

PROFILES IN SUCCESS

NAVY TRANSITION ASSISTANCE PROGRAM

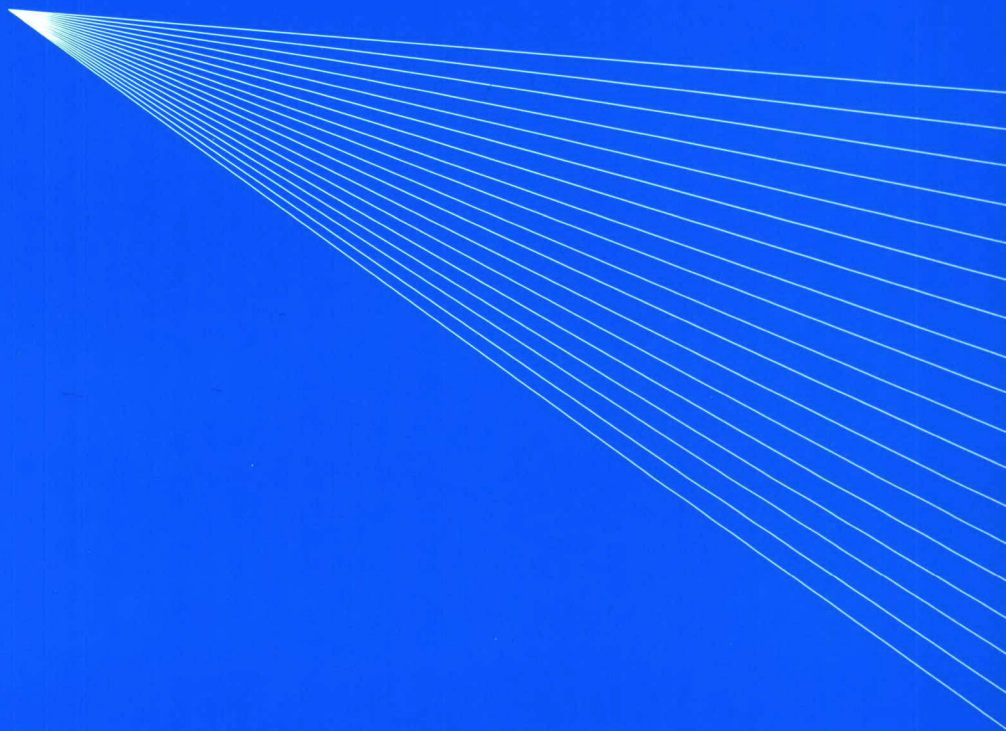
VOLUME 2



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The Commercialization Company

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CONTENTS



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14. ABSTRACT This publication documents the achievements of companies that participated in the 2003-2004 Transition Assistance Program (TAP) sponsored by the US Department of Navy's Small Business Innovation Research (SBIR) Program Office as a means of expediting the transition of technology to the fleet. This competitive 10-month program is offered to Navy SBIR and STTR Phase II awardees. It is designed to assist companies in transitioning to Phase III. Within 18 months of program completion, 72% of the 81 participating firms in the 2003-04 TAP received additional non-SBIR government or private funding and increased sales. This publication features the success stories of 18 of those companies.					
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- 01.** 21st Century Systems, Inc.
 - 02.** Adaptive Technologies, Inc.
 - 03.** Advanced Ceramics Research, Inc.
 - 04.** Advanced Rotorcraft Technology, Inc.
 - 05.** Alliant Techsystems, Inc.
 - 06.** ALPHATECH, Inc.
 - 07.** Cellular Materials International, Inc.
 - 08.** Composix Company
 - 09.** Daniel H. Wagner Associates, Inc.
 - 10.** EnSolve Biosystems, Inc.
 - 11.** Essex Corporation
 - 12.** Form Fit and Function, LLC
 - 13.** Kronos Air Technologies, Inc.
 - 14.** Lambda Technologies
 - 15.** Management Sciences, Inc.
 - 16.** Metric Systems Corporation
 - 17.** ProSensing, Inc.
 - 18.** RLW, Inc.

2003–2004 TAP Finalists: 21st Century Systems, Inc., Aculight Corporation, Adaptive Technologies, Inc., Advanced Ceramics Research, Inc., Advanced Rotorcraft Technology, Inc., Aether Wire & Location, Inc., Alliant Techsystems, Inc., ALPHATECH, Inc., Aptima, Inc., Aqua-Dyne, L.P., Beacon Interactive Systems, Benthos, Inc., BMA Engineering, Inc., Bodkin Design & Engineering, LLC, Business Performance Group, LLC, Cellular Materials International, Inc., CogniTech Corporation, Combustion Research and Flow Technology, Inc., Composix Company, Computer Optics, Inc., Cortana Corporation, Critical Technologies, Inc., Cybernet Systems Corporation, Daniel H. Wagner Associates, Inc., Electron Energy Corporation, Engenium Technologies, Inc., EnSolve Biosystems, Inc., Essex Corporation, Fischer Custom Communications, Inc., Form Fit and Function, LLC, Foster-Miller, Inc., Fractal Antenna Systems, Inc., GMA Industries, Inc., Ill-N Technology, Inc., Industrial Planning Technology, Inc., INTEK Marine Technology, LLC, Interface Displays and Controls, Inc., JENTEK Sensors, Inc., KaZaK Composites, Inc., Kronos Air Technologies, Inc., Lambda Technologies, Linearizer Technology, Inc., Management Sciences, Inc., MARK Resources, Inc., Materials Sciences Corporation, Materials Systems, Inc., Menon and Associates, Inc., Metric Systems Corporation, METSS Corporation, Micro Optics Technologies, Inc., Mide Technology Corporation, New Jersey Microsystems, Inc., Noise Control Engineering, Inc., Nova Engineering, Inc., Omnet, Inc., OptiComp Corporation, Optimization Technology, Inc., OPTRA, Inc., OR Concepts Applied, Physical Optics Corporation, Physical Sciences, Inc., Plasma Processes, Inc., ProSensing, Inc., RDA, Inc., RLW, Inc., Shock Transients, Inc., Sierra Lobo, Inc., Software & Engineering Associates, Inc., Sordal SpeechGear, Inc., TDA Research, Inc., Technology Service Corporation, The Open Group, Thermal Wave Imaging, Inc., Trex Enterprises Corporation, Vektrex, Venture Scientific International, LLC, Wastech International, Inc., Weidlinger Associates, Inc., WW Technology Group, Yankee Environmental Systems, Inc.



PROFILES IN SUCCESS | Navy Transition Assistance Program

There are multiple factors in developing a successful technology and building the business to support it. It requires, not only the scientific knowledge to create a product in need, but also a comprehensive business plan that will guide the company through to their ultimate goals. Small businesses often have staff with the necessary scientific knowledge right at hand, but can use assistance when it comes to navigating the “business side” of transitioning technology—which can be fraught with risk if the company is not properly prepared.

Profiles in Success is a Dawnbreaker publication meant to celebrate the achievements of companies that participated in the 2003–2004 Transition Assistance Program (TAP). The TAP is a Dawnbreaker program sponsored annually by the U.S. Department of the Navy’s Small Business Innovation Research (SBIR) Program Office as a means of expediting the transition of technology to the Fleet.

This competitive, 10 month program is offered exclusively to Navy SBIR and STTR (Small Business Technology Transfer) Phase II award recipients. TAP is designed to assist these companies in confirming customer needs, enhancing their strategies for transitioning to Phase III, and developing a technical brief, as well as a Phase III Transition Plan, among other, appropriate tools. Companies that complete the TAP are given the opportunity to present their projects at the Navy Opportunity Forum® where there will be a large group of high-level decision makers, including prime contractors, other private sector companies and various Defense agencies in attendance.

The TAP has gone through many modifications since the initial pilot was conducted in 1999–2000. The changes made have all focused on achieving the goal of a more rapid transition of SBIR and STTR Program-funded technology to the fleet. The method used by Dawnbreaker in working with participating firms is highly interactive and is focused on developing tools, opportunities and relationships that will facilitate transition.

It is the participating companies’ actions, aided by increased business acumen, information and tools that are re-

sponsible for their success. Following the Forum®, companies may decide to take limited action or aggressively seize new opportunities. Companies may even change direction and more ardently pursue previous initiatives, utilizing the tools developed in the Dawnbreaker program.

The decisions of the company to be more or less aggressive are affected by personalities, financial conditions, availability of contracting vehicles and staffing levels. Other factors that come into play are market conditions and technical issues that may emerge following a presentation at the Forum®.

Eighty-one companies completed the 2003–04 TAP, which culminated in the presentation of 96 projects at the Forum®, held in Washington, D.C. area in May of 2004. Follow-up data were collected at 6, 12, and 18 month intervals following the Forum® in order to determine if the TAP was successful in achieving the desired result of increasing the likelihood and rate of transition.

Within 18 months of program completion, 72 percent of the presenting firms in the 2003–04 TAP received additional non-SBIR government or private funding and/or increased sales, totaling \$353,510,733. This is a significant return in less than a two-year period. Funding came from a wide variety of sources including, Phase III contracts, contracts from prime contractors, corporate acquisitions, and Congressional funding.

Congratulations are extended to all of the program participants for their Phase III achievements. The following 18 profiles are of companies that achieved more than \$1M in sales, Phase III contracts and/or investments during this 18 month period.

21st Century Systems, Inc., Arlington, VA | www.21csi.com

2003–2004 Navy TAP Participant

So much innovation in America comes from smaller businesses, but we would never have fielded a product without the SBIR program. We are indebted to the forward-thinking SBIR program leadership in the Department of Defense who have helped us bring our ideas to fruition.

—Dr. Alexander D. Stoyen, 21CSI CEO and founder

In today's world, nearly all of us have experienced situations in which there is either too much or too little information. Intelligent agent-based software is ideally suited for these circumstances, collecting data, processing it, analyzing it, and ultimately producing useful knowledge with little or no human interaction. Software agents operate in the background, quietly watching the environment, sifting through endless amounts of data, and looking for patterns, irregularities, or operator-defined characteristics. When an agent detects a match or an anomaly, it may alert the operator or begin analysis in order to select a recommended course of action. As the agent uncovers new information or encounters environmental changes, it adjusts its beliefs, modifies its conclusions, and adjusts its course. The agent will quickly provide its human operators useful information when needed, where needed, and in the form needed.

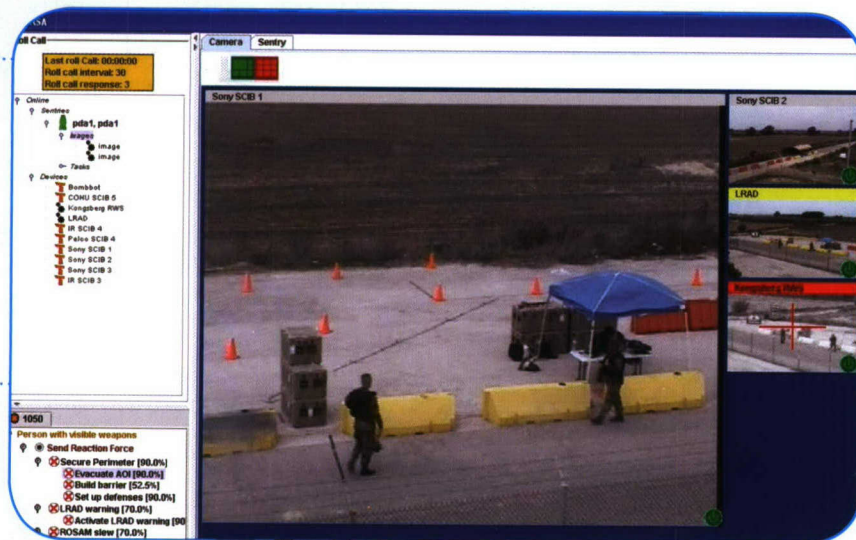
Since its formation in 1996, 21st Century Systems, Inc. (21CSI) has transitioned more than 15 SBIR-funded technologies to Phase III and secured more than \$40 million in non-SBIR government funding to support the development and deployment of agent-based decision support systems. 21CSI's agent technology has been used in satellite management, force protection, and undersea applications, resulting in improved operations at significantly decreased costs.

A related technology to one of the initial awards is CAPS-HIRSA (Critical Area Protection System—High Resolution Situational Awareness). In September 2004, CAPS-HIRSA was deployed for use in Camp Fallujah, Iraq where the 1st Marine Expeditionary Force (I MEF) installed the system with five surveillance nodes and ten optical devices on the network.



Intelligent agents embedded in 21CSI's decision support systems process large amounts of data quickly, providing real-time, actionable knowledge to decision makers. The agents can adapt, respond, and learn from individual users in a variety of situations.

Company Success: More than \$7.5 million in Phase III funding



To the left is a screen capture from 21CSI's HiRSA security software shows Marines at a sentry post. Marines using the software in Iraq reported "improved guard/sentry readiness." Below, Inc. magazine selected 21CSI for the Inc. 500 list of top-growing, private companies in 2005 and 2006.



CAPS-HiRSA provides persistent surveillance and actionable knowledge to I MEF warfighters using software agents to monitor potential threats and provide automated warning and advisory messages. An October 2004 I MEF "Quick-Look" report highlighted "improved guard/sentry readiness" and "reduced risk of injury/death to personnel."

Recognition of 21CSI's quality, innovation, and growth has come in the form of multiple awards, including a 2006 Tibbetts award for SBIR program innovation and leadership, as well as induction into Inc. magazine's Inc. 500 list of top-growing, private companies in the United States for both 2005 and 2006.

"Intelligent software is bringing about a revolution in how humans and computers work together," said Dr. Alexander D. Stoyen, CEO and founder of 21CSI. "So much innovation in America comes from smaller businesses, but we would never have fielded a product without the SBIR program. We are indebted to the forward-thinking SBIR program leadership in the Department of Defense who have helped us bring our ideas to fruition."

In working in the SBIR arena, Dr. Stoyen has developed an effective methodology that relies on a strong understanding of operational requirements to drive a successful project into Phase III. "As with any customer-driven company, we work with the military end-user to understand their needs; then we simply do our best to meet those needs." Many of 21CSI's employees are former

military. As Dr. Stoyen explains, "We recognize that the need for reliability and user-friendliness is paramount—unlike many larger firms, none of our work is exported to foreign countries."

As with many successful smaller companies, 21CSI has had to develop strategies for bridging the gap between acquisition and the end of Phase II. "Even when the acquisition sponsor wants a technology, it can take years for them to obtain the necessary funding," says Dr. Stoyen. "We use local and federal grants, our own internal R&D funding, and Congressional support to continue improving our product while the acquisition sponsor pursues a Program Objective Memorandum (POM) for future dollars."

21CSI has participated in the Navy Transition Assistance Program (TAP) on four occasions. According to Dr. Stoyen it remains the best: a focused process with quality meetings aimed at helping small businesses learn about the transition process and meet potential customers. "Everyone gets something different out of the TAP. For us, initially it provided an awareness that we were not alone. It made an impact and developed a sense of community. The advice provided on developing a business case was done in a non-ad hoc manner. It was reassuring to know that business was not all art or speculation. Now, our participation in the TAP bears different fruit. It is more focused. It provides us with an opportunity to share and to be with like-minded people."

Adaptive Technologies, Inc., Blacksburg, VA | www.adaptivetechinc.com

2003–2004 Navy TAP Participant

The need for hearing protection has been a prevalent issue within DoD for some time and the NAVAIR management team immediately recognized the operational benefits of the ATI technology.

—Dr. William Saunders, ATI co-founder

Moving successfully through the Navy SBIR development cycle takes dedication, perseverance and hard work. Initial Phase I and Phase II success does not always translate into immediate Phase III funding. Much preparation is needed to position the company with the appropriate points of contact and effective communications tools to capitalize on the company's technical progress. This is why the Navy has established its Transition Assistance Program (TAP)—to help SBIR firms successfully navigate through the challenging Phase III transition process.

It takes approximately three years of technical development activity to move from the initial Phase I award to completion of Phase II, with full Phase III implementation taking a similar length of time. Given Phase II technical success, the challenge becomes one of identifying a source for follow-on funding. Many firms falter at this point and are not successful in identifying the operational platforms that need their technology. The source for funding may come from a prime contractor, or potentially, a Navy SYSCOM, with a need for the SBIR technology. Even when all parties agree on the need and urgency of a specific technology, many management milestones must be achieved to successfully transition the technology to the Fleet.

One of the most effective means of addressing these organizational issues is to secure a "vector of support" within the target SYSCOM. Through close involvement with the program TPOC and the associated technical team, the SBIR firm can keep all members of the SYSCOM educated on their technical progress and unique advantages of their SBIR technology.

An excellent example of this type of close involvement can be seen in the recent Phase III success of Adaptive Technologies, Inc. (ATI). Shortly after showcasing its technologies at the Navy Opportunity Forum®, in the summer of 2004, ATI began working

with Lockheed Martin Aeronautics on the systems development and demonstration (SDD) phase of a hearing protection device (HPD) for the Joint Strike Fighter (JSF) program. It was recognized, by all members of the project team, that rapid transition of this technology to the Fleet was of critical importance due to the hearing issues related to jet engine noise levels. ATI's successful proposal for this Lockheed Martin sponsored Phase III activity, resulted in a purchase order for \$5,386,000 in April of 2005. On the strength of this Lockheed Martin funding, NAVAIR provided \$250,000 of matching funds for the rapid development of this much-needed technology.

Dr. William Saunders and Dr. Michael Vaudrey, co-founders of ATI, both agree that, "It was largely through the dedication and support of the entire NAVAIR team, from Carol Van Wyk and Janet McGovern in the SBIR Program Office, to the TPOC team members consisting of Jim D'Andrade, James Wilt and Jim Janousek, that ATI was able to build the appropriate Lockheed Martin business relationships and meet their demanding technical requirements." Continued development success has now led to establishment of a \$25M NAVAIR IDIQ contract that allows procurement of ATI's digital products for flight deck operations and rotor-based engine platforms, including the Marine's EFV, Black Hawk helicopters, and numerous other propeller driven aircraft. As of July 2006, over \$350,000 in task orders have been issued against this IDIQ contract. Dr. Saunders is quick to point out that timing had a great deal to do with the ATI success. "The need for hearing protection has been a prevalent issue within DoD for some time and the NAVAIR management team immediately recognized the operational benefits of the ATI technology."

This SBIR development success began in October 2001, when ATI had only 4 employees in its remote "HUBZone" facility in

Company Success: \$6.2 million in product sales



Blacksburg, Va. At that time it was awarded a Phase I SBIR contract to develop "A Personal Active Communications System for Use in Extreme Noise Environments" (Topic: N01-162). The objective of this SBIR was to address the hearing health issues associated with extreme noise conditions surrounding jet engines. Jet aircraft produce extremely high noise levels that degrade the hearing health of warfighters and civilian personnel and also interfere with communication functions required in various mission-critical situations.

The existing double hearing protection (DHP) legacy systems consisted of a passive earplug worn underneath a passive circumaural ear-cup. The degree of hearing protection from these systems has not been sufficient to prevent flight deck personnel from exceeding safety recommendations for total daily exposures to noise. In addition to this noise reduction deficiency, DHP users also suffered from poor voice reception listening to a communications speaker mounted in the ear-cup. ATI's new custom digital ANR earplug technology is now poised to improve noise reduction. To address the second communications issue, ATI is providing an integrated digital noise-canceling (DNC) microphone designed to cancel ambient noise while allowing the speaker's voice signal to pass through to the listener without degradation.

Participation in the Navy SBIR program gave ATI its initial momentum and allowed it to grow to from a single person company in 1997 to eighteen full-time employees in 2006. This growth was recently recognized by the state of Virginia, which

named ATI one of its "Fifty Fastest Growing Businesses" in 2005. ATI has now expanded its SBIR participation through four additional Phase II contracts and has developed a strong Intellectual Property position with eleven existing and six pending patents.

Based on the magnitude of the Lockheed Martin purchase order and the NAVAIR IDIQ contract, ATI has now established an affiliate manufacturing company, Aegisound, to begin production of its hearing protection and communication systems. Working with a world class contractor like Lockheed Martin, ATI has successfully achieved full ISO 9001:2000 certification. Aegisound is also preparing its Quality System at this time. "This gradual transition of advanced technology from a purely research and development organization to an ISO certified manufacturing company has been one of the biggest challenges for ATI Management," said Dr. Vaudrey. "Our thinking had to move from an R&D focus to a quality-based production mentality, based on strong mentoring from the Lockheed Martin team (Mr. Randy Aust, Mr. Randy McKinney and Mr. Mario Ramirez) and the NAVAIR support teams."

Through dedication, perseverance and hard work, ATI has made this transition and is now being considered for participation in the DoD Mentor/Protégé Program (sponsored by Lockheed Martin Aeronautics and NAVAIR). From very modest beginnings, ATI attributes much of its success to the discipline of the Navy Transition Assistance Program and the strong NAVAIR management support that kept them focused on achieving the SBIR mission of "transitioning technology to the Fleet."

Advanced Ceramics Research, Inc., Tucson, AZ | www.acrtucson.com

2003–2004 Navy TAP Participant

Business for Advanced Ceramics Research's (ACR) low cost tooling materials is taking off. The business is so successful that the company recently split into two different business units. Advanced Ceramic Manufacturing (ACM), which is focused on the company's success in advanced materials products and ACR which is focused on the company's successful unmanned vehicle product line.

Originally developed to reduce production tooling costs for the JSF (Joint Strike Fighter) program, ACR's low-cost composite tooling materials are being put to good use by a variety of high-profile industries. Program Managers at NAVAIR were among the first to recognize that tooling changes driven by inevitable design iterations would be one of the major cost drivers for JSF, during the system development and demonstration (SDD) phase. They therefore set out to drive tooling costs down for composite materials. ACM's technology hit their sweet spot. With funding from the Navy SBIR program, ACR developed a unique water-soluble polymer composite tooling material, now being marketed world-wide under the trade names Aquacore™ and Aquapour™. The resulting tooling costs are 1/30 that of conventional tooling materials.

Aquacore™ and Aquapour™ are castable, inexpensive, easy to use and environmentally friendly. Delivered in either a 5 gallon bucket or a 55 gallon drum, the user then forms the material into a block and machines it or casts it into the unique tool geometry required by the part. Once the manufacturer has produced and cured the composite part, the tooling can then be

washed down the drain with ordinary tap water!

According to Ranji Vaidyanathan, ACM's director for composite materials, "Our material enables people to make complex geometry parts easier and cheaper than ever before. During SDD, when many design changes occur, tooling changes are traditionally expensive and time consuming. ACM's products are ideal for low-cost SDD tooling design changes and can be customized in a cost-effective, easy way."



Nobody comes to you and says, "Hey, we need your material." You've got to go out and sell it. The success we've had is solely based on relationship building, and pursuing those leads and relationships.

—Ranji Vaidyanathan, ACM director of composite materials

Company Success: \$11.1 million in product sales

**The TAP successes relate to the high level contacts we've made at the Forum®...
The Navy program has been the entire reason for the successes of these projects.**

—Ranji Vaidyanathan, ACM director of composite materials

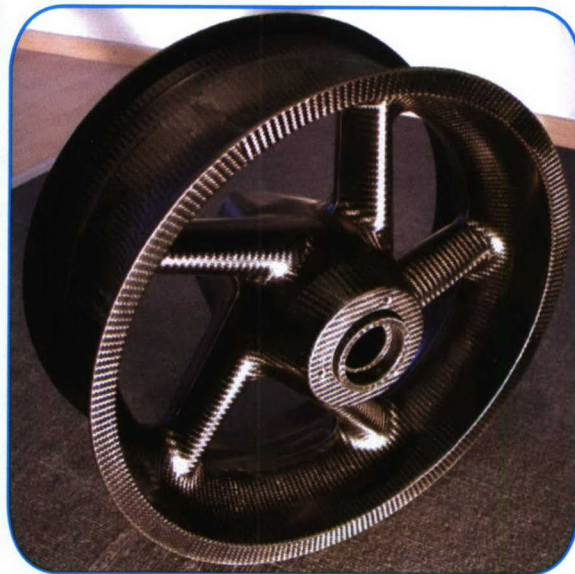
ACM originally focused its promotional efforts on the aerospace industry where the material can be used in making large and small parts. ACM has sold material to Boeing and Lockheed for making UAV and UCAS parts, as well as to Airbus and its suppliers for A380 and Boeing Commercial Airplanes for 787 development. Fifty percent of the weight of these aircrafts is projected to be made of composite materials. The company is seeing additional success in the motorsports market with racing companies such as Kawasaki, McLaren, Williams and Toyota. Woody Berzins, ACR public relations manager, sees tremendous potential in this business area. "Kawasaki sells a one-piece carbon composite motorcycle wheel that is used by all of the winning motorcycle teams. A one-piece wheel cannot be produced with any other process—this is the only process that allows you to do that. The racers don't care about the tooling process, but Kawasaki does because they sell that wheel." Total business from aerospace and motorsports customers is about \$900K to date and the company expects annual sales growth of \$1-2M for this product.

Vaidyanathan credits ACR's proactive commercialization efforts for the business success of this unique enabling technology. These efforts consist of hard work, good planning, strong customer relationships and proactive marketing. "Nobody comes to you and says, 'Hey, we need your material.' You've got to go out and sell it. The success we've had is solely based on relationship building and pursuing those leads and relationships. In addition to the SBIR sponsors, we make a conscious effort to present ourselves to the program people at NAVAIR. That's the only way to achieve those successes. Same with the racing companies and the other commercial business—it all comes from the top down," he remarked.

ACR has been a strong participant in the Navy Transition Assistance Program and is a TAP veteran. "The TAP successes

relate to the high level contacts we've made at the Forum®," Vaidyanathan said. "Another is the capabilities brochure. It's a nice way of conveying what our capabilities are, what our successes are and what our mission is. Those are the things that really help. They channel both your focus and your outreach. TAP is a great help with doing those kinds of things."

The company is also clear about the effect the Navy SBIR program has had on the business. As mentioned at the start, ACR's success is motivating the company to split into separate focused businesses. "The Navy program has been the entire reason for the successes of these projects," Vaidyanathan concluded.



Advanced Rotorcraft Technology, Inc., Mountain View, CA | www.flightlab.com

2003–2004 Navy TAP Participant

SBIR firms need to be constantly aware of other platforms that can benefit from their technology. As evidenced by the ART success in expanding its reach across the Army and Navy flight training centers, other SBIR firms can leverage their Navy technology to support the Army, Air Force and increasingly the Coast Guard in its border security role.

—Dr. Ronald DuVal, ART president

Imagine landing a four and a half ton, heavily armored helicopter on a sandy, wind-blown, desolate terrain with no control tower providing guidance or direction. Now extend that image to a turbulent ocean expanse with storm winds blowing across the bow of your target landing site, bouncing on unfriendly waves 10 feet high and offering no obvious line of approach. Not something a pilot would want to attempt without hours of training and practice.

Since this challenging Navy helicopter scenario is not uncommon, it is one that needs to be characterized, catalogued and properly comprehended in the flight training programs for Navy pilots. This was the challenge identified in the Navy solicitation for development of a "Simulation for Rotorcraft Shipboard Landing Training" issued in 2001. In response to this solicitation, Advanced Rotorcraft Technology, Inc. (ART) recognized the opportunity to extend its FLIGHTLAB™ technology to address this helicopter flight training requirement.

In June 2002, ART was awarded a \$1.2M Phase II SBIR contract to develop a high-fidelity modeling and simulation tool to support shipboard rotorcraft operation analysis. The SBIR objectives included, not only the enhancement of each individual modeling discipline related to the simulation of rotorcraft shipboard testing, but also their integration into a comprehensive simulation environment to allow for rotorcraft/ship interaction. Ship-based rotorcraft operation is a demanding task for both pilot and machine. Due to a harsher environment, that includes ship motion, air-wake from the ship's superstructure and a confined landing area, shipboard operations impose more flight envelope

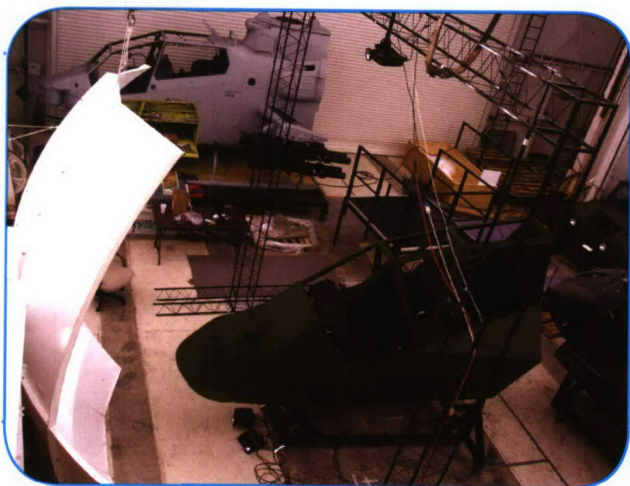
restrictions on the rotorcraft than land-based operations.

At the time of this solicitation, there were no flight simulators that provided training of helicopter shipboard landings. To address these modeling and simulation challenges, the ART design had to develop advanced modeling of the aerodynamic interference of the rotor wake, the ship air-wake, the ship turbulence and their operational interaction. It correspondingly had to provide accurate evaluation of the rotorcraft shipboard dynamic interface testing envelope to effectively support the rotorcraft shipboard test and evaluation process. This requirement included modeling and simulation analysis of the rotorcraft engagement and disengagement operation, rotorcraft on-deck tie-down operation and multi-rotorcraft interference to support design, testing, training and operation.

The successful development of ART's sophisticated simulator, HeliFlight™, was built upon their FLIGHTLAB™ technology, the leading commercial tool for rotorcraft dynamics modeling and analysis. Helicopter training for shipboard landing is complicated by the high number of degrees of freedom that the pilot has to control and the long period instability that is characteristic of helicopters at low speed. Simulators can be an effective aid to augment this flight training since they provide a risk-free environment where the student and instructor may focus on specific flight conditions, without actually having to fly to these conditions.

Successful transition to the Fleet occurred in mid-2005 when Advanced Rotorcraft Technology was awarded a NAVAIR \$200K Phase III IDIQ for its FLIGHTLAB™ modeling tool as part

Company Success: More than \$8.3 million in sales



Wide View Visual System



Deployable System

of the Navy high-performance computing initiative program. With this Navy modeling success and the establishment of the NAVAIR IDIQ contracting instrument, the Army helicopter training center at Ft. Rucker was also able to invest in the ART FLIGHTLAB™ technology to upgrade its UH-60 and UH-60 OFT simulation models.

ART created HeliFlight-R™ as a turnkey reconfigurable helicopter flying skills training simulator (cost ranges from \$600K for a deployable system to \$1M for a motion base system) designed to utilize state-of-the-art simulator technology and support rapid integration of new technology. By designing this simulator as a FLIGHTLAB™ “product-line extension” rather than a one-off response, ART was able to leverage its baseline technology to reduce the implementation costs of the HeliFlight™ solution.

“These contracts were largely the result of prior successes of our FLIGHTLAB™ installations at Redstone Arsenal,” said Dr. Ronald DuVal, president of ART. “We have now extended our HeliFlight™ coverage to four simulations at Pax River with strong coordination between the Redstone Arsenal and Pax River helicopter training centers. This close coordination is largely through the dedicated efforts of Dean Carico at Naval Air Warfare Center, Pax River, Md. and Kris Strobe, U.S. Army AMCOM, Aviation Engineering Division, Redstone Arsenal, Ala.”

Through this close interaction, the Army and Navy are now

both using FLIGHTLAB™ to support rotorcraft flight testing. Under an Army Cooperative Research and Development Agreement (CRADA), the Army has used FLIGHTLAB™ to develop a library of Army rotorcraft flight dynamics models. The Blackhawk, Apache and Kiowa Warrior models developed under this CRADA are being integrated into the Army's Aviation Combined Arms Tactical Training (AVCATT) simulators.

As ART's experience shows, Navy SBIR technologies often have utility across the Department of Defense and Homeland Security. DuVal emphasized the importance of monitoring platforms across the DoD and beyond. “SBIR firms need to be constantly aware of other platforms that can benefit from their technology. As evidenced by the ART success in expanding its reach across the Army and Navy flight training centers, other SBIR firms can leverage their Navy technology to support the Army, Air Force and increasingly the Coast Guard in its border security role,” he said.

Since founding ART in 1982, Dr. DuVal's vision was to provide consulting support and software products to facilitate the use of simulation technology in rotorcraft research and development. Through work with the Navy SBIR program and additional DoD support, he has accomplished this and more, growing from a six employee organization to one of 20 employees who serve a number of DoD training and engineering initiatives.

Alliant Techsystems, Inc., Newington, VA | www.atk.com

2003–2004 Navy TAP Participant

You can have the best technology, but unless you have a customer that is groomed to implement that technology and get it into the system, it's really hard to get it to go anywhere. It really takes all the components, building relationships both with end users as well as facilitators who can lend support with efforts like manufacturing or engineering, to build a strong case for going ahead with these technologies.

—John Pasour, ATK senior scientist

High power amplifiers are key building blocks for the Navy's sophisticated radar and communications systems. The radar and communications systems that have been identified or anticipated for future use by the Navy are unable to be supported by today's microwave amplifiers. Current technology simply cannot provide enough power with the required bandwidth and efficiency to support future applications without introducing different technical pain, such as shielding problems drawing additional power from the platform, etc.

To address this problem, the ONR, through the SBIR program, contracted Alliant Techsystems, Inc. (ATK), formerly known as Mission Research Corporation of Newington, Va., to develop a new electron gun. This electron gun would enable more efficient high-power amplifiers, which would, in turn, support the demands of future systems. The work done by ATI on the project titled, Multiple Beam Electron Gun for High Power Amplifier (Topic #N01-131) has been very well received, and since the end of their Phase II contract, ATK has received a total of \$3.5M from the U.S. Naval Research Laboratory (NRL) for a combination of prototype construction and development work.

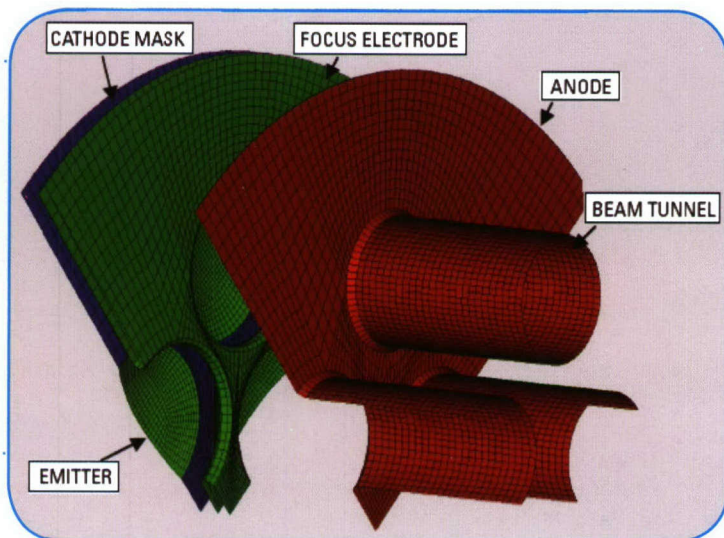
ATK, which was founded in 1970 with a vision to provide solutions for tough, technical problems, has reached the current level of success on this project through a combination of technical excellence and effective relationship building. On the technical side, the company developed unique analytical tools and computer simulation codes and techniques that worked remarkably well at predicting the performance of the gun. On the business side, ATK built strong, well-founded relationships with both NRL and a key partner.

According to John Pasour, ATK senior scientist, "We demonstrated a capability for analyzing these devices, so our credibility was good, and we were successful at demonstrating a unique capability that they could rely on to get to the next level." Customer relationship development and internal program management proved to be equally important. "We had worked closely with the customer during the development phase, so they were aware of our success," Pasour said. "We helped the customer to identify sources of funding they could tap into to get to the next step, and when we successfully developed the gun, the system was well primed to give us the follow-on work for the integration piece of it."

ATK also developed a strong relationship with a key proponent at NRL, Dr. Baruch Levush, and a strong industrial partnership with Communications and Power Industries (CPI). "Dr. Levush championed the technology to the personnel at ONR and to the microwave amplifier industry as well," Pasour explained. "He was a strong proponent of the technology from the beginning, and still is. From the industry side, we had developed a very good relationship with a fabrication partner, CPI, who provided engineering and fabrication know-how and worked with us to optimize the designs to make sure they were manufacturable."

With respect to Phase III success, Pasour offered the following guidance to other small businesses, "Relationship building is key. You can have the best technology, but unless you have a customer that is groomed to implement that technology and get it into the system, it's really hard to get it to go anywhere. It is really key and takes all the components, building relationships both

Company Success: \$3.5 million in Phase III funding



A quarter-section schematic of the eight-beam electron gun is pictured to the left.



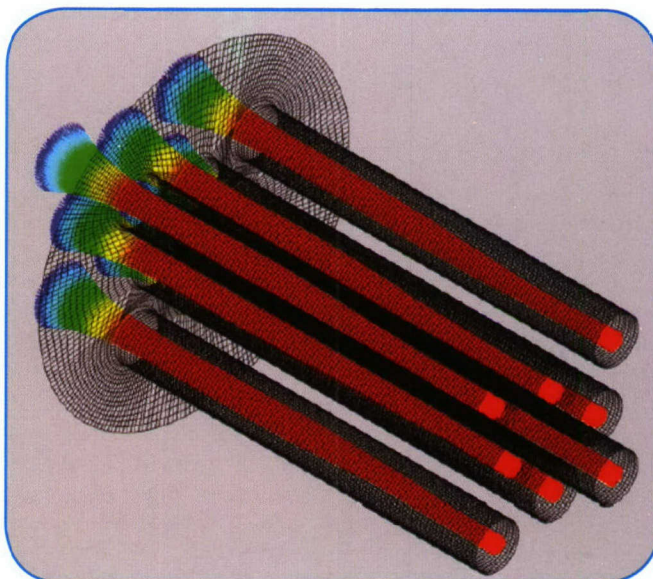
...when we successfully developed the gun, the system was well primed to give us the follow-on work for the integration piece of it.

with end users as well as facilitators who can lend support with efforts like manufacturing or engineering, to build a strong case for going ahead with these technologies."

There are also program management hurdles that need to be overcome in the transition process. "You must be proactive about managing the program; you just have to stay on top of it. We had good people working those issues, and they were able to make things happen," said Pasour.

Pasour considers TAP to be an instrumental part of ATK's Phase III success as well. "What really benefited us was just sitting down and putting together the plan. It forced us to come up with an overall plan of attack and to put things in perspective. This has proven to be useful in terms of going back for additional funding and in making arguments to support why this technology is important."

In 2004, Mission Research was purchased by ATK and became a subsidiary known as Alliant Techsystems, Inc. At that time MRC was a well-established small business with 15 offices and labs around the country. "I think one of the things that made MRC attractive to ATK was not just this particular SBIR project, but the fact that the company had completed a number of Phase II projects, and over the course of the years, had developed some interesting technology in the areas of defense and security. Now, at this point in the game, we're more product-focused."



The image above is an isometric view of all eight beamlets from the optimized gun configuration.

ALPHATECH, Inc., Burlington, MA | www.alphatech.com

2003–2004 Navy TAP Participant

I can talk technology all I want, but that doesn't convey the message to which the customer can relate. The challenge was to convey the solution in the customer's terms. To do that, I needed to effectively communicate what the raw technology could do. I provided a relevant scenario and a compelling case to the services.

—Jason Sroka, ALPHATECH principal engineer

Current and future warfighters and intelligence analysts are faced with data overload as ever-increasing volumes of raw data are collected and need to be transformed into actionable information. New types of sensors are extending the range of data collected, for example as hyper-spectral cameras augment traditional optical and infrared cameras. At the same time, unmanned ground and aerial vehicle deployments are increasingly prevalent for data gathering, increasing the area of sensor coverage and making it more dynamic. When combined with data from fixed sites, for example the Green Zone in Iraq, there is more and more data that needs to be efficiently monitored for actionable information. Networking also makes the data global—an analyst sitting at the Pentagon can easily get a feed from a fixed camera monitoring a corner in the Green Zone. As a result, the volume of data the warfighter has access to and is responsible for continues to grow, while the services are also under pressure to decrease the manpower assigned to find and interpret relevant data.

With funding from a Navy SBIR Phase II award, ALPHATECH, Inc. developed a pattern recognition tool called Indications and Warnings Toolkit (IWT) to sift through massive volumes of data and locate pertinent, actionable information. The software allows the operator to input a description of data that matches either a set of criteria or that falls within a pattern of interest. The software performs a search and filter function, automating the process of sifting through large volumes of data for the useful nuggets, saving the operator valuable time. The software monitors thousands of incoming reports per second, looks for data of interest, alerts the operator when a report matches the pre-set criteria, and archives the information. The operator then decides

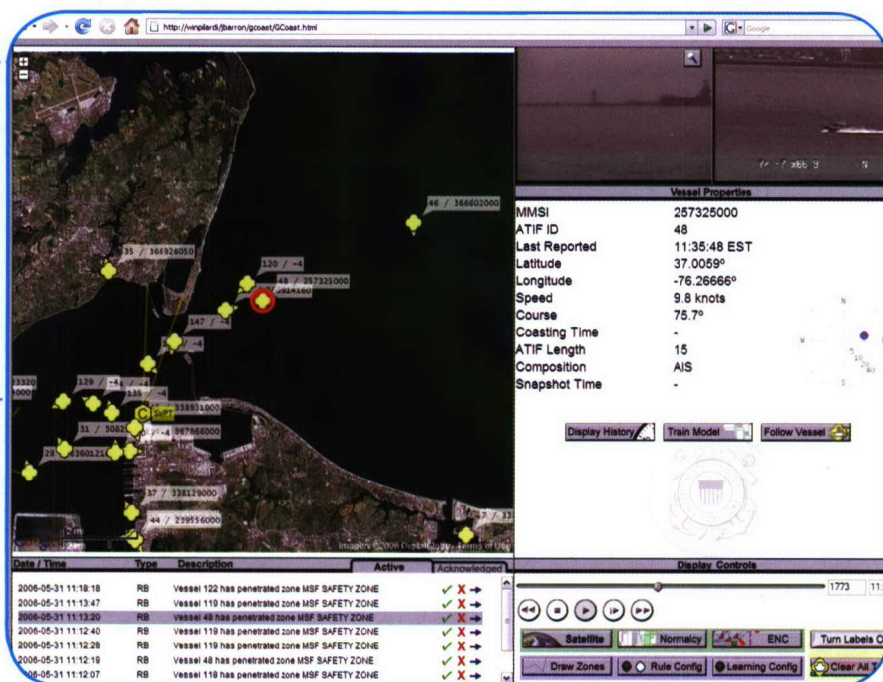
what action is required. ALPHATECH's software is enabling the services to reduce manpower while simultaneously improving the warfighter's situational awareness.

ALPHATECH was founded in 1979 as a spin-off from MIT and has a rich history in advanced R&D and software engineering. Since the 2004 Navy Opportunity Forum®, where the company presented their software, ALPHATECH has received over \$15M of Phase III funding from Air Force Research Laboratory, Department of Homeland Security, and the U.S. Coast Guard for higher level systems that incorporate their innovative technology. A recent DARPA contract will total about \$7M over the next 4 years. And in September 2004, ALPHATECH entered into a definitive merger agreement with BAE Systems North America, ultimately resulting in the acquisition of the company for \$88M. ALPHATECH now operates as BAE Systems Advanced Information Technologies (AIT).

BAE Systems was clearly interested in the unique technologies ALPHATECH had developed, many of which received early stage funding from the Navy SBIR program, including this pattern recognition software. According to Jason Sroka, a principal engineer at ALPHATECH, "This particular tool kit was one of a large suite of capabilities that the company had when BAE did the acquisition. The fact that we were successful with this was an indication of the success we had across SBIRs. ALPHATECH was built upon an SBIR footing."

The company encountered a few major hurdles along the road to Phase III and corporate success. "The biggest hurdle was that nobody wanted to be the first to put us in a deployment for a realistic situation. If you hadn't deployed yet, then they weren't

Company Success: More than \$92 million from acquisition and government contracts



The photo to the left is a screen shot from the system that ALPHATECH's Indications and Warnings Toolkit was integrated into. IWT generated the alerts that are seen at the bottom left frame of the image.



interested in getting you there. Once you get your first deployment, a lot more people are willing to consider and listen to you," Sroka said. "We addressed this first hurdle by being part of a larger system that incorporated a number of fusion capabilities," he continued. "The customer was looking for a suite of capabilities. We fulfilled one of those needs. Other technologies were more mature than ours. Once we had our foot in that door and proved we worked, it was easier for us then to increase our customer base."

Another big hurdle was lack of familiarity with operational environments and the specific data sources used to look for threats, that would enable ALPHATECH to demonstrate to its customers that their system could provide the tools they needed. "I can talk about technology all I want," Sroka said, "but that doesn't convey the message the customer can relate to. I needed to convey the solution in the customer's terms. To convey that message, I needed to translate from what the raw technology could do to a scenario and vocabulary and a use case that would be compelling to the services. For each customer, I needed to get decision makers to see the benefits in their terms and in their context."

Overcoming lack of familiarity required ALPHATECH to work at developing strong relationships with customers. "There was a lot of customer development and domain knowledge improvement. You don't just answer the questions they ask," Sroka commented. "Try to understand why they are asking those questions, get to the root of their interest, as opposed to just answering the question ... Because we are very technical people, it takes a lot of work, as often we deliver our solutions to non-technical people."

Sroka believes strongly that TAP provides excellent short term, as well as long term, benefits. "TAP was a great benefit. It specifically aims to make you more effective at selling the result of your SBIR to others. A lot of TAP would help make you effective at selling in the commercial area," he said. "I still go back to the white paper I wrote for TAP. I've tailored it for at least 5 different customers. When I've talked to people about some need they have, I bring it in line with the key points for that particular customer. Features, advantages and benefits are different for one customer as opposed to another ... it (the white paper) is a good framework for identifying that and the presentation helps us to stay focused and stick to the key points the customer cares about."

Cellular Materials International, Inc., Charlottesville, VA

2003–2004 Navy TAP Participant

www.cellularmaterials.com

I want to emphasize the importance of developing credibility as a key factor for our success.

—Harry Burns, CMI president

Cellular Materials International, Inc. (CMI) develops and manufactures proprietary structural materials based on periodic cellular material (PCM) to satisfy commercial and military requirements for lightweight, multi-functional structures that are cost-effective, safe and efficient. Using funding from the Navy's SBIR program, CMI recently developed a lightweight, high strength sandwich panel to help provide protection to Navy and Marine Corps manned platforms from explosively generated impulses.

The company has received nearly \$3.5M for continued R&D, prototyping and live field testing.

Concurrently, the company has generated strong interest from a number of customers interested in the multi-functionality of the material for defense and space applications. According to Harry A. Burns, CMI president, the success of this innovation—and its suitability for diverse applications—lies in the geometry of the material.

Unlike conventional materials, such as honeycomb, CMI sandwich panels utilize a simple, yet innovative core design for groundbreaking strength-to-weight ratios combined with low relative density (typically 95 percent or more open space) to achieve structural strength, the ability to absorb or deflect energy (ballistic or blast), heat management and the availability of space, which can be used for additional functionality (e.g., use as a fuel tank or to hold electro-magnetic devices).

"The fact that our unique core exceeds the strength-to-weight ratio of conventional designs is in and of itself an important development in structural design. But what sets CMI apart is the fact that we have this high ratio of open space which can be customized for a wide variety of applications," explained Burns.

Since the CMI sandwich panels have high structural strength and excellent heat management and heat transfer characteris-

tics, the material has been adopted for a next generation aircraft carrier Jet Blast Deflector (JBD), which allows the deflector to be totally passive rather than needing pumped water for cooling as required by conventional aircraft carrier JBDs. CMI's materials are also uniquely suited for rockets and space re-entry vehicles. CMI's materials are size scalable, fitting applications from 36' x 14' panels down to the size of a very tiny bone implant or stent.

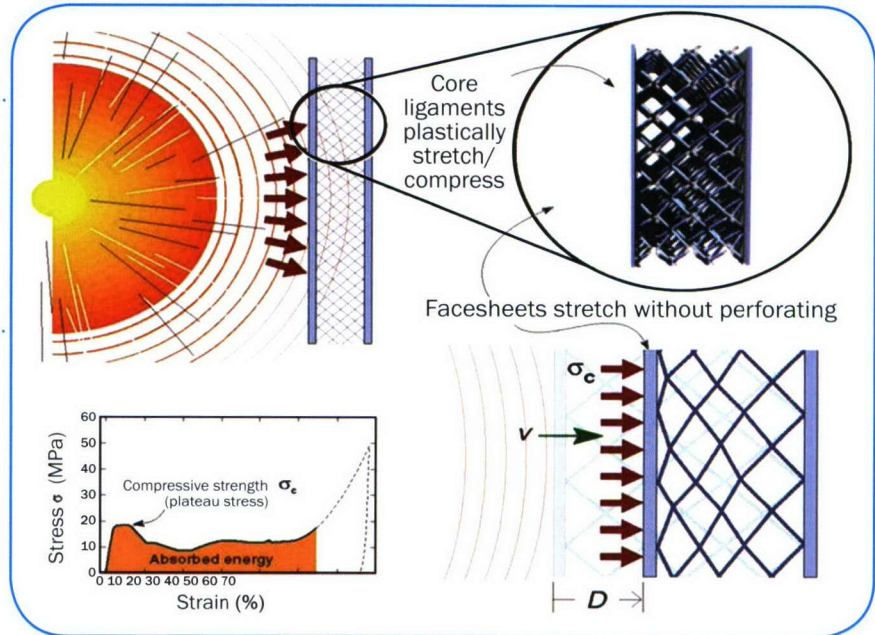
CMI's open space design has led to additional applications. The company has contracts with DARPA and Army Research Lab to develop advanced armor for a variety of threats. "These all relate to the original SBIR, but we've found new ways to build on the core design and create new applications," he said. The initial technology leading to armor has great significance, as the company is urgently building prototypes to be developed and tested for use in Iraq.

Dr. Steve Fishman, at ONR, recognized the value of the technology from the beginning. He became a champion and was instrumental to CMI's Phase III success. According to Burns, support from ONR has been instrumental in the company's success. Over the last year, both CMI and its sister company, DVTI, have experienced very strong growth, increasing employment to more than 24 employees and establishing two new facilities in its hometown of Charlottesville, Va.

Burns believes innovative technology that meets multi-functional needs, coupled with strong credibility, are key factors to their success. "I want to emphasize the importance of developing credibility as a key factor for our success. We've found it critical in developing relationships with the primes and the program managers, including the program managers at the defense labs," he said. "Credibility and quality of product are the keys, and in addition the company has an obligation to look forward and understand what the next steps are to the program, not to wait

Company Success: Nearly \$3.5 million in follow-on research and development

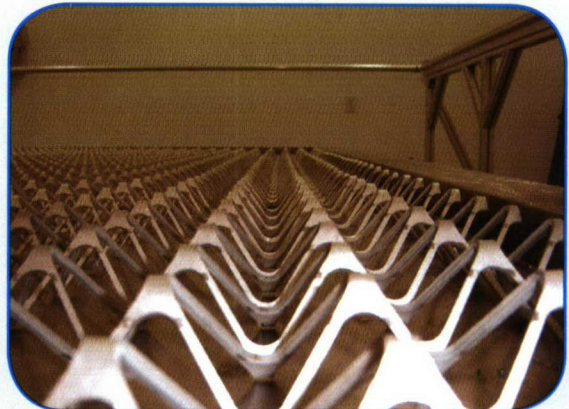
An example of how Cellular Materials International's ultra-light, high-strength sandwich panel helps the Navy and Marine Corps protect their manned platforms from explosively generated impulses.



for the program to come to the company. It's not just about the execution, it's about the planning. You've got to think a few steps ahead, help the program managers develop the next steps and then promote the next steps," Burns stressed.

Burns credited the Navy SBIR program and the TAP for contributing notably to the successful development of CMI. "The emphasis in the SBIR program on commercialization is extremely important. In addition, TAP was helpful in focusing our understanding and helping us communicate our capabilities and describe our business much better. With an emphasis on commercialization planning, TAP also made sure that we understood the system and were focused on paths to transition, not only with the programs but the primes." He continued, "TAP led us to have a number of meetings with various primes and it helped in establishing a network of contacts with the primes that we believe will turn into significant business for us."

As CMI looks into the future, it sees its multi-functional, versatile technology not only being highly valuable to the defense and aerospace industry but being applied to the medical, commercial building and personal computer industry—"really any industry that seeks a strong, lightweight material that offers performance at a lower cost," Burns concluded.



We've developed unique, lightweight sandwich panels which exceed the strength to weight ratio of conventional designs, have the ability to absorb energy and have excellent heat transfer and management capabilities.

—Harry Burns, CMI president

Composix Company, Newark, OH | www.composix.com

2003–2004 Navy TAP Participant

SBIR firms need to reach beyond their immediate SBIR objectives and consider how their technology can be applied across other applications to broaden its base and achieve more cost-effective delivery to all DoD agencies.

—Larry Dickson, Composix president

Successful completion of an SBIR development program generally requires strong program support from a Navy sponsor coupled with equally strong technical and financial support from a prime contractor. In the case of Composix, MARCOR and General Dynamics were the two organizations that provided the team support needed for Composix to successfully deliver an improved armor system for the Expeditionary Fighting Vehicle (EFV).

Armor vehicle construction for our Marine Corps warfighters in Iraq and Afghanistan must meet very demanding standards for adequate personnel protection. The new EFV design depends on a high performance, lightweight armor system that can be produced at an affordable cost. To improve the overall EFV operational performance, MARCOR issued an SBIR solicitation in 2001 for Topic #N01-004: (High Performance Composite Backing Armor System for the Expeditionary Fighting Vehicle.) MARCOR set aggressive improvement targets of 25 percent cost reduction and 10 percent weight reduction versus available armor materials.

Composix responded to this challenge by developing a low cost polyethylene, Kevlar and Vectran composite material. The core development involved transforming low-cost polyethylene, Kevlar and Vectran materials into highly efficient composite armor solutions. This was achieved by innovative processing that dramatically reduced material cost. Working with the prime contractor, General Dynamics, Composix was able to achieve the MARCOR objectives for weight and cost reduction for hard armor applications.

"This was a full team effort orchestrated by the MARCOR Program Office, that leveraged the materials engineering skills of the Composix organization with implementation experience of the General Dynamic's team," said Larry Dickson, Composix

president. Full operational readiness was demonstrated at General Dynamics Testing Laboratories and at the NAVSEA Fire Test Labs at NSWC, Carderock Division, with the support of TPOC, Matt Brown.

This new composite armor material can also be configured to address a broad range of other applications, in both military and commercial areas. Any program that requires a lightweight, cost effective armor system can benefit from this Composix development, including hard armor applications, such as liners for military vehicles, armor for fixed and rotary winged aircraft, shields and breastplate inserts, and soft armor applications such as vests for personnel protection. The development process allows for inherent flexibility in changing resins and fiber reinforcement to suit any particular military or commercial application.

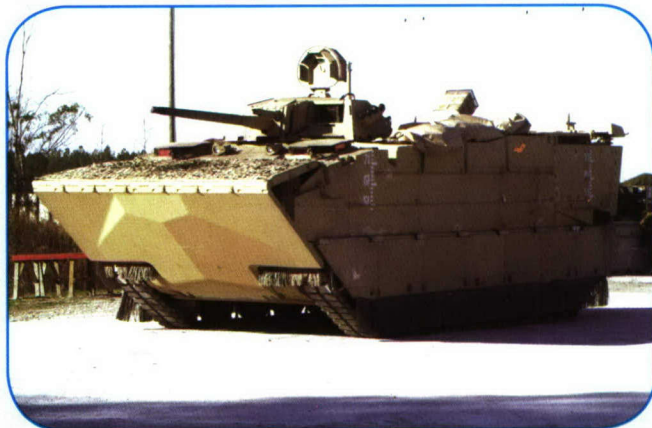


Photo by: Lance Cpl. Brandon R. Holgersen

Company Success: \$12 million in product sales

With transitioning technology to the fleet being the key objective of the Navy SBIR program and the Transition Assistance Program (TAP), the Navy recognizes that many of these technologies can be modified and adapted to other non-Navy applications. Thus, the larger measure of SBIR success goes beyond immediate transition to the Fleet and includes the ability of SBIR firms to leverage the Navy's investment in support of other government and commercial organizations. "SBIR firms need to reach beyond their immediate SBIR objectives and consider how their technology can be applied across other applications to broaden its base and achieve more cost effective delivery to all DoD agencies," said Dickson.

An example of this reach across SBIR objectives, in Aug. 2004, Composix was awarded an Army delivery order of \$5M as part of a \$362M+ firm fixed price fee contract for interceptor body armor inserts (50,000 inserts). Through minor modifications of the Navy technology, Composix was able to meet the Army's body armor insert requirements (Aberdeen Proving Ground, Md. (W91CRB-04-D-0044). Through a competitive solicitation, 16 bids were received and Composix was selected as one of the successful suppliers.

Building upon its recent Navy and Army successes, Composix is optimistic about adapting its SBIR technology to meet the needs of several federal law enforcement agencies, all of which have pressing needs for improved personnel protection. To that end, they have recently received certification from both the Drug Enforcement Agency (DEA) and the FBI as meeting their personnel protection requirements. Additionally, one of the larger, near term opportunities is with the Department of Homeland Security. DHS has issued a consolidation solicitation for the U.S. Border Patrol and the U.S. Coast Guard, which is targeted at \$40M. Composix is confident that their technology will meet the Homeland Security's needs in this competitive bid process.

The Composix management team believes strongly in the benefits associated with leveraging its military success to support other government requirements. This SBIR funding allowed Composix to develop a broad range of armor protection solutions beyond the original EFV requirements. Composix was able to extend this technology to meet the expanding needs of the border and coastal protection agencies.

Similarly, Composix is working with Federal and State law enforcement agencies across the U.S. to adapt their technology to the ever-changing needs of first-responders. As a privately held company of 80 employees, Composix' capabilities range from developing prototype parts and processes, to the production of finished products. Over the past 17 years, Composix has produced a variety of applications in markets ranging from vehicle and aircraft armor protection to personnel body armor. Their corporate strategy is to become the low-cost producer of high-quality armor products through technology investment and vertical integration.



This was a full team effort orchestrated by the MARCOR program office that leveraged the materials engineering skills of the Composix organization with the implementation experience of the General Dynamics team. —Larry Dickson, Composix president

Daniel H. Wagner Associates, Inc., Malvern, PA | www.wagner.com

2003–2004 Navy TAP Participant

As much as possible, Navy program managers want the SBIR firms to provide a complete technology solution that can be implemented as a turnkey system for operational deployment.

—Dr. Reynolds Monach, Daniel H. Wagner vice president



Securing Phase III funding from a large prime contractor (Lockheed Martin, Boeing, Raytheon, Northrop Grumman, etc.) is one of the key objectives of the Navy SBIR program. In fact, much of the Navy sponsored Transition Assistance Program is designed to bring the large prime contractors together with the SBIR firms through the annual Navy Opportunity Forum®. During the second year of a Phase II contract, the TAP program assists SBIR firms in communicating their technology achievements, documenting their corporate capabilities and developing a Phase III transition plan. Through this extensive preparation, the SBIR companies develop a variety of tools to communicate the benefits of their technology. Attracting attention and interest from the prime contractors usually involves a long-range vision that recognizes the size and complexity of these organizations and their changing needs.

While Phase III funding from the large prime contractors is the centerline approach for most SBIR firms, it is not the only alternative. Daniel H. Wagner Associates (Wagner) has found that SBIR firms can also be successful in generating Phase III funding through the development of partnership teams. With the right combination of resources, these teams can provide a more complete systems-oriented approach to addressing the Navy's technology challenges. With over 50 Phase II contracts, Wagner has been successful with both approaches—working with prime contractors such as Lockheed Martin, Boeing and Raytheon, but also in teaming with other small firms to develop integrated and comprehensive systems solutions.

These types of teaming arrangements are generally comprised of two to three firms that have independent, stand-alone technologies. By combining their complementary elements, however, their broader solution can translate into much greater value to the Navy. Two examples of this approach are described

here: Wagner's recent success in partnering with a small prime contractor, Adaptive Methods, to provide Data Fusion technology to NAVSEA IWS5B/PMS-420; and Wagner's recent success in partnering with another small prime contractor, Global Technical Solutions, to provide Data Fusion technology to the Department of Homeland Security (DHS). Both of these partnerships integrate Wagner's Non-Gaussian Data Fusion System (NGDFS) capabilities with communications, data management, and display/Operator System Interface (OSI) software provided by the small primes and other small company partners. These integrated solutions address the full operational requirements of the Navy and DHS while eliminating the need for additional development time and expense by the sponsoring program.

As Dr. Reynolds Monach, vice president for Daniel H. Wagner Associates stated, "As much as possible, Navy program managers want the SBIR firms to provide a complete technology solution that can be implemented as a turnkey system for operational deployment."

The initial problem addressed by the Wagner NGDFS SBIR technology dealt with improvements in the data fusion capability for Anti-Submarine Warfare (ASW) and Surface Warfare (SUW) systems. Existing Navy systems were very limited in their ability to accurately fuse all of the information available from multiple sensors. The existing systems produced localization estimates for many of the tracks that were of poor quality (either wrong or overly optimistic). Incorrect association often led to misidentification of the target tracks.

To address these deficiencies, the Wagner SBIR technology provides a Non-Gaussian Data Fusion System that uses advanced data fusion techniques to significantly improve the Navy's ability to conduct search and surveillance missions against threats from submarines and surface ships. Improved

Company Success: \$1.2 million in Phase III funding

data correlation and tracking technologies are critical components of the Navy's warfighting activities. NGDFS utilizes advanced multiple hypothesis techniques and Non-Gaussian trackers to model target position. It utilizes computer resource optimization algorithms and high-performance, inexpensive hardware to allow this computationally intensive data fusion process to take place in near-real-time. NGDFS improves the processing of data from passive and active acoustic systems used in both traditional monostatic modes; as well as in bistatic (when the receiver and the transmitter are not collocated) modes. It also improves the processing of data from non-acoustic systems, such as radar.

These NGDFS data fusion algorithms represent the Data Fusion Engine (DFEN) Core. Converting this information into operational tools for Navy ships required systems integration and presentation capabilities provided through a partnership with Adaptive Methods (system integrator, communications, data management, display/OSI support). The solution, developed through



Four Navy ships, the USS Paul Hamilton, USS John S. McCain, USS Decatur and USS Milius, utilize Wagner's NGDFS technology in active and potential conflict areas.

this small business partnership, provides a "turnkey" solution that addresses the Navy's full operational needs as evidenced through deployment as part of the SQQ-89 Improved Performance Sonar (IPS) system and the Littoral Combat Ship (LCS) Anti-Submarine Warfare (ASW) Mission Package. Wagner Associates revenues from these programs are approaching \$1M with an on-going annual spend rate of approximately \$400K to \$500K per year. There are now four Navy ships (USS Paul Hamilton, USS John S. McCain, USS Decatur, and USS Milius) utilizing this NGDFS technology in active and potential conflict areas.

Based on their Navy success, Wagner further adapted its technology solution to address border control issues for DHS and teamed with Global Technical Systems (system integrator, communications, data management) and Command and Control Technologies Corporation (display/OSI). This partnership solution is currently undergoing a very successful test and evaluation in Douglas, Ariz. to provide border patrol agents with anti-terror and illegal immigrant surveillance to enhance border protection. The key to developing this border control application was adapting the Navy technology so that it could receive input from ground based radars, seismic sensors, and surveillance cameras. Fortunately, the Wagner management team had made the strategic decision early in the development cycle to build its Data Fusion system so that it could be readily adapted to accept data feeds through an XML interface, which made this integration process relatively straightforward.

In summary, Dr. Monach cited advantages in both types of Fleet transition scenarios. Direct support of large prime contractor initiatives offers a clear path to Fleet transition but requires a very good fit between the SBIR project and the large prime's acquisition program timeline and requirements; while the small business "teaming" approach can often move more quickly, given the focus and flexibility of the partnership members, and the willingness of the Navy program manager to work with a team of small companies.

Adapting the SBIR technology to other government requirements, such as those found within DHS, can also often benefit from the broader resources of the partnership approach. Dr. Monach emphasized that the Navy TAP provides an excellent opportunity to consider both of these delivery mechanisms when addressing the systems integration needs of the acquisition programs.

EnSolve Biosystems, Inc., Raleigh, NC | www.ensolve.com

2003–2004 Navy TAP Participant

The funding from the SBIR program was instrumental. Our company wouldn't be alive today if we hadn't received that funding. It helped us to develop the product from just some ideas to full-fledged production.

—Richard Penny, EnSolve vice president

Contrary to the old adage that oil and water don't mix, given the right circumstances, they do—making the cleaning of bilge water in large Navy vessels a difficult task. EnSolve Biosystems, a small biotechnology company founded in 1995, received a Navy SBIR award to address the issue of cleaning oily bilge water. Traditionally, the Navy has used basic coalescing technology and oil separators, or filters, to remove free-phase oil from bilge water. Physical separation technologies are efficient with free-phase bulk oil, but are less effective with emulsified contaminants. Various types of pumps and/or the addition of chemicals help to emulsify oils common on Navy ships. Gas turbines use synthetic oils and the majority of the cleaning materials and other chemicals used on the ship, such as AFFF (Aqueous Fire Fighting Foam), are emulsifiers. Cleaning of the turbines, fire fighting drills and general maintenance create these mixtures that end up in the bilge getting mixed together by the motion of the ship.

EnSolve Biosystems' developed a bio-mechanical technology, PetroLinator®, that solved the problem. The PetroLinator® destroys oil and grease using naturally occurring bacteria, effectively cleaning bilge water in large vessels. EnSolve's strategy for commercialization of the product included the concurrent development of a commercial product with the Navy project. This was an effective strategy to pursue. As a result, EnSolve can serve the needs of the Navy and the commercial shipping industry. All standing orders are with the commercial maritime sector—tanker companies and cruise lines. Maritime companies have become

increasingly environmentally conscious, especially after several received multi-million dollar fines for discharging bilge water. This change in the industry clearly created demand for an effective process to clean bilge water.

According to Richard Penny, EnSolve vice president, ship-operating companies in several different industries are showing a high level of interest for both environmental and business reasons. "We targeted the cruise industry first because they are in the public eye. We've also made sales to the Great Lakes shipping companies, because that's an environmental special case. A few sales have also been made to customers in the Baltic region which also have confined waters. In the shipping industry, this is clearly the best available technology. Some ship owners hold water on board until they get to shore and discharge ashore. That's very expensive because you can pay anywhere from 20 cents to \$2 per gallon, depending on what port you are in and what the constituents are in the water. If you're processing 1000 or 2000 gallons per day, those numbers add up pretty quickly for each vessel."

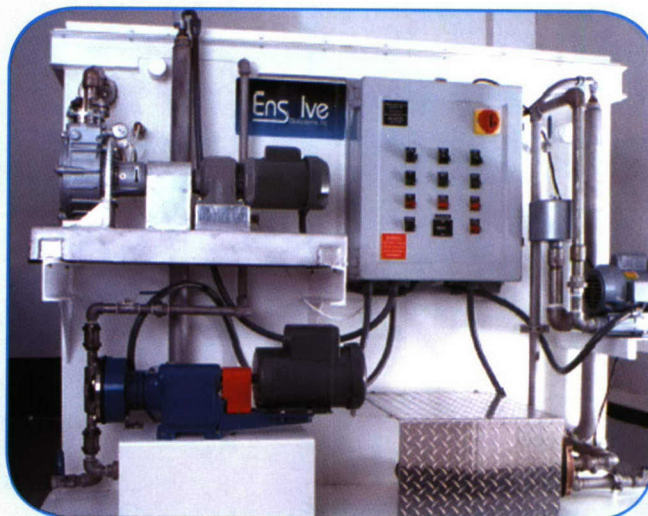
To achieve commercial success, the company has been proactive and persistent. "The maritime industry is conservative, so we had to go through a learning curve with our customers," Penny said. "We worked hard to sell one system to a key client, and that resulted in building a larger relationship. Usually when we sell one system to a client they like the product and then they want more."

Company Success: \$2.1 million in equity and sales

The funding and business relationships gained from working with the Navy SBIR program have been the key to the success of this product for EnSolve. "The funding from the SBIR program was instrumental. Our company wouldn't be alive today if we hadn't received that funding. It helped us to develop the product from just some ideas to full fledged production," Penny continued, "On the business side, I know at least one client who came to us through the Navy program press releases. A direct quote from them was, 'If it works for the U.S. Navy, then it must be a good product.'"

Participation in the Navy TAP was also very beneficial to the company's success. "I think, more than anything, the Navy TAP helped us understand the Navy mentality and the military mentality and how hard we have to work to make sales in a government environment," Penny said. "We haven't made any of those sales yet, but we're getting closer and we have some of the marketing information that we need. But a startup company needs to additionally think 'commercial' to succeed; I know we did."

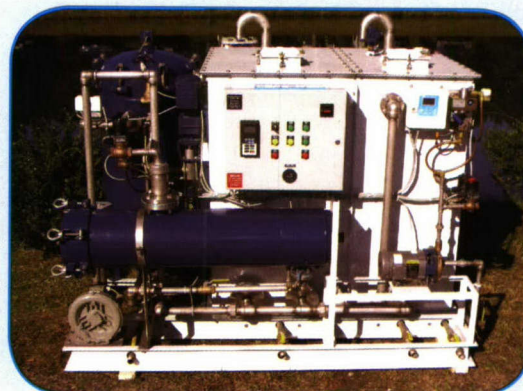
The PetroLimator® is a U.S. Coast Guard and International Maritime Organization approved oily water separator that easily handles phase-separated oil, emulsified oil and water. Each of the three models pictured provides complete pollution-prevention solution for bilge water.



The PetroLimator® 630



The PetroLimator® 300



The PetroLimator® 630M

I think, more than anything, the Navy TAP helped us to understand the Navy mentality and the military mentality and how hard we have to work to make sales in a government environment.

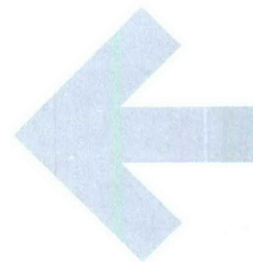
—Richard Penny, EnSolve vice president

Essex Corporation, Columbia, MD | www.essexcorp.com

2003–2004 Navy TAP Participant

Be diligent. Just because you are part of a program doesn't mean people are going to immediately jump out and accept your ideas.

—Keith Frampton, Essex Corporation vice president



Most Missile Defense Agency (MDA) radars utilize traditional linear frequency modulation (LFM) waveforms with stretch processing. In a cluttered environment those waveforms have some limitations. To improve LFM radar performance in cluttered and/or noisy environments, MDA contracted with Essex Corporation to have them develop an optical receiver that could process arbitrary and advanced waveforms, in real-time, to be used by the missile defense community.

To achieve the desired performance, MDA needed real-time operation and a 4-fold increase in bandwidth over the proof-of-performance unit. The funding cycle for this project was somewhat unconventional, but Essex was creative and worked diligently to reach the desired outcome. In the early 1990s, the company had built a proof-of-concept system using optics as a radar image formation tool. Because of this earlier work, no Phase I SBIR money was needed for the proof-of-concept. However, traditional Navy Phase II SBIR funding was used to develop and build a prototype.

Following the completion of their Phase II work the company had an IDIQ in place with NAVAIR, MDA had a need for very similar technology for a similar application and put \$3M against the IDIQ to build and test the unit. Though these funding sources are not Phase III contracts, it is significant to note that the company has received two \$750K contracts from the Army SBIR office for similar technology since that time.

"Strong relationships within MDA and the NAVAIR and Army SBIR offices have been critical to our success on this project," said

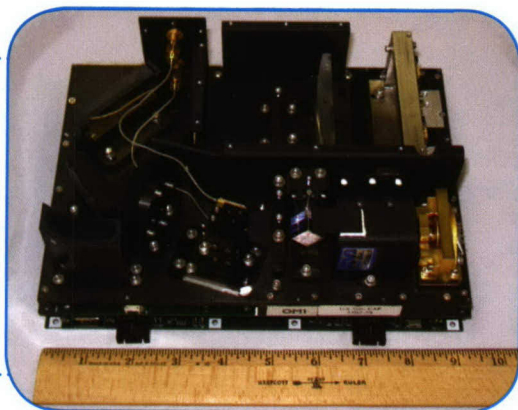
Keith Frampton, Essex vice president. "Champions within MDA funneled the money through the NAVAIR contract. Part of the money came via Army SBIRs and some from the NAVAIR SBIR."

Frampton feels participation in the Navy TAP has been another key in the success of this project, "Looking from the user point of view for what's important instead of getting down into the details of what makes the technology go and working to put the presentations together with the Dawnbreaker team was very beneficial for us. When we put the slides together, to really get to the crux of why we want to do this and what we're doing... I think was very helpful."

This work has been instrumental in the company's developing success in this technology area. "This is one of the first radar systems that we've actually fielded and processed some real radar data, and that's been a big plus. We also have been able to leverage a number of the technologies from this program into other radar programs that are currently being fielded. It has allowed us to show people that we aren't making vaporware—we do have real technology that can be applied to difficult problems and has been shown to be successful," says Frampton.

Frampton has some advice for other SBIR companies on relationship building and how to succeed in the program. "Be diligent. Just because you're part of this program doesn't mean people are going to immediately jump out and accept your ideas. But, being diligent we are starting to get audiences now with a lot of the prime contractors in missile defense that are interested in some of the results."

Company Success: \$3 million IDIQ contract



One prime contractor in particular was interested in the Essex technology and that interest has developed into an important relationship. On Nov. 8, 2006 Essex Corporation announced that it had signed a definitive merger agreement with Northrop Grumman. The transaction is valued at approximately \$580M and is expected to close in the first quarter of 2007.

When asked about the impact of the announcement on the company, Leonard Moodispaw, CEO and president of Essex said, "The proposed acquisition offers new opportunities for Essex and its employees to continue and expand the range and depth of solutions we offer, and to accelerate the advancement of several of our key technologies. Northrop Grumman offers an exciting new platform from which Essex will continue to deliver innovative solutions to the intelligence technology market." Following the close of the transaction, Essex will be operated as a business unit within the Northrop Grumman Mission Systems sector.



Arbitrary Waveform Radar Receiver in 6U form-factor (above) and the Radar Simulator Test Suite support arbitrary waveforms (right)

Strong relationships within MDA as well as the NAVAIR and Army SBIR offices have been critical to our success on this project.

—Keith Frampton, Essex Corporation vice president

Form Fit and Function, LLC, Dover, NJ | www.fffdesign.com

2003–2004 Navy TAP Participant

"It is critical to embrace all members of the Navy support team, to demonstrate your broader corporate maturity and willingness to address any and all issues that may arise in transitioning your technology to the Fleet."

—Odilo Vazquez, Form Fit and Function president

Can securing a \$10M Navy IDIQ contract be considered a Phase III SBIR success story? Certainly it can! In fact, Form Fit and Function, LLC (F3) is enjoying Phase III success of that magnitude brought about by its shock and vibration technology. F3's 2004 NAVAIR IDIQ contract was a direct result of the technology developed under its SBIR Topic: N01-O18 (Semi-Active side-lateral engine mounts for control of vibration and shock loading) which was issued in early 2001. As of July 2006, over \$1.6M in technology tasks have been completed against this IDIQ, with an additional \$690,000 of open tasks scheduled to be completed in 2006 and 2007.

As a fast track requirement, the Navy was very concerned with the inability of existing aircraft engine mounts, specifically those on the E2-C and advanced Hawkeye aircraft, to adequately sustain the shock load associated with aircraft landings, catapult launches and in-flight turbulence. The objective of the SBIR solicitation was to secure a cost effective engine mount system for carrier-based, turbo-prop aircraft. F3 structural engineers addressed this need through the development of a system that would monitor the aircraft's dynamic conditions and adjust the engine mount to compensate for the corresponding dynamic events.

During stress conditions, F3's technology attenuates vibration over 95 percent and it protects the engine up to 4800 lbf during shock events. To achieve this performance, the F3 technology employs magneto rheological fluids coupled with a closed loop control system to react to shock and vibration events in under one millisecond. By utilizing the properties of magneto rheological fluid to change viscosity almost instantly, the technology can tailor the engine mount to react to the dynamic events

in real-time. Without impacting the current aircraft configuration, the F3 system reduces crew fatigue, as well as structural damage to the aircraft, by reducing in-flight vibrations, thereby reducing maintenance costs.

When looking back at how exactly this "fast track" success occurred, multiple factors need to be considered. First of all, was it solely a function of the "magneto rheological fluid" technology or did the Form Fit and Function team implement other management activities that facilitated the adoption of their SBIR technology? These questions were posed to Odilo Vazquez, president of Form Fit and Function, in a discussion concerning F3's Phase III success.

Vazquez acknowledged that the development of the rheological fluid technology was certainly central to satisfying the Navy's technical requirements, but he also emphasized that meeting the SBIR technical specifications was only the "first gate" in securing the \$10M IDIQ contract. The NAVAIR systems command was equally concerned with the ability of a small firm, such as F3, to provide the full range of follow-on support needed to implement this program on the E2-C fleet and other designated military aircraft.

A big challenge for F3 was to build awareness of their technical success. This was achieved by working closely with Sam Carson, the E2-C chief project engineer at Pax River, who also functioned as the SBIR TPOC during the Phase II development cycle. Carson was instrumental in helping the F3 engineers bring their technology to the engineering prototype level and securing the necessary E2-C testing opportunities.

Beyond this technical support, the key management influenc-

Company Success: \$10 million IDIQ contract

Pictured in the upper right is the E2-C Hawkeye Plane. The photo in the lower right is F3's Side Lateral Engine Mount, designed specifically for use on the E2-C Hawkeye.



ers from NAVAIR were Carol VanWyk and Janet McGovern, who both provided strong "shepherding" throughout the Phase III transition process. Their primary focus was one of helping F3 communicate its underlying corporate strengths and broader management capabilities, beyond their demonstrated technical expertise. The F3 management team also built a strong vector-of-support among other NAVAIR support organizations including Larry Miller, who provided technical support and transition assistance and Kevin McDonald, who provided close contract administration support.

"It is critical to embrace all members of the Navy support team, to demonstrate your broader corporate maturity and willingness to address any and all issues that may arise in transitioning your technology to the Fleet," said Vazquez. The trust and confidence that F3 has built with the NAVAIR management team has continued to grow, and has clearly piqued the interest of some prime contractors—as F3 is currently responding to additional interest from Boeing and Airbus for both military and commercial applications.

The Boeing interest developed from the recommendation of a separate Pax River TPOC familiar with the Boeing V22 needs, while the Airbus interest was generated from a recent Form Fit and Function symposium presentation in California. Vazquez emphasized that he utilized the Navy Forum® presentation developed as part of the Dawnbreaker TAP. He felt that this Forum® presentation "clearly communicated the inherent benefits of the rheological fluids technology and, coupled with the Corporate Capabilities brochure, provided both Boeing and Airbus management with a solid, professional understanding of the Form Fit and Function organization."

In summary, the biggest challenge confronted by Vazquez and the F3 team was one of building credibility in their SBIR technology, which they accomplished through effectively communicating their technical readiness level achievements to all of the affected NAVAIR partners. These hard data results were communicated through their network of support contacts, allowing Fit Form and Function to build confidence in their management capability and to rapidly move through the NAVAIR testing and evaluation process. Vazquez emphasized that as SBIR firms navigate through the Phase II/III transition process, "they should be mindful of the need to communicate frequently with all of the key Navy influencers to assure that they are fully aware of the technical progress and the larger support capabilities of their companies."

Kronos Air Technologies, Inc., Belmont, MA | www.kronosati.com

2003–2004 Navy TAP Participant

The Navy SBIR Program Funding has been critical to the success of Kronos Air Technologies.

—Rich Tusing, Kronos COO

Using funding from the Navy SBIR program, Kronos Air Technologies developed a proprietary air movement and purification system that utilizes state-of-the-art high voltage electronics and electrodes to silently move and clean air without any moving parts. The technology was originally developed to supplement or replace onboard ship HVAC and air purification systems. Navy ships use centralized high power fans to create the necessary air movement throughout the ship. In addition, local air distribution is required for local comfort and cooling in sailors' bunks or equipment rooms, for example. The Navy wanted a distributed fan system that could fit in the floor plenum of a ship that would supplement the air coming from the central system, but without adding any decibels of noise. The Kronos solution achieves this goal while simultaneously purifying the air.

According to Kronos CTO, Dr. Igor Krichtafovitch, the technology "is essentially a solid state fan that creates air movement without any moving parts." Krichtafovitch explained, "We do that without any fan blades, engines, or motors. We directly convert electricity into air motion. The product is a printed circuit board that has a high voltage power supply that sits in the base. The 'fan' itself is a set of paired wires and metal plates or what we call collecting electrodes. The product has no moving parts and is completely quiet. Additionally, since the air is being moved by an electrical field, one of the specific properties the electric field has is that it destroys airborne biological viruses, bacteria and mold with very high destruction rates."

The company completed Phase II development of the technology before the Navy was ready to take advantage of it, due to budget constraints. So the company had to focus on commercializing the technology in the private sector. They have found a more ready market in the commercial space with domestic and foreign companies in the air purification business. Kronos has licensed the technology to DESA International, headquartered in Kentucky, for selected commercial air movement products

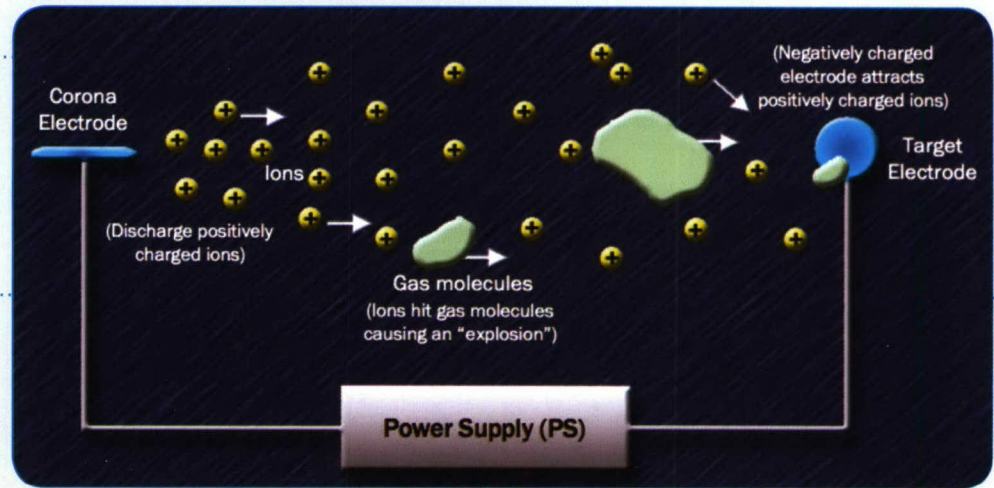
and EOL, LLC, a Russian based company, for medical facility air purification products. According to Kronos COO, Richard Tusing, Kronos is working with additional partners to develop production processes to make a wide range of devices, from those that can be used as a replacement in kitchen exhaust and bathroom fans, to the cooling of the surface area of a microchip.

The air purification systems for medical facilities are also very exciting, Krichtafovitch said. "We know from clinical and medical facility testing, with Kronos partners, that the Kronos Air Purification system effectively eliminates and removes airborne bacteria and viruses including Anthrax, e-coli and Staphylococcus. In conjunction with our partner EOL, LLC, we conducted further testing outside the U.S., because of the availability of customer funding and support," Krichtafovitch continued. "The Russian Research Institute of Medical Equipment in Moscow did sophisticated independent testing from which the Kronos devices demonstrated significant capability of removing virus and bacteria from the air. As organisms went through the device, they were both destroyed and collected. The Russian Institute tested the Kronos air purification system in both closed chamber rooms and in hospital rooms with patients present, to show within 12–28 minutes the viruses and/or bacteria were removed. When they continued to flow the organism into the room, the system continued to effectively remove them," said Krichtafovitch.

As a result of this testing effort, the Russian Research Institute of Medical Equipment approved Kronos devices for use in hospitals and other health care facilities as a Category I air cleaner (product has met the strictest regulations for a device to be used in operating rooms and other areas of the hospital that require a sterile environment) and the Ministry of Health Care and Social Development of the Russian Federation issued a Registration Certificate that designates the Kronos product for medical use. "We licensed the technology to EOL to produce devices that would be used to move and purify air in hospitals,

Company Success: \$9.2 million in investor funding, licensing and revenues

This graphic represents the Kronos technology at work.



assisted living facilities and commercial facilities that have high rates of airborne tuberculosis and other contaminants," Krichtafovitch explained. "EOL is utilizing our designs, innovations and intellectual property and are looking to have the production devices available at the end of 2006."

"The Navy SBIR Program funding has been critical to the success of Kronos Air Technologies. This funding enabled the development of silent and energy efficient, high air flow Kronos devices that do not use motors or fans, and that additionally demonstrate unprecedented particulate collection and biological destruction," said Tusing.

While the SBIR money did not fund the basic R&D for the Kronos technology, it did fund the building of specific prototypes and the testing of the prototypes. "When we started Phase I, we didn't have a working device that could accomplish the specifications. During the course of Phase I, we actually made it work. In Phase II we got over the technical hurdle to scale it up to 1700 fpm, which was what the Navy needed for the shipboard application," said Krichtafovitch. The same base, underlying technology is what Kronos is licensing for commercial use, so the Navy funding was crucial for this success.

"As we continue to develop commercial products and the Navy is less budget constrained, we hope the Navy, other DoD and Homeland Security organizations will come back and ask for a mil spec-ready device," Krichtafovitch concluded. Kronos will be ready and willing to support that need.



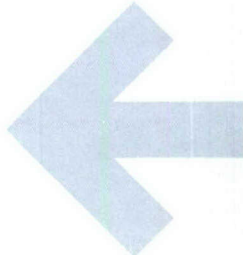
We know from clinical and medical facility testing, with Kronos partners, that the Kronos Air Purification system effectively eliminates and removes airborne bacteria and viruses including Anthrax, e-coli and Staphylococcus.

—Dr. Igor Krichtafovitch, Kronos CTO

Lambda Technologies, Cincinnati, OH | www.lambdatechs.com

2003–2004 Navy TAP Participant

DoD agencies must meet very demanding quality standards before implementing any mission critical technologies. As each SBIR firm approaches its Phase III transition, the management team must be conscious of these requirements and seek out guidance and direction from its Phase III partner.



The Navy TAP was established to assist SBIR firms in identifying and securing Phase III funding for their technology implementation. The program has been of great assistance to thousands of small technology companies in preparing them to effectively transition their technology to large prime contractors or second and third tier suppliers. These major contractors are responsible for delivery of the key Navy platforms that must meet very demanding DoD performance criteria. It is, therefore, important that SBIR firms recognize that winning a Phase III contract with these suppliers is often just the beginning of a long and challenging business relationship.

Lambda Technologies was founded in 1977 by Paul S. Prev y III and Professor B. D. Cullity as an accredited independent laboratory, specializing in X-ray diffraction and related methods of materials testing. Their primary focus is in the areas of residual stress measurement, texture analysis and quantitative phase analysis of polycrystalline metallic and ceramic materials. Lambda discovered how crucial relationships with major contractors and the members of the SBIR community are when it was awarded a \$25M IDIQ contract with NAVAIR in the summer of 2004. This Phase III contract facilitated the NAVAIR Extension award of \$500K for delivery of Lambda's compressor blade fatigue life extension technology (Topic: N01-024). At that time, Carol VanWyk, the NAVAIR Program Manager, recognized the potential improvements available through this surface enhancement technology for both Navy and Air Force aircraft engine performance. Establishment of this IDIQ contract facilitated the

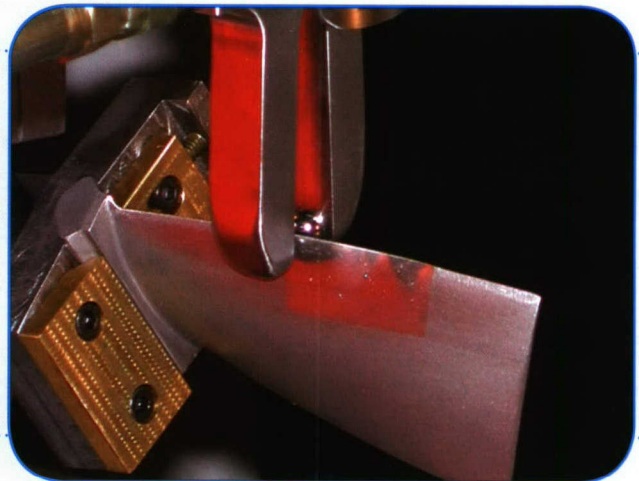
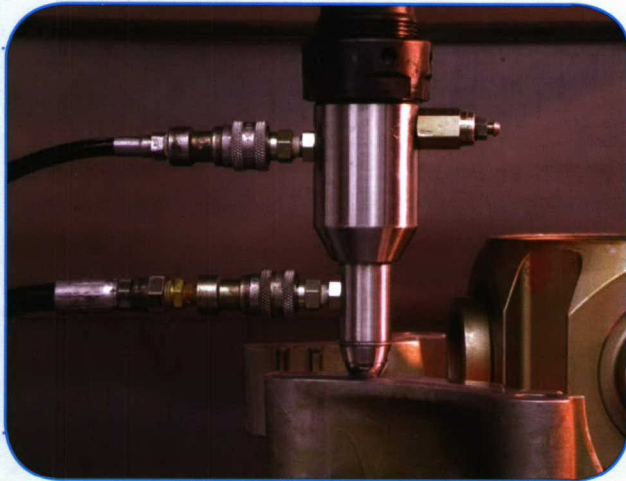
processing of approximately \$1.2M to date in DoD task orders from both NAVAIR and the Air Force (F22 Fighter, C17B3).

Aircraft engines, both turbine and turbo-prop, are subject to high cycle fatigue (HCF) that can lead to engine failures. Further, foreign object damage (FOD) caused by the ingestion of debris (i.e. rocks, screws, shrapnel, etc.) into the engine creates crack initiation sites that exacerbate the effects of HCF. At a minimum, damaged vane, fan, and compressor blades can lead to increased inspections and additional maintenance actions that can negatively impact fleet readiness and operational tempo. At worst, the combined effect of FOD and HCF may cause catastrophic engine failures with severe consequences including mission failures, aircraft damage and loss of life.

To address these issues, Lambda developed its patented Low Plasticity Burnishing (LPB) surface enhancement technology to strengthen the engine components and extend their useful life. From a materials design standpoint, all mechanical surface enhancement methods develop a layer of compressive residual stress following mechanical deformation of the surface. The methods differ in how the surface is deformed and the magnitude and form of the resulting residual stress and cold work (plastic deformation) distributions. The improved Lambda LPB method produces a deep layer of high compression with improved surface finish, lower cost and minimal "cold" work.

What Lambda did not fully appreciate in the early stages of its Phase III success was the number of performance hurdles it would have to pass in order to meet DoD's demanding production

Company Success: More than \$4.2 million in Phase III funding



standards. On the strength of their IDIQ award, Lambda invested \$1.0M in a 30,000 sq. ft. production facility. Lambda's manufacturing affiliate, Surface Enhancement Technologies (SET), completed this expansion in April of 2005. SET soon learned, however, that there were several manufacturing process improvements and quality certifications that needed to be achieved before it could begin active production in this facility.

For the implementation of the F402 LPC Stage 1 Vane repair contract, it was determined that a pre-award survey (August 2005) of their production operation was needed which took six months to arrange. This survey concluded that Lambda's SET affiliate should become ISO 9001 certified before the final award of this contract. Preparation and scheduling of the ISO audit took an additional six months to arrange. Separately, the Navy's pre-award requirements imposed a further production certification requirement under MIL-STD-9858 to cover 50 process definition and implementation steps.

Once these certifications were begun, SET learned that its technology had to be fully documented in accordance with the DoD Configuration Management procedures (MIL-HDBK-61) in order to be installed in a Navy or Air Force aircraft engine. Engineering change orders had to be developed with the assistance of the F402 configuration manager from PMA257, which took an additional two months. Even with all parties working

together to implement this repair contract, the full cycle from Verification and Validation Testing to the final contract award took approximately 20 months. SET finally received its ISO 9001:2000 certification for its quality management system in May 2006.

The key message to other SBIR firms is the recognition that DoD agencies must meet very demanding quality standards before implementing any mission critical technologies. As each SBIR firm approaches its Phase III transition, the management team must be conscious of these requirements and seek out guidance and direction from its Phase III partner. To the extent that these quality standards and configuration management requirements can be identified early in the Phase III process and addressed in parallel, then transition to the Fleet can be achieved more quickly and efficiently with less frustration for the SBIR firm.

Lambda has grown to be the largest and most experienced independent laboratory specializing in X-ray diffraction applications. In 2000, Surface Enhancement Technologies was established to provide comprehensive surface enhancement solutions that can be integrated into existing manufacturing operations. Together, Lambda Research and Surface Enhancement Technologies doing business as Lambda Technologies have 30 employees dedicated to providing solutions for improving the performance of critical metal components through the use of surface enhancement technology.

Management Sciences, Inc., Albuquerque, NM | www.mgtsciences.com

2003–2004 Navy TAP Participant

NAVAIR, specifically the JSF (Joint Strike Fighter) program, has a high level of interest in ambiguity reduction for maintenance and repair activities. The Navy wants maintenance and repair technicians to know exactly where to go to fix a problem without having to search for it. As an example, a good deal of time can be spent diagnosing a seemingly minor problem such as a bad signal from a 3-phase motor. The motor is still working, but it isn't working very well. It is difficult to ascertain whether it is the motor or the wire and just where exactly the failure is taking place. In the meantime, the aircraft sits.

The Navy was in search of an automated way to communicate to the technician exactly where and what the problem was so it could be repaired in a minimal amount of time. NAVAIR 4.4 (power and electrical) needed a solution. Though originally designed for JSF, existing aircraft like the F/A-18 and Army vehicles such as the Humvee and Stryker, are now in need of this solution.

Management Sciences, Inc. (MSI), of Albuquerque, N.M., is in the process of providing a solution to this costly problem with their Smart Wiring System. The system enables sensors to be mounted on engines, motors and wiring harnesses to monitor component and system performance.

Starting with Navy SBIR funding to develop and demonstrate a solution, the company has since received nearly \$3M in Phase III funding from NAVAIR and Army TACOM. According to Ken Blemel, vice-president of MSI, much of the early Phase III work was done with PMA 299 on wiring safety issues for aircraft and

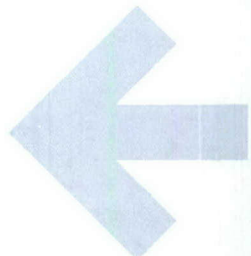
the H60 Helicopter. MSI worked closely with Freddie Cline of PMA 299 to help improve safety. "Because PMA 299 is in charge of the safety monitoring systems such as flight recorders, Freddie's vision was that the vehicle itself could identify the existence of a problem in advance. If the vehicle indicated a performance error beforehand, the aircraft wouldn't even take off. Our technology was a very good fit for PMA 299's needs."

For Blemel, strong relationships with key Navy personnel have been critical to the company's success with this technology.



Relationships were the key with people who were in charge of the safety and maintenance of military vehicles. The biggest challenge is continuity within the services because it takes time, making relationships critically important.

—Ken Blemel, MSI president



Company Success: Nearly \$3 million in Phase III funding

This project has allowed us to change from a PC software company to an electronics company, and that metamorphosis is the difference between a caterpillar and a butterfly. It's a 100% change. We are now butterflies. We used to be caterpillars.

—Ken Blemel, MSI president

"Relationships were the key with people who were in charge of the safety and maintenance of military vehicles. The people at Air 4.4 have been wonderful. Sean Beaden and also Navy Safety Manager Richard Heeling, who is in charge of ways to improve safety for pilots, have been great champions. People, mainly from safety and maintenance communities, wanted this technology to move forward. The biggest challenge is continuity within the services because it takes time, making relationships critically important."

With respect to Army applications, the technology can monitor not only what's going wrong but what's going right. Blemel continued, "If you've been driving and need more fuel or need more bullets in the field, the technology would provide the logistics to the base, pinpointing the right place, at the right time to make the supply drop. This can save a mission. For example, a water pump may go bad and you can get that pump fixed before it fails. People are interested because it's a ubiquitous problem," he said.

Another pressing issue for the safety and maintenance communities is the time vehicles, with little to nothing wrong with them, spend back in the depots. "With a round trip cost in the thousands, the depot may discover the problem may have only been a bad connector, or it was never properly tightened, or the wire was bent 20 times during the course of repairs and the wire finally broke. Management Sciences' technology would eliminate a lot of that wasted time," remarked Blemel.

The Navy funding that started this project and the follow-on DoD funding has enabled a complete transformation of the company. According to Blemel, "This project has allowed us to change from a PC software company to an electronics company, and that metamorphosis is the difference between a caterpillar

and a butterfly. It's a 100% change. We are now butterflies. We used to be caterpillars. The process continues as 2007 funds will transition the technology to the AV-8B Harrier and, pending a new NAVAIR Phase II, will create a tiny electric module for embedded Diagnostics and Prognostics."

MSI has also taken advantage of the TAP program to drive success as a company. "TAP has been really fantastic," Blemel said. "It brought about discussions with a major company who saw us at the Forum®. That exposure, as a place to show off your technologies, is crucial and is rare. The fact that we're always able to show all technologies, in addition to the focus technology, really helps. These are heavy weights we're in front of at the Forum® and they tell you who to call. That really works. It was also good to meet and team with other TAP companies."



Metric Systems Corporation, Vista, CA | www.metricsystems.com

2003–2004 Navy TAP Participant

To date, we have three U.S. published patents on the technology resulting from this SBIR-sponsored contract.

—Bill Brown, Metric Systems Corporation president

Of vital concern on Navy ships is the reliability of core inboard voice, data and video communications in the event of facility damage and/or conflagration. Maintaining mission effectiveness and the survivability of ship and crew following such an event is dependent on quickly establishing and maintaining communications. Metric Systems Corporation (MSC), with funding from the Navy's SBIR program, has developed a broadband frequency agnostic shipboard wireless mesh networking system that augments the ship's traditional communication infrastructure, and automatically provides backup broadband capability when the primary fiber or copper infrastructure facilities are lost or damaged. The AN/WSC-54 is a scalable, multi-channel ad hoc mesh non-line-of-sight wireless networking system with multiple redundant and spectrum operating capabilities to meet the most challenging interior communication scenarios. Blending the best of commercial off-the-shelf technologies with capabilities uniquely required for afloat situations, the AN/WSC-54 uses cognitive radio technologies to probe and scan for the best signal paths to maintain critical voice, data and video communications.

MSC has captured more than \$2M worth of commercial product sales with big name companies, such as ATK Integrated Systems, Microsoft Corporation and CBS, for the commercialized version of the AN/WSC-54 wireless mesh network solution, called the SAFARI Srx. Concurrent with their continued commitment to DoD transition and live shipboard field testing with the Navy, MSC has followed the advice of their NAVSEA contact Frank Plonski, to develop a strategy to commercialize the newly evolved technology. While focused on commercial success of the technology from the start, Bill Brown, MSC president, said that, "Our strategy was to modify the Navy's research and development platform for commercial applications and to add the features and functions required to make it competitively attractive for integrators building video, voice and data communication capability for in-building and in wide-area

applications." The company also invested heavily into protecting the Intellectual Property derived from Navy and IR&D funded activities. "To date, we have three U.S. published patents on the technology resulting from this SBIR-sponsored contract," said Brown.

Continuous development of strong customer relationships and focusing on the specific needs of each customer is critical. "Customers appreciate the fact that the Navy participated in development," said Brown "In positioning SAFARI, we surveyed existing and new customers, including system integrators and non-DoD agencies. We found a need for a reliable, high-definition, streaming-video wireless networking product and as a result, we modified and adjusted the product as a focused solution."

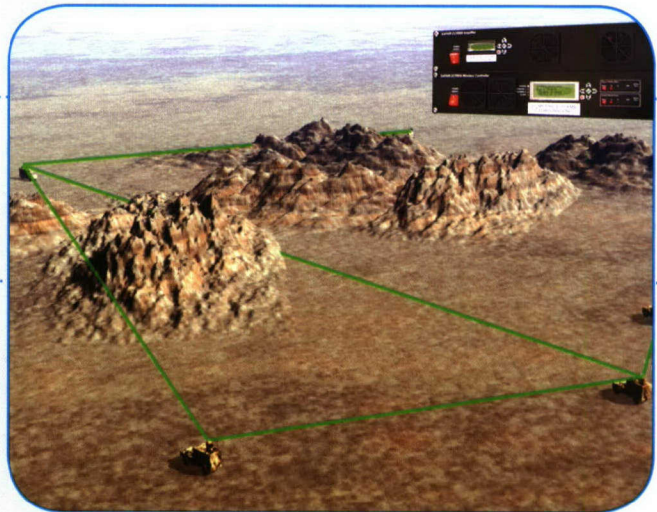
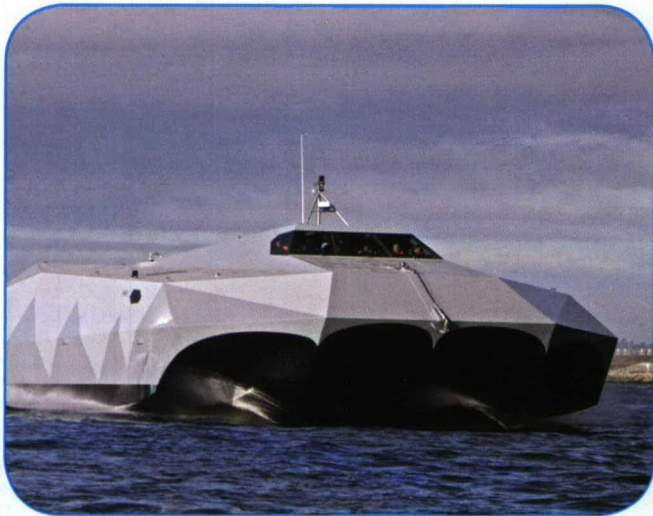
Relationship building and proactive business development are the most important success drivers. Advised Brown, "Nothing walks off the shelf. Toot your own horn. Do the audacious. Go to the top. The top guy has the responsibility to find things that will create profitability, and efficiency in his operations. Simply put, we strive to design and position our products to easily fit into our customers' existing network."

As a 2003–2004 participant, Brown stressed that TAP has been instrumental in the company's success, "The process helped us get realistic about doing business with DoD and the Navy. TAP convinced us that products like ours will be deployed, but it will not happen tomorrow. We need to make sure we continue development and make sure we sell this product in order to grow. It's a good disciplined approach. We learned that we need to look at our technology from the customers' point of view."

The Navy SBIR project and commercialization strategy also dramatically influenced the firm's commercial focus, "We knew had an opportunity here. This meant our ideas made sense to someone other than us. So we decided to run with this technology, and that is what we have been doing ever since—many good things have come out of this."

Company Success: Over \$2 million in product sales

The image to the right is a demonstration of MSC's technology at work in a desert situation. The photo below shows the Stiletto, a composite special warfare vessel that MSC recently completed propagation testing on.



Above: an AN/WSC-54 wireless terminal that Metric Systems Corporation developed to supplement a ship's traditional communication infrastructure.

Nothing walks off the shelf, Toot your own horn. Do the audacious. Go to the top. The top guy has the responsibility to find things that will create profitability and efficiency in his operation.

—Bill Brown, Metric Systems Corporation president

ProSensing, Inc., Amherst, MA | www.prosensing.com

2003–2004 Navy TAP Participant

The National Hurricane Center now requires that data from this instrument be gathered on all hurricane reconnaissance flights as a key input to models that forecast hurricane development.

—Ivan PopStefanija, ProSensing partner

ProSensing is a systems engineering firm specializing in custom-built radar and radiometer systems for environmental remote sensing applications. Since developing a PC-based weather radar processor for tactical radar systems under an SBIR Phase II contract, ProSensing has received over \$2.5M in weather radar sales for systems employing this processor. Customers include the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) program and the National Research Council Canada. The company was contracted to develop add-on hardware and software to convert a sophisticated, electronically scanned military radar into a weather surveillance radar. The challenge was to do this conversion without modifying the rest of the system, allowing the radar to be converted back to its prime military mission, as needed.

To achieve this Phase III success, the company needed to develop a control board and signal processor compatible with the military system that surpassed the capabilities of competitive weather processors available in the market at that time. Novel features of the weather radar processor include its ability to handle combined mechanical and electronic beam steering and its use of PC-based signal processing.

Developing this product required strong relationships with both the radar manufacturer and the hardware supplier. In the case of the radar manufacturer, in addition to developing the processor, the company needed to develop a system to control the radar in a way that is more compatible for weather surveillance than for tracking hard targets. The relationship with the manufacturer, Raytheon, is vital, according to Ivan PopStefanija, ProSensing partner. "To control the radar, of course you have to talk to the manufacturer and this took a little work," he said. "We needed their support for integration success." In the case of the hardware supplier, PopStefanija remarked, "We had to work closely with the supplier because we were pushing their hard-

ware to the edge. They thought it would perform but they had never tested it to that level of performance. That was another hurdle to get over—it took several months to work through the issues. We didn't have a formal partnership, but they responded well. Those two relationships were critical."

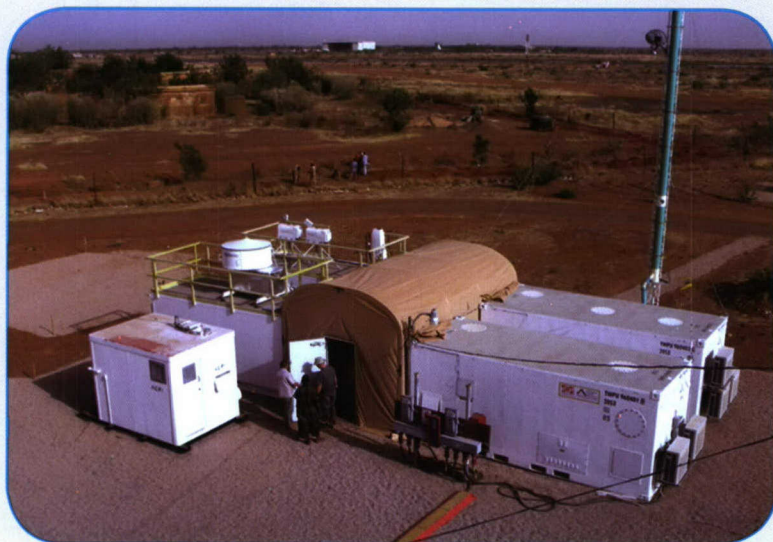
Success with this technology has had a major impact on ProSensing's continued achievements as a company. For example, the DOE ARM program's sites in Oklahoma and Niger, which sample atmospheric data using many different instruments, take advantage of this technology. According to PopStefanija, "Scientists can go to the website and monitor weather based on data from the two sites 24/7. The systems are very reliable and easy to maintain and upgrade, partly due to the fact that we developed PC-based weather processor through the SBIR program."

In the past two years, the firm has also seen critical success with its Stepped Frequency Radiometer (SFMR) system, which is used by multiple NOAA and Air Force hurricane reconnaissance aircraft to measure ocean surface wind speed. "The instrument has moved from a research instrument to an operational instrument. The National Hurricane Center (NHC) now requires that data from this instrument be gathered on all hurricane reconnaissance flights as a key input to models that forecast hurricane development. "This is important for us, that data from SFMR is now mandated by the NHC," PopStefanija said.

Going through the TAP program has also been an essential factor to the company's success as a business, according to PopStefanija. "TAP helped us more in our internal view of the program, forcing us to look at what we were doing, in a business sense, and to pay attention to what it would take to make this into a product rather than just one project. TAP then provided the guidance to help us tie everything to our business plan, focus on exactly what we were trying to do and how we could leverage that for future projects and for the business."

Company Success: More than \$2.5 million in product sales

To the right is the airborne version of ProSensing's solid-state FMCW cloud radar. The system is a cost-effective alternative to high-power cloud radar systems and provides a very fine resolution without the need for ultra-high bandwidth digitization.



Pictured above is the actual system ProSensing developed for the DOE ARM program sites.

At left, WACR installed in the ARM Mobile Facility, Niamey, Niger.

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—Ivan PopStefanija, ProSensing partner

RLW, Inc., State College, PA | www.rlwinc.com

2003–2004 Navy TAP Participant

The SBIR program made all of this possible. Research and development is expensive and small businesses cannot compete without a cash infusion. Without the SBIR funding none of this could have happened.

—Lewis Watt, RLW president

Started in 2000, RLW, Inc. is a State College, Pa. “C” corporation run by co-founders, Lewis Watt and Bill Nickerson. Nickerson is well known in Navy machinery health monitoring circles; Watt is a retired Marine who commanded the Naval Aviation Depot in Cherry Point, N.C., and served as Program Manager for the AV-8 Harrier Program.

RLW, Inc. specializes in the development of Condition-Based Maintenance (CBM) hardware and software solutions. Historically, there have been two methods of addressing the maintenance of mechanical systems. Both have serious drawbacks. The first is to deploy a scheduled maintenance program wherein mission critical parts are replaced before they are able to fail. Many parts with remaining service life are wastefully

replaced before they present an actual problem. Ships at sea carry complete inventories of spare parts, which represent tremendous cost factors and serious weight liability. Additionally, the service process can introduce failure modes, such as opening the machine to outside environmental contamination or the technician can make errors in reassembly, resulting in early system failure. The second maintenance method called “Run To Failure” allows machines to run until they actually fail resulting in complete system reconstruction in the field.

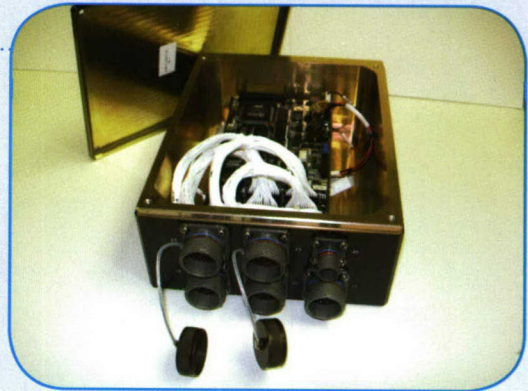
Watt, RLW’s president, comments that, “The RLW S2NAP® solution offers a significant improvement above the currently deployed methods. This enables you to make maintenance decisions based on actual equipment condition, rather than time or usage intervals. S2NAP® can identify problems early, when they are less costly to correct, and perform maintenance only when needed, thereby increasing asset utilization, extending equipment life, and reducing maintenance costs. The cost savings can be significant because component parts are replaced when needed, as opposed to replacing perfectly functioning parts, just in case.”

The U.S. Navy Supply command seems to be in complete agreement with this strategy. “NAVSUP and our Technical Points of Contact in the system command have been really supportive. The program office is behind us as well. They sponsored a Congressional Plus-Up of \$4M to continue the development of this technology,” said Watt. “As a result of the continuing development, S2NAP® underwent sea testing aboard the DDG79 Oscar Austin in September. This technology is ready to deploy at this time and we truly expect this to be a huge success.”

When offering advice to small companies trying to transition



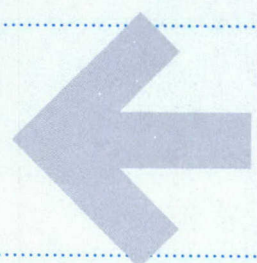
Company Success: \$4.5 million in CNST and ONR funding as well as product sales



Platform that will utilize RLW technology.



Participation in the TAP program provided the catalyst for a significant increase in our ability reach Phase III.



—Lewis Watt, RLW president

their SBIR technology to the fleet, Watt had this to say, "Develop a relationship with your Congressional Representatives and make sure your TPOC's are committed to your success. It's far more difficult if you don't have strong champions that really want your technology."

Commercially, S2NAP® is already making the grade with over \$400K in sales thus far with an anticipated \$1M in 2007. The technology is being deployed on overhead cranes in steel mills; gear boxes in wind farms, shipyard cranes and a whole array of machinery for the power generation industry. In the private sector the cost savings for deploying this technology is in the range of 30 percent as reported by early adopters with beta sites. The SBIR funded research is already spawning new and more advanced systems. The product line has grown to include the improved S4NAP®. S6NAP® range of products. "The SBIR program made all of this possible," Watt said. "Research and development is expensive and

small businesses cannot compete without a cash infusion. Without the SBIR-provided funding none of this could have happened."

He continued, "Participation in the TAP program provided the catalyst for a significant increase in our ability reach Phase III. We developed a first rate brochure that we continue to use to this day. The partnering opportunities afforded by the Opportunity Forum® continue to benefit our company. We're working with other SBIR funded companies that we met at the Forum and some of them have become strong allies."

Looking to the future, RLW, Inc. is planning to embark upon a comprehensive program that monitors overhead crane health in the Portsmouth shipyard. The area of Overhead Crane Health Monitoring is one of the principal directions where the company feels they will focus much of their efforts in the years to come. The benefits of employing the SxNAP® family of technologies in this area are enormous.

