

ARMY



SBIR

SMALL BUSINESS INNOVATION RESEARCH

COMMERCIALIZATION BROCHURE



**US ARMY
RDECOM**



The future readiness and effectiveness of our Army will be determined, in large measure, by our investment in relevant technologies. It is our job to ensure that our Soldiers have the tools they need to meet present and future challenges. 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 to critical Army technology requirements. By capturing the wealth of talent within the U.S. small business community, these programs benefit the Department of Defense, the private sector, and our national economy.



Most often, innovative technologies are invented by creative individuals and small, agile companies within a management structure that is willing to take risks. But to ensure growth and achieve success in today's competitive global economy, many businesses need financial support as well as opportunities for commercialization. Establishing effective partnerships is critical for small businesses, often plagued by lack of funding and limited marketing opportunities. As our Nation's largest source of early-stage technology financing, SBIR and STTR enables hundreds of small businesses to move ideas from drawing boards to the marketplace. Through these programs, the Army forges vital links between our Soldiers, small businesses, and the marketplace.

This brochure highlights success of small businesses that have gone through the SBIR and STTR program process from Phase I to commercialization. I anticipate that in the future small businesses, such as those highlighted in this brochure, will continue to spark unique, new concepts that can be transitioned into new technologies that benefit our Soldiers. This brochure provides valuable information about the SBIR Program, and highlights only a few of our recent success stories.

A handwritten signature in black ink, appearing to read "Scott Fish". The signature is stylized and cursive.

Dr. Scott Fish
Army Chief Scientist



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 \$730,000.

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 percent owned and controlled by another for-profit business concern that is at least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States -- (except in the case of a joint venture);
- Has, including its affiliates, no more than 500 employees. The small business may subcontract a portion of its work, as long as the small business "prime" performs at least two-thirds of the Phase I work and half of the Phase II work. For the purposes of determining compliance, percent of work is usually measured by both direct and indirect costs; however, the actual method of measurement will be verified during contract negotiations.



The STTR Program is open to any team consisting of a small business, as defined previously and a research institution. The research institution may be any U.S.-based nonprofit research institution, federally funded research and development center (FFRDC), or university or college. The small business must perform at least 40 percent of the Phase I and Phase II work. The research institution must perform at least 30 percent of the Phase I and Phase II work. Any part of the remaining 30 percent of the work may be subcontracted.

For the SBIR Program Phase I and II efforts, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the proposed effort. Primary employment means that more than one-half of the principal investigator's time is spent with the small business. For 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.

PHASE III AND COMMERCIALIZATION

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

Phase III represents the successful culmination of an SBIR/STTR project. SBIR Phase III refers to work that derives from, extends, or logically concludes efforts performed under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented towards commercialization of SBIR/STTR developed research or technology. While Phase II success is measured by whether the prototype product or service developed by the small business can meet an Army need, Phase III success can 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:

- Technical Assistance
- Phase II Enhancement
- Commercialization Readiness Program



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 the projects; b) solving technical problems which arise during the conduct of the projects; c) minimizing technical risks associated with the projects; and d) developing and commercializing new commercial products and processes resulting from the 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 and technology effort, or a 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's 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 for the additional effort to be executed with the SBIR Phase II Enhancement funds. The statement of work should contain adequate detail to be included in any contract modification.
- A detailed cost proposal for the Phase II enhancement. Matching funds are not required, but if available, include 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 READINESS PROGRAM

The Army SBIR Program will administer the Commercialization Readiness Program (CRP) in response to the 2012 National Defense Authorization Act, with the purpose of increasing SBIR technology transition and commercialization success. Under a former program name, Commercialization Pilot Program, a focused set of ongoing SBIR Phase II participants with potential to transition their technologies were selected for inclusion and provided additional funding and assistance to support commercialization activities. While technology transition to Army acquisition activities is the CRP primary focus, the civilian marketplace and commercialization opportunities were not ignored. The Army can gain significant value through commercializing dual-use products.



Projects participating in the CRP 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.

The Army is currently structuring a permanent SBIR CRP program and this will be a transition year for SBIR Phase II commercialization assistance with CRP legislation just recently passed. The intent is for the new permanent program to incorporate best practices learned for the past four years and will also address Congressional intent as defined by the SBIR Reauthorization language. During this transition period there will not be a Commercialization and Transition Assessment (CTA) form posted on the SBIR Portal for Phase II companies to complete in order to be considered for additional technology maturation and commercialization support. Phase II companies interested in securing additional support and funding for transition of their technology during this transition period should follow the process established for Phase II Enhancements. Companies interested in pursuing Phase II Enhancement consideration are encouraged to contact their Contracting Officer's Representative (COR) or their Technical Assistant Advocate (TAA), which can provide additional information and assistance.





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A SCOPE™ - DUAL MODE, NOISE IMMUNE STETHOSCOPE

In the extreme noise environment of fixed and rotary wing casualty evacuation aircraft, a critical need exists to detect normal vs. pathologic heart and breath sounds and discriminate among their components. Evaluations by the U.S. Army Aeromedical Research Laboratory (USAARL) have demonstrated that no such capability exists whether in standard acoustic stethoscopes or electronic noise-canceling stethoscopes. Because of this capability gap, USAARL and the Medical Research and Materiel Command (MRMC) initiated development of a stethoscope for assessing heart and lung function in high noise environments. The anticipated benefits from this technology include increased capability of the medics to assess patients who are being evacuated in these environments. This same capability is needed in ground based ambulances where high background noise and vibration present challenges to hearing breath or heart sounds of patients being transported to treatment centers.

The Active Signal Technologies noise-immune A SCOPE™ enables auscultation (listening to internal body sounds) in high noise through a sensor head that combines a very sensitive noise-rejecting acoustic stethoscope with a low power Doppler transceiver. In acoustic mode, the device provides high fidelity heart and lung sounds at background noise levels up to 95dBA. However, the cabin of a military rotorcraft typically reaches 95-115dBA. At these levels the Doppler Mode is engaged and generates clearly audible frequency shifts in response to tissue motion in the heart and lungs.

TECHNOLOGY TRANSITION

Since completing the Phase II, the program received additional funding of \$1.1M through the State of Maryland economic development funds, Army SBIR Phase III advanced development funding, and Army purchase of evaluation units. The A SCOPE™ has completed FDA approval, military ruggedness testing (MILSTD 810F), airworthiness certification, reverberation chamber assessment and functional testing aboard Army helicopters and has transitioned to a commercially available product. The first shipment was deployed to Afghanistan for field evaluation late in 2011.

Ongoing sales to the Army of 500-1000 units per year are anticipated. Military and private sector funding is sought to productize the simpler, noise-rejecting acoustic mode as a highly capable inexpensive stethoscope for broad based military and civilian applications where high background noise is encountered not exceeding 95dBA.

Active Signal Technologies, Inc.



Linthicum Heights, MD
www.activesignaltech.com

U.S. Army Medical Research and Materiel Command



ROTORCRAFT COMPONENTS DESIGN TOOL

The Army is continuously modernizing its rotorcraft fleet and has identified the need for new transmission designs with higher power density and improved durability. The performance, reliability and safety of fatigue sensitive steel components in military and commercial rotorcraft can be significantly improved with the creation of deep compressive residual stresses in critical surface regions. The objective of this SBIR project was to develop a design tool to estimate and optimize the residual stress profiles and fatigue life improvement resulting from laser shock peening (LSP) of fatigue sensitive steel rotorcraft components. In the past, creation of post heat treatment compressive residual stresses has been limited to only shallow depths of 0.005 inches or less. Deeper compressive residual stresses are possible but result in excessive roughness of the surface, which is undesirable in precision dynamic components with lubricated contacts. The use of a laser to create a high-energy pressure pulse on the surface of titanium and aluminum has shown the capability to achieve significant surface residual stresses 10-20 times greater in depth than conventional peening and with minimal increase in surface roughness. The process results in large increases in the fatigue strength of components fabricated from these materials.

Deformation Control Technology, Inc. (DCT) developed a LSP process design tool, consisting of a validated computer model capable of predicting residual stress response in prior heat treated, carburized gear steels in support of efforts to develop LSP technology for helicopter drive-train gears. Helicopter gears must transmit high powers at the lowest possible weights (i.e., high power densities). Consequently improving gear fatigue strength in the flank and root areas with the associated inhibition of crack initiation and growth in the gear root is projected to have high payoffs, including meeting new and more demanding mission needs as well as improved component lifetime and reliability and lower maintenance costs.

TECHNOLOGY TRANSITION

DCT's objective transition was to develop, validate, and verify a software release for use by commercial industries in an effort to broaden the number of materials and geometries in the software database and validate the software on arbitrary LSP components. The resulting residual stress and fatigue life optimization tool will be highly beneficial to both military and commercial rotorcraft components. Boeing and Metals Improvement Company are currently using the product to develop a LSP method for gears on the AH-64 helicopter. \$200K in additional funds to further develop the modeling tool has been provided by Metals Improvement Company who has the capability to provide LSP services to the Original Equipment Manufacturers.

Deformation Control Technology, Inc.



Cleveland, OH

www.deformationcontrol.com

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



MULTIPLEX DATA BUS CONTROLLER/TRANSLATOR TRANSMITTER (MDBCTT “MUDBUCKET”)

During flight operations, aircraft avionic systems must be integrated and be able to effectively communicate with each other through the use of multiplex data bus systems. The data bus controls data streams among aircraft components. Presently, testing these bus systems requires extensive flight testing that is costly and results in safety of flight issues. A critical requirement exists to be able to transparently manipulate aircraft data as it moves throughout the platform to verify and validate these systems.

Coherent Technical Services, Inc. (CTSi) developed the *Mudbucket* technology and validated its use controlling and manipulating the conditions within aircraft MIL-STD-1553 systems. MIL-STD-1553 is a military standard that describes mechanical, electrical and functional features of a serial data bus. CTSi began this innovation under the technical direction of the Army Aviation Flight Test Directorate (AFTD) who is building a System Test and Integration Lab (STIL) for a virtual testing environment. This technology enables combined systems of systems testing in a controlled environment and under various conditions with other Army and Department of Defense (DoD) facilities. This testing can be fully immersive, where all simulation is completely controlled by the tester, or additive, such as in flight tests where the *Mudbucket* can be used to enhance and add a degree of control to an open-air flight test. In addition, CTSi is developing the complementary *Mudbucket* ARINC 429 data bus technology which has the potential to support Army Aviation STIL test requirements and the much broader commercial aviation market. The safety risk and high cost of open air flight testing influences the degree to which the aviation test and evaluator can observe responses to variable aircraft and system states. Full involvement, system-to-systems integration and testing are mandatory to meet Army future force requirements.

TECHNOLOGY TRANSITION

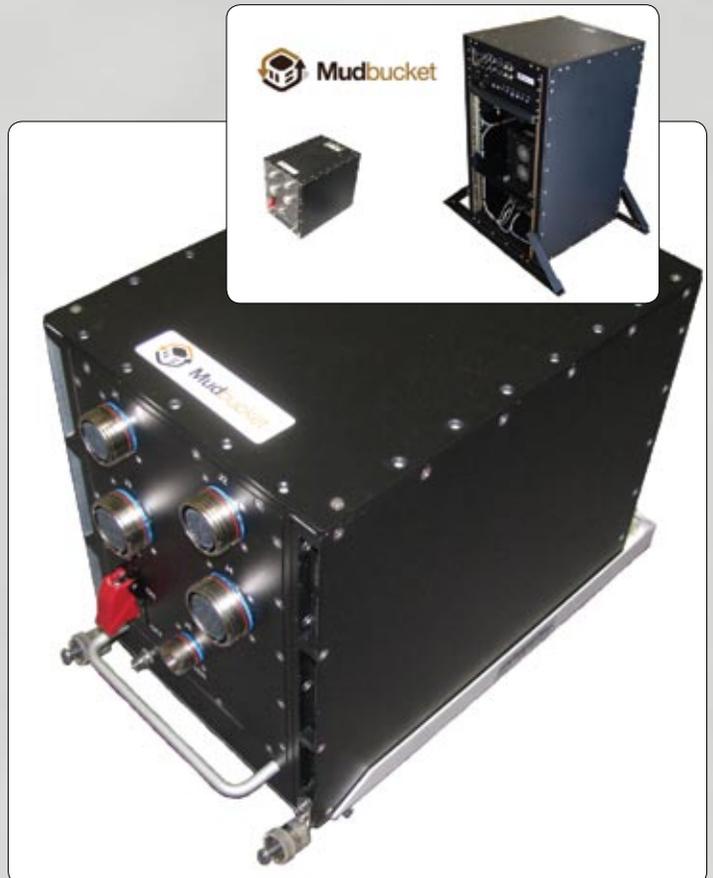
CTSi has received \$5.9M in Phase III funding from various sources to further develop *Mudbucket* and integrate it within the STIL. The Joint Distributed Infrared Counter Measures (IRCM) Ground-Test System (JDIGS), AFTD and NAVAIR are purchasing additional *Mudbucket* hardware and software to support ground based countermeasures testing. The Navy, leveraging the Army SBIR investment, has contracted with CTSi to deliver an F/A-18 *Mudbucket* surrogate that can be used to test UAV software for Navy specific missions under the monitor and control of an onboard safety pilot. The Navy is also using the *Mudbucket* to integrate new guidance and control systems into existing air platforms to enable autonomous aerial refueling development and test.

Coherent Technical Services, Inc.



Lexington Park, MD
www.goctsi.com

U.S. Army Test and Evaluation Command



FLEXIBLE COLOR DISPLAYS

Universal Display Corporation is developing advanced organic light emitting diode (OLED) technology based on their proprietary high-efficiency phosphorescent, transparent and flexible technologies. The novel integration of low power consumption, top-emitting phosphorescent technology, and a suitable backplane deposited on a thin, flexible, stainless-steel foil or plastic substrate is the best solution to meet the project requirements. OLEDs are thinner, lighter, and have less power consumption and offer significantly better performance features - faster response times, wider viewing angles, higher contrast ratios, and brighter with more color saturation. Because OLEDs have fewer processing steps and require less material and equipment than today's LCDs, they have the potential to be more cost effective.

The company recently delivered eight wrist-mounted phosphorescent OLED displays built on thin flexible plastic to the U.S. Army Communications-Electronics Research, Development and Engineering Center (CERDEC) and Project Director – Common Hardware Systems (PD-CHS) as part of a program to develop a thin, lightweight and ruggedized communication device. Integrated by L-3 Display Systems, the units offer various advanced communications features, all integrated into a housing that fits on a Soldier's wrist. During tests, OLED was shown depicting a number of different sources of information, including a real-time unmanned air vehicle video feed and various other images received through computers running different applications. These devices have the potential to provide Soldiers better situational awareness, mitigate risk, and improve performance and mission accomplishment. Moreover, this project will create numerous benefits in a variety of military and commercial applications and provides the Army with a clearly demonstrated technology path for flexible displays for use in vehicles, command centers, and on individual Soldiers.

TECHNOLOGY TRANSITION

Universal Display Corporation has realized \$10M in Phase III commercialization on this SBIR program; a \$6M contract with the Army Research Laboratory and \$4M in private investment. By developing certain technology components necessary to fabricate these displays through the work under this program, Universal Display expects to commercialize these technologies for military and commercial applications through joint ventures and licensing partnerships. Projections indicate that OLED display revenues could grow to \$6 billion by 2015.

Universal Display Corporation



Ewing, NJ
www.universaldisplay.com

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



FATIGUE CRACK DETECTION

Safety and dependability of vehicle and aircraft structures are of great concern to the Army and are paramount for force protection. Unfortunately, current inspection and maintenance procedures for in-service systems can be time consuming, costly, and are labor intensive. Acellent Technologies has developed an innovative sensor cluster-based structural health monitoring system that combines Acellent's current single element SMART Layer actuator/sensor network with multi-element phased arrays to produce a Sensor Cluster Network. The system can quantitatively assess structural damage such as cracks due to fatigue, identify damage in inaccessible areas of structures, characterize damage growth, and provide an image of the damage size and orientation. Acellent's SMART Layer technology uses a network of miniature piezoelectric elements to transmit and receive acousto-ultrasonic signals. Features from the acousto-ultrasonic signals are extracted and used to detect, locate and estimate the size of any existing cracks. This system provides an innovative alternative that can significantly reduce inspection costs, enhance the reliability of the structures and improve their efficiency and readiness.

TECHNOLOGY TRANSITION

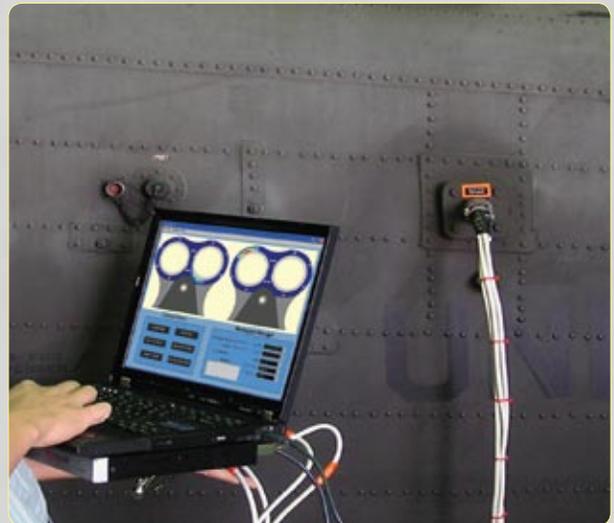
Acellent Technologies has received \$1.6M toward commercializing this effort. The system is being tested under several Cooperative Research and Development Agreements (CRADAs) with the Army Research Laboratory (ARL), through which the SMART Layers have been installed on the tailboom of a Black Hawk and flying for over 2 years. Also, the system is being tested as part of the Operations Support and Sustainment Technologies (OSST) program with Bell Helicopters targeted at U.S. Army helicopters. In the OSST program, Acellent's system was tested on a rotorcraft component and demonstrated the capability to detect, locate, and characterize damage (fatigue cracking, battle damage, etc.). The system is currently undergoing MIL-STD testing along with flight tests and integration with the OH-58D Health and Usage Monitoring system for implementation within a 2 year timeframe. The product is also being evaluated by the Federal Aviation Administration (FAA), Sikorsky for rotorcraft applications and Boeing, Airbus, Embraer, and Bombardier for commercial aircraft applications. This development is also supported by British Petroleum (BP) for fixed base structures.

Acellent Technologies, Inc.



Sunnyvale, CA
www.acellent.com

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



SUPERCONDUCTING, ALL DIGITAL RECEIVER (ADR)

Now in their fifth year since the initial X-Band success, HYPRES has again broken barriers in Superconducting Digital-RF technology by performing simultaneous multi-band digitization in data yielding frequencies beyond X to now include the higher bands: Ku and Ka. Additionally, the latest ADR derivative successfully harvested data from a satellite link without the use of a Low Noise Amplifier (LNA), demonstrating the ability to broaden the digital domain and driving the analog boundaries further out in both frequency and power. The HYPRES ADR performed in place of the demodulator, down converter and LNA with all the functions currently found in the analog domain. Upon transition, the Army's Joint SATCOM Engineering Center (JSEC), in collaboration with the Navy's Office of Naval Research (ONR), will possess the capability to digitize an entire payload instantaneously.

Although there have been many technology challenges, HYPRES has made significant advancement in dynamic range, thermal management, digital amplification, spectral masking, low maintenance cooling and spectral analysis. These achievements will further the work in all areas of communication by expanding the digital boundaries particularly at the long haul applications. Most significantly, this technology will provide a more powerful tool in the user's hands. The ADR technology will assist both the Army and the Navy in their plans to reduce infrastructure costs by introducing large all digital platforms, such as the Army Future Advanced SATCOM Terminals architecture.

TECHNOLOGY TRANSITION

The Program Executive Officer (PEO), Enterprise Information Systems (EIS), is the transition lead for this technology. CERDEC's JSEC will receive this system to use as a digital mining tool for high frequency broadband exploration. JSEC's targeted use is for more affordable protected communications and bandwidth reuse applications reducing costs for in garrison and in theater operations. Another key use includes JSEC's bandwidth expansion initiative via precision polarization diversity achievable only with the ADR. The Army plans to field a set of four ADR units at various strategic earth terminals around the world for approximately one year before ramping up to full fielding. The Navy has also invested \$3M in the development of a different variant of the Digital-RF receiver for shipboard applications.

HYPRES, Inc.



Elmsford, NY
www.hypres.com

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



WHEELS OVER TRACK OPTIMIZATION

The Army's focus is on being faster, lighter and more agile and wheeled vehicles figure prominently in this vision. Compared to tracked vehicles, wheeled vehicles have many positive features, but they lack mobility in certain soil types and weather conditions. A solution that is being explored is to provide an optional band track system to be placed over the wheels when extra mobility is required, although the suspension system effects are reduced, causing cornering and stability problems and limiting the vehicles to slower speeds. GS Engineering developed computer algorithms to interface with vehicle simulation programs for coupling the wheel suspension, band track, and the supporting suspension system. This module allowed detailed design, analysis and optimization of a complete band track over wheels system.

GS Engineering was awarded SBIR contracts to develop a Band Track over Wheels prototype for military vehicles to significantly enhance soft soil mobility. This effort led to additional development of Track-over-Tires prototypes for commercial customers. GS Engineering designed an innovative, robust track tensioning system, and, in conjunction with Camoplast, Inc., developed a prototype rubber track. GS Engineering installed the track and tensioning system, instrumented the test vehicle with multiple data acquisition transducers, and performed a series of successful off-road tests including mud, sand, and deep snow conditions. GS Engineering recently completed a SBIR Phase III contract which successfully demonstrated a segmented version of the Band Track over Wheels system. This version demonstrated significant off-road mobility enhancement, including a successful field endurance test. The segmented band track also has the capability of rapid field installation and improved maintenance by allowing the replacement of individual segments instead of the entire track.

TECHNOLOGY TRANSITION

GS Engineering has received over \$3.3M in commercialization investments as a subcontractor under Century 3-Plus LLC and AM General LLC. They have also received a \$1.1M Phase III contract for a Track-Over-Wheel Program from the U.S. Army Tank-automotive and Armaments Command (TACOM). This technology is directly applicable to the present Stryker Infantry Vehicle and the Marine Corps Light Armored Vehicle Program. Oshkosh Truck Corporation is also very interested in this technology as a complement to their in-hub electric motors concept.

GS Engineering, Inc.



Houghton, MI

www.gsengineering.com

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



ATLAS™ - MAINTENANCE MODELING AND SIMULATION TOOL

Because of the increasing complexity of Army systems, the popularity of using modeling and simulation among competing quantitative Combat Service Support tools can be attributed to the fact that it is simple, cost effective, and intuitive. It facilitates experimentation with systems that would either be impossible or too costly and is often the only scientific methodology available for the analysis of complex systems and resources in a dynamic environment. Planners must be able to account for the interactions among the key factors such as operational tempo, asset employment policies, operating environment, maintenance practices and policies, accumulated age or wear, and probabilistic conditions.

The Army Transformation in Logistics and Sustainment (ATLAS™) Go-to-War (GTW™) simulator developed by Knowledge Based Systems is a combined modeling, simulation and experimentation framework to evaluate the impacts of current and future force employment, maintenance doctrine, and resourcing strategies within a dynamic environment. Through the use of this technology, the Army Aviation and Missile Life Cycle Management Command (AMCOM LCMC) has decreased lead times for depots, decrease demand on the repair program, and give additional flexibility to Army's Force Generation and reset programs. The AMCOM LCMC Integrated Materiel Management Center selected the ATLAS™ GTW™ as its spare parts operation tool in conjunction with the web-based Collaborating Online Between Resupply Activities (COBRA) system. Recent enhancements have expanded the scope of the GTW™ to leverage data being collected about key aviation components under the Army's Condition Based Maintenance Plus (CBM+) initiative. This will ensure versatility across both aviation and missile system platforms and provide spare parts forecasts for high cost and/or mission-critical components. This enhances the applicability of the technology across the entire maintenance and support community. ATLAS™ has shown significant payoff potential by enabling increased operational readiness, a smaller logistics imprint, and considerable spare parts acquisition savings.

TECHNOLOGY TRANSITION

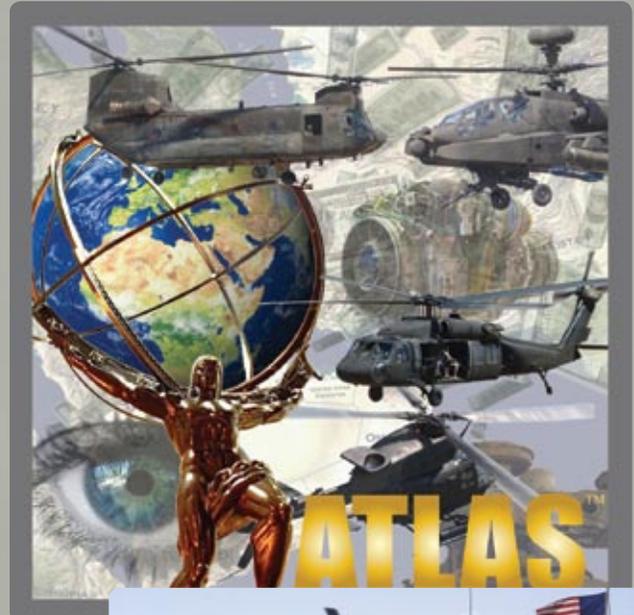
To date, over \$5.6M in Phase III resources have been invested in GTW™ technology refinement by partners in AMCOM IMMC and PEO Aviation to develop the setting that offers a unified modeling and experimentation framework for measuring current and future combat systems maintenance concepts and optimization capabilities. An additional \$1M Phase II Enhancement funding has been awarded to aid transition of the technology.

Knowledge Based Systems, Inc.

College Station, TX
www.kbsi.com



U.S. Army Research Laboratory



SMART PROTECTIVE INSERTS

The ceramic tiles in the interceptor body armor plate system are subject to cracking through impact or simple misuse, potentially compromising ballistic integrity and Soldier safety. Currently, periodic non-destructive, pre-impact inspections of armor personnel plates are required during use by Soldiers and prior to reissue to determine continued serviceability. These inspections require expensive, fixed-site digital X-ray units that are relatively slow, are burdened by numerous logistics issues, and require teams of trained operators.

The objective of this effort is to develop a smart personnel armor insert that features embedded low-cost ultra-lightweight sensors and a simple reliable indicator of armor serviceability for use by Soldiers in any conditions and at any time. Newport Sensor's Armor Inspection and Monitoring (AIM) technology provides Soldiers with a simple, effective, and reliable means to determine body armor integrity at any time and place in a matter of seconds. Embedded ultra-lightweight sensors linked to a microprocessor detect damage in the ceramic armor plate. A tiny key can be connected to the armor and provides a simple "go/no go" LED readout. AIM provides an immediate, reliable and readily accessible ballistic assurance to Soldiers pre-combat. Newport Sensors' AIM system has demonstrated superior damage detection capability. It also provides substantial cost savings by eliminating the significant expense associated with the necessary up-front costs and logistics tail of the current digital X-ray technology.

TECHNOLOGY TRANSITION

Based on the criticality of the technology, Newport Sensors, Inc. was selected for the U.S. Army Commercialization Pilot Program and a Phase II Enhancement for an additional \$1.7M in SBIR funding. This project has received strong support from the end user – the US Army PEO Soldier, PM Soldier Protective Equipment, which has provided an additional \$1M funding for prototyping and evaluating the newly developed smart armor inserts.

Newport Sensors, Inc.



Irvine, CA

www.newportsensors.com

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



NANOEYE™ - LOW-COST SPACE SURVEILLANCE

For over forty years the United States has used high resolution satellite systems for many different purposes, but these are very expensive systems. Their availability and flexibility is limited, and useable data can take time to become available. Situational awareness is paramount for our deployed Soldiers and the Army's objective is to develop rapid and tactically knowledgeable imaging systems to meet the present and future needs of Soldiers. Microcosm Incorporated has created the *NanoEye™* satellite, a highly responsive and maneuverable space observation system to provide very low cost images with a sub-meter resolution at nadir. Additional *NanoEye™* features are the ability to be tasked directly from the field and to temporarily lower its orbital altitude to improve its nominal 1.5 m resolution to sub-meter. Requested battlefield views can be part of planning and execution of military operations including a desired angle before, during, or after a planned operation. *NanoEye™* will provide Army commanders with control of space resources and immediate, real-time access to the collected data. The primary benefit of this technology is the ability to deliver low-cost, low risk, and low-mass orbital systems while providing strategic area coverage with many passes in a given day. *NanoEye™* has the potential to be used by the Department of Defense as well as throughout the Federal government including the Department of Homeland Security (DHS), the National Oceanic and Atmospheric Administration (NOAA), and the National Air and Space Administration (NASA) for natural and man-made disaster monitoring and response as well as environmental monitoring.

TECHNOLOGY TRANSITION

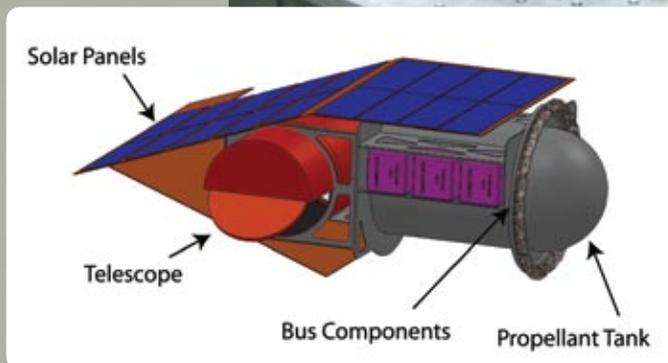
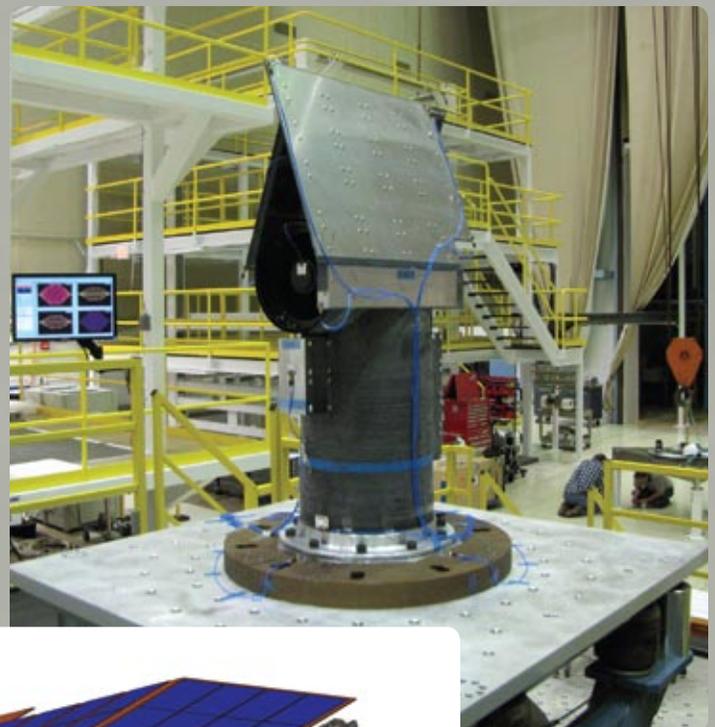
Microcosm has received \$2M to develop electro-optical/infrared payload and propulsion for the full *NanoEye™* configuration. The National Reconnaissance Office (NRO) is providing \$780K in Phase III funding towards future system advancement of sensors and information processes. Prospective sources for further transition include the Army, SOCOM, DARPA, and the Air Force. Microcosm developed other new innovations to enable this satellite and reduce cost including all-composite propellant tanks and satellite platform autonomous orbit control. In addition, they are developing a small launch vehicle to enable responsive and affordable access to space for tactical satellites.

Microcosm, Inc.



Hawthorne, CA
www.smad.com

U.S. Army Space and Missile Defense Command/
Army Forces Strategic Command



AIRWORTHY CABLE ANGLE MEASUREMENT SYSTEM

Roadside bombs and ambushes during convoy missions account for a large percentage of the total casualties sustained in current conflicts. Manned helicopters for resupply could reduce the number of trucks on the roads, but are limited by hardware and pilot availability. The US Army and Marines Corps (USMC) have begun testing and fielding unmanned helicopters with external cargo sling-loads to satisfy this mission need and save lives. Successful air operations with slung loads are challenging because the loads move in complex ways during flight. To improve flight safety, pilots need feedback from the slung load to compensate for this motion. Unmanned Aircraft Systems (UAS) present an even tougher challenge since there is no person to “feel” load motion.

Advanced Optical Systems, Inc. (AOS) has developed the Cable Angle Measurement System (CAMS) to provide feedback to pilots and flight computers about the position of the load beneath the aircraft. By using an optical sensor, beacon, and custom electronics, the CAMS measures the load’s angle relative to the helicopter with better than 0.1° accuracy across a 150° field of view. The CAMS load position feedback allows flight control computers to steady loads dynamically.

TECHNOLOGY TRANSITION



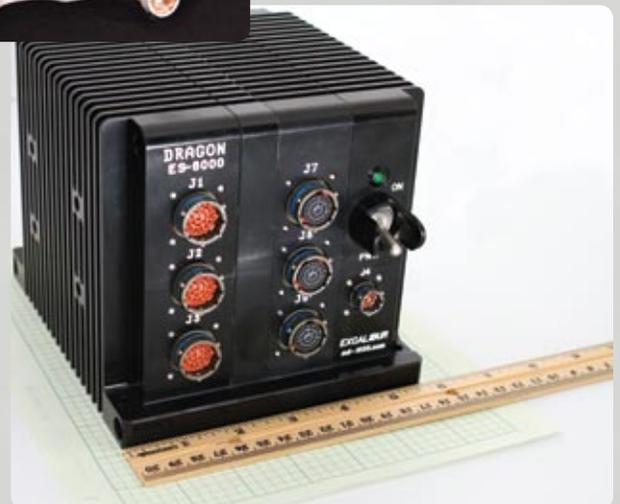
As part of an Army Phase II Enhancement, AOS is preparing CAMS for integration into the existing Hermes auto sling-load pick-up and delivery system - another Army SBIR technology. AOS secured \$1.9M in matching funding from Lockheed Martin to complete development, qualification testing, and demonstration of key CAMS components. As a result of early successes, the USMC has ordered 3 Hermes auto load delivery systems for deployment to Afghanistan in May 2012. The combined system will increase the speed and accuracy of UAS cargo resupply and reduce the hardware footprint and need for highly trained personnel at forward operating bases.

Advanced Optical Systems, Inc.



Huntsville, AL
www.aos-inc.com

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



FERROELECTRIC GENERATORS (FEGS)

The Army strives to build smaller, lighter and less costly systems with enhanced performance, but the tradeoff has historically been that these devices place greater demands on power supplies. As a result, there are major efforts to develop more energetic compact power supplies. TRS Technologies has developed high energy density components for the Ferroelectric Generators which provides two to three times more power output than state-of-the-art materials. This was accomplished by using advanced processing methods to fabricate high density ferroelectric ceramics with significantly increased energy storage capabilities that can potentially provide our Soldiers with valuable new tools to disrupt enemy communications, destroy electronically stored information, and disrupt vehicle operations.

Ferroelectric generators are fairly simple devices mostly consisting of a small energy storage unit. When electrically polarized, they store energy in the form of bound electric charge. When the FEG is shocked, the material is depolarized, releasing this stored charge to an output circuit. There has been and continues to be active research to further develop FEGs as very compact power supplies for a variety of loads including antennas, neutron generators, and detonator arrays. The Army is working to develop new types of munitions, both lethal and less than lethal which will depend on this type of innovative electrical power.

TECHNOLOGY TRANSITION

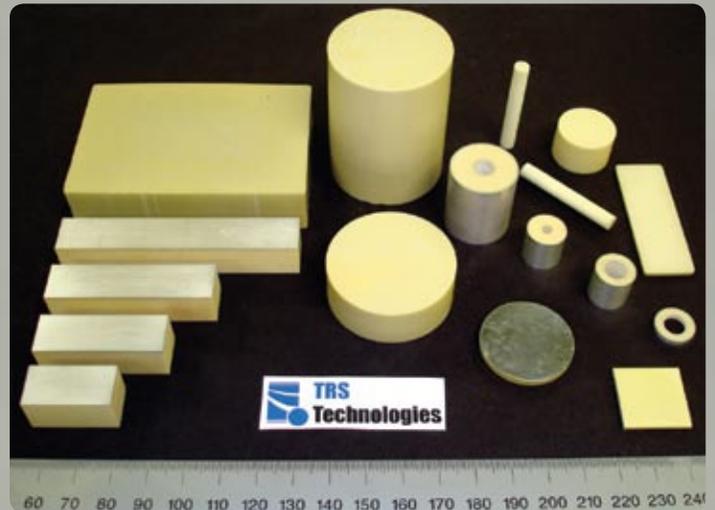
This technology is being transitioned into a device being developed by the U.S. Army Space and Missile Defense Command under a \$1.1M Phase III contract. TRS Technologies is using this technology to develop pulse power components for counter Improvised Explosive Devices, directed energy weapons, and multipoint detonation systems to be used on mobile platforms such as vehicles, aircraft, missiles, and projectiles. These materials are enabling electromagnetic pulse weapons to remotely defeat IEDs and suicide bombs in a less than lethal manner with limited collateral damage. This processing method also results in devices that are small enough to be man-portable, yet powerful enough to disrupt electronics over significant ranges.

TRS Technologies, Inc.



State College, PA
www.trstechnologies.com

U.S. Army Space and Missile Defense
Command/Army Forces Strategic Command



W-BAND HIGH POWER AMPLIFIERS

The increasing prevalence of military operations in urban environments as a result of counterinsurgency and counterterrorism is driving the need for more advanced electronic systems with greater performance and power, smaller size, and newer capabilities. Applications for millimeter wave systems include imaging weapons under clothing, detecting Improvised Explosive Device triggers, identifying chemical and biological threats, and at higher power, non-lethal directed energy weapons. The objective of this program is to develop a very high frequency, high power amplifier as a source for various advanced battlefield critical electronic operations.

InnoSys has developed an entirely new class of highly compact millimeter wave (MMW) high power devices. These devices are powered by high voltage electronic power conditioners (EPCs), also developed by InnoSys. Together, these devices produce a family of highly compact MMW modular sources that can operate efficiently at power levels at least an order of magnitude greater than current devices to enable a new generation of advanced electronic systems and support applications urgently needed by our Soldiers. The most noticeable advantages of these high power device products are their higher manufacturing yield and reliability together with their smaller size and lighter weight. Furthermore, high efficiency, very broad bandwidth and good linearity, all with high output power have all been demonstrated. InnoSys will integrate its millimeter wave power amplifier and its associated electronic power conditioner into a very compact, light weight MMW high power source module for precision strike munitions and is currently supporting broadband communications and active MMW imaging systems testing with high power amplifiers and sources.

TECHNOLOGY TRANSITION

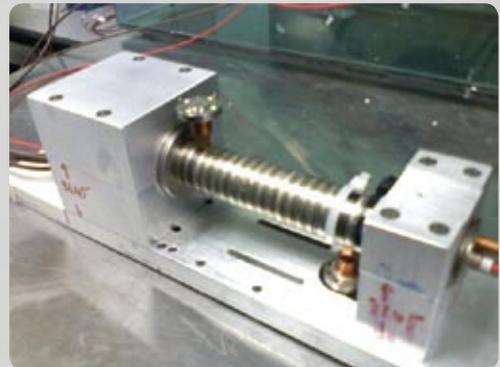
InnoSys was selected for the U.S. Army's Commercialization Pilot Program (CPP) and awarded a \$600K contract to develop a testable prototype of its W-band high power amplifier. Recently under a purchase agreement worth over \$1.3M from a major defense contractor, InnoSys manufactured and shipped two sets of W-band high power amplifiers and their associated electronic power conditioners for a biological, chemical and weapons detection system test.

InnoSys, Inc.

INNOSYS INC.

Salt Lake City, UT
www.innosystech.com

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



DISPOSABLE SENSOR SYSTEM

Unattended Ground Sensors (UGS) are battery powered, wireless persistent surveillance systems that automatically and autonomously detect activity by vehicles and personnel. In recent years, UGS have become increasingly capable with the ability to detect, classify and identify activity at longer ranges with a higher probability of detection and lower false alarm rates – all characteristics that make them increasingly valuable to the Army. However, they also have become increasingly expensive restricting their use to special applications. McQ developed, demonstrated and delivered 100 prototype UGS sensors that pushed the cost dramatically lower - \$10-\$20 per sensor. These Disposable Sensor System (DSS) UGS units have seismic, magnetic, acoustic and passive infrared detection modalities with ad hoc mesh networked wireless communications and advanced signal processing – just like their more expensive counterparts.

McQ built upon this project in a number of different ways. In a Phase III SBIR for the Defense Threat Reduction Agency, McQ modified DSS and demonstrated in field tests the ability of the sensor to localize weapon impact locations to within a few meters for bomb damage assessment applications. McQ further refined DSS into a highly capable UGS sensor called iScout®. iScout® has seismic, magnetic, acoustic and passive infrared detectors, but unlike other low cost sensors, it is small enough to fit in a Soldier's pocket and has multiple digital signal processors for staged processing. This approach to processing, the first of its kind for this class of sensor, results in low power consumption and detection performance comparable to larger, more expensive UGS systems. iScout® has been widely accepted, with several thousand units manufactured and delivered to operational forces. The uses for iScout® have expanded far beyond what was originally envisioned in the original SBIR including variants that have been used for cueing for airborne imagers, cueing for ground based optical tracking, perimeter protection for weapons storage, boundary monitoring, and non-lethal mine applications. The DSS SBIR efforts have also spawned the development of an advanced UGS communications system to support iScout® and other UGS systems.

TECHNOLOGY TRANSITION

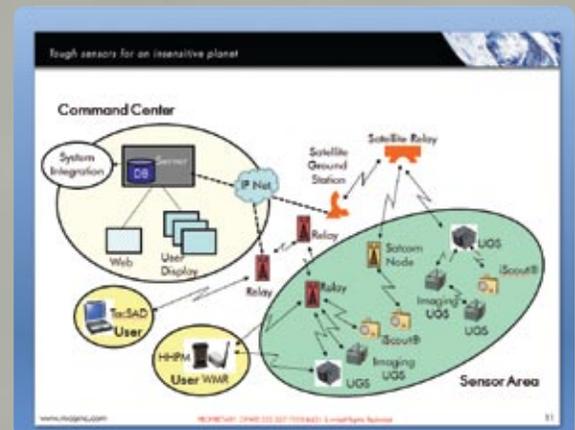
McQ, Inc. has realized over \$8.3M in Phase III funding, over \$5.6M in sales and \$2.5M in private investments. McQ has experience in designing state of the art remote sensor systems and successfully commercializing them for a variety of applications.

**McQ
Incorporated**



Fredericksburg, VA
www.mcqinc.com

U.S. Army Research Laboratory



DUAL BAND X/KA ON-THE-MOVE ANTENNA SYSTEM

Command and control vehicles are an obvious target because of their high profile and greater number of antennas. To counter this threat, the Army must reduce antenna profile as much as possible without compromising a communication system's ability to reliably deliver critical information via key Department of Defense satellite constellations such as the Wideband Global Satellite Communications system (WGS). A low profile, dual band (X/Ka) on-the-move antenna system will provide an inconspicuous low profile appearance and will provide significant performance advantages over a similarly sized dish. In addition to reducing the vehicle's overall antenna system height, a dual band antenna system will also increase network availability by providing Soldiers access to a more diverse set of satellite resources. In situations where Ka-band on WGS is unavailable, the antenna is capable of switching in a matter of seconds to X-band or switching to an entirely different satellite constellation, thereby offering the Soldier uninterrupted access to the Global Information Grid.

The objective of this project is to initiate the design and development of key components of the dual band satellite communications antenna system. ThinkKom was able to successfully deliver the complete antenna system for test and evaluation early this year, and is now developing a smaller diameter variant of this antenna system that will offer greater compatibility with a broader range of Army vehicles. The smaller diameter X/Ka-band antenna system is expected to more easily mount on the roof of a military vehicle, while reducing the height over existing antenna systems. Because the electronics for the system are completely self-contained under a common radome, an integrated cooling system was developed to ensure components do not exceed allowable operating temperatures.

TECHNOLOGY TRANSITION

ThinkKom received \$1.9M from the Program Manager Warfighter Information Network- Tactical (PM WIN-T) for further development of the antenna subsystem design utilizing the high efficiency Continuous Transverse Stub (CTS) and low profile technologies. ThinkKom has successfully transitioned the X-Band portion of the antenna subsystem to full production through a US State Department Manufacturing License Agreement (MLA) for delivery of X-Band communications on-the-move antenna systems to the Spanish Ministry of Defense (MOD). Presently 54 such systems are on order, with 8 units expected to be delivered to the Spanish MOD during 2012.

ThinkKom Solutions, Inc.



Torrance, CA

www.thin-kom.com

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



OPTFORCE™ - SHAPING THE FORCE

OptTek Systems collaborated with the Military Strength Analysis and Forecasting Branch at the Department of the Army G-1 to develop a tool, OptForce™ to support personnel recruitment, accession, and retention decision making processes for the entire Army team. This task is critical to the human resources readiness of the Total Army across the full spectrum of operations. OptForce™ is a web-deployed force structure modeling system that provides a simulation enhancement capability to reliably model the force structure and enable the optimization of retention and balanced force goals. It can recommend manpower policies such as promotions, bonuses, and incentives. OptForce™ simulates inventory movement to display the effects the manning system has on readiness, force alignment, and other important human capital characteristics. The software was built on the existing foundation of a commercial metaheuristic-based optimization engine and overcomes weaknesses typically found in the use of agent based modeling including the difficulty in solving the model for optimality.

The G-1 initially employed OptForce™ to support mission critical force-shaping goals, using it to analyze the “surge” and “draw-down” strength requirements in the Temporary End-Strength Increase planning effort. The Temporary End-Strength Increase enables the deployment of units at minimum 90 percent strength while allowing reset forces to properly man, equip, and train future deploying units. The accuracy of these forecasts is not only crucial for force balance, but the estimate is that for every 10,000 excess soldiers, approximately one billion dollars is required over budget.

TECHNOLOGY TRANSITION



OptTek and G-1 are working together to refine the tool. Once fully operational in G1 force shaping activities, the plan is to expand its use to other requirements including the National Guard, Army Reserve, and the Human Resources Command. Army G-1 has provided \$1M Phase III resources matched by \$1.2M additional SBIR Phase II Enhancement funding, and plans more resources in the future to fully transition this technology.

OptTek has also sold a commercial license to CH2Mhill, generating revenues of approximately \$200K to integrate OptForce™ into their business strategic planning process. OptTek also has developed pilot implementations at the Catholic Health Initiatives and the US Navy’s OPNAV/N14.

OptTek Systems, Inc.

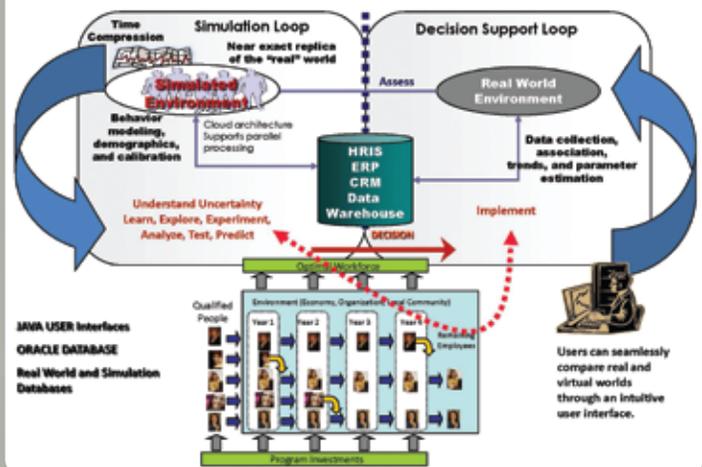


Boulder, CO
www.opttek.com

U.S. Army Research Laboratory



OptForce™ Strength Planning Technology



CHEMICAL BIOLOGICAL PERIMETER SURVEILLANCE

Improvised Explosive Devices (IEDs), buried anti-tank mines, and off-route mines are major threats for our deployed Soldiers. The use of radios, remote control, and mobile devices can assist insurgent groups and other forces by giving them the capability to harm soldiers from a distance without personal risk. Planning Systems, Inc. has patented the Maverick system, an Improvised Explosive Device (IED) detection device. The Maverick inspection can identify buried landmines by generating three-dimensional (3-D), real-time mine images using Ground Penetrating Radar (GPR). GPR is a geophysical technique that uses radar patterns to image below ground. The system can detect both metallic and plastic under the surface objects from the air and ground, over large areas rapidly from a standoff distance. This method does not use radiation for examination; instead it transmits radio signals into the ground with less power than a mobile phone. It images and processes a 20-meter wide field up to 30-meters forward of the array. This technology will provide better accuracy of detection and improve the overall performance of the GPRs.

TECHNOLOGY TRANSITION

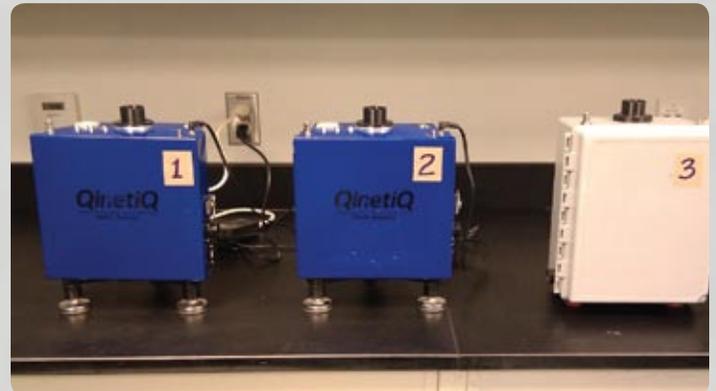
The Maverick system also performs these scans to discover private utilities, support engineering and geophysical studies, and non-destructively locate burial sites. Some of the other applications for GPR can be used for detection in concrete for bridges, retaining walls, elevator shafts, air ducts, and laboratories. Planning Systems, Inc. received multiple SBIR Phase III contracts with a total ceiling of approximately \$15M and has also obtained another \$6M in investments and sales in support of this technology.

QinetiQ North America



McLean, VA
www.qinetiq-na.com

U.S. Army Edgewood Chemical Biological Center



DARWIN - RAPID SOFTWARE INTEGRATION AND TEST

The Army is building highly complex information systems leveraging state-of-the-art computer language, software architectures, and new networking paradigms to achieve more transparent computing and software intensive systems capabilities. The complexity of these systems is challenging traditional testing methods, processes and technologies which have not kept abreast with the software they are designed to test. Compounding these challenges is that the existing test model has proven to be too expensive to convert manual test procedures to automated tests. In addition, current test automation technologies build test architectures which are tightly coupled to the physical source code and data model which results in frequent break downs of the tests, causing unplanned cost and schedule delays.

The Darwin technology developed by ProServices can build flexible test architectures and provide technology to define and describe the various test dimensions within a framework that can be leveraged against the system's source code and data models. It also incorporates algorithms which are applied to generate test frameworks. These algorithms are used to vary the data models, sequence and other relationship dimensions to achieve an unprecedented flexibility and variability that can be auto constructed. Darwin reverses the current economic model of automated testing by giving a mechanism to re-factor thousands of automated tests into one Darwin test framework. This re-factoring allows the program to create orders of magnitudes of tests for the same cost as current processes, as well as obtaining a flexible test model abstracted from the code reducing the costs of rework due to breakage. Using Darwin, unit tests can be constructed to become a key component during the integration testing enabling organizations to recoup and leverage the investments made early in the development lifecycle.

TECHNOLOGY TRANSITION

ProServices has received a \$1M Phase III contract award from Lockheed Martin and a \$500K contract from the Program Manager, Distributed Common Ground System-Army (PM DCGS-A). The Program Executive Office Intelligence Electronic Warfare & Sensors (PEO IEW&S) and Program Executive Office for Simulation, Training & Instrumentation (PEO STRI) have shown interest in Darwin and its capabilities.

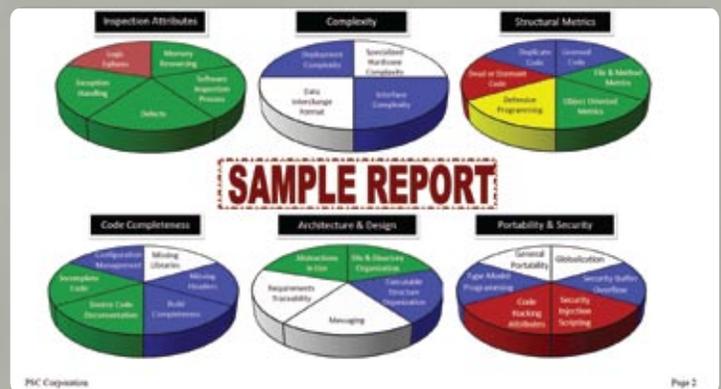
proServices Corporation



Trenton, NJ

www.proservicescorp.com

*Program Executive Office Intelligence,
Electronic Warfare and Sensors*



AUTOMATED WINGMAN

Modeling and Simulation (M&S) play a major role in the development of new technologies for military and civilian applications. The Army uses M&S to improve effectiveness and efficiency in developing tactics, techniques, and procedures, while also reducing the manpower required and training expenses. Synthetic intelligent behavior models that simulate the behavior of Army wingmen can increase flexibility in training fixed-wing (FWA) and rotary-wing (RWA) aircraft pilots in team training, force integration, radio protocol, and coordinated tactics training. A major shortcoming in the virtual environment is the lack of simulators to populate M&S environments. This problem can be alleviated by computer-generated entities, but these entities often lack adequately human-like behavior, making the environment less realistic which leads to ineffective training and evaluations. This SBIR project addresses this problem by presenting a computer-generated entity called the Automated Wingman (AutoWingman). AutoWingman is an entity control system that uses artificial intelligence and knowledge to implement a behavior system that provides a simulated wingman for a human pilot in a virtual cockpit. AutoWingman encodes the behavior of human pilots into a computational form that generates doctrinally correct behavior.

Soar Technology developed the core rotary-wing pilot behavior model and integrated it into existing simulation environments such as Mak Technologies' VR-Forces and the Joint Semi-Automated Forces. AutoWingman is able to fly air assault, direct attack, search-and-rescue, and CAS missions and can fly any role in a mission, including the lead. AutoWingman accomplishes its missions by integrating a wide variety of intelligent capabilities, including real-time hierarchical execution of complex goals and plans, communication and coordination with humans and simulated entities, and the ability to accept and respond to verbal orders while in flight.

TECHNOLOGY TRANSITION

To date, SoarTech has received \$3.3M in Phase III contracts from the US Army Tank-automotive and Armaments Command (TACOM). The technology components developed in this effort has been applied in a variety of systems and domains including joint tactical air controller (JTAC) training, pilot training, airspace management, air traffic control training, course-of-action planning, and most recently multi-modal robotic control. Besides military applications, this technology can be used in civilian aviation training and testing.

Soar Technology, Inc.



Ann Arbor, MI
www.soartech.com

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



HIGH PERFORMANCE TRANSPARENT ARMOR

Deployed U.S. forces have an urgent and immediate requirement for lightweight transparent armor with improved ballistic protection capabilities against emerging threats. Polycarbonate (PC) materials have been the standard for Soldier face and eye protection for decades; however, polycarbonate does not provide sufficient protection to counter the current threat.

Frontier Performance Polymers (FPP) developed an innovative lightweight, high-performance, transparent armor by upgrading ballistic performance, while also retaining excellent optical properties and reducing weight. The advanced transparent armor material was developed based on uni-directionally oriented polypropylene (UOPP) film lamination technology. This super high strength UOPP laminate exhibits as much as 100 percent greater ballistic impact resistance over conventional transparent armor materials, such as polycarbonate (PC) and polymethylmethacrylate (PMMA). Moreover, the density of UOPP is 25 percent lower than PC or PMMA. The technical success of this project has led to an advanced transparent armor technology that delivers lighter weight, better optical properties, higher ballistic resistance and lower cost products.

FPP expects to enter into agreements with manufacturers with established transparent armor product lines to commercialize their transparent armor technology. Initial technology transition is targeting ½" Cupola Protective Ensemble (CPE) (VBS450) face shield as well as ¼" and 3/8" curved, non-ballistic face shields, such as those used in countermine and riot control. More importantly, UOPP technology can be transitioned to any current high threat protective face shield system, such as Advanced Bomb Suit (ABS) Explosive Ordnance Disposal Personal Protective Equipment (EOD PPE). FPP was recently awarded another SBIR Phase II at Natick Soldier Research, Development and Engineering Center directly related to this current effort to assist with the development of the thicker ballistic face shield for the Advanced Bomb Suit.

TECHNOLOGY TRANSITION

To date, this project has received \$1.7M in resources from the Commercialization Pilot Program, Natick Soldier Research, Development and Engineering Center, Program Manager Soldier Protective Equipment (PM SPE), and the Helmet Reset Program to further develop the technology.

Frontier Performance Polymers Corporation



Dover, NJ
www.frontierpolymer.com

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



BIOMIMETRIC CONTROLS OF MICRO AERIAL VEHICLES

Micro Aerial Vehicles (MAV) have shown great potential to provide real time situational awareness in close quarters for our deployed Soldiers. Obstacle avoidance and maintaining course are serious issues as micro machines become smaller and smaller with the corresponding potential to be destroyed or taken off course in one encounter with the smallest obstacle or lightest environmental forces. PSI has developed what is believed to be one of the smallest fully functional MAV (InstantEye) equipped with an innovative insect inspired “reflexive” controller or autopilot which provides the necessary control to allow recovery from upsets due to collisions or environmental disturbances. Due to its small size, power consumption and cost, these MAVs can be carried and used by individual Soldiers, capabilities that are unavailable today. Missions that InstantEye can support include: Explosive Ordnance Detachments support; window and door clearance; roof and overpass clearance; around the corner or down the street reconnaissance; culvert clearance; Nuclear, Biological, Chemical and Weapons of Mass Destruction zone reconnaissance, Improvised Explosive Devices reconnaissance; and disaster search and rescue. At a target price of \$300 per MAV it is truly expendable; and at 19cm and 200 grams it is inaudible and visually indistinguishable at 50 feet standoff distance.

To enhance situational awareness, InstantEye is launched by a soldier and directed to position where its onboard video cameras can view the target area. Rather than soldiers flying the vehicle in the conventional sense, they will direct the vehicle using a game-like hand-held controller. Once positioned Instant Eye requires no further input from the operator and will remain in position until repositioned, recalled or discarded.

TECHNOLOGY TRANSITION

PSI has received approximately \$925K in Phase II Enhancement funds matched by approximately \$1M Phase III from the Office of the Secretary of Defense Rapid Reaction Technology Office and the Combatting Terrorism Technical Support Office. PSI has also invested in early InstantEye prototype development to guide and focus the effort toward the Army’s identified critical mission. Prototypes are scheduled for delivery to customers for in-theater evaluation.

Physical Sciences, Inc.



Andover, MA
www.psicorp.com

U.S. Army Research Laboratory



RADIO TRANSCEIVERS DETECTION

The pervasive use of smartphones and other communication devices with photographic capability causes significant information and physical security risks in and around sensitive facilities. The ever present push for smaller devices complicates the efforts of physical security organizations to determine if personnel entering a facility have one or more devices in their possession. Nonetheless, wireless devices will continue to grow in number and shrink in size. Therefore, the Army has the need to develop radio transceivers with short-range detection capabilities to combat these risks in support of physical security measures. Vadum utilized its extensive experience with active detection technology and target device construction and characteristics to maximize project success in the SBIR program. Vadum developed an active detection technique that extracts a unique signature from the devices reducing false alarms and has been shown to effectively detect all types of transceivers tested. This technique utilizes inherent properties of the electronic circuitry in the target devices, detection of devices can occur regardless of the power state (on/off) or whether the devices are actively transmitting or receiving intended signals.

This capability will provide improved protection at secure sites and restricted areas where the presence of a communications link represents a severe threat to information and physical security. Comparable profits apply to commercial uses of this equipment in the area of security and information protection. With a development path to man-portable units, the active detection technology may find use in mobile RF transceiver detection for short-range device location applications in: intelligence, non-line-of-sight (non-LOS) personnel tracking, and wireless communications situational responsiveness.

TECHNOLOGY TRANSITION



The Navy Explosive Ordnance Technology Division (NAVEODTECHDIV), a field activity of the Naval Sea Systems Command (NAVSEA) invested \$3M in Phase III funds in this technology. The Joint Improvised Explosive Device Defeat Organization has invested approximately \$1.5M in Vadum towards an outdoor detection program focused on a variety of wireless remote control devices.

Vadum, Inc.



Raleigh, NC
www.vaduminc.com

U.S. Army Research Laboratory



MODELING THERMAL BATTERIES

Today's advanced gun-fired munitions require power sources with increased power and energy densities, but are contained in smaller packages. Munitions power sources typically must operate over a wide temperature range (generally -45 to 145°F), withstand prolonged storage (10-20 years), and survive the harsh environment of a ballistic launch. Munition power sources are designed to be inert prior to deployment, which promotes long shelf life and enhances safety and reliability of the system. A limited ability exists among battery vendors to perform design through Modeling and Simulation (M&S). Comprehensive thermo-chemistry modeling is necessary to balance performance with heat management. It is the "heat balance" which controls the internal response rate of the active materials, and allows performance to be elevated for the broad operational temperature range for weapons. While thermal batteries offer designers several key advantages, the design and integration of this technology into new applications suffers from two significant impediments; the lack of suitable design tools, and the time and large expense necessary to qualify a new battery design through testing. Both of these factors cause significant lead-time and cost impacts.

Erigo Technologies completed a comprehensive computer model for thermal batteries and developed the required input property data. A prototype of this code was developed that provides capabilities that are available in no other modeling package. This prototype was subsequently generalized so that it can handle most battery chemistries without rewriting the code. Through this successful SBIR project, Erigo Technologies developed the technology to provide detailed mechanical, chemical and thermal simulation of thermal batteries. Using these simulations, thermal batteries can be designed to be longer lasting, more effective, and smaller by innovative thermal management techniques and electrochemical designs.

TECHNOLOGY TRANSITION



Erigo Technologies has tested the overall approach for the structural modeling by performing a shaker table test at the battery manufacturer, Eagle-Picher, on a battery selected specifically to enable clear observation of internal vibratory modes of the pellet stack. Integrated thermal and electrochemical analyses of a number of existing and proposed thermal battery designs have also been conducted by Erigo and EP. They have received a \$1.5M Phase III contract from the Joint Munitions and Lethality Life Cycle Management Command and \$375K in commercial investments and sales.

Erigo Technologies LLC



Enfield, NH
www.erigo.com

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



SENSING HUMAN INTENT

To prevent possible threats and to increase situational awareness, the Army requires an advanced sensor system for remote detection of stress in humans, specifically for the purpose of identifying individuals with potentially destructive motives without physical searches in public surroundings. The ultimate goal of this SBIR project is to develop a remote operational system that can characterize human intent in uncooperative environments in real-time. A comprehensive study was conducted to determine the most effective approach for utilizing spectral imaging to improve the accuracy and veracity of non-contact intent analysis based on physiological signatures associated with stress, fear, deception, and other human emotions. The research findings culminated in a design and concept for a prototype biometric imaging system to be built to a fully commercialized system for applications in security screening, perimeter monitoring, interrogation, lie detection, and other similar Department of Defense and civilian law enforcement applications.

For this project, Opto-Knowledge Systems, Inc. (OKSI) collaborated with a leading research group that has scientific insight and proven techniques in psycho-physiological characterization and stress analysis. The combined expertise of the team enabled an efficient and effective determination of appropriate technology from both practical and scientific perspectives. OKSI develops systems that combine imaging and spectroscopy, including the mechanical assembly, electronics, optics, computer interface and acquisition, and algorithms for signal and data processing. OKSI's Four-Dimensional Imaging Spectrometer (4DIS) system has the ability to provide real-time data processing which offers a new and enhanced capability over present sensors. The Army will benefit immensely through the number of lives saved due to prior identification at checkpoints of suicide bombers, gunmen, or any other intentions of dangerous behaviors.

TECHNOLOGY TRANSITION

The Army Communications-Electronics Research, Development and Engineering Center (CERDEC) and Armament Research, Development and Engineering Center (ARDEC) have expressed an interest in this technology. Once fully developed, this technology will be used by force protection, homeland security, agencies with checkpoint/screening and/or interrogation applications.

Opto-Knowledge Systems, Inc.



Torrance, CA
www.oksi.com

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



LOW COST GROUND GUIDANCE

Force protection dictates that our Soldiers have a low cost, easily deployable navigation systems that can perform real-time route planning, provide threat assessments during movement, and enable Blue Force Tracking for relevant friendly forces location. Soldiers need to be able to gain and sustain situational awareness and generate multiple safe routes to support both routine movements and emergency situations. They should also be able to use “hot buttons” to compute safe routes back to the base and support ongoing missions and rescue operations. The current capability objective is to leverage existing route planning technology found in commercial automobile navigation systems, but to provide enhancements for alternative multiple routes based on real-time threat information, known hazards, and user input to support route updates. The system should advise Soldiers to use different safe routes selected randomly to avoid complacency in convoy operations.

Current plans are for the next generation map display system to feature a fully functional real-time route planning capability for tactical and logistic vehicles in urban and suburban terrain. Under this SBIR project, Primordial developed a software application (Ground Guidance®) that displays maps and navigation utilities for ground vehicles and specializes in generating fast and concealed routes through all terrain, both on and off roads. This software application can be used by dismounted Soldiers for real-time routing capabilities and more precise Blue Force Tracking. The outcome of this SBIR project is ground guidance system enhancements capable of integrating with existing and future systems, allowing Soldiers to easily plan safe routes based on real-time information and generating safe emergency routes at any time. The software can integrate with existing systems, such as the Army Land Warrior System, Movement Tracking System (MTS), and Command and Control Mobile Intelligent Net-Centric Software (C2MINCS).

TECHNOLOGY TRANSITION

Primordial has received \$2M in Phase III resources from the Communications-Electronics Command (CECOM), Army Geospatial Center, Adventium, Oshkosh, and General Dynamics. They are working to extend the capabilities of Ground Guidance® to other Army programs by integrating the core functionality with these existing programs. Primordial has several customers interested in advancing Ground Guidance® technology including Magellan, Rockwell Collins, General Dynamics C4 Systems, and Concurrent Technologies Corporation (CTC).

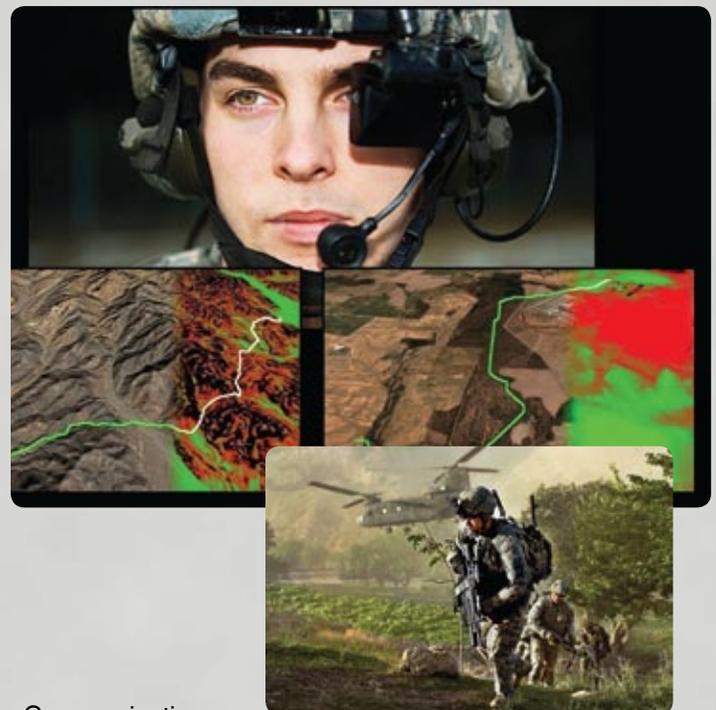
Primordial, Inc.



PRIMORDIAL

Saint Paul, MN
www.primordial.com

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



INTERMODAL SHIPPING CONTAINER

Because the Army relies heavily on petroleum-based fuel for all its operations, a strategic imperative is to reduce the demand for energy in military operations, improve the efficiency of military energy use in order to enhance combat effectiveness and force protection, and to reduce costs. Advanced intermodal modular packaging techniques will improve logistics by reducing retrograde, waste, and storage requirements and eliminate the current blocking of containers which is very time consuming.

In this SBIR project, Triton Systems is leveraging the key features of the Joint Modular Intermodal Container (JMIC) program to contribute to improved logistics support. Triton designed and fabricated JMIC – Ultralight, a low cost, lightweight, fuel saving version of the JMIC with enhanced capability for in-transit asset tracking and environmental monitoring. JMIC – Ultralight is easy to assemble, stackable, man portable, has a 1500 pound payload, weighs 55 percent less than the current legacy JMIC, and has the ability to interface with the standard 463L pallet. The standard 463L pallet has a capacity of 10,000 pounds, but typically much less can be shipped because the present “lump and net” system is very inefficient. This technology has the ability to double stack and its modular nature allows up to 8 containers per 463L pallet. The lightweight nature of the JMIC-UltraLight enables the full 10,000 pounds per 463L pallet; minimizes container weight; and, maximizes air cargo utilization up to 100 percent of capacity. This translates to potentially saving as many as 80 percent of supply missions, saving millions of gallons of fuel and dramatically reducing costs. The system withstands the harsh marine environment underway and enables the safe delivery of food, medicines, and ordinance to its final destination.

TECHNOLOGY TRANSITION

\$140K has been provided by the Army to produce prototype JMIC-UltraLights to test them against MIL-STD 3028 which establishes design guidelines and associated tests. Triton is building a series of operational test units for the Army Product Manager Force Sustainment Systems (PM-FSS), Marine Corps Program Manager Expeditionary Power Systems, (USMC PM EPS), and the Telemedicine and Advanced Technology Research Center (TATRC) for Joint Medical Logistics.

Triton Systems, Inc.



Chelmsford, MA
www.tritonsystems.com

U.S. Army Research Laboratory



INFRARED HYPERSCOPE FOR ARMAMENTS

Our deployed Soldiers need smaller, lighter, and more capable imaging sensors than what is currently available for better situational awareness and to be able to effectively respond to a much more sophisticated threat. Under the SBIR Program, Surface Optics Corporation developed a prototype hyperspectral scope (“HyperScope”) based upon a novel non-scanning 3-D hyperspectral detector. The system builds upon Surface Optics’ real-time hyperspectral imaging technology and recently-developed hyperspectral imaging techniques to generate a compact scope that includes real-time overlay of identified objects of interest. Wavelength coverage extends from the visible through short wavelength infrared to provide passive day/night operation. The HyperScope collects, analyzes, and displays hyperspectral images of at least 32 spectral bands and displays the results on integrated displays. This technology can also be used in analysis, quality control and more in depth detection efforts.

Compared to other hyperspectral imagers, the HyperScope is relatively inexpensive to produce, operates at video rate and is compact. Integral to the system is a real-time processor, initially implemented using Surface Optics Corp’s current processing technology that analyzes the spectral content to find and mark targets at video frame rates, but with a path to migration to recent advances in multi-core Digital Signal Processors. By making hyper-spectral sensors handheld, rugged, and inexpensive; production of the HyperScope will enhance the capabilities of the Army to recognize, track, and mark threats and will increase the Army’s ability to extract information from a scene that is unavailable with current tactical imaging systems. Further commercialization will vastly improve our Soldier’s ability to detect highly camouflaged threats with a day or night capability.

TECHNOLOGY TRANSITION

This SBIR project produced a HyperScope of unsurpassed capability, with varied military and commercial applications and will be transitioned to both commercial and military markets. The HyperScope’s Size, Weight, and Power (SWaP) is appropriate for use as military optical scopes for rifles and for use on Unmanned Air and Ground Vehicles. The Company has Phase III contracts with the Naval Air Systems Command (NAVAIR) in the amount of \$1.5M for development of an Unmanned Aerial Vehicle (UAV) Real-time Hyperspectral Targeting Systems and with Johns Hopkins University in the amount of \$190K for the expansion of the visible and near-infrared, (VNIR) 3-D hyperspectral Video Rate Camera.

Surface Optics Corporation



San Diego, CA

www.surfaceoptics.com

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





STTR

Small Business
Technology Transfer

EBOARD™ - POWER DISTRIBUTION AND CONTROL

Security and robustness of future power networks will be improved by controlling access and minimizing points of vulnerability. This Small Business Technology Transfer (STTR) program has worked toward these objectives by developing microgrid control technology that has the following capabilities: access control to prevent unauthorized use; distributed intelligent control to achieve local area efficiency and to prevent single point of control vulnerability; multi-tier load control down to the device level to allow control of assets according to mission priorities; plug and play of diverse generation assets; and, fast-acting frequency based control to maintain system stability.

Odysian Technology developed a power distribution and control technology called eBoard™. To improve user access to electrical power, this innovative technology replaces discrete electrical outlets with a wall mounted power track system that allows plug-in along its entire length. Adapters are used that allow plug-in of conventional pronged plugs into the power track system. More advanced versions of eBoard™ have been developed under this program that provides for intelligent load control at the device and power track levels using microprocessor based power control modules, smart load adapters, and a wireless mesh power control network.

The eBoard™ power track system has advantages over conventional wire and outlet configurations including improved access to power along its entire length, improved ease of installation and removal, and ease of restricting access through use of a controlled unique interface.

TECHNOLOGY TRANSITION

Demonstration of the STTR smart eBoard™ system to Natick Soldier Research, Development and Engineering Center (NSRDEC) resulted in a contract to develop a derivative of the smart eBoard™ system capable of phase balancing within military tactical shelters. A more conventional cable-box design was later developed for use in soft walled shelters. This cable-box version, which is named the PACAS™ (Power Access and Control for Army Shelters), has been developed using production processes and commercial-off-the-shelf (COTS) components. Computer controlled circuit breaker panels provide circuit protection and networked control of multiple microprocessor controlled receptacles that are connected in series on each circuit. NSRDEC plans to send the PACAS™ System to the Army Medical Command for test and evaluation. Approximately \$800K in Phase III funds have been used to develop the eBoard™ and PACAS™ shelter phase balancing systems.

**Odysian
Technology**



South Bend, IN
www.odysian.com

U.S. Army Engineer Research and Development Center



**US Army Corps
of Engineers®**
Engineer Research
and Development Center

eBoard™ Power Track



NON-INVASIVE TRAUMATIC BRAIN INJURY MONITOR

Currently, one in every four combat casualties is due to head injuries. Traumatic Brain Injury (TBI) resulting from these injuries is a major cause of cognitive deficits, as well as a series of physiological and psychological disorders that can result in impaired memory, judgment, and perception. Closed head injuries are a major concern because they are difficult to detect and early detection is necessary to improve the treatment and therapy of injured Soldiers. Rapid assessment of injury severity, as well as non-invasive continuous monitoring of brain physiology after the occurrence is expected to have a positive impact on selection of treatment strategies and improved outcomes among TBI patients.

The current brain physiology monitoring methods are either invasive or not suitable for continuous monitoring. A noninvasive device suitable for long-term continuous monitoring of physiologic changes in the brain after injury would be highly beneficial to patient management and therapy outcomes. To address this need, a prototype TBI monitor utilizing time domain near-infrared spectroscopy (TDNIRS) was developed by Physical Sciences, Inc. in collaboration with the Massachusetts General Hospital. TDNIRS is an optical technique that allows for noninvasive determination of tissue blood perfusion and oxygenation in vivo. By directing near-infrared pulsed light into the scalp and collecting the diffusely scattered light, a map of the optical absorption properties of the brain can be retrieved from the changes in light pulse profile. Near-infrared measurements are particularly sensitive to changes in blood flow, volume, and tissue oxygenation which, using sophisticated software algorithms, are then used to process this data and display it in real-time using a graphical user interface. The TDNIRS instrument offers real-time feedback and can be used to monitor therapy results. The advantage of this technology over radiological approaches is continuous bedside monitoring at negligible costs, which is not possible with either CT or MR imaging.

TECHNOLOGY TRANSITION

Physical Sciences developed the TDNIRS prototype and tested it on TBI, subarachnoid hemorrhage, and stroke patients. Findings were correlated with CT/MR images, as well as with patient's heart rate, blood pressure, respiration rate, and intracranial pressure. A good correlation was found in most of the patients which demonstrated the feasibility of this technology for neurointensive care patient monitoring. PSI has also received a Congressionally Directed Medical Research Program award of \$560K to further test this technology in TBI, subarachnoid hemorrhage, and stroke patients. If this study confirms suitability, Physical Sciences will seek additional funding to make it more portable and perform multisite clinical testing. This technology could be used in the neurointensive care units, for patient monitoring after injury, or a more portable version could be used in the field hospitals for patient triage.

Physical Sciences, Inc.



Andover, MA
www.psicorp.com

U.S. Army Medical Research and Materiel Command



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 Washington, DC. 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, Contracting Official, and Project Technical Monitor.

The Achievement Awards Program is competitive. This year, 613 projects were eligible to compete of which 37 nominations were forwarded to the Selection Committee. Ten projects were selected that represent the best in small business research and development.

ACHIEVEMENT AWARDS

Following are the 2012 Achievement Awardees:

- Advanced Circulatory Systems
- Luna Innovations, Inc.
- Migma Systems, Inc.
- Radiance Technologies, Inc.
- RBC Technologies
- Rothtec
- Soar Technology, Inc.
- Spectrum Research Corporation
- Translume
- UES, Inc.

The following pages contain project descriptions.



The 2011 Achievement Award winners with Dr. Scott Fish, Army Chief Scientist

RESQVENT™ - TREATMENT FOR TRAUMATIC BRAIN INJURY

U.S. Army Medical Research and Materiel Command

Advanced Circulatory Systems is developing a product, the *ResQVent™*, for use on the battlefield and during transport of soldiers with traumatic brain injury (TBI) and/or hypotensive emergencies. The *ResQVent™* is an electronic, portable device that delivers novel Intrathoracic Pressure Regulation (IPR) therapy. IPR therapy non-invasively provides positive pressure ventilation and can lower intrathoracic pressures to sub-atmospheric levels during each expiratory phase. By regulating intrathoracic pressures the device can significantly lower intracranial pressure and enhance venous return to the heart, thus providing a new way to help treat head injury and severe hypotension from blood loss, sepsis, and cardiac arrest. Completion of the *ResQVent™* transport ventilator for IPR therapy and Food and Drug Administration (FDA) device approval are scheduled for completion in 2012. Extensive published animal studies have shown the significant potential of this new therapy to increase blood pressure, increase cerebral perfusion pressure and decrease intracranial pressures. These results have been validated with three Phase I human studies conducted with a FDA-approved, mechanical version of the *ResQVent™*.



Advanced Circulatory Systems

Roseville, MN

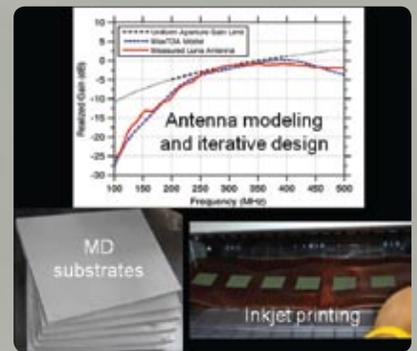
www.advancedcirculatory.com



CONFORMAL AND EMBEDDED ANTENNAS

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

The use of conformal and embedded antennas can significantly reduce the visibility of communication antennas and improve aerodynamic performance for a number of ground and airborne platforms. Despite these advantages, the largest limitation for conventional conformal and embedded antennas is the tradeoff between reducing the profile of the antenna and maintaining antenna performance. To overcome these challenges, Luna Innovations and the Georgia Tech Research Institute have developed high performance antennas through combining specially engineered Magneto-Dielectric (MD) substrate materials, unique antenna designs, and inkjet printing for rapid antenna prototyping techniques. Traditional antennas are often bulky, visibly distinguished, and prone to being damaged or destroyed during operation or transport. This technology being developed will eliminate these problems by enabling the production of low-profile, low-cost and high performance conformal antennas. Conformal/printable antennas are highly desired for a number of ground and airborne platforms that need to reduce their visual signature and improve aerodynamic performance. Luna Innovations has received support from Northrop Grumman who, being a prime military communications systems developer and integrator, will facilitate technology transition.



Luna Innovations, Inc.

Roanoke, VA

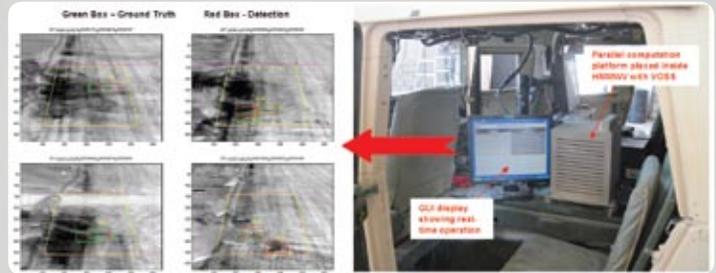
www.lunainnovations.com



INFRARED IED AND LANDMINE DETECTION SYSTEMS

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

Migma Systems, Inc (MSI) developed hardware, software, and algorithms for detection of buried mines and Improvised Explosive Devices (IED) to be integrated into Vehicle Optics Sensor System vehicles that are currently deployed in Theater. Route detection and clearance operator's are hindered by the surveillance operator large workload and fatigue caused mainly by continuous manual observation of multiple sensors. The goal is to be able to automatically detect buried mines and IED in real time during day and night at standoff distances of 150 feet or greater and at speeds of 10-15 miles per hour. Mine and IED signatures are always changing with time and environments and there are numerous natural clutters; therefore, no single or double false alarm mitigators (FAMs) are able to eliminate all false alarms. Migma developed and used a series of independent FAMs based on numerous features including target shapes, sizes, and entropy and performed fusion of FAMs to reduce false alarms. A prototype platform was designed, built and tested for stability in stressed environments and the complete system was field-validated for real-time IED and mine detection.



Migma Systems, Inc.
Walpole, MA
www.migmasys.com



POWER CONDITIONING FOR EXPLOSIVE PULSED POWER

U.S. Army Space and Missile Defense Command/Army Forces Strategic Command

Radiance Technologies, Inc. has developed a unique technology for converting energy from explosives or other sources into Radio Frequency energy for applications in Electromagnetic Pulse Warheads (EMP), Improvised Explosive Device (IED) detection and defeat, and for stopping hostile vehicle or vessels with little or no collateral damage. The technology consists of unique switches, intermediate energy storage elements, voltage transformation systems, and high voltage insulating techniques, all aimed at low cost, small volume and mass configurations. Current prototypes have functioned for hundreds of tests without failure at Military testing facilities. RF munitions are being developed and tested that may also result in substantial sales in sizes ranging from small rockets to large warheads. This technology will transition to many advanced applications currently under consideration by the Program Executive Office Ammunition, Joint Non-Lethal Weapons Directorate, Program Executive Office Missiles and the Joint Improvised Explosive Device Defeat Organization. Temporary or permanently installed low cost, vehicle disablement systems are near term practical applications to pressing Army, homeland security, and border patrol urgent needs.



Radiance Technologies, Inc.
College Station, TX
www.rbctx.com



SELF-CONTAINED AIR ACTIVATED RATION HEATER

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

The ability for deployed Soldiers in austere environments to heat rations safely and easily is integral to successful sustainment, morale, and mission accomplishment. Present technology requires adding critical drinking water to activate the heater and generates significant amounts of hydrogen gas when heating. RBC Technologies developed a self-contained air-activated ration heater for use with Meal, Ready-to-Eat™ (MRE) rations. Using its extensive technical background in energy storage and delivery electrochemistry, RBC developed a low-cost and scalable alternative to the incumbent ration heater based on zinc-air battery technology. While not typically regarded as a fuel, the air oxidation of zinc can produce enormous amounts of energy per unit mass. The development also encompassed a comprehensive investigation for compliance with all safety and health regulations during operation, transportation, storage, and disposal of the reactants and packaging. This technology can be used in situations that do not readily permit the use of a powered heating source and represents a significant advance in portable heater technology with widespread use in both private sector and military markets.



RBC Technologies
College Station, TX
www.rbctx.com



DIGITAL PRINTING WITH NEAR INFRARED REFLECTANCE PROPERTIES

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

Rothtec's efforts have been focused on new innovations in the digital ink jet printing process to print military textiles with near-infrared camouflage patterns and at the same time meet the strict uniform field use performance requirements. The research efforts have resulted in the development of innovative processes in the use of digital inkjet print software, firmware, and hardware resulting in new technology that has the capability to significantly reduce the time to field combat uniforms with new camouflage designs, making site-specific camouflage clothing and equipment an operational reality. This new technology enhances concealment for Soldiers in the visual, near and enhanced infrared range, reducing the threat level and enhancing force protection. The developed technology is capable of printing military textiles that are difficult or impossible to print with the current wet printing technology. Rothtec has demonstrated that the technology is highly suitable for cost effectively printing challenging fabrics, such as loop, or high value fabrics required in small volumes, such as stretch woven fabrics. Commercialization potential includes the U.S. Military, other friendly foreign militaries, tactical, law enforcement and hunting markets and uniforms with this new technology are currently being used by Special Operations Soldiers in theater.

Rothtec Digital Ink Jet Printing Technology Enhances Soldier Concealment



Rothtec
New Bedford, MA
www.rothtec.com



TIGER BOARD - AIR TRAFFIC CONTROL SIMULATION

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

Modeling and simulation is a low-cost and effective substitute to live Air-Traffic Control (ATC) exercises, replacing human role-players with computer-generated forces (CGFs). Soar Technology has designed the *Tiger Board* - an intuitive, domain-centric interface to compose synthetic air traffic for ATC exercises. Using *Tiger Board*, scenario developers and operators who have limited or no experience with programming or behavior modeling will be able to easily compose, debug, and control simulated aircraft CGFs for a variety of airspace management training objectives. This innovative approach to scenario authoring and real-time control of computer-generated forces (CGF) provides trainers the ability to generate training for student air-traffic controllers without any requirement for live aircraft or simulation operators. SoarTech's novel approach to scenario authoring and real-time control of CGFs use doctrinal speech commands already familiar to the target audience. By combining a compatible user-interface design with an embedded real-time controller, CGFs composed using the *Tiger Board* can be controlled using doctrinal ATC commands delivered via speech.



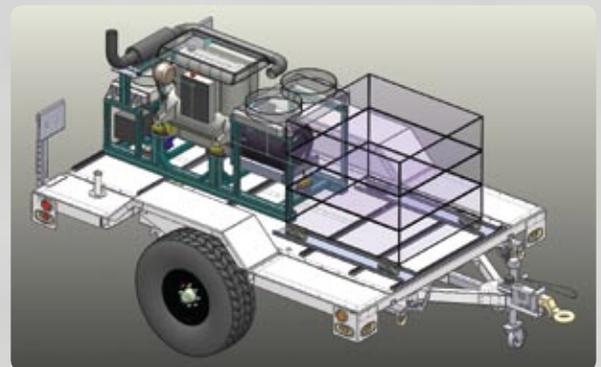
Soar Technology, Inc.
Ann Arbor, MI
www.soartech.com



TOWABLE 100 KW POWER UNIT

Program Executive Office Command, Control and Communications Tactical

Spectrum Research has developed a prototype 100 kW Tactical Quiet Generator (TQG) that can be towed behind a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV). Innovations include: a) hybrid electric architecture, b) energy storage subsystem which provides for uninterrupted power, c) intelligent variable engine speed controls, and d) the inherent capability to parallel multiple systems to form a grid with no third party controls. In contrast to a conventional generator set that continually runs at full speed, this technology will contain a hybrid electronic structure so that the speed of the engine is constantly varied to match the applied load. Spectrum Research's prototype compared to conventional single-speed TQGs, results in a 20 percent reduction in fuel consumption. Soldiers will immediately notice less fatigue due to the reduced acoustic signature especially at partial power settings. In addition, the reduced fuel consumption will not only reduce operational costs, but will also translate to fewer soldier casualties associated with fuel runs. Commercial applications include marine, construction, and ultra-quiet standby generator sets.



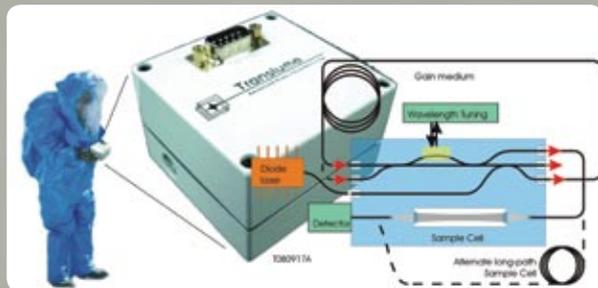
Spectrum Research Corporation
Albany, NY
www.generators.com



LASER SPECTROMETER FOR TOXIC CHEMICAL DETECTION

U.S. Army Edgewood Chemical Biological Center

Translume is developing a small, robust, field-compatible, infrared laser spectrometer for ultra-sensitive chemical detection to replace current infrared spectrometers, which are large and expensive. Current technology size, weight, fragility and power requirements have severely limited their utility in the field. Their new spectrometer uses as its primary optical source a novel highly integrated tunable hybrid fiber-waveguide laser that is extremely robust even in demanding field environments. This novel optical source opens up the path to design robust, simple, inexpensive spectrometers for chemicals characterization, including toxic chemicals harmful to Soldiers. The finished product will convert optical measurements into meaningful spectral identification of targeted chemicals. This technology has the potential to greatly improve micromanufacturing of miniaturized optics and optical devices and can be incorporated into the next generation of chemical and biological sensors to provide early warning of an attack. A sensor based on spectroscopy can be very rugged and reliable, does not require consumables, and can operate for an extended period of time unattended. This product is of interest to numerous parties including the Army, Department of Defense, civilian first responders and the chemical manufacturing industry.



Translume
Ann Arbor, MI
www.translume.com



NANO-SENSOR BIOAGENT DETECTION

U.S. Army Engineer Research and Development Center

UES, Inc. developed *SilverHAWQ™* (Silver film-based Human-portable Air and Water Quality), a nano sensor-based system that is modular, can be modified to detect many biological targets and has long-term stability when deployed. UES identified robust ligands against targets of interest using combinatorial libraries. The ligands are designed to be stable at room temperature for months or even years, adding significantly to the longevity of the fielded system. The sensors can be adapted to a broad range of targets of interest, and the straight forward technology allows the sensor to be utilized with limited training. Soldiers know within minutes if water or air sources are contaminated versus taking samples to a laboratory from a forward operating position. Additionally, the sensor enhances output signals when the target is detected, increasing the signal-to-noise ratio several fold for better sensitivity. The flexible system allows components to be added or removed, and for integration of additional sensors.



UES, Inc.
Dayton, OH
www.ues.com



US Army Corps of Engineers
Engineer Research and Development Center

OUTREACH AND SOURCES OF INFORMATION

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

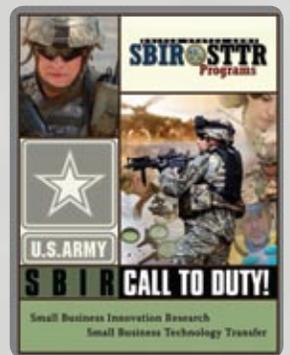
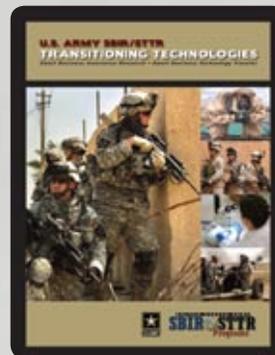
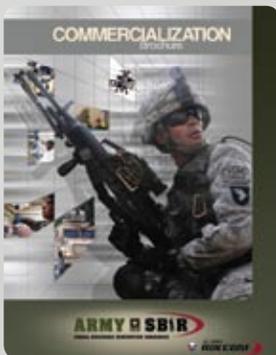


The Army SBIR/STTR Programs conduct an aggressive outreach program to increase small business awareness of broad opportunities provided by the Army. Army SBIR/STTR personnel participate in national, regional, and local conferences across the country. This provides small businesses with face-to-face contact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

General SBIR/STTR information

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

Past Commercialization Brochures





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Photos courtesy of the U.S. Army, www.defense.gov and dams.defenseimagery.mil

