DEPARTMENT OF THE NAVY SBIR/STTR SUCCESS STORIES

Small Business Innovation Research/
Small Business Technology Transfer








Thanks to all the companies for their participation in this Navy SBIR/STTR Success Story publication.

We appreciate the time and effort it took to compile and share facts, details, and graphics for the stories.

For more information about this publication or additional copies, please contact:

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Letter from the Admiral

As the world continues to become a truly global, connected economy, the ability for ideas and technology to move rapidly around the world increases every day. For the Department of the Navy to continue to field the most technologically capable force, it is critical that we find and use every possible source of innovative thinking available. A critical strength of the United States has always been the innovation and entrepreneurial spirit of individual inventors and small businesses. They have been key partners in developing today's Navy and Marine Corps and will maintain that key role into the future.

The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs allow the Navy to solicit a competition of ideas from U.S. small businesses, to develop technologies that cut cost, streamline production, improve efficiency and effectiveness, and produce superior solutions for many of the Navy's needs. From innovations that speed the rate of knowledge accumulation and transfer, to equipment and products that have never before been commercially available, safer to operate, or more environmentally compatible, small businesses are at the frontline of many of these innovations.

This Navy SBIR/STTR Success Book highlights the achievements of some of these companies and their technology. By creating strong partnerships with businesses, the Navy has already begun the process of transforming itself and its relationship to the battlespace. It is our hope that this publication and the success stories therein will advance the superiority of naval technology and ensure the continued success of the Navy of tomorrow.

William E. Landay III
Rear Admiral, USN
Chief of Naval Research

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The Department of Navy's SBIR/STTR Program

The Navy's SBIR and STTR program is a highly competitive three-phase process that funds research and development (R&D) areas identified by the acquisition community that enhances warfighting capabilities through innovations developed by small businesses.

In 1982, Congress established the Small Business Innovation Research (SBIR) Program in order to provide small businesses with help to facilitate technological innovation and to meet the R&D needs of the Federal government. Since then, the SBIR program has become one of the most effective technology development programs in the government and has earned the respect of those in the scientific, small business, and academic communities across the nation.

The Small Business Technology Transfer Program (STTR) was established in 1992 and is modeled and essentially executed in the same manner as the SBIR Program. The STTR Program is designed for companies to partner with researchers at not-for-profit research institutes, contractor-operated federally-funded R&D centers, or universities. Companies and research partners work as a team to turn ideas into technologies or products for the Naval Fleet.

Both the SBIR and STTR programs involve small businesses with fewer than 500 employees that are engaged in federal R&D. Federal agencies that participate in the SBIR/STTR program report that the program has had a positive impact on their agencies' research program. The program's ability to help advance technology and propel economic growth has been cited in studies by the General Accounting Office and recognized by the Small Business Administration.

In order to increase the likelihood that the Department of Navy realizes a return on its SBIR/STTR investment in the form of products, processes, or services, it established the Transition Assistance Program (TAP). TAP works with Phase II companies to help them conduct preliminary strategic planning and assist with the marketing of their products to Navy and DoD program managers.

Navy SBIR/STTR Three Phase Program

PHASE I determines the scientific and technical merit, the feasibility of the proposed innovation, and the quality of the small business' performance. This phase may also support small scale testing. Base awards have typically been $70,000 with a $30,000 option that may be exercised if the project is selected for continuation into Phase II. The option bridges the gap between Phase I and Phase II awards. Phase I typically lasts six months and the option may extend the effort for an additional three months (see the current solicitation for specific details).

PHASE II continues the Phase I effort and demonstrates the theory by building and testing a prototype. Base awards are typically $450,000 to $1,000,000 and $500,000 for STTR. Awards may include options that can be exercised if the project shows strong Phase III transition potential. Phase II usually lasts 24 months.

PHASE III transitions the technology or product into a DoD application. Production or additional research and development efforts are supported by DoD, the Federal Government, defense prime contractors, or the private sector. The company can receive either government or private sector funds, but no longer receives SBIR/STTR funding.

The success of the Navy's SBIR/STTR program is measured by the companies that transition their concepts into products, tools, or services that benefit the Navy acquisition community. The Navy's program has achieved the highest rate of transitioning technology back to the military of any DoD agency as evidenced by the data collected by DoD and shown in chart 1.

The **companies included in this Navy Success publication** have all reached the Phase III level of the SBIR/STTR program. For each story, we have described:

- The technology developed by the small business
- The military and commercial significance of the technology
- The application of the technology
- Additional information about the company
- A description of the SBIR/STTR investment and follow-on revenues

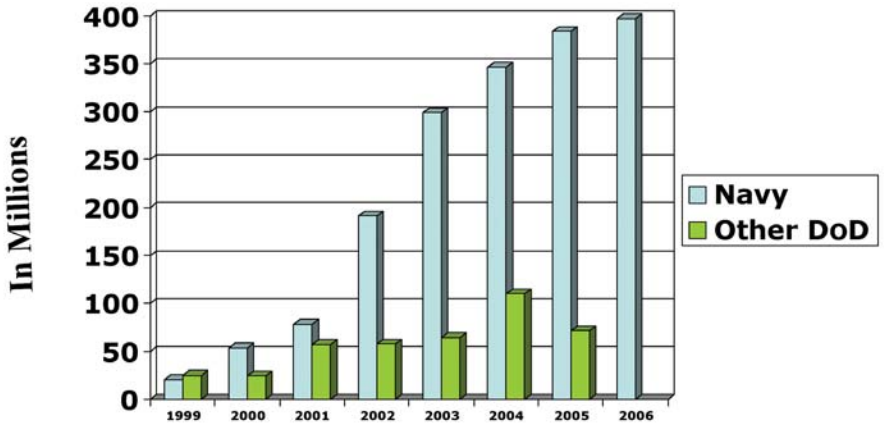
  - **SBIR/STTR INVESTMENT–** the dollar amount the SBIR/STTR program invested in the company to develop the technology

  - **PROJECT REVENUE–** non-SBIR/STTR dollars that were invested in the company for additional research and development or the result of product sales, i.e. Phase III.

If you would like to know more about the SBIR/STTR program, identify the latest technology advances, or participate in the SBIR/STTR solicitation, please visit our website at http://www.onr.navy.mil/sbir or contact one of the Navy program managers listed in the back of this publication.

Chart 1

OSD DD-350 Report Data on DoD Funded Phase III Contracts During FY99-FY06

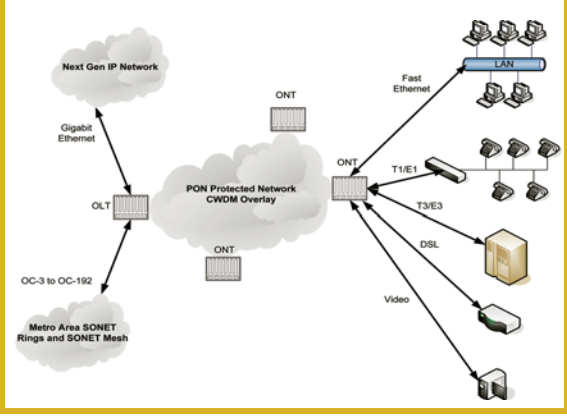


- FY05 DoD Phase III funding was $455M, Navy portion was $383M
- In FY05 Navy received 23% of DoD SBIR $ and obtained 84% of Phase III $
- In FY05 Navy Phase III funding came from 129 individual contracts to 89 individual firms (ATK Missile included)

THE SUCCESS STORIES

3 PHOENIX, INC.

REAL TIME SYNCHRONIZATION AND FUSION TECHNOLOGY



Data Fusion Network Architecture

Topic Number: N04-138
(ONR, NAVSEA/PEO-IWS)

SBIR Investment: $832K
Project Revenue: $8.93M

3 Phoenix, Inc.

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Fairfax, VA 22033
(703) 956-6480
www.3phoenix.com
john.jamieson@3phoenix.com
John Jamieson

About the Technology

3 Phoenix, Inc. (3Pi) developed a low power, open architecture data fusion system designed to address the Navy's need for a technology that provides continuous sonar distribution and allows the merging and aggregation of data from a wide range of sensors while still maintaining close synchronization. 3Pi's iPON (inverted Passive Optical Network) and iPEN (inverted Passive Electrical Network) are passive technologies that greatly reduce the power required to obtain data from disparate sensors. The technology allows time synchronization and data fusion from different sensors, gathers data from a variety of sources and format, and supports bi-directional communications links.

3 Phoenix received funding from Program Executive Office (PEO), Integrated Warfare Systems (IWS) to apply its iPON and iPEN technology to the Periscope Detection Radar (PDR) to enable enhanced detection capabilities for the fleet. The Office of Naval Research and PEO Submarine (SUB) uses the technology in towed array telemetry for submarines, surface ships, and machinery monitoring/damage control sensor applications.

Military and Commercial Significance

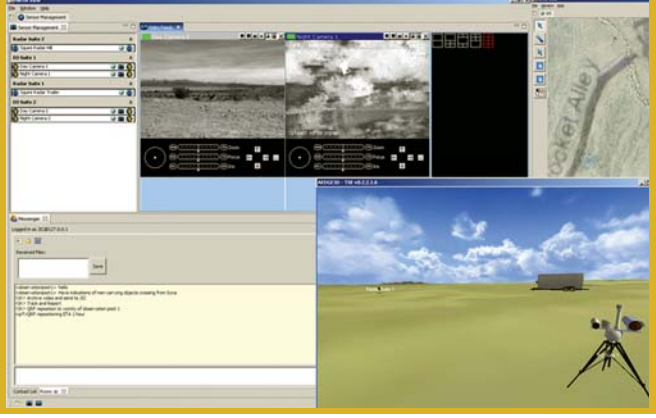
3Pi's iPON and iPEN are based on technology widely adopted by telecommunications and digital cable service providers. The technologies presents cost effective solutions for navy open architecture net-centric warfare system which requires low power, high computational density, network consolidation, and robust communications on existing network resources. iPON and iPEN accept inputs from independent analog, digital or smart sensors, synchronize the data to a common time standard, combine the signals, optionally compress the data, and re-transmit the information to data analysts using a variety of radio frequency channels or internet protocol-based networks.

About the Company

3 Phoenix, Inc (3Pi) provides technology products and services for defense applications. 3Pi's real time synchronization and fusion technology has had a major impact on the company's growth. 3Pi's success with SBIR opportunities, allows the company to develop technology for dual use and provide quality engineering and management services to customers. 3Pi's core competencies include real-time architecture systems and design, passive and active sonar signal processing, telecommunications and embedded design, open architecture computing environment practices, and program and financial management.

APPLICATIONS

- PEO IWS: PDR – Submarine detection
- PEO SUB - Towed array telemetry for submarines and surface ships
- Navy Surface Ships: SONAR Systems - Radar post processing and anti-submarine warfare
- Navy Open Architecture/Net-Centric Warfare
- Navy: Small naval research aircraft - Atmospheric measurements
- NAVSEA - Machinery monitoring, damage control sensor



21ST CENTURY SYSTEMS, INCORPORATED® (21CSI®)

HIGH RESOLUTION SITUATIONAL AWARENESS (HIRSA)

Border Surveillance

Topic Number: N02-207 (ONR)

SBIR Investment: $925K
Project Revenue: $2.04M

21st Century Systems, Inc.

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www.21csi.com
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Jeffrey D. Hicks

About the Technology

21st Century Systems, Inc. (21CSI) developed the High Resolution Situational Awareness™ (HiRSA™), product line, and open architecture, modular software that integrates data feeds from a variety of sensors and displays them via a user-defined operating picture for Anti-Terrorism/Force Protection (AT/FP) operators. The HiRSA software is augmented by intelligent agents that provide persistent surveillance and automatic alert capability. HiRSA's intelligent agents continuously monitor, detect, and warn of impending threats. Decision support modules recommend courses of action to operators, including automatic notifications and remote slew of sensors and weapons. Using a high-resolution geospatial representation of the operational environment, including terrain elevation and imagery data, HiRSA provides a detailed, correlated 2-D and 3-D view of the battlespace to operators at a command center or in the field.

HiRSA allows sentries to share information about detected suspicious activity using linked wireless handheld devices. Roving sentries are able to view security video feeds from low light and infrared cameras, send still photos, and create security event reports for remote viewing by personnel in command and control centers, using geospatial and imaging software on mobile devices. As the integrative software for Critical Area Protection System (CAPS™), HiRSA has been deployed to Camp Fallujah, Iraq, as well as in and around the Naval Surface Warfare Center Panama City base complex.

Military and Commercial Significance

21CSI's HiRSA product line provides the AT/FP community with an efficient and cost-effective means to improve force protection, situational awareness, and decision making with significantly fewer sentries and support manpower. HiRSA improves AT/FP situational awareness while reducing command center manpower. Additionally, HiRSA provides the means for security forces to share real-time information throughout the network. Because HiRSA easily accommodates a wide variety of sensors and legacy systems, it does not require substantial hardware upgrades. The results are greater cost savings and better force protection.

APPLICATIONS

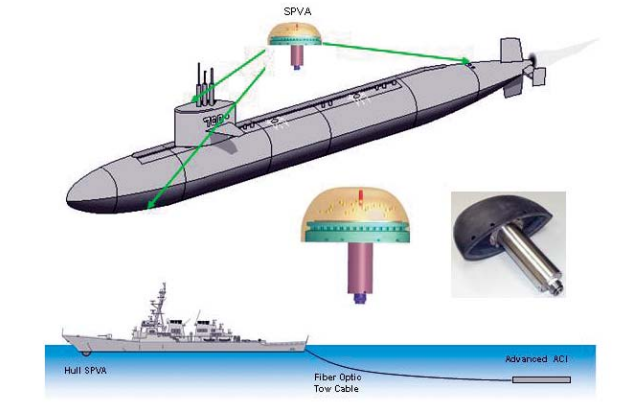
- Integrating software for CAPS
- Installation and expeditionary baseline perimeter security systems
- Military utility assessment and integrating software for CAPS multi-sensor system
- Commercial and industrial infrastructure security and system management

About the Company

21st Century Systems, Inc. (21CSI) develops decision support software to help operators manage complex, high-stress, rapidly changing environments through sound, computer-assisted data monitoring and decision making. Intelligent agents embedded in the systems enable the software to adapt, respond, and learn from individual users in a variety of situations. In 2005 and 2006, Inc. Magazine inducted 21CSI into the Inc. 500, the magazine's annual ranking of the fastest-growing privately held companies in the U.S. Now entering its 12th year, 21CSI has offices in nine states supporting government and private sector clients. 21CSI is located on the web at www.21csi.com.

ADVANCED ACOUSTIC CONCEPTS INCORPORATED

ACOUSTIC INTERCEPT IMPROVEMENT INITIATIVE



Sparsely Populated Volumetric Array for Submarine and Surface Vessel Acoustic Intercept

Topic Number: N98-106 (NAVSEA)

SBIR Investment: $844K
Project Revenue: $37M

Advanced Acoustic Concepts Inc.

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Michael Carnovale

About the Technology

In response to the Navy's need for submarine detection systems that provide tracking and classification of acoustic energy from ships, submarines, and torpedoes, Advanced Acoustic Concepts, Inc. (AAC) developed the Sparsely Populated Volumetric Array (SPVA). The SPVA consists of eighteen hydrophones potted in polyurethane that form a sparse array that allows novel real-time signal processing techniques over a wide frequency range, and greatly reduces the computing power required, compared to conventional sonar array processing. At-sea tests have proven that the SPVA sensor accurately detects, localizes, tracks, and classifies any surface or subsurface craft. The detection system is able to provide full spatial coverage around an entire submarine and detect narrowband and broadband acoustic signals in real time.

The SPVA has transitioned to the surface fleet for anti-submarine warfare and self-protection. As part of the demonstration of Improved Performance Sonar (IPS) and production systems of Scaled IPS, SPVA has been installed on five Navy destroyers. The Navy is looking into installing the SPVA on many more surface ships including combatants and non-combatants, resulting in total battle group defensive and "force multiplier" capabilities.

Military and Commercial Significance

The SPVA is a compact, cost effective, commercially available, open architecture solution for the Navy's acoustic intercept needs. SPVA offers enhanced capability and covers a larger frequency range over legacy sensors for acoustic intercept (weapon and search sonar) and situation awareness. The SPVA enables an integrated self defense system that provides situation adaptive countermeasure deployment and evasion tactics based on continuous tracking of threat weapons, and can be directly applied to interference rejection for non-self defense systems and sensors.

About the Company

Advanced Acoustic Concepts, Inc. (AAC) is a technical leader of sonar detection, torpedo defense technology, advanced distributed training, knowledge management systems, software engineering and systems integration. Headquartered in Hauppauge, Long Island, New York, AAC has been selected by the Navy as a lead contractor for the Surface Ship Torpedo Defense program. The success of AAC's SPVA technology, and its spin-off products, is a major factor in the company's growth, with sales increasing by over 100% in recent years.

APPLICATIONS

- Naval Surface Ships - Combatants and non-combatants and detection systems
- Waterside facility protection
- Harbor/port security
- Commercial/private boat/ship protection
- Acoustic monitoring of marine life (e.g., for fishing industry)
- Oil platform underwater security
- Gas/oil pipeline anti-tamper and security

A Skier Using Head Sport's Intelligence Skies Powered by ACI's Piezoelectric Ceramic Fibers

ADVANCED CERAMETRICS, INC.

MULTIFUNCTIONAL ACTIVE FIBER COMPOSITES FOR SENSORS AND ACTUATORS

Topic Number: N95-T005 (ONR)

SBIR Investment: $760K
Project Revenue: $8.5M

Advanced Cerametrics, Inc.

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(609) 397-2900
farhad.mohammadi@acitek.com
Farhad Mohammadi

About the Technology

Advanced Cerametrics, Inc. (ACI) has developed a technique that produces flexible piezoelectric fibers, suitable for high performance sensor and actuator applications. Using this technique, non-piezoelectric fibers from almost any ceramics can be produced for structural reinforcement applications. Piezoelectric materials convert mechanical energy into electricity and, inversely, convert electricity into mechanical energy. ACI's fiber technology makes composites with high fracture toughness that are much harder to break. Ceramic fibers made from ACI's Viscous Suspension Spinning Process (VSSP) are flexible, lightweight, and inexpensive to produce.

ACI also developed a new technology, which allows ACI to apply its flexible ceramic material to address additional military needs, including a new actuator/sensor design for helicopter rotors. The technology reduces vibration and gearbox wear, by actively controlling the blade flexure and harvesting the reclaimed energy to power such systems from ambient sources of mechanical energy. Funding was provided to develop technology to produce piezoelectric ceramic fibers for sensors, actuators and, most recently, energy harvesting systems. ACI has a contract with Head Sports, for its Piezoelectric Fiber Composites (PFC) that is used for its "intelligence" line of tennis rackets and skis and has resulted in several million dollars of Head Sports product sales.

Military and Commercial Significance

ACI's piezoelectric-fiber composite technology and energy harvesting transducers have enormous applications within DoD. The piezoelectric fiber material has led to improved stealth in DoD platforms by reducing vibration noise through embedded active structural control. Using piezoelectric fiber composites, to convert wasted energy to power monitors that oversee the status of shipboard and airborne structures and equipment, eliminates the need for expensive batteries or heavy and labor intensive power cabling. The technology has led to several commercial and DoD R&D contracts, and is currently being used for a health monitoring systems for the DDG 1000, and the development of other naval systems.

APPLICATIONS

- Navy - Fiber composite actuators for torpedo silencing and helicopter rotor twist control
- Navy - Piezoelectric ceramic fibers for sensors and actuators
- Navy - Self-powered health monitoring systems for the DDG 1000
- Lightweight sonar and disposable sonobuoys
- Self-powered wireless rotor tips lights

About the Company

Advanced Cerametrics Inc. (ACI) has evolved from a small, family owned manufacturer of ceramic wear parts for the textile industry, to a prominent, high-tech company developing and manufacturing advanced materials. The SBIR/STTR program enabled ACI to develop and commercialize its active fiber composite and achieve orders and contracts exceeding $4.5 million. ACI's piezoelectric fiber composites technology is the basis for the development of a cost effective fiber production method, and has allowed the company to attract venture capital companies, grow its business, and expand its product line.

NAVAIR

ADVANCED TECHNOLOGIES GROUP, INC.

HYDRODYNAMIC SEALS FOR ENHANCED ENGINE PERFORMANCE

Seal and Housing

Topic Number: N00-005 (NAVAIR)

SBIR Investment: $973K
Project Revenue: $26M

Advanced Technologies Group, Inc

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Stuart, FL 34994
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jjustak@advancedtg.com
John Justak

About the Technology

In order to accommodate the next generation of turbine engines, an advanced gas turbine seal is needed capable of improved performance, reduced leakage, and both forward and reserve engine rotation. Legacy engine seals do not meet engine demands for durability or forward and reverse engine rotation for the V-22 Osprey, without damaging seals and increasing leakage. Fixed clearance labyrinth seals provide a varying gap due to engine and aircraft dynamics, while brush seals wear out over time. Both seals have inconsistent effective clearances at different power points of the engine, resulting in decreased engine performance.

Advanced Technologies Group, Inc.'s (ATG) Hybrid seals (H-Seal) are capable of forward and reverse engine rotation, improves leakage over existing brush seals by 50 percent, increase durability, reduce operating cost, and are compatible with lower tolerance designs. ATG incorporates the advantages of a compliant brush seal with the non-wearing characteristics of a hydrostatic bearing that maintains a fixed gap in relationship to the rotor regardless of roto excursions. The H-Seal produces a non-contacting seal capable of long life, under high surface speed and temperature conditions. ATG received a contract from NAVAIR to provide H-Seals for gas turbine engines, contingent on testing results. The company also received funding from Army to test the compressor discharge seal for the Black Hawk Helicopter.

Military and Commercial Significance

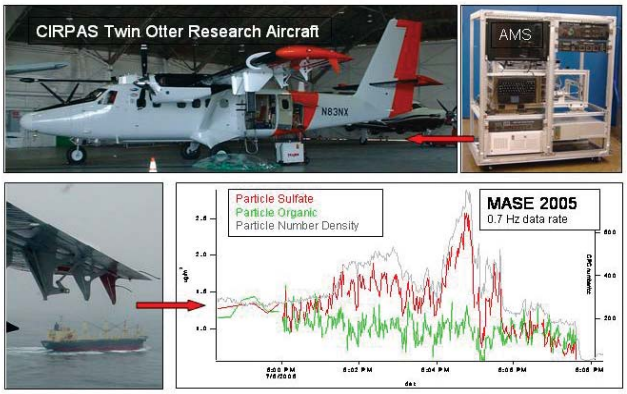
ATG H-Seals meet engine goals for thrust-to-weight ratios, emissions, durability, fuel consumption, and operating cost. By replacing just two turbine seals, fuel use is reduced by 2 percent resulting in improved engine efficiency and a reduction in turbine air temperature. Studies have shown a 10-degree reduction in turbine temperature increases turbine blade life by 50 percent.

About the Company

Advanced Technologies Group, Inc., ATG, is a privately held engineering R&D firm that specializes in the design and development of precision cryogenic and gas turbine turbo-machinery. By providing innovative, timely, cost-efficient design and consulting services, ATG has seen a large increase in government and private-sector clients. The success of the hydrodynamic seals was due to the Navy SBIR program, and has enabled ATG to acquire outside funding and a reputation for quality with major gas turbine engine manufacturers and component suppliers. ATG is currently licensing the technology and manufacturing the technology in-house.

APPLICATIONS

- NAVAIR: Osprey - Enhanced engine performance
- Army: Black Hawk Helicopter - Enhanced engine performance
- Commercial aviation engines, industrial gas turbine engines, steam turbines - Seals for enhanced engine performance
- Private sector - Gas turbine, turbopump, and other gas path sealing applications



TOF-AMS on CIRPAS Twin Otter Research Aircraft Detecting Ship Plume

AERODYNE RESEARCH, INC.

TIME OF FLIGHT REAL-TIME AEROSOL ANALYZER FOR AIRCRAFT PLATFORMS

Topic Number: N03-227 (ONR)

SBIR Investment: $549K
Project Revenue: $5M

Aerodyne Research, Inc.

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(978) 663-9500
www.aerodyne.com
jayne@aerodyne.com
John Jayne

About the Technology

Atmospheric Particle Matter (PM), plays an important role in altering climate and visibility when scattering is absorbed by solar radiation. The PM and airborne matter may also pose security risks as shipboard combustion systems emit "ship track" clouds that reveal the position and heading of naval assets. Aerodyne Research, Inc. developed the Aerosol Mass Spectrometer (AMS), which measures both the size and chemical composition of PM. The AMS couples aerosol sampling and mass spectrometric techniques into a single measurement system. Airborne particulates, such as biological toxins and submicron combustion particles, are sampled in a high vacuum system called the "aerodynamic lens". The lens focuses the particles and creates a beam of particles that is directed through the vacuum system onto a resistively heated surface.

Aerosol constituents are vaporized, ionized (electron impact) and identified using a compact time-of-flight mass spectrometer to reveal chemical composition information. The AMS was successfully deployed on a Twin Otter research aircraft for the Naval Post Graduate School (Center for Interdisciplinary Remotely Piloted Aircraft Studies), in conjunction with the California Institute of Technology, during the Marine Aerosol Stratus Experiment.

Military and Commercial Significance

The AMS provides critical information for improved modeling and prediction of visibility in the environment and marine boundary layer. The spectrometer can be operated autonomously, and quickly measures aerosol size and chemical properties thereby enabling the development of proper control and/or avoidance strategies, and the creation of the data source needed to validate atmospheric models. The AMS rapid (1-2 Hz) measurement capability allows operation on aircraft platforms where size, weight, power requirements, and fast data rates are important.

APPLICATIONS

- Naval Post Graduate School Center for Interdisciplinary Remotely Piloted Aircraft Studies – Marine Aerosol Stratus Experiments
- DoE - Pacific Northwest National Laboratory Environmental Molecular Sciences Laboratory Brookhaven National Laboratory Atmospheric Sciences Program

About the Company

Founded in 1970, Aerodyne Research, Inc. (ARI) provides research and development services to commercial and government clients. ARI produces remote sensing, surveillance, image processing, tracking and recognition systems for commercial and environmental applications and national defense. Funding from the SBIR/STTR programs was instrumental in ARI's transformation, and the company now has 17 US patents and $3.6 million in revenue generated from the aerosol mass spectrometer technology.

AGILE SYSTEMS INC.

NAVAL STOWAGE AND RETRIEVAL SYSTEM (NAVSTORS)

NAVSTORS with Missile Containers and Ready Service Weapons

Topic Number: N00-038
(NAVSEA; Carriers, ONR)

SBIR Investment: $850K
Project Revenue: $3.93M

Agile Systems Inc.

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www.agilesystems.com
jkarlen@agilesystems.com
James P. Karlen

About the Technology

Originally conceived for PEO Aircraft Carriers, Agile Systems, Inc.'s Naval Stowage and Retrieval System (NAVSTORS) was designed for the automated handling of air-launched weapons in their bulk-stowage and ready-service forms. NAVSTORS is capable of accommodating palletized and containerized loads of many different sizes and shapes while, at the same time, improving stowage density and providing selective access to any one of the unit loads contained. The system employs a unique "moving floor" mechanism, based on slide-puzzle geometry. This geometry provides the highest possible three-dimensional stowage density of payloads within a given hold or magazine by permitting pallets and containers to be stacked right to the overhead and eliminating fixed aisles altogether.

Computer-controlled platforms called Payload Carriers, driven by linear synchronous motors, move stacks of pallets and containers weighing as much as 18,000 pounds within the stowage matrix. Material in almost any size or configuration is automatically and selectively indexed to and from stowage and vertical conveyance. The addition of a fleet of omnidirectional guided vehicles expands the scope of NAVSTORS to achieve an end-to-end intraship handling solution. Agile received follow-on funding from PEO Carriers, PEO Ships, ONR, and the AOE(X) replenishing ship program, to evaluate system throughput on CVN 21, study non-aircraft carrier applications aboard naval vessels, and to build and test full-scale and subscale system/subsystem prototypes. ONR is currently sponsoring a study that utilizes NAVSTORS technology as part of the High Rate Vertical to Horizontal Material Movement system. Agile is also building an automated weapons assembly system for PEO Carriers that uses the NAVSTORS high-capacity robot and moving floor system.

Military and Commercial Significance

Increased weapons stowage density through the NAVSTORS indexing matrix, combined with manpower requirements. Since 2000, Agile Systems has identified applications related to all facets of shipboard material handling.

About the Company

Agile Systems Inc. specializes in large-scale robotics and has conducted Navy research since 1998, ranging from automated stowage and retrieval, to the automated handling of package size provisions. Agile Systems has applied the NAVSTORS technology to surface combatant stores handling and CVN air-launched weapons de-containerizing and de-palletizing. The company has received two additional Phase II SBIR contracts to employ NAVSTORS subsystems to address shipboard material handling activities peripheral to automated stowage and retrieval.

APPLICATIONS

- ONR Future Naval Capabilities/Operational Logistics - Integration Programs: Sea Base and Combat Logistics Force
- PEO Aircraft Carriers - Air-launch weapons
- PEO Ships and PEO Carriers: Air-launched weapons de-containerizing/ depalletizing
- Seabasing - Automated handling of modular and conventional 20-foot ISO containers and vehicles

LSE Directs H60 to safe landing

ALION SCIENCE AND TECHNOLOGY

(FORMERLY CARMEL APPLIED TECHNOLOGIES, INC.- CATI)

VIRTUAL FLIGHT DECK TRAINING SYSTEM

Topic Number: N02-080 (ONR)

SBIR Investment: $1.4M
Project Revenue: $1.52M

Alion Science and Technology

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sschaber@alionscience.com
Steven Schaber

About the Technology

The Landing Signal Enlisted (LSE) is the person responsible for directing Navy pilots landing helicopters aboard ships. It is paramount that the LSE be aware of, and able to coordinate and communicate any situational awareness on deck and in the air, to avoid jeopardizing the safety of the pilot, crew and personnel shipboard. However, the average LSE trainee receives less than sixty seconds of live interaction with a helicopter during training. The time the LSE spends training is largely limited to learning the operations and procedures for guiding helicopter landings. The actual practice of guiding helicopter landings and learning how to respond to emergencies on the ship must be learned on the job in real situations.

Alion Science and Technology (Alion) CATI Operation developed the Virtual Flight Deck Training System (VFDTS) that immerses LSE trainees in a 3D environment aboard a virtual ship. The VFDTS uses a head-mounted display along with Alion-CATI's X-IG image generator to submerge trainees in a virtual environment. The LSE student uses hand signals to direct realistic, simulated helicopters onto a virtual flight deck. The Naval Air Systems Command for Aviation Training Systems has acquisitioned the training simulation system for all four Navy Landing Signalman Enlisted Schools, in support of the mandatory curriculum for all LSE personnel. The virtual training system allows the students to use standardized Navy hand signals to direct the helicopter as it approaches, lands, or prepares for departure, from a "virtual flight deck." The VFDTS uses a combination of seven Navy ships and seven different helicopters 3D models to allow trainees to gain experience in operations, such as vertical replenishment, before completing their classroom training and train on the flight deck along side a certified LSE.

Military and Commercial Significance

The operating cost to train LSE students in actual helicopters is over $12,000 an hour. The ability to train students in classrooms with VFDTS is safer, offers more flexibility, a variety of situations, and is less costly overall than training LSE on the shipboard of real aircrafts. The virtual training system can be modified to meet similar military, civilian, and commercial training applications.

APPLICATIONS

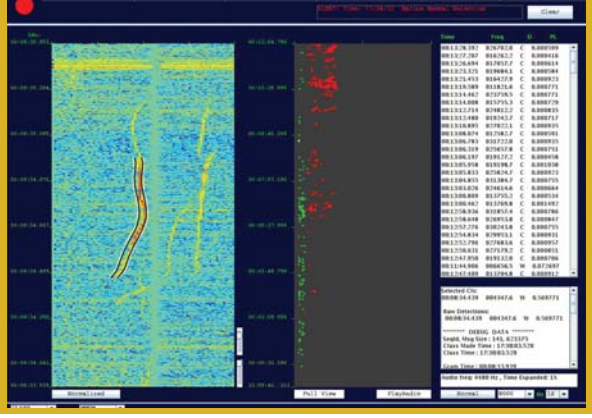
- Naval Aviation Systems Command
- Helicopter Sea Combat Squadron
- Helicopter Anti-Submarine Squadron

About the Company

Alion Science and Technology (Alion) purchased Carmel Applied Technologies, Inc. (CATI) in February 2005. Alion is an employee-owned technology solutions company that delivers technical expertise and operational support to the Department of Defense, government agencies, and commercial customers. Building on almost 70 years of R&D and engineering experience, Alion brings innovation and insight to multiple business areas, including defense operations, modeling and simulation, wireless communication, industrial technology, as well as chemical, biological, nuclear, and marine engineering.

ANALYSIS, DESIGN & DIAGNOSTICS, INC. (AD&D)

MARINE MAMMAL DETECTION AND MITIGATION



Auto Classification Display (Marine Mammal Whistle)

Topic Number: N01-T002 (ONR)

SBIR Investment: $632K
Project Revenue: $14.8M

Analysis, Design & Diagnostics, Inc.

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About the Technology

Analysis, Design & Diagnostics, Inc. (AD&D) developed an automated system that passively detects and automatically classifies marine mammal vocalizations. The technology was designed to use on-board sensors and is an open architecture solution that operates on commercial-off-the-shelf hardware approved for shipboard use. Teaming with Woods Hole Oceanographic Institution, Duke University Marine Laboratory, and Advanced Acoustic Concepts, Inc., AD&D's efforts addresses the Navy's need for a system that detects and localizes the presence of marine mammals to effectively mitigate harmful effects caused by naval operations and commercial shipping. AD&D mammal detection system has been installed onboard two Improved Performance Sonar (IPS) platforms used by NAVSEA PEO Integrated Weapons Systems for advanced system development.

Military and Commercial Significance

AD&D provides the Navy a viable method of conducting marine mammal mitigation twenty-four hours a day, regardless of weather or operational conditions. AD&D's detection system is scheduled for integration into Scaled IPS and future AN/SQQ-89 builds. The detection system allows commercial industry an effective and low-cost method to monitor marine mammal activity when conducting offshore activities that may be harmful to marine life. In the near future, all DDG 1000 and CG warships will employ the capability to protect marine mammals from the adverse effects of active sonars, while still allowing the Navy to maintain anti-submarine warfare readiness.

About the Company

Analysis, Design & Diagnostics, Inc. (AD&D) is a military technical service company that has earned a reputation for unparalleled customer satisfaction, responsiveness, reliability and technical innovation. The Navy STTR program was critical to the success of the marine mammal detection system, and has allowed AD&D to penetrate into new market areas and add additional technical personnel to the organization. AD&D has provided technical services to various entities within the Navy, the Office of Naval Intelligence, the Coast Guard, and the National Security Agency.

APPLICATIONS

- Naval – Mammal detection system
- Marine Mammal Research – Identify and log marine mammal vocalization activity
- Oil drilling, commercial shipping and fishing – Mammal detection system
- Marine mineral exploration and seismic profilers

AROSS Turret

ARETÉ ASSOCIATES

AROSS WAVE IMAGING SYSTEM FOR PELICAN REMOTELY PILOTED AIRCRAFT(RPA)

Topic Number: N96-150 (ONR)

SBIR Investment: $1.62M
Project Revenue: $10.5M

Areté Associates

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About the Technology

Areté's Airborne Remote Optical Spotlight System (AROSS) addresses the Navy's requirement for an innovative sensor and measurement system able to obtain marine atmospheric and oceanographic variables, such as physical, chemical, optical, geophysical, biological and acoustic, in 3-D space and time. The sensor consists of a digital framing camera mounted in a Predator turret that is driven by a PC-based controller using measurements from an integrated GPS/Inertial Measurement Unit (IMU). The digital imagery has a larger field of view and wider dynamic range compared to video cameras currently used on Unmanned Aerial Vehicles (UAVs). Imagery is recorded with multiple hard drives at framing rates of up to 8 Hz, much higher than necessary for most planned missions.

AROSS successfully trades off unnecessary high framing rates for much improved spatial resolution. In addition, mounting the IMU directly on the camera in the turret instead of on the airframe improves pointing accuracy and enables quick, simple changes between mission packages. The sensor and platform combine to create a unique test environment for Intelligence, Surveillance, and Reconnaissance (ISR) technology for future UAVs. Areté's received a contract to design and construct its AROSS to provide a state-of-the-art electro-optic imaging system for experimental use on the Naval Postgraduate School (NPS) Center for Interdisciplinary Remotely Piloted Aircraft Studies (CIRPAS) Pelican optionally piloted aircraft.

Military and Commercial Significance

AROSS demonstrates that digital sensor payload can exploit image-processing software coded from advanced physics-based algorithms. The technology has been shown to be effective in targeting with a < 3 meter spherical error of probability from a 3 kilometer stand-off in geo-location of stationary obstacles, and detecting the presence and estimating the state vector of moving objects. AROSS is useful in battlespace preparation through hydrographic and topographic characterization of various beach and underwater environments, including production of maps of water depths, currents, and surf zone characteristics.

APPLICATIONS

- NPS CIRPAS Pelican aircraft - Electro-optic imaging system
- ONR - Littoral Remote Sensing Program, Fleet Battle Experiment Hotel, Kernel Blitz, Near Shore Canyon Experiment, Tactical Littoral Sensing Program
- Naval Research Laboratory/DARPA Strategic Technology Office Direct Geo-Referencing Algorithm Study
- NAVSEA: Littoral and Mine Warfare - Coastal Battlefield Reconnaissance and Analysis System

About the Company

Areté Associates has developed a variety of sensor systems for critical applications for Navy and DoD. The AROSS program led to the development of unique value-added algorithms that exploit space/time image-data-gathering and several transitions to operational use for military ISR. The AROSS SBIR contract was the springboard for a sustained, multi-million-dollar ISR thrust aimed at UAV sensor payload, which resulted in new technology and core competencies, and the application of proprietary space/time processing algorithms for sensor systems on non-UAV-platforms. Today, Areté is a markedly different company, in part because of the SBIR program.

ARMORWORKS, LLC.

EXPEDITIONARY FIGHTING VEHICLE (EFV) COMPOSITE ARMOR SYSTEM

ArmorWorks M915 and HMMWV Armor Kits

Topic Number: N01-004 (MARCOR)

SBIR Investment: $699K
Project Revenue: $62.8M

ArmorWorks, LLC.

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About the Technology

ArmorWorks LLC has developed a high-performance, low-cost composite armor suite for the U.S. Marine Corps' (USMC) new Expeditionary Fighting Vehicle (EFV). ArmorWorks developed the composite armor system in response to a Navy requirement for a lightweight armor component that can be affordably produced and assembled. The system is made from low cost composite ballistic materials, providing the EFV with maximum ballistic protection while maintaining a minimum overall weight addition. The ballistic protection suite, using state-of-the-art composite materials was evaluated, tested and presented to the Navy and USMC.

In early 2004, ArmorWorks won a contract from the Army for procurement of armor kits for the High Mobility Multipurpose Wheeled Vehicles (HMMWV). In 2005, the company received a contract from the USMC to replace the existing steel armor on its fleet of CH46 helicopters, and an additional contract in 2006, from the USMC for Enhanced Small Arms Protective Inserts (ESAPI). The technology is presently being used to provide extra armor for protective vests worn by marines and soldiers serving in Iraq and Afghanistan.

Military and Commercial Significance

The ballistic effectiveness of this hybrid composite armor for the EFV provides unique combinations of dissimilar composite materials that offer lighter weight protection, at a much lower cost than other evaluated high performance composites. The technology demonstrates the improvement of using backings in ceramic and fragment armor systems. The armor backing reduces cost and improves multi-hit protection and structural integrity of ceramic armors against armor piercing bullets, artillery fragments and improvised explosive devices. In addition, ballistic performance models and material cost models were developed for other armor system designs. The hybrid composite armor designs, ballistic performance models are applicable to personnel, aircraft, ship, and ground vehicle systems for both military and commercial applications

About the Company

ArmorWorks LLC is a Phoenix, Arizona privately held company that designs and manufactures high-tech body, aircraft, marine and vehicle armor, for protection against a broad spectrum of ballistic threats. The company specializes in all aspects of armor technology, design, in-house testing and material technology, and provides high-tech armor protection to DoD locations around the world. ArmorWorks has produced over 500,000 ceramic armor components for a variety of personnel armor, aircraft, and vehicle applications.

APPLICATIONS

- Vehicles: HMMWV armor, M-915 A2/A3 truck armor and the USMC Fast Attack Vehicles
- Aircraft: CH-47, CH-46, OH-58 and the – AH-64 helicopters
- Ship: Landing craft, air cushion
- Personnel: Body armor Small Arms Protective Inserts (SAPI), ESAPI and side SAPI

The Bluefin 1.5kWh hybrid pressure-tolerant battery pack

BLUEFIN ROBOTICS CORPORATION

PRESSURE-TOLERANT BATTERIES FOR AUTONOMOUS UNDERSEA APPLICATIONS

Topic Number: N99-215, N04-127, N04-053, N04-087 (ONR)

SBIR Investment: $516K
Project Revenue: $2.5M

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About the Technology

There are a number of battery chemistries available to provide motive power and sensors for Autonomous Undersea Vehicles (AUVs). Currently, batteries made from silver-zinc are the most commonly used power source. While the energy density of silver-zinc batteries is high there remains several drawbacks to the technology. The cells have a limited charge/discharge life cycle, need low-temperature storage, experience hazardous liquid electrolyte leakage, are prone to off-gassing, and require pressure vessels to house the batteries.

Alternatively, Bluefin has designed a pressure-tolerant battery pack that uses rechargeable lithium polymer cells to address the limitations of the silver-zinc battery. The battery pack is safer to operate, uses solid electrolyte to alleviate leakage problems, and performs well under a full range of ocean and coastal temperatures. The pressure-tolerant 1.5kWh pack can withstand full ambient ocean pressure, thus eliminating the need for a pressure vessel. Unlike batteries enclosed in pressure vessels, the battery can be quickly removed from the vehicle, replaced and autonomously recharged without the need to service pressure seals or contend with harmful gases.

Bluefin has manufactured over 250 pressure-tolerant lithium polymer packs for the Navy and DoD. Its battery technology supports vehicle platforms in a number of Navy programs including Battlespace Preparation Autonomous Undersea Vehicle Mission Package (BPAUV-MP), and Autonomous Operations Future Naval Capabilities (AOFNC).

Military and Commercial Significance

Bluefin's pressure-tolerant capabilities create a new operational paradigm where around-the-clock at-sea operation is nearly possible. The rechargeable lithium polymer cells improve reliability, reducing the number of pressure seals that must be mated for each dive, and allows batteries to be charged in-situ. Using the pressure-tolerant batteries also removes the need for a bulky and sometimes heavy pressure vessel, permits the volume of water displaced by the cells to contribute directly to the vehicles buoyancy, and reduces life-cycle maintenance problems.

APPLICATIONS

- Office of Naval Research: BPAUV-MP, AOFNC: AUVs
- NAVSEA: BPAUV for the Littoral Combat Ship, Surface Mine Countermeasures: AUVs
- Space and Naval Warfare Systems Command: AUVs

About the Company

Bluefin is a wholly-owned subsidiary of Battelle Memorial Institute and specializes in engineering and commercializing the most durable, reliable and user-friendly AUVs and derivative products, including navigation, propulsion, and communication systems. The successful commercialization of the initial SBIR battery technology has allowed Bluefin to provide customers with batteries for AUVs and as standalone units. Today, Bluefin is designing larger battery packs and energy systems for applications other than AUVs, while simultaneously refining control solutions, improving product packaging, and increasing energy and power densities.

CLOUD CAP TECHNOLOGY

THE PICCOLO FAMILY OF UAV AUTOPILOTS

Piccolo Autopilots Support a Wide Range of UAV Systems

Topic Number: N01-147 (ONR)

SBIR Investment: $768K
Project Revenue: $4.9M

Cloud Cap Technology

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About the Technology

The Piccolo family of autopilots provides a miniaturized, highly integrated, inexpensive, and battlefield-proven avionics solution applicable to a wide range of Unmanned Aerial Vehicles (UAVs). Each of the Piccolo options is a complete autopilot solution that includes the control processor, inertial and air data sensors, GPS, and data link. The Piccolo Plus is a full featured autopilot for small fixed wing UAVs. The Piccolo II is a drop-in replacement for the Piccolo Plus and offers expanded Input/Output for additional payload support and a higher rate GPS (4 Hz). All models offer plug-n-play support for external devices including the MicroAir transponder, Honeywell magnetometer, above ground level sensors, military data links and Iridium based satellite communications.

The Piccolo autopilots are being employed on UAV platforms for operations in Iraq and Afghanistan, and are used mainly in intelligence, surveillance, and reconnaissance applications. The Piccolo autopilot system has undergone NAVAIR flight certification, is currently deployed in the Tiger Shark, Silver Fox and Mako UAVs, and has flown successfully on more than thirty different airframes. Universities and government laboratories also use the Piccolo system as a platform for advanced research and development in small UAV technology.

Military and Commercial Significance

The Piccolo family of autopilots provides solutions that are directly applicable to Tier I through Tier II UAV platforms. The Piccolo system consists of an autopilot and ground station component, simulation environment, operator interface software, and supports fully autonomous flight operations.

About the Company

Cloud Cap was founded in 1999 with an initial investment of $20,000. In 2006, Cloud Cap's revenue exceeded $4M, employed more than 17 full-time and part-time employees, and has delivered over 1,400 autopilots. A key component of the company's success was its SBIR funding that allowed Cloud Cap to take the Piccolo UAV autopilot system from a pre-production demonstrator to a full-fledged, industry-leading solution.

APPLICATIONS

- UAV platforms: Silver Fox, Mako, Tiger Shark, Manta, LR3
- AAI Aerosonde: T-15, T-16, Killer Bee, Sky Spirit, Evolution, Tern, SPIDER helicopter

Single Particle Soot Photometer (SP-2)

DROPLET MEASUREMENT TECHNOLOGIES, INC.

INDIVIDUAL BLACK CARBON PARTICLE MEASUREMENTS

Topic Number: N00-094 (ONR)

SBIR Investment: $945K
Project Revenue: $1.55M

Droplet Measurement Technologies, Inc.

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William Dawson

About the Technology

The Single Particle Soot Photometer (SP-2) is a sensor that measures the optical properties of individual carbon particles. Developed by Droplet Measurement Technologies, Inc. (DMT), the SP-2 classifies black carbon particles in the atmosphere, by number, size, and by counting individual particles. Previous technology collected particles on filters and measured the reduction in light transmission through the filter, but the process was slow and took hours to make a measurement. The SP-2 measures individual particles in real time.

With the SP-2, a sample of environmental air is subjected to a high-power YAG (yttrium aluminum garnet) laser beam. The black, light absorbing, aerosol particles are identified and vaporized as they pass through the laser beam. The destruction of the soot particle produces a quantity of photons that represent the mass and composition of the particle. The larger the soot particle, the more photons are released. The concentration of carbon is then determined by counting the number of vaporized particles in a sample. Additional information on the mixing state of the carbon particles can be ascertained by measuring the peak height of the signals and the timing of the peaks.

Military and Commercial Significance

Atmospheric carbon, like that contained in diesel smoke and power plant pollution, is a key component to the increase of radiatively important particles in the atmosphere. Carbon found in marine aerosols have a significant impact on the optical properties of the atmosphere, and the effects of carbon aerosols on both solar and infrared wave-lengths strongly influence the performance of electro-optic/infrared sensors. DMT's SP-2 offers researchers access to information on individual carbon particles that had never before been available, and provides a vehicle to acquiring new data and understanding of how and why carbon particles effect changes in the atmosphere and their affects on health, climate, and the environment. The Naval Post Graduate School has used SP-2 during research flights of the Center for Interdisciplinary Remotely-Piloted Aircraft Studies Twin Otter aircraft to measure smoke plumes from ship exhaust and forest fires.

APPLICATIONS

- Navy - Research mission flight for carbon-mapping
- NOAA Aeronomy Laboratory - High-altitude black carbon aerosol studies
- NASA: WB57 F CRAVE Program, DC-8 - SOLVE II Mission
- Boston College - Study involved the Aerodyne Mass Spectrometer
- University of Manchester, England: ACTIVE program for cloud studies

About the Company

Droplet Measurement Technologies (DMT) was incorporated in 1987 and manufactures its own line of airborne and particle spectrometers. DMT attributes its success directly to the Navy SBIR program. The first SBIR contract resulted in the Cloud, Aerosol, and Precipitation Spectrometer (CAPS), which became the industry standard spectrometer for airborne cloud and storm research. Sales from the CAPS have given DMT the resources it needed to further its line of products, and the electronics and optics technology from SBIR funding allowed DMT to produce several complimentary products.

SPAWAR

EFFICIENT CHANNEL CODING, INC.

HIGH-CODING-GAIN, HIGH-RATE TURBO PRODUCT CODES, FOR ROBUST DIRECT BROADCAST SATELLITE SYSTEMS

iPSTAR

Topic Number: N96-258 (SPAWAR)

SBIR Investment: $837.6K
Project Revenue: $9.9M

Efficient Channel Coding, Inc.

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Mark Vanderaar

About the Technology

Current information obtained from direct broadcast satellite systems indicates a higher than expected data implementation loss when compared to theoretical performance. Examination of theoretical coding implementation has also shown a sharp decline of data transmission, resulting in a nearly total loss of signal for small degradations in communication link performance. ECC has developed a powerful class of forward error-correcting codes that outperform those used in today's systems. Turbo Product Codes (TPCs) use a high-speed, flexible, Application-Specific Integrated Circuit (ASIC) and a low-speed, flexible, software-based decoder architecture that corrects transmission errors, thus increasing the reliability of digital communication links.

TPCs are ideally suited to systems where large coding gain is required, but only a limited overhead is acceptable. TPC offers a code rate of 4/5 and a coding gain of 7.0 dB at a bit error rate of 10 P-6P, which is 1.5 dB from the Shannon limit. To achieve this performance, ECC developed three decoding algorithms that exhibit an extreme reduction in complexity over existing techniques, resulting in a simpler decoder that enables the construction of a high-speed "turbo-like" codec on a chip.

ECC has applied TPCs to the next generation of direct broadcast satellites, satellite communication and terrestrial systems. Advanced Hardware Architectures, Inc., a seller of error correction ASICs, has partnered with ECC to make TPCs available commercially. ECC has also commercialized the technology in a semiconductor chip form that is used in a wide range of satellite communications products for Navy, DoD, federal, and commercial applications. Additional follow-on technologies have also been developed.

Military and Commercial Significance

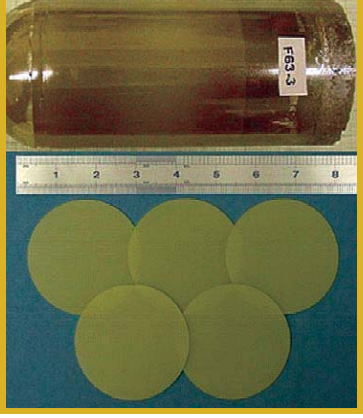
The TPC's flexibility, combined with their iterative decoding, makes them useful in links with variable satellite network receivers and variable data rates affected by rain fade or multi-path interference. The technology improves performance over the most powerful error correction codes used in legacy modern digital communications, and provides an increase in the number of transmittable data bits per hertz of frequency.

About the Company

Efficient Channel Coding, Inc. (ECC) provides real-world digital communication solutions for some of the world's largest companies. The company provides expert engineering for satellite, optical and terrestrial wireless communication systems, as well as advanced air interface design, and standards participation. This SBIR effort was instrumental in allowing ECC to grow from three employees and less than $1M in revenue to over 40 employees and more than $10M in revenue. In December 2005, ECC was acquired by ViaSat, Inc. and now operates as a wholly-owned subsidiary.

APPLICATIONS

- Navy:
  Satellite-to-mobile systems, Phase III global broadcast service terminals, iPSTAR Broadband satellite communication to narrow-band undersea communication
- Commercial Application:
  Broadband satellite system, Intelsat satellite modems, satellite VSAT networks, wireless networks



3-inch PMN-PT Crystal and (001)-Cut Wafers

H. C. MATERIALS CORPORATION

NEXT GENERATION OF PIEZOELECTRIC CRYSTAL PRODUCTS

Topic Number: 03SBI-0031 (ONR)

SBIR Investment: $898K
Project Revenue: $100M

H. C. Materials Corporation

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About the Technology

To achieve efficient energy conversion and higher signal-to-noise ratios, the Navy seeks the next generation of piezoelectric crystals with improved electro-mechanical properties for use in SONARs, hydrophones, adaptive optics, and acoustic guidance and countermeasure systems. H. C. Materials Corporation (HCMC) developed a cost effective method, "Multi-crucible and seeded Bridgman growth associated with zone-leveling techniques", to manufacture high quality PMN-PT (lead magnesium niobate-lead titanate) single crystals. The PMN-PT single crystal is formulated to exhibit high piezoelectric coefficient, large electric-mechanical coupling coefficient, high dielectric constants and low dielectric losses. Piezoelectric coefficient is generally higher than piezoelectric ceramics, which produces improved bandwidth, sensitivity, and source level in applications.

Current PMN-PT single crystals show super field-induced strains up to 1%, and large electro-mechanical coupling factors above 0.90. However, due to chemical segregation, growing the crystal in larger sizes has been difficult, without loosing compositional homogeneity and property control. HCMC is able to routinely manufacture single crystals of more than 3" in diameter and 7" in length, weighing 6 kilograms. The company's PMN-PT single crystals has been successfully commercialized for broadband transducers of medical ultrasound imaging system, e.g., Philips "pure-Wave" technology using the crystal transducer probes. As the core component used to achieve greater signal to noise ratios, energy conversion, and enhanced ultrasound for Navy SONAR systems, H.C. Materials received a contract to provide its 4 inch diameter single crystal for installation in SONAR transducers for torpedo guidance systems, radio sono-buoys, and vector-sensors.

Military and Commercial Significance

Incorporating PMN-PT crystals into Navy fleet provides high-energy density acoustic transducers for Navy SONAR systems, such as super high-sensibility acoustic sensors for accelerometers, and deformable mirror control for missile guiding. The successful manufacture of PMN-PT crystals has enabled the development of the next generation of acoustic transduction devices for military and commercial application.

APPLICATIONS

- Navy:
  - Torpedo guidance and countermeasure sonar transducers
  - Radio sono-buoys (acoustic modem), vector-sensors for accelerometers and hydrophones
  - Linear micro-positioning, e. g. deformable mirror control
- Medical: Imaging Systems

About the Company

H.C. Materials Corporation (HCMC) is a leader in developing and manufacturing high-performance single crystals, specializing in PMN-PT crystal products for acoustic transduction applications. Prototype acoustic transduction devices that employ HCMC's PMN-PT provides superior performance over any known piezo-electric materials such as piezo-electric ceramics. To date over 20,000 PMN-PT crystal wafers have been supplied to more than 20 clients including Philips, GE, and Raytheon. HCMC seeks to partner with prime contractors to integrate crystals into transducers and other systems.

IMPACT TECHNOLOGIES, LLC

SMART OIL SENSOR: AN ON-LINE, AUTONOMOUS OIL QUALITY MONITORING SYSTEM

Smart Oil Sensor

Topic Number: N02-063 (ONR)

SBIR Investment: $70K
Project Revenue: $2.6M

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About the Technology

Over the past decade, it has become increasingly clear that the state of mechanical 'health' of a machine can be substantially assessed through knowledge of the condition of the lubricating oil, coolant or hydraulic fluid. Low quality, old or contaminated oil can jeopardize a mission and must therefore be monitored. The Navy has a need for an inexpensive novel, integrated sensor-diagnostic package to monitor the condition of fuels, lubricants, coolants or hydraulic fluids non-evasively and in real-time.

Impact Technologies' Smart Oil Sensor (SOS), uses novel broadband impedance spectroscopy coupled with proprietary signal processing, discriminant classifiers, and data fusion to provide continuous in-service monitoring of contaminants in lubricants such as water, fuel, and soot. Maintaining healthy fluid systems has always been critical to keeping machinery in a state of readiness. SOS is a low-cost, compact, and lightweight solution that eliminates the need for traditional off-line and walk-around analysis that requires expensive laboratory equipment. The sensor is designed to be inserted directly into a drain plug, or a similar port in a fluid circulation line. SOS' power consumption is extremely low (10 – 20 mW) and each unit is designed to transmit fluid and contaminant information via controller area network or RS232 interfaces to local annunciator display panels or shipboard monitoring systems. Impact Technologies, with ONR funding, developed a viable SoS prototype and verified the technical performance through a series of demonstrations and validation tests. This effort has resulted in a commercial product for marine, automotive, and power generation diesels.

Military and Commercial Significance

Smart Oil Sensors can be utilized in most sea and land-based applications where the quality and quantity of machinery fluids, water levels, and fuel contaminant need to be monitored. Combined with the condition based maintenance approach to machinery readiness, SOS reduces life cycle maintenance costs, improves safety, increases operational readiness, and reduces the generation of fluid waste. The autonomy of SOS eliminates the need for oil analysis by experienced personnel, thereby optimizing onboard manning and maintenance resources.

About the Company

Since its founding, in 1999, Impact Technologies, LLC has received several SBIR awards from Navy, Army, Air Force, and Marine Corps for Prognostic Health Management and CBM solutions. Impact received the Tibbetts Award in 2002 exemplifying the very best in SBIR achievement and product commercialization. With the benefit of ONR funding beginning in 4Q 2003, an SOS prototype was completed. In the fourth quarter of 2006, the product matured enough to officially release as a commercial product, through a joint venture company (www.flowtonics.com) focused on bringing SOS to the automotive market.

APPLICATIONS

- Navy diesel engines – Propulsion and electricity generators
- Land-based stationary diesel engines and generators
- Transmission gearboxes
- Automotive and truck engines and transmissions
- Hydraulic and actuator systems

Airborne Laser Window

INFRARED FIBER SYSTEMS

OXYFLUORIDE GLASS (OFG™)

Topic Number: N96-246 (SPAWAR)

SBIR Investment: $850K
Project Revenue: $5M

Infrared Fiber Systems

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About the Technology

The High-Energy Laser Joint Technology Office (JTO) issued a requirement for high-energy laser weapons systems. One major technical challenge for implementing high-powered lasers is that the windows through which the lasers are fired must provide scatter-free transmission of the beam. Any distortion can reduce the beam's power and deflect it from its target. Responding to this challenge, Infrared Fiber Systems (IFS) developed a new infrared-transmitting glass based on oxyfluorides for fabricating large-diameter infrared multi-spectral laser windows. Unlike other fluoride-based infrared glasses, the Oxyfluoride Glass (OFG™) has excellent chemical durability and glass forming ability. OFG high-stability glass has minimum optical path distortion and good infrared transmission.

A unique casting process was developed for making small and large-size windows, that allowed for fabrication of various sized dimensions for multiple applications. A 6-inch, 16-inch, and a 39-inch-diameter window plus a hemisphere up to 12 inches in diameter were fabricated and successfully tested. IFS received a contract from the Air Force and Lockheed-Martin to add the infrared window application to the Air Force's Airborne Laser Program. IFS also received a contract to extend the infrared wave length range of its OFG glass to the 3-4 micron range and to fabricate a 75-centimeter diameter window blank, which is being used on the Navy High Energy Laser Program. IFS has received a JTO contract to fabricate a 60-centimeter diameter conformal optical dome made from the OFG glass.

Military and Commercial Significance

The infrared window provides unmatched capability for transmission and a near-zero optical path difference in the infrared range, making the windows particularly useful for next generation weapon systems. The windows are also being used as components windows of various diameters enables the technology to be applied to programs where increased window size was unavailable.

APPLICATIONS

Joint Technology Offices:

- Navy: High Energy Laser Program Infrared Fiber Systems, oxyfluoride glass
- Air Force: Airborne Laser Program - Infrared Fiber Systems, oxyfluoride glass
- Army: Tactical High Energy Laser System - Extend the infrared wavelength range and fabricate a 75-centimeter diameter window
- Commercial: Medical laser procedures, aero space laser technology, and sensor systems

About the Company

Founded in 1986, Infrared Fiber Systems, Inc. (IFS) is world renowned for its production of optical products that service the near and mid-infrared wavelength range. IFS is a leading supplier of infrared transmitting fiber optics bulk glasses, and spectrometers for sensor and laser power delivery applications. Located in a suburb of Washington, DC, the IFS facility includes state-of-the-art fiber draw towers, controlled atmosphere glove boxes, glass melting clean room stations, and optics testing and instrumentation laboratories.

INSTITUTE OF MEDICAL CYBERNETICS (IMC), INC.

DYNAMIC ASSET ALLOCATION AND PERSONNEL MANAGEMENT FOR DAMAGE CONTROL IN NAVY SHIPS

Topic Number: N96-145 (NAVSEA)

SBIR Investment: $745K
Project Revenue: $1.22M

Institute of Medical Cybernetics, Inc.

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Yan Yufik

About the Technology

Naval ship systems, including surface ships and submarines, are operated and maintained by a large number of crew members. Facing new challenges of fluctuating and non-determined operational environment, and the reduction in defense budget, Navy ships must now operate in a more cost effective manner and perform better when handling multiple unexpected scenarios and changing environments. Mitigating casualties, such as fires and flooding following a missile hit, require the mobilization and deployment of available assets and resources to be flexible and optimally managed throughout the entire damage control process. In order to adequately work under these conditions, the Navy is in need of an efficient systems-engineering method to integrate the human, hardware, and software elements to ensure their efficient coordination under dynamic and uncertain conditions.

The Institute of Medical Cybernetics (IMC), Inc. has developed a prototype systems-engineering aid for planning and modeling operation of human-machine systems on ships. The model explains and simulates human capability in order to integrate data from a variety of disparate sources, and to solve large-scale control problems in real time. The prototype identifies system functions that can be automated and interchanged between man and machine, and analyzes the effects of organizational restructuring on the manning reduction. The IMC received funding from Northrop Grumman Ship Systems to develop requirements for the DDG 1000 Damage Control effort. The company also received funding from NAVAIR Patuxent River and Maryland Technology Development Corporation to investigate technology applications for naval aircraft maintenance, real-time fault diagnosis, and maintenance optimization.

Military and Commercial Significance

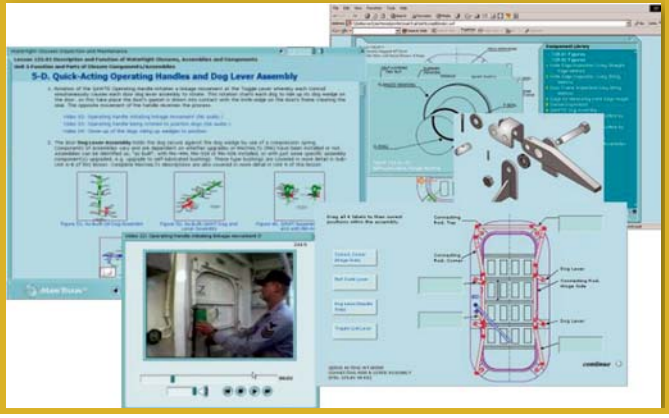
The IMC's technology allows efficient asset management, task coordination, and function allocation between the crew and system automation, thus improving operator situational awareness and situation comprehension while reducing cognitive overload. When used in damage control, the software, contributes to crew safety and ship survivability. The underlying resource allocation algorithms are used in large-scale weapons allocation.

About the Company

The Institute of Medical Cybernetics (IMC), Inc. specializes in R&D in the area of cognitive modeling, interface design and optimization, and decision support in complex large-scale tasks. The IMC has consulted and performed contract research for NASA, Army, Navy, Air Force, DARPA, NSF, FMC Corporation, Boeing Space Systems, and others. The IMC received funding from NAVAIR and Maryland Technology Development Corporation to investigate technology applications for naval aircraft maintenance, real-time fault diagnosis, and management optimization, which resulted in additional consulting work with the Naval Research Laboratory.

APPLICATIONS

- NAVSEA: Damage-control requirements
- NAVAIR- Sensor integration and predictive aircraft maintenance
- Army: Ballistic Missile Defense - Large-scale weapons allocation and battle management
- Raytheon Advanced Systems – Army band width and communication resources management



MainTrain Watertight Closure Course

INTELLIGENT SYSTEMS TECHNOLOGY, INC.

MAINTRAIN™: MAINTENANCE SKILLS TRAINING THROUGH DISTRIBUTED LEARNING PRINCIPLES

Topic Number: N01-101 (NAVSEA)

SBIR Investment: $850K
Project Revenue: $5.49M

Intelligent Systems Technology, Inc.

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Dr. Azad Madni

About the Technology

Intelligent Systems Technology, Inc. has developed MainTrain™, a learner-centric, web-based e-learning platform for maintenance skills training. MainTrain employs the science of learning and interactive multi-media technology to make learning informative, memorable, and fun. Unlike previous naval e-learning systems that were patterned after the traditional classroom instructional hour, MainTrain offers instruction under learner control in five-to-ten minute training vignettes with frequent assessment and feedback to sustain learner motivation.

MainTrain's interactive courseware is available to the Navy in the Integrated Learning Environment format or on a CD ROM, for those without Internet connection. The web-based interactive courseware allows the learner to maintain control of the learning experience while continuing to build on prior knowledge in a manner that lends itself to effective transfer of knowledge to new problems.

Military and Commercial Significance

MainTrain offers the Navy a low-cost, web-based learning solution for dramatically increasing on-the-job performance of maintenance personnel. MainTrain technology standardizes the training process while dramatically reducing the time that sailors spend away from their command attending school. For the Watertight Closure (WTC) Maintenance course, MainTrain can be expected to accelerate the training time of sailors by 50% or better, while lowering the cost of training. According to the analysis conducted by the Commander, Fleet Forces Command, per seat, per-year savings associated with travel, accommodation, instructor, and facility cost, for watertight closure maintenance training is expected to decrease from $1,172 to $28. The Center for Naval Engineering has procured the MainTrain WTC Maintenance course for fleetwide deployment on all surface ships.

APPLICATIONS

- Navy, MARCOR, Air Force – MainTrain E- Learning Suite for maintenance skills training
- NAVSEA: Surface Ships WTC Maintenance Course
- US Coast Guard: Merchant ships, NATO ships – WTC Maintenance Course
- Commercial Equipment Maintenace Training
- Culture Familiarization Training

About the Company

Intelligent Systems Technology, Inc. (ISTI) is a provider of innovative, cost-effective, technologies and solutions for e-learning, simulation-based training, just-in-time training, and performance support, as well as learning content security. Successful SBIR research has led to innovative products and pre-commercialization stage technologies. ISTI is a past winner of the SBA's National Tibbetts Award for California. Navy SBIR funding has enabled ISTI to grow profitably while garnering prestigious industry awards, including the 2000 and 2004 Developer of the Year Software Industry Awards sponsored by Technology Council of Southern California.

NAVAIR

ITCN, INC.

INSTRUMENTING EMBEDDED SOFTWARE BEHAVIOR VIA BUSSES

SystemTrace ST-201 VME Backplane Monitor

Topic Number: N98-160 (NAVAIR)

SBIR Investment: $1.1M
Project Revenue: $1.3M

ITCN, Inc.

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Roy Penwell

About the Technology

Navy mission critical systems are designed with built-in monitoring ports to allow real time software behavior data extraction for debugging and integration execution. New systems, designed for desktop workstations, use multiple Commercial-Off-The-Shelf (COTS) processors and high performance processors, but do not include built-in monitoring signals. Given the rapid move to multiple processor COTS systems, the Navy needs an instrumentation system for COTS based multi-processors that satisfies software debug and integration requirements, which is applicable to both commercial and military system development. ITCN's SystemTrace®, satisfies the Navy's need for an interactive, user-configurable command and control system, that records, monitors, fuses, and displays real-time data from multiple airborne payloads, and disseminates graphs and tabular data to remote users via SATCOM and the Internet.

ITCN's instrumentation technology monitors multiple data paths, including backplanes, data busses and processors. The software is capable of monitoring and analyzing all data streams of a multi-processor, embedded system simultaneously and in real-time with no functional intrusion to system operation. The Navy uses SystemTrace to help develop software and systems for several platforms supporting the War on Terror including, the F/A-18, AH-1, P-3 Orion, TPX-42, and C2P Radar Simulator.

Military and Commercial Significance

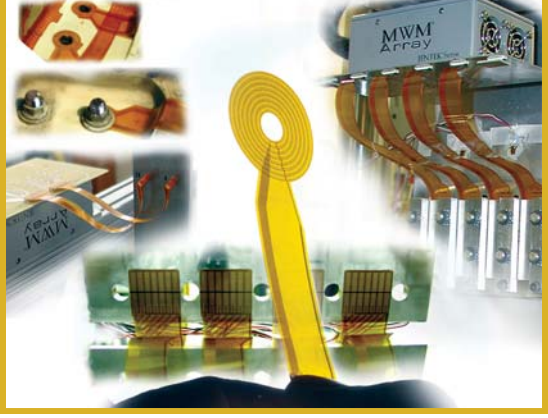
Maintenance of embedded real-time systems is by far the largest cost element in the life cycle of DoD systems. ITCN's SystemTrace significantly reduces the time required to understand the cause of system problems. Legacy systems require multiple tools with multiple interfaces and an engineering effort to coordinate the operator's control and collection of input data. SystemTrace provides a single interface for the test operator to setup and monitor a complete system performing at full speed. The operator is able to monitor the system in the normal environment with minimal or no intrusion, resulting in life cycle cost savings and improved system performance.

About the Company

ITCN designs and manufactures embedded systems instrumentation, and develops custom instrumentation systems for the Military/Aerospace market. The SystemTrace® product line has broadened ITCN's market base from a specialized application in Software Development and Integration Laboratories to general-purpose applications in operations and maintenance. ITCN received the 2006 Tibbetts Award, which exemplify the very best in SBIR achievement.

APPLICATIONS

- Navy: Anti-submarine Aircraft P-3, TPX-42, AH-1 - Software testing and integration, F/A-18 - Operational Flight Program development
- Air Force: F-15, C-130 - System software testing and integration
- Industrial Process Control, telecommunications, transportation, medical, and aerospace



Fatigue Monitoring Sensor Networks

NAVAIR

JENTEK SENSORS, INC.

APPLICATION OF MWM-ARRAYS TO DETECTION AND QUANTIFICATION OF CUMULATIVE FATIGUE DAMAGE IN AIRCRAFT STRUCTURAL COMPONENTS

Topic Number: N95-033 (NAVAIR)

SBIR Investment: $1.2M
Project Revenue: $4M

JENTEK Sensors, Inc.

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Dr. Neil Goldfine

About the Technology

JENTEK Sensors' (JENTEK) family of scanning, and permanently mounted sensors and arrays, detects and monitors material degradation and fatigue cracking, using its Meandering Winding Magnetometer (MWM®). The MWM is an eddy current sensor that is flexible, lightweight, and can be fabricated and tailored in a variety of shapes and sizes to fit a wide range of applications. MWM-Arrays can be integrated into scanners to produce images of cracks, hidden corrosion damage, and stress distributions, or can be incorporated into structures and components to provide early warning of internal degradation, and to monitor stress. Scanning MWM-Arrays were developed in response to a Navy requirement for Non-Destructive Evaluation (NDE) techniques to assess the state of structural fatigue in naval aircraft. The sensors and arrays are able to inspect aircraft engine blades and fretting regions of engine disks where fatigue crack detection by conventional NDE techniques has been unreliable.

JENTEK was funded under a contract to apply its technology on three aircraft platforms. JENTEK's MWM-Array with air calibration was used at Naval Air Depots (NADEP) on over 3,000 engine slots and over 10,000 inspected blades. The inspections performed at NADEP Cherry Point for naval engine disk slots, have significantly impacted the readiness of a naval aircraft fleet that is critical to the on-going War on Terror.

Military and Commercial Significance

JENTEK's Scanning MWM-Array provides improved safety margins for operational aircraft by identifying engine blade and disk cracks that might otherwise go undetected. The system improves readiness, reduces maintenance cost, affords early warning and monitoring of new and growing fatigue cracks, and reduces or eliminates unnecessary disassembly for inspection of Navy fleets. Permanently mounted MWM-Arrays are being used to support fatigue testing programs, to manufacture real crack specimens for NDE calibration and verification, and are transitioning to monitoring of critical structures in aircraft and rotorcraft.

APPLICATIONS

- NAVAIR Depot, Cherry Point, NC: Aircraft fatigue monitoring, engine disk slot inspection, P-3 propeller cold work quality assessment
- NAVAIR Depot, Jacksonville, FL: Engine blade - Dovetail and disk slot inspection; P-3 propeller cold work quality assessment
- NAVAIR Depot, Whidbey Island, WA: P-3 propeller cold work quality assessment
- Air Force Warner Robins Air Logistics Center: C-130 propeller cold work quality assessment

About the Company

The SBIR program has been a key factor in JENTEK's rapid growth. From its founding in 1992, JENTEK has grown to over 25 full-time employees. The company was the winner of the 2004 Outstanding Phase III Transition Award sponsored by the Navy Transition Assistance Program, the 2006 National Tibbetts Award, and the recipient of the 2004 Materials Evaluation Magazine best paper award. JENTEK has received over 15 DoD Phase II awards, which have generated over $20M in revenue.

K&M ENVIRONMENTAL, INC

DISPOSABLE CHEMICAL DETECTION

The Chameleon

Topic Number: N02-117 (MARCOR)

SBIR Investment: $696K
Project Revenue: $238K

K&M Environmental, Inc.
(dba Morphix Technologies)

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Kimberly Chapman

About the Technology

K&M Environmental, Inc. has developed a lightweight armband instrument that provides an immediate visual indication of the presence of a chemical hazard. The Chameleon® enables war fighters and first responders to visually monitor the presence of up to ten hazardous chemicals simultaneously in real time. Each disposable cassette in the armband sensor detects a different type of chemical threat. The cassettes have been tested under a variety of environmental conditions, including arctic, desert and tropical, and can withstand immersion in salt and fresh water for up to one hour. The disposable cassette is inserted in the reusable armband, enabling the first responder to configure the Chameleon® for specific mission needs.

The Chameleon fills the niche between M9 paper and the Joint Chemical Agent Detector by offering sensor technology that responds to gases, vapors and aerosols in a rapidly deployable module design. Current chemical detectors for war-fighters are costly and complex, and are not as suitable for personal chemical threat detection. The Chameleon is designed as a device to be used by the individual war-fighters, and complements existing chemical detection technologies. The Marine Corps (MARCOR) provided additional funds both for research and acquisition of the Chameleon. The MARCOR Chemical Biological Incident Response Force performed a Field User Evaluation and the Army Rangers evaluated the Chameleon during operations in Afghanistan.

Military and Commercial Significance

K&M Environmental's Chameleon offers Navy a low-cost, rapidly deployable, armband sensor that immediately responds to gases, vapors and aerosols. The combination of its ease-of-use and non-obstructive profile makes the Chameleon an ideal device to detect exposure to toxic chemicals and presents a significant improvement over current chemical detection devices for use by the individual war-fighter and first responder. The field configurability of the device allows rapid deployability and the cost effective disposable technology eliminates decon issues. The sensor offers increased information about chemical threats across the battlespace in accordance with Joint Vision 2010 and the DTO's Joint Science and Technology Plan 2003.

About the Company

Since its inception in 1995, K&M Environmental, Inc has developed and provided chemical detection sensors to chemical plants, laboratories, airports, HazMat teams and many federal agencies. Navy SBIR funding was critical to the success of the Chameleon®. Using SBIR funding, K&M Environmental was able to develop a commercial line of rugged chemical sensors, add three additional research chemists and increase its distribution by 50%. The future market potential of the Chameleon is estimated to be $10-50 million dollars worldwide.

APPLICATIONS

- Chemical detection for the individual soldier
- Coast Guard Civil Support Teams
- Coast Guard - Homeland Security Maritime Security
- Naval Surface Warfare Development Group
- DEA, U.S. Drug Enforcement Agency
- First Responders – Fire Departments, HazMat Teams, Airports

Advanced Cooling of Phased Array

K TECHNOLOGY CORPORTION

ADVANCED TRANSMIT/RECEIVE MODULE THERMAL MANAGEMENT AND PACKAGING DEVELOPMENT

Topic Number: N02-045 (NAVSEA)

SBIR Investment: $849K
Project Revenue: $1.4M

k Technology Corporation

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Mark Montesano

About the Technology

Thermal management has become the limiting factor in the advancement of many new electronic systems. Current thermal management materials have either reached their performance limits or are impractical due to high cost. As applications for high density, high clock rate electronics increase, new substrate materials and heat transfer methods are required to provide for low cost, high reliability operations. k Technology Corporation's (kTC) thermal management materials enable the passive thermal management of electronic systems. Adapting its k-Core® thermal management system, kTC produced k-Core radar cold plates to allow the conductive cooling of the Navy's AN/SPY-3 Multifunction Radar.

k-Core material is a high conductivity, greater than 1000 Watts per Meter per Kelvin (W/mK), macro composite comprised of an aluminum shell encapsulating annealed pyrolytic graphite which has an in-plane thermal conductivity of 1700 W/mK. Because of k-Core's high conductivity and tailorable coefficient of thermal expansion, chips can run cooler in high-performance electronic packages, enabling the use of higher overall power or smaller package size. k-Core cold plates are currently installed and operating in the naval fleet, and kTC's materials are qualified in numerous systems including, SPY3 radars, AN/ALQ-99 Tactical Jamming System low band transmitter, F-35 Joint Strike Fighter avionics system, and the F-22 Fighter mission computer.

Military and Commercial Significance

k Technology's highly conductive thermal management system and packaging configuration significantly improves the performance and lowers the cost of the thermal management system of current phased array radar systems. The k-Core material provides a lightweight thermal management solution for weight sensitive applications, increases conductivity of the cold plate five times that of aluminum, and has a 30% lower density. In addition, the system provides thermal management in confined spaces and permits high electronic packaging densities.

APPLICATIONS

- NAVSEA: AN/ALQ-99 - Low band transmitter
- NAVAIR, PEO(JSF): F-35 - Camera Cooling (Excel Based Optical Design and Analysis Software & Electro-Optical Targeting Systems) and k-Core Modules
- NAVAIR, PEO(A):UH-60 - Light airborne multipurpose system and power converter cold plates
- Air Force: F-22, F-16 - Thermal cores

About the Company

k Technology Corporation, founded in 1994, is a rapidly growing thermal management company that designs, manufactures, and markets the patented k-Core™ material system for passive thermal management applications. The SBIR program allowed kTC to develop the k-Core technology for use in Navy and other DoD systems. Since 2000, kTC has been supplying its k-Core heat sinks and spreaders to the Navy and aerospace markets. The company is qualified by system primes and is ISO9001:2000 certified by Underwriters Laboratory.

NAVAIR

LAMBDA TECHNOLOGIES

AFFORDABLE SURFACE ENHANCEMENT

Lambda Technologies Low Plasticity Burnishing of Turbine Engine Blade

Topic Number: N01-024 (NAVAIR)

SBIR Investment: $1.01M
Project Revenue: $2.05M

Lambda Technologies

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kbellamy@lambda-research.com
Kim Bellamy

About the Technology

Extensive inspection and maintenance programs are required to detect and replace critical blades with as little as 0.005-inch deep Foreign Object Damage (FOD). The estimated $400M expended annually for High Cycle Fatigue (HCF) greatly increases the total ownership cost of military aircraft. Lambda's Low Plasticity Burnishing (LPB) produces deep levels of compressive residual stress in steel, titanium, aluminum, and nickel-based alloys and improves damage tolerance and fatigue life using conventional Computer Numerical Controlled (CNC) machine tools. The affordable LPB processing is easily incorporated into existing manufacturing and overhaul operations and improves engine life and performance while reducing ownership costs by mitigating foreign object damage, Stress Corrosion Cracking (SCC), corrosion fatigue, and fretting fatigue.

Military and Commercial Significance

Annual military expenditures for aircraft maintenance exceed $2B. By extending the life of critical components, Lambda's LPB technology can reduce costs by 50-80% and processing time by as much as 90%. The LPB process can be performed using typical CNC machine tools in maintenance repair and overhaul facilities and repair depots. The application specific turn-key technology provides real-time Quality Assurance process control, insuring repeatable outcomes and resulting in increased tolerance to common damage mechanisms and simplified inspection procedures. Private sector benefits include improved surface finish and quality, reproducibility, increased component life, low capitalization costs, cost-effective cycle times similar to those achieved with CNC machining.

About the Company

Since its founding in 1977, Lambda Technologies' have become more involved in the development of a process that would enhance fatigue life at a cost savings to manufacturers and end users. The success of Lambda's patented LPB technology in extending the life of metals and metal alloys, created the need for an engineering group to design tools for clients seeking to develop a stronger and longer life product. The Navy SBIR program has been instrumental in supporting the development of the LPB process, which has allowed the company to acquire a 30,000 sq. ft. production facility for in-house LPB processing.

APPLICATIONS

- NAVAIR: Main Landing Gear- SCC Mitigation and HCF Improvement
- FOD Tolerance-F119 Engine 4th Stage; Integral Bladed Rotors Leading Edge, Trailing Edge/Tip, F402 Engine; LPC1 Vane, F402 Engine
- Fretting Tolerance - F402 Engine; LPC1 Dovetail, P-3 Orion; Propeller Hub
- P-3 Orion; Propeller Bore

LOCKHEED MARTIN COHERENT TECHNOLOGIES (LMCT)

(FORMERLY COHERENT TECHNOLOGIES, INC)

COHERENT LIDAR FOR WIND DETECTION AND TRACKING

LMCT's WindTracer® LIDAR detects and tracks hazardous weather conditions

Topic Number: N92-027 (SPAWAR: PEO C4I & Space)

SBIR Investment: $800K
Project Revenue: $3.4M

Lockheed Martin Coherent Technologies

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Denny Chrismer

About the Technology

With a fleet of more than 4,000 aircrafts, the Navy has a need for innovative technology to improve flight safety, and in particular to measure wind fields around air stations and aircraft carriers. Atmospheric winds can affect aircraft missions and a broad range of weapons systems, including the TOMAHAWK and all ballistic missiles. Measuring wind speed and direction around an aircraft currently involves deck-level anemometers, instruments long used for this purpose but ineffective for providing accurate wind data.

Lockheed Martin Coherent Technologies (LMCT) delivers instruments that measure wind speed and direction using Light Detection and Ranging Systems (LIDAR), an advanced remote sensing technique that uses pulsed laser light instead of radio waves (radar) to detect particles and varying conditions in the atmosphere. The company has developed a pulsed coherent 2 limiting diode-pumped solid-state LIDAR receiver on an injection-seeded, Q-switched, 2 micron laser that meets Navy requirements for remote sensing, moderate range, high spatial resolution wind field measurements around air stations and aircraft carriers. LMCT received funding from the Office of Naval Research (ONR) to use LIDAR on the CIRPAS (Center for Interdisciplinary Remotely-Piloted Aircraft Studies) Twin Otter aircraft for research of the lower atmosphere.

Military and Commercial Significance

LIDAR is ideally suited for range-resolved, volumetric clear wind-field mapping, and for measuring aerosol concentration levels over municipal-sized areas. LIDAR collects local area measurements of wind speed and direction between the regional surface and 3-kilometer altitude, with a vertical resolution of 100 meters or better. LMCT's solid-state LIDAR is field deployable with an unattended round-the-clock operation capability. All of these attributes result in the ability to enhance flight safety by collecting better data on wind speed, turbulence, and microbursts.

APPLICATIONS

- ONR: CIRPAS- Research of the lower atmosphere
- U.S. Army Research Laboratory – Urban test scenarios
- U.S. Army Dugway Proving Grounds - Truth sensor for chemical biological testing
- Commercial and university aviation facilities

About the Company

Bridging the gap between innovation and application, Lockheed Martin Coherent Technologies (LMCT) is a world leader in the development of laser-based remote sensing systems. The company's technological advances are at the heart of its products designed to meet the rigorous requirements of government, military, and commercial customers. LMCT and its commercial Products Group is a full-service company capable of generating new laser-based technology concepts from technology development and demonstration through product engineering and product manufacturing.

NAVAIR

MATERIALS RESEARCH & DESIGN

REPAIR OF CERAMIC MATRIX COMPOSITES FOR EXHAUST WASHED AIRFRAME STRUCTURES

Low Observable Ceramic Matrix Composite Exhaust System

Topic Number: N98-149 (NAVAIR)

SBIR Investment: $1.9M
Project Revenue: $2.4M

Materials
Research & Design

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Kent Buesking

About the Technology

The Navy has an immediate need for an alternative to the metallic blast shield currently used on the AV-8B Harrier aircraft. The blast shield protects the fuselage from the harsh exhaust environment, but the existing component exhibits severe degradation due to the high thermal and acoustic loads. Blackglas™ Ceramic Matrix Composites (CMCs) have been identified as potential replacement for existing steel blast shields that require significant maintenance because of thermal and acoustic loads. However, the composites cannot be employed in the fleet until further testing, development, and repair procedures have been established.

Materials Research & Design (MR&D) has developed ceramic matrix composites, which can be used to manufacture replacements parts for certain Navy jet and helicopter metal components. MR&D's test data demonstrated that the repaired panel restored 95 percent of the load-carrying capability of the baseline composite. In addition, a micromechanical model and a thermal/acoustic finite element model were created to evaluate the effects of damage and design repairs on ceramic matrix composites. These models help MR&D to further develop repairs that arise from normal wear, abuse, and battle damage. MR&D received funding to develop analytical models and perform experiments to understand the effects of the operating environment (temperature, chemical species) on the structural properties of the CMC nozzle components in the AV-8B Joint Strike Fighter. MR&D has also received a contract from NAVSEA to design and analyze CMC components that have been successfully ground tested in the divert and attitude control system Standard Missile-3 Trident.

Military and Commercial Significance

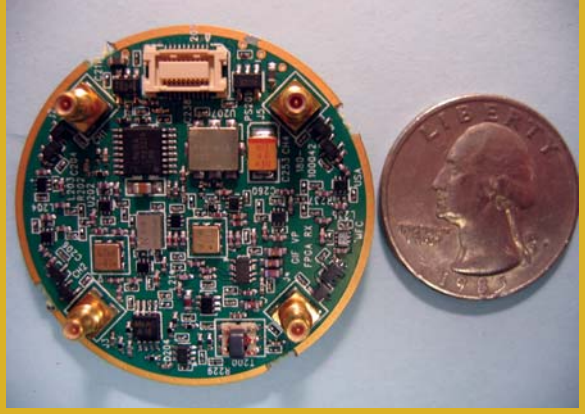
MR&D's ceramic matrix composites increase the cycle life and reduce repair costs of wing metal components on Naval jets and helicopters, such as AV-8B. Ceramic matrix composite materials tolerate a higher operating temperature in power turbines, which increases their efficiency and reduces the amount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

About the Company

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

APPLICATIONS

- NAVAIR
  - AV-8B Joint Strike Fighter - Design and analyze CMC components
  - Firescout unmanned aerial vehicle design, analysis, fabrication, and flight test
- NAVSEA
  - Standard Missile-3 Trident- Develop analytical models and performing experiments for CMC nozzle components
  - Commercial sector: Land-based turbines, power generation equipment



Miniaturized GIF GPS Receiver

MAYFLOWER COMMUNICATIONS COMPANY, INC.

PROJECTILE INERTIAL NAVIGATOR FROM COTS INSTRUMENTS

Topic Number: N01-077 (NAVSEA, PEO-SHIPS & IWS & SUBS)

SBIR Investment: $1.1M
Project Revenue: $18.1M

Mayflower Communications Company, Inc.

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Triveni Upadhyay

About the Technology

Mayflower Communications Company, Inc. has developed a High Anti-Jam (AJ) GPS Guidance Electronics Unit (GEU) that has miniaturized Selective Availability Anti-Spoofing Module GPS receivers and GPS anti-jam modules suitable for most precision guidance munitions. The gun-hardened GEU system has anti-jam capability and provides a high degree of protection against jamming of GPS receivers. The AJ GPS guidance system was developed in response to Navy's need for a commercially available and affordable inertial navigator that is suitable for use in guidance and control of projectiles.

In a teaming arrangement with Alliant Technologies, Inc. (ATK), Mayflower is supporting the Ballistic Trajectory Extended Range Munitions (BTERM II) Demonstration Program. The company is providing its GPS antenna AJ electronics to ATK/Draper for the Navy BTERM II projectiles. BTERM II is considered an alternative to the extended range, gun launched projectile and an alternative to the Extended Range Guided Munitions. Mayflower is also applying its GPS/AJ technology to the DoD's Guidance Integrated Fuze (GIF) Demonstration Program, and is developing miniaturized anti-jam antenna electronics and a single chip SAASM GPS receiver for use in the GIF GEU.

Military and Commercial Significance

Mayflower's Anti-Jam GPS GEU offers a powerful, high performance, small size, low cost solution for precision guided munitions. Production cost is decreased by using commercially available instruments, miniaturizing the enhanced GPS receiver and anti-jam module unit, and by using "accelerometers only" inertial navigation systems without including the more expensive gun-hard gyroscope that is not available commercially. The GPS anti-jam technology mitigates multiple wideband jammers for gun-launched rolling projectiles by utilizing a conformal antenna. The GIF program seeks to replace the existing NATO standard fuze on existing stockpiled Army, Navy, and Marine Corp ammunition with a low-cost, fuze-sized module.

APPLICATIONS

- Navy – Guidance Integrated Fuze, Ballistic Trajectory Extended Range Munitions II
- Army - Precision Guidance Kit, homeland security, battery operated robots, soldier radio
- Air Force - Unmanned Aerial System
- Commercial Industry - GPS navigation for aviation, automotive, farm, mobile robots for mining and hazardous materials

About the Company

Mayflower Communications, founded in 1986, is a technology leader in providing cost-effective solutions for high performance affordable radio navigation and communication products. Mayflower has led the development of RFI mitigation technologies and products utilizing advances in signal processing, antenna and sensor integration technologies. The Navy SBIR program has greatly impacted the company's increase in revenues and growth of more than 50% within the last year. Because of SBIR funding and acquisitions, Mayflower is now a competitive, qualified source of military GPS receivers, and GPS anti-jam products for the DoD.

MCQ INC.

OMNISENSE® REMOTE NETWORKED SENSOR SYSTEM

OmniSense® provides enhanced capabilities to find and attack insurgents

Topic Number:
OSD00-SSW04
(ONR)

SBIR Investment: $849K
Project Revenue: $38.6M

McQ Inc.

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John McQuiddy

About the Technology

McQ's OmniSense® is a fully networked satellite linked persistent surveillance system that integrates advanced sensors in the field to a powerful map based user interface. The user interface visualizes the operational situation and provides command and control of the sensors over the same network used by the sensors to report the detection of targets. The persistent surveillance sensors are currently deployed, in quantity, to warfighting areas to monitor roads, borders, and areas of interest for insurgent activities. Developed for the Navy, the advanced OmniSense® Visually Enhanced Tracking Sensor (OVETS) provides automated target detection and sensor imaging. The detected targets are tracked with either a daytime color camera or an uncooled nighttime infrared camera so the user sees the target as it is detected.

The Sensor Information Management System (SIMS), developed for the Air Force, produced a Common Data Interchange Format (CDIF) data structure, which is the "glue" of the user interface and visualization technology, and ties the field deployed sensors and the "back end" user together via a network architecture. The network architecture is compatible with the military Non-classified Internet Protocol Router Network and Secret Protocol Network versions of the commercial networks. The OVETS and SIMS combined to produce a highly successful deployed capability to detect and locate insurgent activities in Iraq and Afghanistan. The CDIF data structure has been adopted by Special Operations Command, Defence Intelligence Agency, CENTCOM, and INSCOM as the required data layer for all unattended ground sensors in the current Middle East conflict areas.

Military and Commercial Significance

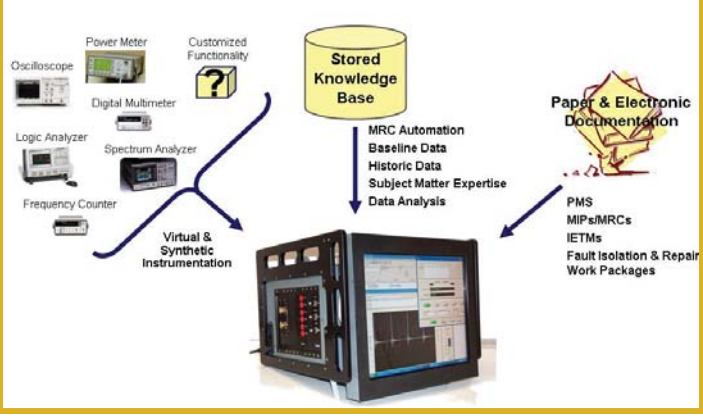
OVETS collects thermal infrared video images captured by a network of sensors spread across a region, and fuses the data to create a comprehensive picture of the battlefield. The system allows operators a 360 degree, 24 hours situational awareness and significantly increased operational effectiveness, and revolutionizes the availability of battlefield information.

About the Company

McQ Inc. is a high technology leader in remote surveillance, security, and environmental monitoring products that offer complete 'concept to product' R&D capabilities. For more than two decades the company has delivered state of the art surveillance and remote sensor systems to commercial, industrial, and government clients. The success of the OmniSense® system has allowed McQ to expand into other DoD programs. Production contracts resulting from McQ's SBIR efforts enabled the company to hire new personnel and to reinvest money into product improvements.

APPLICATIONS

- MARCOR: Tactical Remote Sensor System Program – New Marine Corps Battlefield Sensor System
- Army: Army Research Lab, Intelligence and Security Command, Ft. Belvoir - Persistent Surveillance System used in Iraq and Afghanistan to find and attack insurgents
- Special Operations Command: Unattended Ground Sensors Program – The OmniSense® User Interface is used by SOCOM for all UGS reporting in CENTCOM's Area of Responsibility



MIKROS SYSTEMS CORPORATION

MULTI-FUNCTION DISTRIBUTED ANALYSIS TOOL (MFDAT)

The ADEPT ® Solution

About the Technology

Using the technology conceived under the Multi-Function Distributed Analysis Tool Mikros Systems developed ADEPT®, the Adaptive Diagnostic Electronic Portable Testset. ADEPT is a computer-aided alignment and maintenance tool for the AN/SPY-1 radar system, the primary air and surface radar for the Aegis Combat System installed on Ticonderoga (CG-47) and Arleigh Burke (DDG-51) class warships. By integrating the required test equipment functionality and automating the testing processes, ADEPT significantly reduces system calibration, alignment, maintenance and repair times, optimizing radar performance and enhancing overall Aegis readiness.

ADEPT eliminates the need for traditional manuals and other paper documentation by incorporating the information in an internal database and presenting it to the operator in a logical, user-friendly interface through its XML-driven document processing engine. The maintenance procedures, intermediate measurements, and test results are stored in the database and made available for trend analyses in support of pro-active remediation and logistics planning. ADEPT's distance support capability allows sharing data and technical resources ashore and for real-time remote operations, to assist the onboard maintainer and reduce the need for expensive, shipboard technical assistants. The historic measurement data is also used to provide a realistic, off-line training capability, further reducing system maintenance downtime. As a programmable, modular, PC-based maintenance tool, ADEPT applicability can be expanded to other complex military and commercial electronic systems.

Military and Commercial Significance

ADEPT represents a major step in the standardization of electronic test equipment and system testing processes. The system provides a viable path towards meeting DoD's readiness goals while reducing the dependency on manpower, training, and manually-operated test equipment. ADEPT's PC-assisted, semi-automated maintenance processes enables consistent grooming of any complex electronic system to a peak operational condition using general technicians. ADEPT has reduced the calibration and alignment maintenance times for the AN/SPY-1A radar by about 50%.

Topic Number: N02-039 (NAVSEA)

SBIR Investment: $1.1M
Project Revenue: $7.7M

Mikros Systems Corporation

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David C. Bryan

APPLICATIONS

- Navy: AN/SPY-1A Radar maintenance and test tool
- ADEPT application modules for all other variants of the SPY-1
- Projected near-term applications:
  - AN/SPS-67 Surface Search Radar
  - AN/SPS-49 long-range air surveillance radar
  - AN/SPQ-9B surface surveillance and tracking radar
  - AN/SLQ-32 electronic countermeasures

About the Company

Mikros Systems Corporation specializes in the research and development of electronic systems technology for military applications. Since becoming active in the SBIR program in 1988, Mikros has won 17 SBIR awards, including six Phase II awards and four Phase III technology commercialization programs. In 1996 the company was the first New Jersey recipient of the Tibbetts Award for SBIR Excellence. In 2005, and due in large part to the ADEPT® program, Mikros was recognized by Deloitte as one of the 500 fastest-growing technology companies in the U. S. and Canada. Projected revenue for 2007 is over $3M.

MIOX CORPORATION

LIGHT-WEIGHT, PORTABLE WATER PURIFICATION DEVICE

The Mountain Safety Research MIOX hand-held purifier

Topic Number: N03-159 (MARCOR)

SBIR Investment: $98.6K
Project Revenue: $1.5M

MIOX Corporation

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Gregg Mich

About the Technology

For troops on reconnaissance missions, the availability of clean drinking water directly correlates with survival and mission success. Depending upon climate and mission requirements, Marines must carry over 25 pounds of water for a 72-hour mission, to avoid dehydration. MIOX Corporation partnered with Mountain Safety Research (MSR), now part of Cascade Designs Incorporated (CDI) to develop and commercialize water purifier that utilizes salt, water and power to generate a strong disinfectant solution. When the solution is added to untreated water, it rapidly and effectively inactivates a number of common water-borne pathogens, including E. coli, Giardia, and Cryptosporidium. The water purifier is effective against several chemical and biological warfare agents as well. The MSR MIOX purifier provides the warfighter with a portable, light-weight water purification device that alleviates the expense and difficulties of water logistics. The purifier does not require pumping, which is an advantage in a hostile environment where water must be captured quickly and treated under cover.

The MSR MIOX purifier has been deployed to both Iraq and Afghanistan. The device disinfects water collected from streams, rivers, and lakes, and is safe to drink after treatment with the purifier. MIOX received funding to develop other components for a complete hydration system. The hydration system currently under development includes a 3 liter hydration bag, a disinfection device in the cap of the bag, and a filter for removing particles and other contaminants from raw water.

Military and Commercial Significance

The MSR MIOX purifier allows troops to purify water in any environment, and complies with the Environmental Protection Agency standards for microbiological purifiers (bacterial removal to 6 logs, viral removal to 4 logs, and protozoan cyst removal to 3 logs). The purifier operates in Nuclear, Biological, and Chemical (NBC) environments, and tests on selected NBC contaminants have shown it to be effective in removal and destruction of those contaminants.

About the Company

MIOX Corporation was incorporated in 1994 and is a high technology growth company in the Rio Grande corridor. The SBIR/STTR program enables MIOX to research and develop the miniaturization of its existing municipal water purification technologies. Miniaturization of this technology has provided MIOX Corporation with the design basis for a variety of small-system applications. MIOX Corporation partnered with CDI to commercialize the efficient, sleek, light-weight hand-purifier for military and civilian functionality.

APPLICATIONS

- Military - Portable water purification
- Commercial: Outdoor enthusiasts and international travelers
- Humanitarian: Disaster relief and water treatment for compromised water

NAVAIR

NAVMAR APPLIED SCIENCES CORPORATION

LADAR (LASER RADAR) IDENTIFICATION DEMONSTRATION

Future Operational Concept

Topic Number: N92-170 (NAVAIR)

SBIR Investment: $1.03M
Project Revenue: $25M

Navmar Applied Sciences Corporation

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Richard DeFrancesco

About the Technology

Navmar Applied Sciences Corporation (Navmar) has developed technology to address the Navy's need for portable surveillance and remote target identification systems. The technology provides a total integrated system approach to the modification of Patrol and Reconnaissance aircrafts with Intelligence, Surveillance, and Reconnaissance (ISR) and enhanced communications packages. The portable system can be used with fixed wing Unmanned Aerial Systems (UAS) and reconfigurable payloads to provide low-cost, expendable-standoff surveillance, reconnaissance, and targeting.

The remote targeting identification application addresses a requirement by the Navy for automatic target recognition technology. The system's signal processing and target identification functions have direct application to acoustic, non-acoustic, and seismic sensors for remote surveillance applications, which require airdropped and hand-emplaced sensors to remotely monitor and detect/identify targets. Navmar received funding to install the detection systems on its Unmanned Aerial Vehicles, as a "carrier" for the systems to achieve a portable surveillance capability. The portable surveillance and remote targeting identification system is being employed in support of Operation Enduring Freedom.

Military and Commercial Significance

Navmar's successful NAVAIR test performance for in-theater operational use reveals the targeting system's electro optic surveillance feature provides hands-off queuing and targeting that addresses other surveillance application needs of the Navy. The technology utilized the 3 to 5 micron infrared focal plane array instead of the standard 8 to 12 micron focal planes used by many existing systems, which has resulted in higher resolution imagery portability and more sensitive detection capability. Of prime importance are the SBIR technologies developed from the original remote targeting technology that are applicable to flexible payload delivery, and especially applicable to UASs, remote surveillance, and other spin-off technologies.

APPLICATIONS

- NAVAIR: Fixed Wing and UAS -ISR
- UAS - Requirement for re-configurable payloads
- Navy - Troop/convoy (force) protection, improvised explosive devices detection
- Homeland Security - Border surveillance, counter drug surveillance

About the Company

Navmar has provided professional engineering services and rapid prototyping under contract to the DoD and other government and private sector clients. The company has assisted clients in meeting the challenges of an ever-changing national and international environment. Engineering disciplines include system engineering, system design and development, system integration, and life-cycle management. Navmar subject matter expertise includes avionics, material sciences, acoustic sensors, electro-optics, and communications and navigation.

OCEANA SENSOR TECHNOLOGIES, INC.

DESIGN AND FABRICATION OF PROTOTYPE WIRELESS SENSING SYSTEM

ICHM ® 20/20 Wireless Smart Data Acquisition Product

Topic Number: OSD00-008 (NAVSEA, OSD)

SBIR Investment: $100K
Project Revenue: $6.2M

Oceana Sensor Technologies, Inc.

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Don Bradway

About the Technology

The Navy has a need for a critical technology that reduces the cost of implementing condition-based maintenance (CBM) in naval weapons platforms. To meet this need, Oceana Sensor Technologies (Oceana) developed a wireless integrated Intelligent Condition Health Monitoring (ICHM®) device, that offers a low cost means to integrate smart load sensors into critical machinery components. The ICHM wireless device monitors machinery, transmits sensor data, and provides an embedded load measurement in real-time, for a variety of CBM, load and other sensor monitoring applications. The system achieves smaller element of intrusion, cost effective integration with mechanical components, and incorporates integrated processing capability.

Unlike conventional CBM approaches based on acceleration (vibration) monitoring that detects imminent failure, mechanical load based CBM can assess or predict a component's life expectancy, which allows advanced planning of critical maintenance. Oceana Sensors has transitioned this technology for use in USS Carl Vinson monitoring of vent fans, Land Based Engineering Site testing for shipboard elevator monitoring, and developed a prototype system for gear box monitoring.

Military and Commercial Significance

The availability of Oceana's ICHM® device affords low-cost embedded load measurement and processing. The system enables predictive maintenance, characterization and optimization of operational conditions, overload detection and avoidance, and fatigue observation. The ICHM® device reduces shipboard manning and allows the monitoring of hard to reach places and hazardous areas. Moreover, access to real-time mechanical load data affords overload avoidance or optimization of operating conditions. The technology enables the most affordable CBM implementation practicable, which in turn reduces life cycle costs. The technology is applicable to all types of rotating machinery and benefits U.S. military platforms such as the Joint Strike Fighter (JSF), Advanced Amphibious Assault Vehicles (AAAV), CVX Aircraft carriers, and the Distance Support Program.

About the Company

Oceana Sensor is a leading manufacturer of sensing systems for a wide variety of applications including machinery health monitoring. Many types of industries and measurement services use Oceana sensors and data collection tools to monitor mission-critical operations and to assess when components need replacement or repair. The Navy SBIR funding enabled Oceana Sensor to increase their technical expertise and become more competitive in both the Government and commercial markets. As a result, Oceana Sensor's revenue increased by 20% with a large portion coming from increased market share.

APPLICATIONS

- Navy: JSF, AAAV, CVX
  - Smart Carrier Program- USS Carl Vinson monitoring of vent fans
  - AAA Program - Developed prototype system for gear box monitoring
  - Land Based Engineering Site – Testing for shipboard elevator monitoring
  - Distance Support Program

Artist's Concept of H-60/VTDP SpeedHawk™

NAVAIR

PIASECKI AIRCRAFT CORPORATION

VECTORED THRUST DUCTED PROPELLER (VTDP) COMPOUND HELICOPTER TECHNOLOGY

Topic Number: N91-317 (NAVAIR)

SBIR Investment: $784K
Project Revenue: $65.3M

Piasecki Aircraft Corporation

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John W. Piasecki

About the Technology

Piasecki Aircraft (PiAC) has developed the Vectored Thrust Ducted Propeller (VTDP) Compound Helicopter Technology, which adds a fixed wing and a tail-mounted ducted propeller to a conventional single rotor helicopter. The technology consists of a five-bladed propeller within an 8-foot diameter composite duct with thrust-vectoring sectors and a horizontal elevator. As the aircraft accelerates, the VTDP sectors retract to direct all thrust along the line of flight. Power to the tail thruster increases as the fixed wing unloads the main rotor, providing the compound helicopter with greater speed and range and less vibration than conventional helicopters.

PiAC received a Naval Air Systems Command contract for preliminary design of AH-1W/VTDP and SH-60/VTDP Compound Helicopters and detail design, fabrication, and ground testing of the full-scale, flight-worthy VTDP. The VTDP test program was successfully completed in June 2000, and all technical objectives were met or exceeded. The first flight of this aircraft occurred on June 29, 2007, and the flight test program is proceeding in two phases. Phase 1 verifies the aeromechanical and structural suitability of the X-49A within the SH-60F Naval Air Training and Operating Procedures Standardization (NATOPS) limits, thereby supporting Phase 2 Flight Test expansion beyond the NATOPS limits to demonstrate the full performance capability of the VTDP technology.

Military and Commercial Significance

The VTDP compound helicopter technology offers the military an affordable means of upgrading existing and future helicopter performance while reducing planned recapitalization costs. Lower operating costs are achieved by decreasing fatigue loads and vibration levels, which can extend the life of helicopter parts. The technology enables a rotary wing aircraft to fly at increased speeds with greater maneuverability, resulting in greater survivability. Successful completion of the VTDP Compound Helicopter ATD flight demonstration program enables DoD to expand the mission capability of the existing helicopter fleet as part of its $40 billion, 25 year recapitalization effort and provide a technology option for future rotorcraft platforms.

APPLICATIONS

- Navy: MH-60R/S - Candidate for VTDP Compound Helicopter Technology
- Marine Corps: AH-1Z, UH-1Y - Candidate for VTDP Compound Helicopter Technology
- Army: UH-60M, MH-60M, AH-64D - Candidate for VTDP Compound Helicopter Technology

About the Company

Piasecki Aircraft Corporation is an aerospace research and development engineering and manufacturing company that develops advanced vertical lift aircraft technologies. Founder Frank Piasecki is one of the original inventors of the helicopter and a pioneer in landing vertical take-off and landing crafts. Successful flight demonstration of the technology developed under this SBIR program offers the opportunity to develop and produce retrofit programs for conversion of existing conventional single rotor helicopters to a compound configuration for significant improvements in performance, survivability, and life cycle cost.

PLASMA PROCESSES, INC.

LOW-COST, NON-ERODING PROPULSION AND HOT GAS COMPONENTS

Net Shape Throats

Topic Number: N00-056 (NAVSEA)

SBIR Investment: $842K
Project Revenue: $2.66M

Plasma Processes, Inc.

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Timothy McKechnie

About the Technology

Integrated High Payoff Rocket Propulsion Technology (IHPRPT) is a nationwide defense system initiative to improve rocket propulsion technology. In order to meet this objective, ultrahigh-temperature, non-eroding energy management devices are required to constrain propellants operating at temperatures in excess of 6,000 degrees Fahrenheit and pressures greater than 2,000 pounds per square inch. Plasma Processes, Inc. (PPI) has developed low-cost, zero-erosion, net-shape refractory and ceramic propulsion, and hot-gas valve components that have successfully completed subscale hot-fire testing.

Rocket nozzle throat inserts are manufactured using PPI's Vacuum Plasma Spray (VPS) net shape manufacturing technique, a coating process in which a combination of high-melting and chemically stable refractory metals and their ceramics are sprayed onto a mandrel of the desired shape under vacuum or low pressure. The technique eliminates machining issues inherent with brittle, refractory materials and deposition rates. In addition to reducing the cost of rocket engines and improving performance, VPS technology yields a low recurring component cost after development. PPI's VPS technology is being tested in solid rocket motors for the Standard Missile-3, as part of the Navy's sea-based Aegis ballistic missile defense system that will provide theater-wide defense against medium and long range ballistic missiles.

Military and Commercial Significance

The VPS net shape manufacturing technique lowers rocket-engine costs, improves propulsion performance, and increases payload size. The manufacturing technique offers the flexibility of material choices and incorporates multiple materials within the component structure, through the use of functional gradients, thereby increasing performance and life-cycle. In a series of scale-up tests using a .351-inch diameter valve throat specimen and 4K rocket motor containing either Class 1.3 or Class 1.1 propellant, the PPI nozzle demonstrated less than 0.2 mils/second erosion rate and 90 times less erosion when compared with a 4D Carbon-Carbon throat insert.

About the Company

Plasma Processes, Inc.'s participation in the SBIR and STTR programs has resulted in affordable new technologies and innovative manufacturing techniques. The company has developed diverse technologies with broad applications for markets and product areas in both the military and commercial sectors. Plasma Processes has been awarded the 2002 Turning Goals Into Reality Award by NASA, Alabama Manufacturer of the Year 2000 by the Business Council of Alabama, and Small Business of the Year 2000 by the Huntsville Chamber of Commerce.

APPLICATIONS

- Navy, Air Force, Army, and Missile Defense Agency - Non-eroding nozzles
- Navy, Air Force, Army, and Missile Defense Agency : Joint Common Missile, Compact Kinetic Energy Missile - Solid rocket motors
- Energy industry: Meets high thermal requirement and environmental non-reactivity needs
- Coatings industry: Corrosion protection, electrical resistively/conductivity, oxidation resistance, thermal protection, wear resistance

Trial Application, Port of Houston, TX

POLYMERIGHT, INC.

POLYSULFIDE MODIFIED EPOXY NOVOLAC CLADDING FOR STEEL IMMERSION/SPLASH ZONE SERVICE

Topic Number: N02-006 (NAVFAC)

SBIR Investment: $264K
Project Revenue: $602K

POLYMERight, Inc.

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Alex Vainer

About the Technology

The Navy has over 54 million square feet of waterfront construction in tidal/splash zones that requires regular applications of protective anticorrosive coatings. The existing Unified Facilities Guide Specification provides the option of two coating systems for initial painting of steel placed in sea water immersion/splash zones. Each system provides approximately three to five years splash zone service before complete removal and reapplication is needed. In addition, these coating systems require a very lengthy and complex application process, and contain high amounts of Volatile Organic Compounds (VOCs) and hazardous/carcinogenic chemicals that are now being phased out.

POLYMERight, Inc. has developed and patented a broad, new family of reasonably priced, environmentally safe polysulfide-containing resins from which multiple types of adhesives, coatings, sealants, and other reactive polymeric formulations can be created. POLYMERight's polysulfide-containing coatings are designed to protect steel constructions in tidal/splash zones for at least 7 years, do not require a primer and top coat, and do not contain VOCs, hazardous air pollutants, or carcinogenic coal tar. The unique properties of the polysulfide chemical segments allow products based on these resins to have outstanding flexibility, excellent cold-temperature properties, high oil and gasoline resistance, and exceptional liquid and gas impermeability, UV-resistance, and hydrophobicity. POLYMERight received a contract from the Naval Facilities Engineering Command for its improved coating development under the SBIR Program. Additional funding was provided by the Environmental Security Technology Certification Program and the Deputy Undersecretary of Defense for Acquisition, Technology, and Logistics.

Military and Commercial Significance

POLYMERight's coating technology addresses a number of constraints posed by current coating systems used by the Navy. The coating improves corrosion control, decreases the frequency and duration of maintenance painting, eliminates many environmental hazards, and significantly reduces total ownership costs for the Navy.

APPLICATIONS

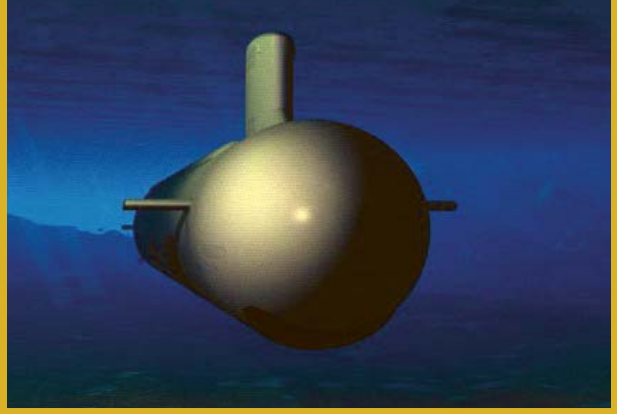
- Chief Naval Installations Command
  - Naval port facilities and waterfront structures
  - Improved coating
- Construction facility painter – Harbor sheet piles preventive maintenance paint
  - Improved coating
- Shipping industry – Bulkheads, pipe piles, H-piles, cranes, ships (ballast tanks)
  - Improved coating
- State and federal government
  - Bridges, water and wastewater structures

About the Company

POLYMERight, Inc. is a technology-driven specialty chemical company primarily engaged in the development, sales, and marketing of new types of synthetic polymeric materials. Formed in 1998, the company's objective has been to develop new polymeric materials for a variety of industrial markets. The anticorrosive tidal/splash zone coating technology that POLYMERight developed under the SBIR program was licensed by Chevron Phillips Chemical Company LP, which is now responsible for its manufacture and marketing.

PROGENY SYSTEMS CORPORATION

SUBMARINE TECHNOLOGY INSERTION FOR COTS-BASED SYSTEMS



Submarine Technology Intersection

Topic Number: N96-278 (NAVSEA)

SBIR Investment: $850K
Project Revenue: $130M

Progeny Systems Corporation

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Walter Kitonis

About the Technology

Many of today's weapons systems are obsolete and cannot support the changes needed to adapt to new threats. Solutions to obsolescence typically involve replacing rather than modifying the existing system, which is an expensive option. Newer, high-density systems can be reasonably migrated to higher performance, like-technology components as long as the base architectures have not changed. Moreover, if discipline is applied to the design and development process, the anticipated migration effort, even for systems that differ architecturally, can be minimized significantly.

Progeny Systems has developed a prototype environment and method for facilitating commercial off-the-shelf technology infusion into embedded computer systems, by providing open architecture infrastructure components, infusion assessment and management tools, strategies, and methodologies for creating resilient system designs.

Progeny has applied its technology to the Program Executive Office (PEO) SUBS, in a number of systems and architectures, such as non-tactical data processing and system automation software that supports reduced manning onboard submarines, upgraded torpedo electronics for improved performance and reduced cost, submarine weapon simulators, and information assurance products for the management of classified data.

Military and Commercial Significance

Progeny Systems' technology insertion designs and methodologies have helped to significantly drive down overall cost of combat system upgrades, while reducing life-cycle costs, improving both reliability and availability, increasing capabilities, and improving the entire quality of the system. Progeny Systems' approach to technology insertion makes future technology upgrades easier and less costly than replacing obsolete combat systems.

About the Company

Since its incorporation in 1995, Progeny Systems Corporation has provided high quality engineering services to the Navy, Air Force, Army, DARPA, and corporate customers. Since August of 1996, when the Naval Sea Systems Command awarded Progeny Systems its first SBIR contract, Progeny Systems has received numerous SBIR contracts, many of which have involved leveraging commercial technologies into special customer applications, reducing life cycle cost, and improving system performance. Progeny Systems attributes a significant portion of its growth, of more than 300 employees and 2006 revenues of $60 million, to the Navy SBIR program.

APPLICATIONS

- NAVSEA: PEO SUBS Submarine sonar systems
- NAVSEA: PEO SUBS Virginia Class submarine electronics
- System automation for reduced manning on-board submarines
- Non-tactical data processing, torpedo electronics, weapon simulators

QUINSTAR TECHNOLOGY, INC.

ANTENNA FOR SHIPBOARD MISSILE DETECTION SYSTEM

Millimeter-wave antennas with integral downconverters

Topic Number: N02-087 (ONR)

SBIR Investment: $834K
Project Revenue: $329K

QuinStar Technology, Inc.

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John Kuno

About the Technology

A great deal of interest and effort has been directed toward the development of Millimeter - Wave (MMW) missile seekers, over the years. Relatively small antennas can provide high gain and narrow beamwidth at MMW frequencies. The MMW technology can penetrate fog, smoke, clouds, and dust, and because of its short wavelength, can provide sensing accuracy, when used in sensor systems such as radars. It is widely projected that anti-ship missile systems will operate in the Ka-band and W-band where low atmospheric attenuation windows exist around 35 GHz and 94 GHz, respectively. In order to defend naval ships against such missiles armed with MMW seeker technology, detection systems with a high probability of detection and intercept are needed.

QuinStar Technology, Inc. has developed high gain MMW omnidirectional antennas, direction finding antennas, and integral upconverters, for the 30-40 GHz and 90-100 GHz bands, where missile attack threats are deemed the highest. The key elements of the MMW receiver systems are the downconverters and antennas, which can detect vertical and horizontal polarizations. QuinStar received funding from SPAWAR and General Dynamic to develop millimeter-wave antennas and integral converters for the Surface Electronic Warfare Improvement Program (SEWIP).

Military and Commercial Significance

The shipboard missile detection technology is the primary feature of the new Navy SEWIP, which replaces the older AN/SLQ-32 system. Combined with the integral MMW down-converters, the MMW antennas can be used to upgrade existing systems, or as the front-end of new naval electronic warfare systems and implemented across several classes of ships. The MMW antenna provides enabling technology for the development of new systems and other applications including high data rate communications, force protection, surveillance, homeland security, and Unmanned Aerial Vehicles (UAV) control and data transmission.

APPLICATIONS

- Navy: SEWIP, Anti-Ship Missile Defense System, AN/SLO-32 – Future naval electronic warfare systems
- Communication Industry: Wireless LAN, wide band communications - Point to multipoint data communication systems
- Homeland Security: Security systems, emergency communication systems, surveillance, secure data communications, quick deployment
- UAV control and data transmission, force protection, surveillance

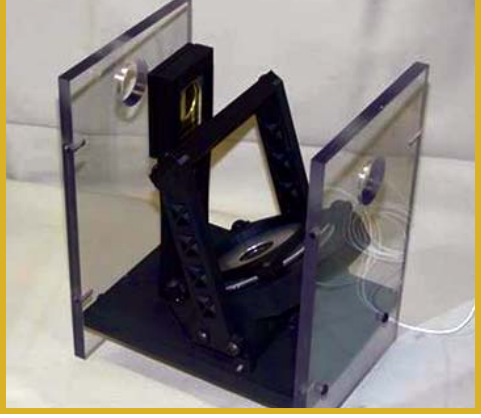
About the Company

QuinStar Technology, Inc. is an ISO9001:2000-certified MMW technology company offering innovative product solutions. With expertise in MMW products, micro electronic assembly, rapid prototyping, and mass customization, the company serves the commercial, scientific, and defense arena. QuinStar's program experience includes DoD R&D, high reliability space flight, and volume production of products fielded in broadband wireless communication networks. SBIR funding has allowed QuinStar to work with a system integrator prime contractor and to explore other system applications.

NAVAIR

RL ASSOCIATES

DEVELOPMENT OF A HIGH-EFFICIENCY ULTRA NARROWBAND VOLUME HOLOGRAPHIC OPTICAL FILTER



One of RL Associates' Optical Filters

Topic Number: N97-006 (NAVAIR)

SBIR Investment: $895K
Project Revenue: $11.5M

RL Associates

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Richard Billmers

About the Technology

RL Associates (RLA) has developed extremely efficient ultra-narrowband optical filters for various Light Detection and Ranging (LIDAR) applications such as detecting cloud formations and airborne and underwater objects such as mines and submarines. The technology was developed in response to the Navy's need for laser radar for underwater detection of mines, near the water surface and shore, where the acoustic techniques are limited. RL Associates' narrow linewidth, high efficiency optical filter greatly enhances the performance of all types of detection systems. In the RLA system, a laser transmitter illuminates the target and some portion of the laser light is reflected back from the target and becomes incident on the imaging detector.

RLA has received funding from the Office of Naval Research to develop the concept of a FireLidar system, which would be used to overcome some of the shortcomings of thermally imaging systems. The FireLidar unit is either mounted on the firefighters' helmet or hand-held, and consists of a diode laser transmitter, an ultra-narrowband optical filter, and a sensitive imaging camera.

Military and Commercial Significance

RLA's efficient ultra-narrowband optical filter reduces the solar background scatter by orders of magnitude thus allowing equal daytime/nighttime performance. RLA's optical filter is much more rugged than existing models and can withstand the vibrations, mechanical conditions, and the extremes of temperature associated with spaced-based or airborne military platforms. A key aspect of this system is the ultra-narrowband optical filter that only allows the reflected laser light through and rejects any and all other intense light. The systems maintains eye safety while allowing use of a high power optical transmitter for increased image contrast and system sensitivity.

About the Company

RL Associates, Inc. (RLA) specializes in design and fabrication of electro-optic systems and devices. The company is currently developing a narrow-band optical filter in a thick volume holographic material to reduce ambient background optical signals detected by LIDAR systems. The company's proprietary technology is sponsored by the SBIR programs at NAVAIR and ONR. RLA's business base has grown from less than $100,000 of SBIR funds in 1996 to more than $1.75 million in 2004; approximately $1.3 million of this revenue is from non-SBIR transition.

APPLICATIONS

- NAVAIR - Ocean Water Lidar systems
- Office of Naval Research - Future Naval Capabilities for Platform Protection
- Naval Research Laboratory - Solar and astronomical observation
- Missile Defense Agency - Targeting and tracking system applicationstes

High Speed Torpedo Launch

SEA CORP

ADVANCED TORPEDO/ COUNTERMEASURE LAUNCHING SYSTEM

Topic Number: N95-208 (NAVSEA)

SBIR Investment: $777K
Project Revenue: $8.4M

SEA CORP

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Barry Holland

About the Technology

Since the advent of the Lightweight (LW) torpedo, the energy used to launch torpedoes from ships has been supplied by high pressure air stored in refillable flasks attached to the torpedo tube breech. The flasks are maintenance intensive, and the physical profile, energy capacity, thrust, and payload dimensions cannot accommodate the changing needs of evolving weapons, sensors and platforms.

SEA CORP has developed an innovative family of launchers using automotive airbag inflators to provide the impulse energy. The commercially available inflators, with a 15-year shelf-life, are inexpensive, reliable, and permit the modularity of a completely sealed, maintenance-free launcher system. Through inflator selection, variable timing, and design features, the technology can accommodate a wide variety of payloads and can be adapted to platforms ranging from small unmanned surface vessels to major combatants, and aircrafts. A series of land-based and at-sea testing has brought the Advanced Surface Launcher to Technology Readiness Level 6.

Continued development is being funded by PEO Integrated Warfare Systems (IWS) not only for LW torpedo launchers, but also for future payloads such as the Common Very Light Weight torpedo. Additionally, several government agencies have funded development of a variety of launchers using this technology for other payloads.

Military and Commercial Significance

SEA CORP's inflator technology provides a lightweight torpedo launcher that is completely modular, requires little or no maintenance, and is 100% operationally ready at all times. Because of the versatility of the inflators, and by using tailored inserts, various payloads with different characteristics can be accommodated within a single launcher. The system is self-contained, never needs charging from outside sources, is usable aboard any platform, and can be installed, removed, or motivated quickly for mission-specific payloads. Commercially, the technology is applicable to launch payloads from different types of platforms or land-based facilities.

APPLICATIONS

- NAVSEA: PEO IWS
  - Surface vessel torpedo launcher, small-diameter acoustic countermeasures
  - Anti-torpedo weapons
- NAVAIR
  - Helicopter launched sonobuoys (multi-mission maritime helicopter)

About the Company

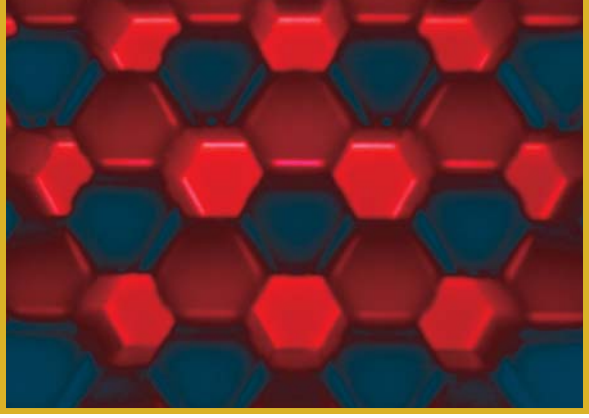
An avid participant in the SBIR Program since 1993, SEA CORP has leveraged its SBIR success into a program for launcher development. The launcher program sustains a robust department of about a dozen engineers and technicians and is the only mature developmental program for surface ship torpedo launchers. Building on its mature torpedo launcher program success, SEA CORP recently completed a Phase II SBIR for a sonobuoy launcher for the Navy's MH-60R helicopter, based on similar technology.

NAVAIR

SEA SYSTEMS

(FORMERLY TRIANGLE RESEARCH AND DEVELOPMENT CORPORATION)

DEVELOPMENT OF HELICOPTER CUSHIONS TO INCREASE SURVIVABILITY (MITIGATOR TECHNOLOGY)



The MitiGator energy dissipating technology

Topic Number: N92-152 (NAVAIR)

SBIR Investment: $857K
Project Revenue: $28M

SEA Systems

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Richard McKinney

About the Technology

For naval personnel who work on air, land or sea vehicles, constant or single impact, shock, or vibration can cause fatigue, pain, injuries, reduce proficiency, and even death. SEA Systems' MitiGator Technology™ is a smart, passive engineered cushioning material (utilizing one or more layers) that reduces or eliminates damage or injury caused by collision, repeated shock, shaking, and explosions. The MitiGator™ uses patented air control technology to dissipate enegy before it is transmitted to the body, thus reducing the level of injury sustained.

The MitiGator has been validated through intensive in-house testing as well as by independent testing by the Navy and Air Force. The MitiGator is currently being used in over five thousand Army Humvees in Iraq to protect against injury or death by landmine or improvised explosive device blasts, with eleven thousand more to be deployed in 2007. Small quantities have begun to reach Iraq for several Marine Corp (MARCOR) and Army helicopters to protect against crash landings and hard contacts. Navy, MARCOR, and Army have all provided acquisition or research dollars to transfer the MitiGator to various platforms.

Military and Commercial Significance

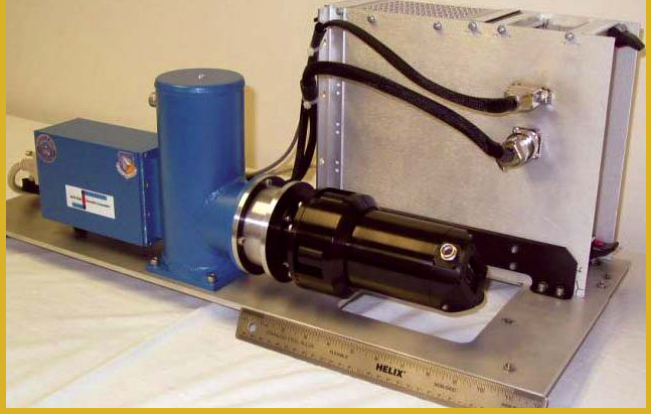
The MitiGator advanced cushioning methodology is certified for flight by the Navy. The cushions use internally molded air passages and interconnecting orifices that employ airflow to redirect impact energy laterally, to maximize energy absorption and lower vibration transmission. The cushioning technology reduces whole body motion by an average of 36% and as much as 75%, thus reducing fatigue during long missions. The system is as effective against repeated impacts (high speed boats or ground vehicles) as it is against one-time events (crash landings), and returns to its original configuration after hard contact, making it suitable for reoccurring impacts.

About the Company

In August 2006, SEA Systems Group, Inc. (SEAS) obtained a certificate of registration as an ISO 9001:2000 facility. In October 2004, SEAS received the prestigious Outstanding Phase III Transition Award from the Navy and Dawnbreaker. The company was also included in the 2004 edition of Profiles In Success, Navy Transition Assistance Program. In November 2004, SEAS received The Leader in Science and Technology Award from the Southern Piedmont Technology council at the Institute for Advanced Learning and Research.

APPLICATIONS

- MitiGator™ seat cushion: crash landings and hard impacts protection
  - NAVAIR, MARCOR: AH-1W/UH-1 Helicopters ; Coast Guard: MH-68A Helicopters; Army AH-64, OH-58 and OH-6 Helicopters
  - MARCOR: Expeditionary Fighting Vehicles, Growler Expeditionary Fire Support System
- Army HMMWV for Up Armor Applications
  - MitiGator™ seat cushions: protects during blasts from landmines and IEDs



Battlefield Event ISR Sensor Prototype for UAV Applications

NAVAIR

SOLID STATE SCIENTIFIC CORPORATION

BATTLEFIELD EVENT ISR SENSOR FOR UAV PLATFORMS (UAVCDP2)

Topic Number: N03-008 (NAVAIR)

SBIR Investment: $850K
Project Revenue: $5.5M

Solid State Scientific Corporation

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James Murguia

About the Technology

Military and commercial aircrafts are vulnerable to attack from a wide variety of guided and unguided rockets and explosive projectile threats. The ability to correctly identify propulsion systems and missile types in real time allows the Navy to effectively institute countermeasures and tactics against threats and enhance the situational awareness of the battlespace. To address this need, Solid State Scientific Corporation developed the Battlefield Event Intelligence Surveillance Reconnaissance (ISR) Sensor that uniquely identifies rocket motors and explosive initiated projectiles, and allows the reliable identification and location of a projectile launch as a passive sensor. The Battlefield Event ISR Sensor measures 260 simultaneous spectral bands from energetic battlefield transient events over a relatively wide field of view. The sensor utilizes an optical element called the crossed-dispersion prism, which simultaneously projects the Medium-Wave Infrared (MWIR) and either the Visible (VIS) or Short-Wave Infrared (SWIR) spectra of point targets onto a common Focal Plane Array (FPA).

The Battlefield Event IRS Sensor is designed to have the VIS/SWIR and MWIR spectra display at a right angle on the FPA, allowing the system to spectrally self-calibrate and provide sub-pixel accuracy in the location of point target events. The Air Force sponsored tests, conducted at Yuma Proving Ground, for automated detection, spectral extraction, event classification, and identification algorithms. The Battlefield Event ISR Sensor was successfully demonstrated in tests against live targets onboard a NAVAIR AeroStar Unmanned Aerial Vehicle (UAV).

Military and Commercial Significance

The Battlefield Event ISR Sensor provides intelligence about battlefield events such as rocket launches and anti-aircraft artillery. The sensor includes a multi-band electro-optic camera and customized processing that quickly detects, locates, and identifies battlefield events in real time. Unlike traditional high-resolution broad-band imaging sensors that have limited discrimination capability and require large communication bandwidths, the Battlefield Event ISR Sensor provides location and identity information in a text message within seconds of each event.

APPLICATIONS

- NAVAIR: PEO Weapons UAV - Battlefield Event ISR
- NAVAIR: PEO Air Assault & Special Missions Program -Missile Threat Warning and Threat Identification; Targeting
- NAVAIR: PEO Weapons- Real-time Bomb Damage Assessment

About the Company

Solid State Scientific Corporation (SSSC) researches and develops high-throughput spectral imaging and pseudo-imaging sensors and algorithms for defense applications. Since 1994, SSSC has designed, built, and tested advanced prototype hyper spectral imaging systems for a range of military electro-optic infrared applications in the visible/near infrared, SWIR, MWIR, and long-wave Infrared bands. SSSC has pioneered simultaneous spectral-temporal sensing for real-time identification and tracking of energetic battlefield events for such applications as missile threat warning, bomb damage assessment, situational awareness, and launch detection.

SONALYSTS, INC.

EMBEDDED TRAINING IN AN OPTIMIZED MANNING ENVIRONMENT

ASTAC ITA Mode Selection Screen

Topic Number: N01-116
(NAVSEA, PEO-SUBS)

SBIR Investment: $849K
Project Revenue
(ASTAC ITA): $2.66M
Project Revenue
(STG ILE): $1.94M

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John Wayne

About the Technology

The next generation of Navy surface ships will be far more advanced, and operate and be maintained by significantly fewer sailors. The reduction in manning will result in fewer sailors in need of training and fewer knowledgeable instructors available to conduct training. In addition, training will involve sailors learning new and complicated systems to meet the Navy's knowledge and skill requirements. Sonalysts, Inc. has addressed this training need by developing PC-based Closed-loop Adaptive Training (CLAT) technology. CLAT applies four different, but mutually supportive components: simulation, adaptive interactive multimedia instruction, simulation-based intelligent tutoring, and a Learner Model to facilitate efficient and effective knowledge and skill acquisition by individual students. The CLAT system automatically creates and delivers an "individualized training plan" based on the student's mastery of defined learning objectives, available learning objects, student population, and instructional definition data.

Sonalysts was awarded an Indefinite Delivery Indefinite Quantity contract from Naval Surface Warfare Center Dahlgren Division to implement the CLAT technology in support of Navy training requirements. The first delivery order under this contract is to develop an Anti-Submarine Warfare/Anti-Surface Warfare Tactical Air Controller Intelligent Training Aid (ASTAC ITA) to support ASTAC training requirements, with an expected completion date of 31 January 2008. In addition, a second delivery order was awarded to support Surface Sonar Technician training in the Navy's Integrated Learning Environment.

Military and Commercial Significance

Implementation of ASTAC ITA is expected to achieve a significant return on investment resulting from decreased trainer maintenance costs, decreased student attrition, higher student throughput, and more effective staff utilization. Additionally, marked increases in student proficiency are expected. The Office of Naval Research is conducting an effectiveness evaluation of different versions of the ASTAC ITA tutor component. The evaluation will enable developers to maximize the cost-effectiveness of future intelligent tutoring systems.

About the Company

The Navy SBIR/STTR Program represents an important portion of Sonalysts' corporate research and development efforts, and has been instrumental in the company's $60M in sales for FY06 and steady growth over the last 18 years. While this Phase III award is a major milestone, Sonalysts has won 29 Phase I and 12 Phase II Navy SBIR contracts valued at more than $9.7M. Several of the Navy SBIR awards, including the Phase II prototype ASTAC ITA effort, have been instrumental in supporting Sonalysts' design and development of the CLAT technology – making Sonalysts a leader in the field of advanced computer-based instructional applications.

APPLICATIONS

- NAVSEA: Center for Surface Combat Systems – Training for Navy air controllers, sonar technicians, and other Under Sea Warfare personnel
- NAVSEA: DDG 1000 Next Generation Destroyer Program – Training for sailors
- Commercial aviation industry: Air Traffic Controller basic operational aircraft control procedures

Laser PC/QA System

TECHNOLOGY SYSTEMS, INC.

LASER FABRICATION FOR SHIP STRUCTURES

Topic Number: N99-141
(NAVSEA)

SBIR Investment: $60K
Project Revenue: $14M

Technology Systems, Inc.

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Charles Benton

About the Technology

Technology Systems, Inc. (TSI), along with its partner Applied Thermal Sciences (ATS), has developed a laser-welding process control system, using both autogenous laser and hybrid (laser and gas metal arc) welding technology, that provides for high-speed, precision, low-distortion, and affordable fabricated structures. The application of industrial lasers in producing structural shapes for shipbuilding creates enormous savings and results in higher-quality products than those produced by present methods. Components fabricated from plate steel are inherently more precise and of lower weight than those produced from traditional rolled steel.

The process control system is designed to automate categorization, nesting, and handling of steel plates used in the fabrication of structural shapes such as I-beams and T-beams. The system includes a quality-assurance capability that provides in-process weld pool monitoring and after-weld inspection. The controller is referred to as the Process Control/ Quality Assurance system. Initially developed to fabricate stiffeners for ship construction, the technology has allowed for the development of high strength-to-weight ratio sandwich panels, which is appropriate for a number of shipboard applications such as decks, bulkheads, and system platforms. The technology is going through certification of applications on the CVN and DDG 1000 platforms.

Military and Commercial Significance

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

APPLICATIONS

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

About the Company

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

TECHNO-SCIENCES, INC.

OPERATIONS SCHEDULING TOOLS FOR NAVAL AVIATION UNITS

STORM system used to manage progress of student aviators for F-14 training program

Topic Number: N90-351 (ONR)

SBIR Investment: $814K
Project Revenue: $14.2M

Techno-Sciences, Inc.

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Amy Hizoune

About the Technology

Many mission planning and execution tasks can be automated or assisted by the use of artificial intelligence (AI) or expert system technologies. Techno-Sciences, Inc. (TSi) has developed an automated scheduling system, which incorporates constraint directed reasoning with stochastic operations research ideas and leverages existing software from another resource allocation system. TSi's Scheduling Tool for Readiness Management (STORM) system applies advanced AI and Neural processing techniques to solve mission planning and execution problems to helps increase mission effectiveness, reduce aircrew workload and operational readiness.

Scheduling algorithms are dynamic list policies and are motivated by the stochastic nature of the availability and demand models. Because of advances in processing technology, this automation system can be accomplished economically at low to medium risk. STORM enables constraint directed reasoning to allow for the explicit representation of the relationship between scheduling constraints and unsatisfied (mission) demand, and provides a mechanism for relaxing active constraints in a rational way. The Norfolk base, which trains Naval Aviators for fleet replacement (Squadron VF-101), has used TSi's automated system continuously for several years. The Naval Artificial Intelligence Research Center at the Naval Research Laboratory at Norfolk contracted with TSI to develop the STORM system for use by Naval scheduling officers in managing the progress of student aviators through the 39 week training program for F-14.

Military and Commercial Significance

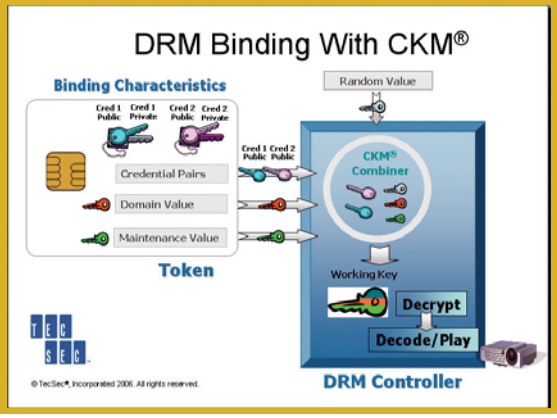
TSI's STORM improves naval aviation unit operational readiness and mission effectiveness. The system minimizes schedule turbulence, reduces mission risk, allow Navy personnel to respond to aviator scheduling request, view and archive aviator status information, and automatically schedule and reschedule aircrews.

About the Company

Techno-Sciences (TSi) is a growing employee-owned, high technology company with four main divisions: Search and Rescue (COSPAS-SARSAT [Space System for the Search Vessels in Distress - Search and Satellite-Aided Tracking]), Defense Systems, Systems Engineering, and Aerospace Engineering. TSi's early experience covered an extensive range of advanced technical feasibility studies and advanced software designs in communications, remote sensing, and search and rescue. Over the past 10 years TSi has evolved from providing research into a company that develops innovative products and engineering solutions.

APPLICATIONS

- Naval Artificial Intelligence Research Center NRL - Manage the progress of student aviators and the availability of instructors
- Naval Base at Norfolk, VA: Training naval aviators fleet replacement (Squadron VF-101)



TECSEC INCORPORATED

INVESTIGATE TECHNIQUES TO DEVELOP HIGHLY TRUSTED SECURITY FEATURES FOR WORKSTATIONS

TecSec Digital Rights Management

About the Technology

In an effort to develop a highly trusted, secure workstation with encryption TecSec Incorporated developed the Constructive Key Management® (CKM®), a cryptography key management system. Legacy server based encryption systems limited the networks' ability to accommodate the growing need for scalability, mobility and operating efficiency. TecSec's cryptographic technology is able to provide end-to-end security that includes a hard token with CKM embedded in integrated circuits, in smart cards.

The CKM Enabled® multi-application Smart Card carries radio frequency ID and logical access to PCs, functions as a federating device, and permits ID Management for controlled access among various applications. The cardholder gains a mobile ID device, where permission varies depending upon one's role and/or location. Keys are created on an as needed basis, and then destroyed, not stored. Different access permissions are assigned to objects by the message originator. Lacking a recipient's access permission, only the enterprise owner can recreate keys. Information is highly granular and managed at the object level. Laptop content protection is one selected military application of CKM. The Department of Homeland Security Advanced Research supports TecSec's Cyber Security solution in the nation's power grid, a Homeland Security Presidential Directive 7 Critical Infrastructure solution. The Treasury Department employs CKM for laptop and workstation protection. This Navy SBIR has since been subsumed in the Net Centricity orientation of current Joint Global Information Grid programs.

Military and Commercial Significance

TecSec's object management greatly expands the functionality of encryption through enforcement of information rights management. CKM provides a range of solutions, safeguards information, and selectively shares data within or outside of an organization. TecSec's reduced role for the server and heightened functionality at the workstation has brought a paradigm shift that enforces role based access, at the object level, to anything digital that can be named, be it physical, logical, or functional.

Topic Number: N91-057 (SPAWAR)

SBIR Investment: $795K
Project Revenue: $23.4M

TecSec Incorporated

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John Petty

APPLICATIONS

- DoD: Iraq - Biometrics recording and verfication
- Joint Battle Center Lab - Coalition Information Sharing
- Joint Warrior Interoperability Demonstrations of Interface Applications
- Joint Emergency Management Framework
- African Endeavors - EUCOM, Tech advisers: SPAWAR/DISA
- National Counter Terrorism Center

About the Company

TecSec is a standards-based product and solutions company, which focuses on data management and information privacy and confidentiality. TecSec develops and sells information assurance through a cryptographic approach that enforces management's rules and standards of conduct. TecSec has greatly expanded the applications of cryptography through its basic characteristics, assisted by a sophisticated key management system. The product life cycle of a new generation of cryptography and key management system requires protracted periods of development and testing. The SBIR program has been most helpful in this lengthy process.

TOYON RESEARCH CORPORATION

MINIATURE ANTI-JAM GPS/INTEGRATED COMMUNICATIONS ANTENNA FOR GUIDANCE INTEGRATED FUZE

T-MAGIC Antenna System

Topic Number: N01-120 (NAVSEA/PEO-SHIPS, IWS, & SUBS)

SBIR Investment: $1.1M
Project Revenue: $2.4M

Toyon Research Corporation

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Kenan Ezal

About the Technology

New weapons for Naval Surface Fire Support use GPS as their primary means of navigation. The loss of GPS signal due to interference is a real threat to naval communications, positioning, and navigation systems. The Navy needs a system that measures interference of GPS signals, analyzes the affects of interference on navy weapons, and mitigates the impact of interference. To address the Navy's needs, Toyon Research Corporation (Toyon) developed a low-cost Miniature Anti-jam GPS Integrated Communications (MAGIC) antenna system for the Guidance Integrated Fuze (GIF).

Toyon's MAGIC (T-MAGIC™) antenna system occupies less than 0.5 cubic inches and comprises anti-jam GPS electronics and two antenna elements that fit within a given trapezoidal volume. T-MAGIC's two antennas can be electronically reconfigured and has a closed-loop radio frequency interference (RFI) suppression system. The antennas provide anti-jam protection (nulling) for the GPS receiver without consuming more that 150 milliwatts of power. The electronically reconfigurable system is designed to maintain optimal performance across large temperature variations. The first generation T-MAGIC was successfully launched at Naval Surface Warfare Center Dahlgren, in a test firing of a 155mm Howitzer round, and operates at rotations of up to 250 Hz.

Military and Commercial Significance

Achieving good RFI rejection has become more difficult as military and civilian electronic systems become smaller, lighter and cheaper. The small size of the T-MAGIC antenna system allows it to meet military and commercial industries space and cost requirements for GPS and communications systems. T-MAGIC's anti-jam capability boosts the robustness of precision guided munitions, reduces the possibility of collateral damage, and increases the performance of standard artillery systems by using GPS to achieve improved "metal on target" accuracy, all at a lower cost. Because the GIF is a potential replacement for the NATO standard Multi-Option Fuze for Artillery, T-MAGIC technology is applicable to many existing 155mm, 105mm, and 76mm projectiles, and 120mm and 81mm mortars.

About the Company

Toyon Research Corporation is a leader in technical analysis, modeling, and simulation of sensors and weapon systems used in hostile environments. Toyon's longstanding participation in the SBIR Program has led to the development of successful antenna design services. The company has received SBIR funding for a number of software technologies that have resulted in the development of several simulation products used Government-wide, and acclaimed by industry and DoD customers. Toyon anticipates significant increases in revenue from the use of its T-MAGIC technology on alternative platforms, such as UAVs, and an estimated 100,000 T-MAGIC units per year.

APPLICATIONS

- NAVSEA: Naval Surface Warfare Center: 155mm and 105mm artillery systems, small munitions - GIF and Course Correcting Fuze
- Army: Tank Automotive and Armaments Command: Army Research, Development and Engineering Center - Course Correcting Fuze
- Commercial – GPS, wireless and telecommunications industries, Mobile Ad-hoc Networks

TRIDENT SYSTEMS, INC.

SAFE TEST BOUNDARIES

Testing and certification system used on AEGIS Surface Combat Systems

Topic Number: N00-062
(NAVSEA, PEO-IWS)

SBIR Investment: $849K
Project Revenue: $1.69M

Trident Systems, Inc.

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Michael Stoddard

About the Technology

Testing and certification, of multiple computer systems for software upgrade compatibility and integration with legacy systems can be time consuming and costly. The inefficiency of current recertification methods is even more apparent when new source code discrepancies impact only one type of platform or system while not impacting other legacy systems. The Navy needs an automated test capability for its AEGIS Surface Combat System that provides automated re-certification of downward compatible computer programs, maintains functionality, interfaces with legacy computer programs, and insures that older systems are not adversely impacted by upgrades.

Trident Systems has developed "Safe Test Boundaries (STB)"- a diagnostic application that compares and analyzes dependencies in large, complex software source codes. The application compares the changes found between two baselines of a software project and determines, based on dependency analysis, the elements that need to be retested because an element has changed or is dependent on an element that has changed. Once testing and procedures are linked to code elements, the diagnostic application recommends which test procedures need to be re-run based on the STB analysis.

Military and Commercial Significance

DoD is the primary user and tester of software systems provided by contractors. The STB increases testing efficiency, effectiveness, and reduces maintenance and testing costs by an estimated 30-50%. The application increases software reliability by allowing evaluators to focus on source codes and functionality changes, along with eliminating dependency on functionality changes without having to involve the whole system at all stages of testing. The STB identifies those parts of the software system that are at highest risk, software elements that may be safely recertified without further intervention and those parts of the system with no changes.

APPLICATIONS

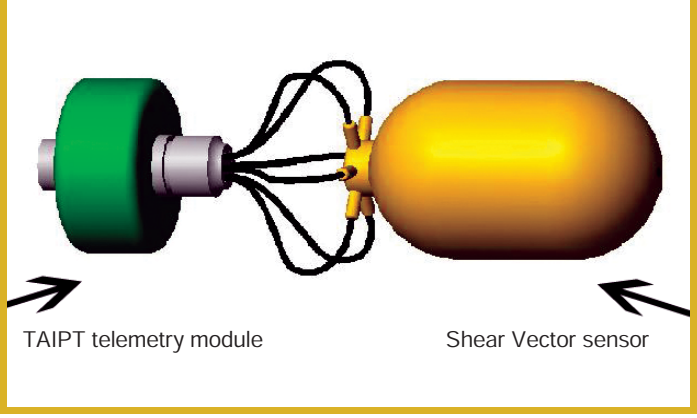
- NAVSEA: Aegis Ship Self Defense System - Reduce testing cost
- NAVSEA: Chief Engineer - Evaluate changes to model data
- NAVAIR: E2C Aircraft - Evaluate changes between the Platform Independent Model and a Platform Specific Model

About the Company

Trident Systems Incorporated is a veteran owned small business providing hardware and software systems to military and commercial clients since 1985. The SBIR/STTR program continues to be the primary source of startup revenue for Trident Systems. Hardware and software products developed from SBIR/STTR contracts include the XTouch touch screen solutions, Digital Intelligence Situation Mapboard handheld situational awareness device, and InterchangeSE systems engineering integration framework. Last year Trident Systems' revenue grew by almost 50%, and is expected to exceed $40M this year.

WILCOXON RESEARCH, INC.

SHEAR MODE VECTOR SENSOR WITH ARRAY COMMUNICATION ELECTRONICS



Shear Vector Sensor with Telemetry Module

Topic Number: N02-066 (ONR)

SBIR Investment: $700K
Project Revenue: $3.98M

Wilcoxon Research, Inc.

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Clay Shipps

About the Technology

For many years towed arrays have been utilized by the Navy's submarine fleet to detect underwater acoustic signal. Currently existing arrays employ omni-directional hydrophones which cannot determine if the signal is emanating from the left or right side. To determine the bearing of the detected signal, the submarine must conduct maneuvers which change the position of the array so that the bearing to the target can be triangulated. These maneuvers take time and often the detected signal is lost. Directional information can be achieved by towing multiple arrays behind the submarine but these systems are difficult to deploy and retrieve and are costly to implement.

Wilcoxon Research, Inc. has developed an advanced towed array sensing technology that uses the single piezocrystal to create an acoustic Vector sensor that meets the submarine community's directional sensing needs. The neutrally buoyant sensor combines an omni-hydrophone with a tri-axial accelerometer. The hydrophone detects a target's acoustic pressure and the accelerometers detect the target's directional acoustic particle velocity. Wilcoxon's Shear Mode Vector Senor has been tow tested at the Navy's Lake Pend Oreille facility in Idaho. It has also been tested at sea in California's Monterey Bay as a towed array behind a Unmanned Undersea Vehicles (UUV) and as a bottom mounted array.

Military and Commercial Significance

Wilcoxon Research's low noise Vector sensor can be rapidly integrated into existing Naval towed array applications. Unlike existing omni-directional hydrophones, the Vector sensor provides directional information on target noise sources. The acoustic Vector sensor eliminates left/right ambiguity while providing a bearing accuracy of 1 degree and 4.8 - 6.0 dB of gain of amplification over traditional hydrophones. The sensor's null can be steered in any direction to reduce noise interference, thereby increasing signal to noise gain and allowing increased resolution of faint acoustic signals. The sensor can also be used in sea life studies to determine behavioral patterns.

About the Company

Wilcoxon Research, Inc. is committed to the ongoing evolution of pioneering research and development in advanced piezoelectric transducers. The company manufactures a wide range of vibration instruments, and manufacturing and test equipment ranging from basic precision machinery for providing high quality sensor components, to custom-built machinery specifically designed for transducer fabrication. Wilcoxon's extensive engineering experience and manufacturing expertise provide a solid foundation on which to design and build the products of tomorrow.

APPLICATIONS

- Navy -Towed arrays for UUVs and gliders, towed arrays for submarines and surface ships, and sonobuoys
- Department of Homeland Security - Harbor and port defense
- Energy Industry - Oil and gas exploration

ZWEAVE, INC.

PLM SOFTWARE FOR MILITARY APPAREL, UNIFORMS, AND PROTECTIVE CLOTHING

CPLM™ - Zweave's Integrated Digital Environment for Clothing and Equipment

Topic Number: N02-008 (NAVSUP)

SBIR Investment: $700K
Project Revenue: $1.2M

Zweave, Inc.

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David Buck

About the Technology

With the advent of scanners that can measure individual human bodies in three dimensions, the technology is finally available to create electronic models of body size and shape based on the surface data of real people. The Army, Air Force, and Marine Corps have begun gathering 3-D anthropometric data on their personnel. A survey of the adult civilian population of NATO countries is also underway. There is now both an opportunity and a need to develop new tools for incorporating 3-D body size information in the design and manufacture of both military and civilian apparel. Zweave has taken advantage of this opportunity by developing software that compliments 3-D computer aided design systems for apparel.

Zweave has developed the first human-centered Product Lifecycle Management (PLM) software solution to support the information-management challenges experienced by federal and commercial manufacturers of apparel, uniforms, and protective clothing items. Through its CPLM™ Solution (Collaborative Product Lifecycle Management), Zweave supplies military uniform and apparel modernization program offices, their prime contractors, suppliers, and manufacturers with the tools to manage product lifecycles, from requirements determination through development and testing. The Army's Program Executive Office, Soldier, and Joint Project Management Office - Individual Protection (JPMO-IP) have awarded Zweave with a contract for continued development. Zweave's solution are in final stages of development and testing and will be piloted within several DoD laboratories.

Military and Commercial Significance

Both the Navy and the Army use Zweave's software solutions in the development of warfighter uniforms and safety equipment to support the configuration management of product development information from materials, fit, patterns, and specifications. The technology manages the bill of material data, created to assist the design and procurement efforts of program management offices and their network of partners from design, enginering and RD&E. CPLM also manages 3-D information including sizing systems, patterns, body scans, and garments.

APPLICATIONS

- Navy: Military uniform and apparel - Development and testing
- Air Force: Military uniform and apparel - Development and testing
- Army: Military uniform and apparel - Development and testing
- JPMO-IP: Military uniform and apparel - Development and testing
- Fashion and Apparel Industry: Designers and pattern makers

About the Company

Zweave has spent over three years researching and advancing the unique requirements and functionality of product engineering teams within multiple federal product development laboratories. The company has worked on projects for both military and civilian contractors, and has created the PLM requirements for Gap, Banana Republic, and Old Navy. Zweave anticipates capturing signicant DoD and commercial contracts in 2007.

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For more information on the Navy SBIR/STTR Program,
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