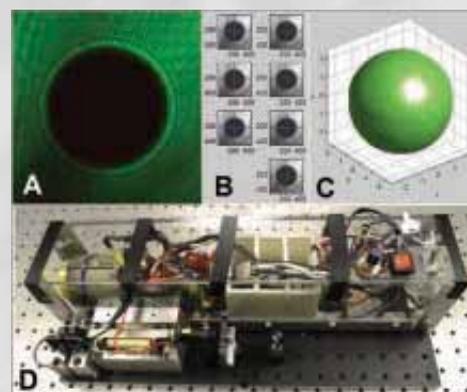
U. S. Army Aviation and Missile Research, Development and Engineering Center



DMS Technology, Inc.
Huntsville, AL - www.dmstech.net

DMS Technology has devised a non-intrusive technique to visualize one droplet or a group of droplets and determine their sizes and 3-D shapes in a laboratory or test site environment. The droplets may be static or moving at low to high supersonic speeds. DMS Technology, in association with the University of Dayton developed the technology using digital holography. The method involves recording digital holograms and analyzing them using holographic tomography. DMS has validated

the methodology in a laboratory setting using single and multiple ball lenses as the object and are preparing to use it to characterize falling water droplets. Static objects were imaged with a continuous wave laser whereas a pulsed laser was used for moving objects. The pulsed laser was designed and fabricated by DMS Technology for a fraction of market cost using off-the-self parts. An immediate application of this technique will be for assessing the "Rain Field Upgrade" for the U.S. Army and in the Rain Shower facility at Holloman Air Force Base. This technique may also be used for measuring shapes and sizes for such weather elements as



sand, hail, snow, ice and volcanic ash. There are many other commercial applications including ink jet and fuel injector spray characterizations.

Low Cost Manufacturing of Ballistic Helmets

U.S. Army Research Laboratory



Inter Materials

Midlothian, VA - www.intermaterials-usa.com

A top priority of the U.S. Army has been lightening the load carried by our Soldiers. Material developments in ultra high molecular weight polyethylene fibers (UHMWPE), thermoplastic matrix resins and structural composite materials have recently demonstrated potential to meet structural and ballistic military requirements in addition to reducing the weight of future

ballistic helmets. INTER Materials has developed an innovative technology for cost-effectively manufacturing thermoplastic matrix composite helmets that meet structural and ballistic requirements for the new Enhanced Combat Helmet (ECH) and Light Weight Advanced Combat Helmet (LWACH). This new technology utilizes 70-80% of the current helmet manufacturing infrastructure, resulting in a reduction of the investment risk when adopting a new helmet system and increasing the potential for transition to commercialization. INTER



Materials technology will allow the U.S. Army to combine superior ballistic protection with significant weight reduction at competitive manufacturing costs for their next generation of ballistic helmets.

Real-Time Chemometrics and Sensor Fusion Technology

U.S. Army Research Laboratory



ChemImage Corporation

Pittsburgh, PA - www.chemimage.com

Improvised Explosive Devices (IEDs) are a constant threat to our deployed Soldiers. What is required for adequate force protection is stand-off detection capabilities of vehicle and personnel borne IEDs while both stationary and moving. Current fielded technologies are challenged by low area search rates, poor targeting efficiency, lack of sensitivity and specificity, eye-safety concerns, and the inability to operate while moving. The ChemImage standoff

sensing technology addresses these limitations through the use of multiple sensor platforms for the detection of signatures that are associated with IEDs. ChemImage has developed the Real-Time Toolkit (RTTK) which is a key technology component of these sensors. It is a set of algorithms and software that analyze the data acquired and present the results of that analysis to the Soldier in real-time. The RTTK includes advanced algorithms that provide robust and accurate identifications, multi-core distributed processing, and a highly intuitive user interface that allows the user to quickly comprehend the level of threat



and make rapid decisions. The RTTK is adaptable to field use, fully automated, and easily operated by untrained personnel. This new capability provides important benefits to the Soldier including reduced exposure to high-threat situations through the stand-off nature of the sensor and real-time processing capabilities.

High Efficiency, Low Power, Low Noise Amplifiers for SATCOM

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

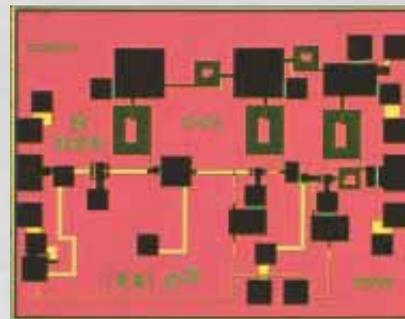


Custom MMIC Design Services, Inc.

Westford, MA - www.custommmic.com

Phased array receiver systems are currently limited by inefficient and underperforming low noise Monolithic Microwave Integrated Circuits (MMIC) amplifiers. Such systems, which can involve up to 5,000 elements, can dissipate up to 1.25 kW of power in the Low Noise Amplifiers (LNAs) alone, a level which requires bulky and expensive mechanical structures to remove the heat

and ensure reliable operation. Custom MMIC Design Services (CMDS) has developed a family of ultra low noise, ultra low power dissipation MMIC amplifiers at 10 GHz and 20 GHz. By combining a state-of-the-art semiconductor process with proprietary design techniques, CMDS has reduced the power dissipation of each LNA by a factor of five to 30mW and reduced the noise figure by 1 dB. The 10 GHz LNA exhibited 20 dB of gain with a noise figure of 0.8 dB, while the 20 GHz LNA exhibited 25 dB of gain with a noise figure of 1.2 dB. All designs have been tested and verified



over the full commercial and military temperature ranges, are production tooled, and are shipping in volume. These designs will help make Active Electronically Scanned Array (AESA) technology a reality in the battlefield. In addition, these LNAs are gaining traction in commercial microwave and millimeter wave communication systems.

Handheld Software Defined Radio (SDR) for Force Protection

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



Digital Receiver Technology

Germantown, MD - www.drtd.com

When a signal is detected on a battlefield, is it from friend or foe; where is the signal emanating from; what kind of signal is it; and what is the intent? These questions are very important for threat warning and situation awareness. Significant innovation is required to develop a handheld threat warning receiver (TWR) small enough and lightweight enough to be practical for ground combat that can effectively detect, identify, track and target hostile communications.

Digital Receiver Technology (DRT) developed a portable TWR that gives the Soldier immediate access to signal exploitation, electronic attack, force protection and wireless networking functions. It uses new software defined radio (SDR) technology to analyze the incoming signals instead of discrete electrical circuits. SDR technology still requires an antenna and some circuits but much of the signal processing is performed by software which enables high speed, wideband scanning with direction finding (DF) and ease of upgrades. The radio can warn of threats audibly or by vibration and the display can be viewed for more detailed



information. The ability to provide multiple operator feedback mechanisms allows reporting methods to be tailored and different software and antenna configurations can be used depending on the mission.

Cooling Objectives and Operative Leverage Techniques

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



International Mezzo

Baton Rouge, LA - www.mezzotech.com

International Mezzo possesses extensive experience in the design, manufacturing and support of thermal products and micro-manufacturing. Mezzo has developed revolutionary thermal products such as ultra-compact micro channel heat exchangers by merging thermal science and micro-machining technology. Mezzo has developed custom thermal solutions using its micro

channel heat exchangers to provide solutions to a number of customers in different industries including: Aerospace, Defense, Electronics, Ground Vehicles, HVAC, Petrochemical, Power, Naval, and Racing. This technology has provided significant benefits over standard plate fin technologies by having a lighter weight, lower cost, increased heat transfer, lower pressure drop and in increasing fuel efficiency. These benefits can be applied to many types of heat exchangers including radiators,



evaporators, condensers, chillers, oil coolers and charged air coolers.

Long Lasting Insecticide Impregnated Bed Nets

U.S. Army Medical Research and Materiel Command



Triton Systems, Inc.

Chelmsford, MA - www.tritonsystems.com

Insect-borne diseases such as malaria, dengue, and leishmaniasis pose a significant threat to the operational effectiveness of our military forces. Bed nets are used to prevent disease transmission from sand flies, mosquitoes and other biting arthropods. However, current products being used have limitations that prevent long term effective use. Triton has developed a long lasting insecticide bed net with a self-contained floor that can fit a standard Army cot and

can be erected in just 5 minutes. These bed nets are treated with EPA approved insecticides using Triton's unique Advanced Solutions in Surface Engineering Technology (ASSET™). The ASSET™ coating process binds insecticide directly to the bed net fabric enabling long lasting insecticide effect by maintaining the active ingredients on the surface. It also significantly lowers toxic effect to humans and the environment by reducing the total amount of insecticide applied during impregnation and preventing its leaching into the environment. Furthermore, Triton's fabric design is based on a larger size mesh which makes it more breathable and comfortable.



Triton's ASSET™ treated bed net decreases incidence of insect-borne diseases and improves the armed forces readiness.

Combined Heat and Power System (CHPS)

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



Infinia Corporation

Kennewick, MA - www.infiniacorp.com

In response to deficiencies in current standard military equipment and the need for reliable and cost effective power solutions, the Army has pursued a variety of innovative solutions to reduce weight, increase efficiency, reduce maintenance, and increase reliability in logistics fuel technologies. Force sustainment kitchens presently use JP 8 logistics fuel for both power

generators and hot water heaters for cooking and sanitary kitchen uses. Infinia has integrated an innovative external combustion Free-Piston Stirling Engine designed for low cost mass-production as a solar dish engine product into a JP-8 fueled Combined Heat and Power System (CHPS) to deliver electricity and useful hot water simultaneously. The CHPS nearly doubles the effective, overall combined system efficiency for existing field kitchens with fuel efficiencies that range between 70 to 80%. The CHPS provides efficient mobile power and hot water in a single package that approximates



the 3 kW tactical quiet generator (TQG) size and weight with high turndown ratios at high efficiency, reduced emissions, much lower noise levels, high reliability, and greatly reduced maintenance requirements. Infinia's CHPS is an attractive alternative for standard TQG sets used in the field today as well as an efficient solution for energy efficient building power and heat in commercial applications.

Ethylene Control in Fresh Fruits and Vegetables

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



Primaira, LLC

Woburn, MA - www.primaira.com

The spoilage of fresh fruits and vegetables caused by the accumulation of ethylene gas during transport and storage is an important problem for the U.S. Army and for commercial agriculture. Certain fruits and vegetables generate ethylene as a natural part of their ripening cycle; others are highly sensitive to the presence of ethylene, but may or may not produce ethylene themselves. Small amounts of ethylene can induce fruit ripening, produce undesirable changes to

flavors (bitterness), color (yellowing or browning), and texture (softening), and can increase susceptibility to disease. Primaira, LLC has developed an Ethylene Elimination Unit (EEU), a unique, patent-pending technology that has been proven in full-scale, side-by-side comparison testing to safely and cost-effectively remove ethylene, inhibit microbial growth, and improve the quality and longevity of fresh fruits & vegetables. This technology has benefits along the entire storage, distribution, transport, and end-use supply chain. The EEU has a positive effect on quality of produce quality and storage life, and has application in multiple



sizes of transport containers, cold storage rooms, walk-in refrigerators, reach-in refrigerators and general produce storage areas. It is a self-contained, self-cleaning, rugged, low-cost, low-power, air cleaning technology. The system is easy to install and the required service interval is greater than one year.

High Throughput Processing for Hyperspectral Imaging Sensors

Joint Program Executive Office, Chemical and Biological Defense



Physical Sciences, Inc. Andover, MA - www.psicorp.com

The remote detection of chemical agent vapors and liquids, as well as non-traditional agents, is critical to situational awareness. Physical Sciences Inc. (PSI) has developed a suite of innovative algorithms, coupled to a high speed signal processor, that enable the transition of its Adaptive Infrared Imaging Spectrometer hyperspectral standoff chemical agent detection technology to meet these detection needs. The primary innovations are: 1) adaptation of image registration

algorithms typically used with panchromatic and visible imagery from airborne reconnaissance platforms to register hyperspectral imagery acquired from moving vehicles and 2) utilization of a commercial off-the-shelf graphics processing unit to perform the highly parallel image registration and detection operations in real-time. Registration algorithm development and validation required novel use of concepts from information theory that were successfully validated in testing at Dugway Proving Ground. These advances enable the AIRIS sensor to provide "on-the-move" detection capability for 16 target compounds from ranges up to 5 km. PSI has signed a



Joint Development Agreement with Smiths Detection Inc (SDI) under which PSI and SDI will jointly produce and service the sensors.

Outreach and Sources of Information

Army SBIR/STTR Web Site - www.armysbir.army.mil

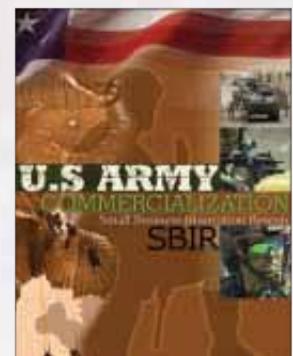
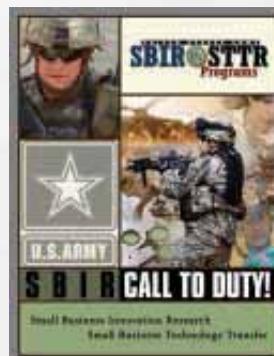
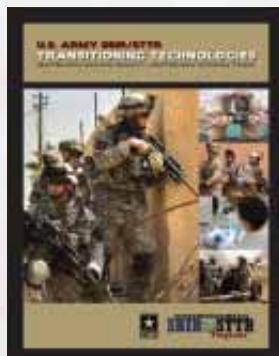


The Army SBIR/STTR Programs conduct an aggressive outreach program to increase small business awareness of broad opportunities provided by the Army. Army SBIR/STTR personnel participate in national, regional, and local conferences across the country. This provides small businesses with face-to-face contact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

General SBIR/STTR information

- Changes and new requirements
- Points of Contact and links to other Army programs
- Proposal submission procedures
- Recent Army SBIR/STTR awards
- Searchable database of past awards
- Chemical and Biological Defense SBIR Program
- Phase III Success Stories
- Achievement Awards Program

Past Commercialization Brochures







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Photos courtesy of the U.S. Army, www.defense.gov and www.flickr.com