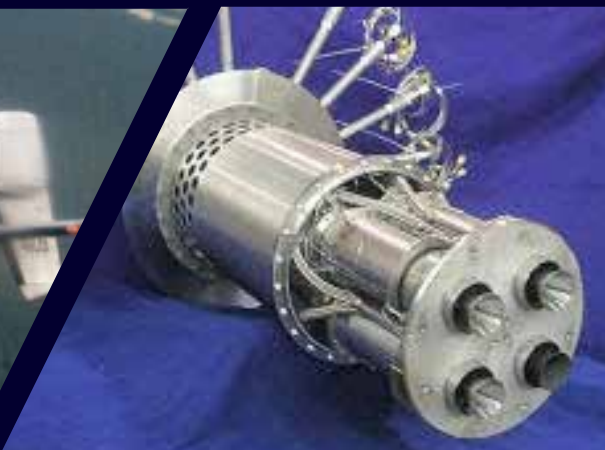


PROFILES

IN SUCCESS

WINTER 2010



DAWNBREAKER[®]
The Commercialization Company

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NAVY TAP/DOE CAP

The Transition Assistance Program (TAP) is a competitive program designed for, and offered exclusively to, the Navy SBIR/STTR Phase II awardees. The Commercialization Assistance Program (CAP), which is similar to the TAP, was designed to meet the DOE SBIR program needs. These two programs assist participants with market research, Phase III strategies and development of other appropriate tools. Companies that complete the TAP or CAP can then present their projects to government agencies, contractors, investors and other private sector companies in attendance at the *Navy Opportunity Forum*[®] or *DOE Opportunity Forum*[®].

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Sixty-three percent of the presenting firms in the 2005-06 TAP received a combined total of \$265 million from non-SBIR government / private funding or increased sales within the 18 month period following the 2006 Navy Opportunity Forum.



FROM THE EDITOR

Profiles in Success is a Dawnbreaker® publication. This issue celebrates the achievements of companies that participated in the 2005-2006 Transition Assistance Programs (TAP) conducted for the U.S. Navy and the 2005-2006 Commercialization Assistance Program (CAP) conducted for the Department of Energy. The TAP is sponsored annually by the U.S. Department of the Navy's Small Business Innovation Research (SBIR) Program Office and continually evolves in order to achieve the goal of more rapid transition of SBIR and Small Business Technology Transfer Program (STTR)-funded technology into the fleet. The methodology used by Dawnbreaker® in working with participating firms is highly interactive and is focused on developing specific tools, opportunities and relationships that will facilitate transition.

Since 1990, Dawnbreaker has had the pleasure of assisting more than 3,400 SBIR and STTR funded firms, and by collecting follow-up data at 6, 12 and 18 month after the Opportunity Forum®, Dawnbreaker is able to monitor the results of participation in our Phase II program. On average, fifty percent of Dawnbreaker clients receive private sector financing within 18 months following the development of business plans with our assistance, and over 60% of those participating in the Transition Assistance Program receive Phase III funding.

The 2005-06 TAP and CAP saw the participation of a combined total of 232 companies. The 13 companies presented in this iteration of *Profiles in Success* are a select group of the nearly 50 companies that achieved more than \$1 million in sales, Phase III contracts and/or investments during the 18-month evaluation period. Sixty-three percent of the presenting firms in the 2005-06 TAP received a combined total of \$265 million from non-SBIR government / private funding or increased sales within the 18 month period following the 2006 Navy Opportunity Forum. 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.



Jenny C. Servo, Ph.D.
President, Dawnbreaker, Inc.
The Commercialization Company



Since 1990, Dawnbreaker has had the pleasure of assisting more than 3,400 SBIR and STTR funded firms.

01

Advanced Energy Systems

Agency: Navy | 05/06 Navy TAP Participant

Visit Advanced Energy Systems online at:

www.aesys.net

► Phase III Success: \$2.7 million in Phase III funding from the Office of Naval Research and the Joint Technology Office

While the development of the FEL is still in the early stage, AES is well positioned to continue to develop the superconductor RF accelerate cavity for the injector. The company has partnered with major prime contractors in order to continue the maturation of their technology.

FOUNDED IN 1998 with roots that trace back to Northrop Grumman Corporation, Advanced Energy Systems, Inc. (AES), headquartered in Medford, N.Y., was the recipient of a 2004 SBIR Phase II, sponsored by NAVSEA. The SBIR topic N02-010, entitled *High Energy Free Electron Laser (FEL) for Ship Self-Defense*, sought to “design, develop and demonstrate components in support of a Free Electron Laser System that can be packaged for naval platforms.” According to Dr. Alan Todd, vice president and treasurer of AES, “We’re working on one of the most difficult problems within the FEL system, which is the electron injector. For the FEL to operate, very high current and very high-quality electron beams have to be produced. The technology this SBIR addressed was how to get such high quality, high-current beams. The electron injector is a very important piece in what is a very large and complex system.”

According to the Office of Naval Research (ONR), Innovative Naval Prototypes (INPs), “push the boundaries of our nation’s technical talent to deliver transformational warfighting capabilities to the U.S. Navy and Marine Corps.” Currently, there are six INPs, among them the Free Electron Laser (FEL). All the INPs share the potential to, “dramatically change the way naval forces fight.” As published by ONR, “the Navy’s future Free Electron Laser (FEL) weapon system is being designed to be game changing... The FEL provides naval platforms with a highly effective and affordable point defense capability against many surface and air threats, future anti-ship cruise missiles or a swarm of small boats. Utilization of FEL also allows an unlimited maga-

zine with speed-of-light delivery.” At the center of this technological breakthrough is a small business, Advanced Energy Systems, Inc.

The FEL system is clearly aligned with the AES corporate strategy and R&D efforts. As the leading U.S. manufacturer of superconducting accelerator cavities, which are used by the military, the Department of Energy and by university research communities, AES’ primary focus is particle acceleration components, generally high-current electron accelerate components.

AES has experienced early success from their SBIR Phase II work, receiving more than \$2.7 million in Phase III funding from the Joint Technology Office and ONR. Although this early Phase III funding is encouraging, Todd knows that they are at the early stages of development. “We are working on a research and development item. If you look at the ground rules for the Navy INP, they are considered very high-risk things that need special treatment – an electron injector is a multi-million dollar item. There’s a long period of time before these types of components reach the Navy.” While the development of the FEL is still in the early stage, AES is well positioned to continue to develop the superconductor RF accelerate cavity for the injector. The company has partnered with major prime contractors in order to continue the maturation of their technology.

With more than 20 years of experience in particle accelerator components, the company is unlike most other small businesses participating in the SBIR program. “We don’t make smaller devices that are close to transitioning to weapon programs. Nor do

“Participation in the TAP and the subsequent Phase III work has allowed AES to establish a relationship with a number of prime defense contractors and to realize a measurable growth in sales.”

we make a large number of things. We tend to do this big, expensive one-off thing. Because of that, we are a different animal. However, we’ve still benefited from the SBIR program,” Todd said. One way they have benefited is through their participation in the Navy Transition Assistance Program (TAP), which culminates with the Navy Opportunity Forum. According to Dr. Todd, “a key output of the TAP for us was the marketing information. It’s very difficult for a small company to get access to marketing information, so the Transition Information Packet we received from Dawnbreaker was extremely helpful.” In addition to the valuable market research they received, AES was also pleased with the completion of their capabilities brochure. “It is a wonderful bro-

chure. It is certainly not something we were capable of just going out and putting together. The professional help we received was great.”

AES has also experienced other benefits as an outcome of their Navy SBIR/TAP participation. Their participation in the program and the subsequent Phase III work has allowed them to establish a relationship with a number of prime defense contractors and to realize a measurable growth in sales. “Last year sales were \$5.2 million, and this year, we’re looking at \$7 or \$8 million, and more than \$10 million the following year,” said Todd. Over the next three years, they are expecting to double their business, with a good portion of that business being related to the Navy program work they have undertaken. ◀

According to Dr. Todd, “a key output of the TAP for us was the marketing information. It’s very difficult for a small company to get access to marketing information, so the Transition Information Packet we received from Dawnbreaker was extremely helpful.”



02

Advanced Rotorcraft Technology, Inc.

Agency: Navy | 05/06 Navy TAP Participant

Visit Advanced Rotorcraft online at:

www.flightlab.com

► Phase III Success: \$5,250,000 in sales

As computing power increased, ART was able to develop models capable of running in real-time. As a result, ART was able to provide far superior models for training exercises.

IN 2003, THE NAVY SPONSORED a Small Business Innovation Research (SBIR) topic focused on the development of an aerodynamic model that would "support multi-aircraft/ship dynamic interface analysis and testing." As described in the solicitation, "the dynamic interface problem refers to shipboard landing of aircraft and represents one of the most challenging technical areas of research and development." Specifically, the Navy was asking the SBIR community to provide a modeling solution that would allow the Navy to support future aircraft and ship testing. This was a natural fit for Advanced Rotorcraft Technology, Inc. (ART) a Mountain View, CA based company committed to being at the forefront of rotorcraft technology since its founding in 1982.

ART participated in the 2005-2006 Navy Transition Assistance Program and presented the re-

sults of this SBIR project during the 2006 Navy Opportunity Forum. According to Dr. Ronald Du Val, president of ART, the Navy SBIR allowed them to provide, "a detailed V-22 model originally designed to support shipboard operations by looking at interactions of the ship air wake with the V-22 tilt rotor system." Du Val continued by saying that the Company, "compared the results with the data recorded from an actual incident and the results correlated very well." ART has worked extensively to provide "aspects of the model tool that deal with analyzing handling qualities in the shipboard environment and support the design of control systems that better suppress gusts and make the vehicle more controllable in the shipboard environment." Working closely with Naval Air Systems Command at Patuxent River, Md., they have refined their modeling of the interaction of the ship and its air wake with the rotorcraft. Although the original focus was on shipboard operations, this SBIR topic enhanced ART's ability to model interference effect from other vehicles. The implications of this development lie in its ability to "allow the Navy to model the impact on the aircraft of wakes generated from external sources, and this includes non-shipboard environments, such as turbulence from a building if you're landing in an urban environment," Du Val explained.

ART is no stranger to SBIR success. They won their first SBIR award in 1985; three years after the company's founding. Based on Du Val's experience in commercializing SBIR technology, he offered the following regarding participation in the Navy Transition Assistance Program. "A lot of small busi-



nesses are generally unprepared for commercialization. They have the technology, but they don't understand how to commercialize it. The Navy TAP program can definitely help them understand the process of commercialization and the Navy Opportunity Forums are good exposure to the military environment. From that standpoint," he continued, "it helps open some doors." The capabilities the Navy sought were cultivated over more than 25 years of providing advanced aerodynamic modeling to military and non-military markets.

When Du Val founded ART in 1982, he had a vision to "provide consulting support and software products to facilitate the use of simulation technology in rotorcraft research and development." Over the next two decades the company would leverage the SBIR program to provide cutting edge solutions to technical problems facing the war fighter, and to lay the foundation for their FlightLab software product.

In 1986, ART began developing "FlightLab, a rapid prototyping environment for rotorcraft modeling and analysis." According to Du Val, their FlightLab software leveraged their experience and knowledge in, "modeling and analyzing helicopter aerodynamic stability and control, propulsion, and flight control systems." In the mid 1990s they introduced, "comprehensive modeling elements, including nonlinear beam elements and vortex wake aerodynamics" to the FlightLab software. They also took advantage of technological advances in computing power. Prior to enhanced computing capabilities, ART models were, "too sophisticated to run in real time." As computing power increased, ART was able to develop models capable of running in real-time. As a result, ART was able to provide far superior models for training exercises. By the late 1990s, ART had developed a successful model of leveraging the SBIR program to enhance the functionality of their FlightLab software, and had successfully incorporated its software into Army programs. As such, when the Navy needed a model to, "support multi-aircraft/ship dynamic interface analysis and testing," ART was prepared.

As a result of the Navy SBIR program, ART was able to enhance both the flight dynamic models, which they sell to large defense prime contractors, and their FlightLab Product. The company also delivered a flight simulator to NAVAIR at



Patuxent River, Md. Collectively, these activities have resulted in more than \$5 million in Phase III product sales between 2006 and 2008. The company has grown by fifty percent over the last year, largely because they are getting more heavily involved in the training system areas, and there is an increasing market for this product line. This drove the production of a reconfigurable simulator which was sold to the U.S. Navy and Liverpool University. According to Du Val, "the simulator is well suited for engineering and training applications. It's a glass cockpit that can be reconfigured to resemble any aircraft cockpit simply through software; and aircraft-specific flight dynamics models can be interchangeably loaded to represent any aircraft." Their technology is a single simulator that can be used to model any type of aircraft with rotary wing and/or fixed wing. Du Val shared that, "the Navy TAP specifically helped [ART] by giving us more exposure in the U.S. Navy. It has also made us think more about our business and marketing plans, and how best to commercialize what we are doing. We received good support and input from the TAP and as a part of that, Dawnbreaker has provided market research that has been quite helpful." ◀

A lot of small businesses are generally unprepared for commercialization...The Navy TAP program can definitely help them understand the process of commercialization and the Navy Opportunity Forums are good exposure to the military environment.

► Phase III Success: \$4.5 million in Phase III funding from DARPA and ONR

“While Arété’s growth has not been singularly brought about by our participation in the SBIR/STTR program, a substantial portion of it is certainly related to our work in the SBIR/STTR arena.”

DERIVED FROM THE GREEK WORD ARETÉ, which means the achievement of maximum performance, the pursuit of excellence, Arété Associates is an advanced science and engineering company that has pursued excellence while providing innovative solutions to the most challenging technical problems faced by the U.S. Defense and Intelligence agencies. Founded in 1976, the company works with a wide-range of customers across the Intelligence Community and the Department of Defense, including the Navy, offering technical solutions that include intelligence surveillance, reconnaissance and targeting, mine countermeasures, and anti-submarine warfare.

Recognizing that current tactical unmanned aerial vehicles (UAVs) were utilizing “only very basic technology and were not capable of deriving quantitative, militarily actionable information from the imagery they collect,” the Office of Naval Research issued a STTR Phase I topic (N03-T018) entitled Advanced EO Sensor for Multi-Mission USN/USMC UAVs. The topic sought to develop and evaluate a prototype intelligence, surveillance, and reconnaissance (ISR) sensor package suitable for use on organic UAVs. Arété Associates was selected for work on this topic and, after participating in the Navy Transition Assistance Program (TAP), presented their solution during the 2006 Navy Opportunity Forum.

Prior to 1994, Arété did not participate in the SBIR/STTR programs; however, that changed with the addition of Dr. Philip Selwyn, former Director of the Office of Naval Technology and Arété’s corporate vice president for strategic development. Selwyn joined the company in 1993 and quickly

pointed out to his peers that, “the SBIR/STTR program was an opportunity that the company was missing.” As a result, the company made a strategic decision to participate in the SBIR/STTR programs, winning their first award in 1994. Since then, the company has won 40 SBIR/STTR Phase II awards, and impressively, they have obtained 15 Phase III contracts during this period.

The first series of SBIR/STTR awards they won laid the foundation for the project with which they entered into the Navy Transition Assistance Program. “This family of SBIRs went to create test-bed digital optical sensors that permitted the collection of spatially registered, space-time images of both the oceans and land. The first-generation system was a panchromatic system, the second-generation system was a four-color system,” said Selwyn. They consider STTR topic N03-T018 the third generation of the technology. The work undertaken during this award resulted in the development of an Airborne Remote Optical Spotlight System – Multi-Spectral Polarimeter, abbreviated, AROSS-MSP. “This STTR allowed us to expand to a 9-channel system, with the capacity to simultaneously obtain imagery in 3 color bands and 3 polarization channels,” explained, Dr. Brett Hooper, senior scientist at Arété Associates. With Phase III support, AROSS-MSP is now a 12-camera system capable of color and polarization imagery from blue to near-infrared. Although the technology presented during the Navy Opportunity Forum is still under development, certain variations are being used. “Other generations beyond this one have emphasized miniaturization so it can go on a broader range of platforms,” Selwyn explained. “For example, this project was pointed towards



Airborne Remote
Optical Spotlight System
Multispectral Polarimeter
(AROSS-MSP)

far left: AROSS-MSP in its original 9-camera configuration. The red, green and blue 3-polarization payload is shown in its yoke-style positioner.

left: The present 12-camera system capable of red, green, blue and near-infrared polarization imagery shown in the photogrammetry hole of a Twin Otter DHC-6 aircraft.

UAVs, and certain developments along these lines are continuing. The miniaturization I've talked about is to move this technology, which was originally conceived for large UAVs, and apply it to small UAVs."

Areté Associates' ability to continually develop and enhance this family of SBIR/STTR awards is the result of a strategic decision to invest in their development. The primary focus of the awards was the hardware, with a secondary focus on the algorithms and software. The focus of their Phase III efforts has been an emphasis on the algorithm development and the utilization of the unique data products that come out of the sensor systems that were the hardware focus for the SBIRs. "As we went to the first, to the second, to the third of these generations, Areté made significant capital investments into the hardware, because the SBIR/STTR budgets alone were insufficient to do the engineering work, the test work, and to procure the hardware components," said Selwyn. "Essentially, company leadership decided to make significant capital investments so Areté would be in a position to use those end items in future programs. This approach has proven beneficial." Selwyn continued, "Because our technology is still being developed, and some of the algorithms are being applied to sensor systems that we did not develop ourselves. Instead, we have adapted the algorithms to other companies sensors. Some of these sensors have been transitioned into acquisition programs."

Since Areté Associates started developing this

family of technologies, the company has more than doubled in size. "While our growth has not been singularly brought about by our participation in the SBIR/STTR program, a substantial portion of it is certainly related to our work in the SBIR/STTR arena and via the Phase III initiatives that have resulted from our participation in the programs. We've experienced significant growth in size, growth in revenues, and our technologies have transitioned in a variety of ways – either directly into operational use or into acquisition programs that are headed to operational use, with both hardware and software variants on this technology," said Selwyn.

Although Areté Associates was a proven and successful firm prior to participating in the Navy Transition Assistance Program (TAP), the program still provided tremendous value, augmenting the knowledge of their principal investigator, Dr. Hooper. According to Selwyn, "Part of the reason we entered this process was that Dr. Hooper had come in from an academic position, and we thought involvement in the TAP would be very important to his development as a senior scientist at Areté... that it would provide him a better understanding of what's involved in our business."

"The TAP opened my eyes to the process of government-sponsored funding, specifically the ONR SBIR/STTR technology transition process, and gave me the opportunity to think about the goals and technologies for Areté Associates on a deeper, more determined level," agreed Hooper. ◀

04

EDaptive Computing, Inc.

Agency: Navy

05/06 Navy TAP Participant

Visit EDaptive Computing, Inc. online at:

www.edaptive.com

► Phase III Success: \$5 million in Phase III funding from NAVAIR, OSD and product sales to prime contractors

Though the Syscape framework was already in development, the SBIR award allowed Edaptive to enhance the software to capture models of systems that will allow the user to detect anomalies when they occur within the system.

EDAPTIVE COMPUTING, INC. (Edaptive) was the 2005 Phase II recipient of a joint DARPA and NAVAIR SBIR award. The SBIR award, entitled *User-Defined Critics for Software Adaptation*, sought to develop adaptive software that would adapt itself to changing situations based on user-defined criteria, which according to the SBIR solicitation, represents one of the next great challenges in software development. The SBIR solicitation further stated that “there is currently no effective way for users to define unforeseen situation-specific needs, nor is there a way to apply that information to adapt existing or future software. The development of tools that allow users to define critics would go a long way towards the goal of flexible software.” Edaptive was chosen to develop a solution to this challenge and was a participant in the 2005-06 Navy Transition Assistance Program (TAP). The company successfully completed the program and then presented their solution during the 2006 Navy Opportunity Forum.

Founded in 1997 and headquartered in Dayton, Ohio, Edaptive provides rapid analysis of system-of-systems and associated processes at design and deployment time. With a core focus on analysis and optimization, Edaptive understood the challenge facing the Navy. According to Praveen Chawla, CEO/CTO of Edaptive, “Systems often fail because of unknown or unanticipated errors. If software/hardware components detected and corrected errors, a substantial cost savings would be realized and it would greatly enhance system reliability.” Chawla went on to explain that to move towards developing a robust, adaptable, and error correcting system, “a paradigm must be created in which the

system becomes more aware of its operation performance characteristics and conditions that prompt intervention to prevent failure.” Understanding this, Edaptive set out to overcome this initial challenge. What resulted was EDaptive® Syscape™.

Syscape is a software framework that allows Edaptive to do three fundamental things. First, it allows them to capture the structure of a system of systems, or a process, which they are trying to analyze or optimize. Secondly, Syscape can capture the behavior of the system, or a process. Chawla elaborated, “The behavior is really captured by a user defining various views for the various elements of the system. And, for each view we can attach a computer sensible model, or whatever file type we want to attach to that view.” Lastly, their software gives them the ability to write java plug-ins by using a well-defined application programming interface (API). These fundamental features allow Edaptive to use the API to get access to the structure and behavior that had been defined by the user so that the user can analyze it in a specific way.

According to Chawla, “A unique differentiator for the capability we have created is our ability to rapidly customize its analysis capabilities because of the way it has been architected.” The same software can be applied for a variety of applications, so they take a single framework and then create an application from this framework for a specific purpose. As a result of this architecture, Syscape has both military and commercial applications. It has been used to model the, “constellation of UAVs and platforms; used in the Future Tactical Truck System (FTTS) for the Army; as well as used



“The training that occurred during the months leading up to the Navy Opportunity Forum helped us focus our thoughts and ideas into documents that we then used to market and sell our technologies. Those are the type of things that pay off in larger projects.”

Edaptive successfully applied this capability to analyze complex systems of systems when they worked on the U.S. Navy E-2C Hawkeye program, modeling a multi-function control display unit.

to model supply chain for a Fortune 25 company and a business process for a hospital emergency department.”

Though the Syscape framework was already in development, the SBIR award allowed Edaptive to enhance the software to capture models of systems that will allow the user to detect anomalies when they occur within the system. By running the model concurrently with the actual system, the system is able to detect anomalies when they occur and correct them using strategies defined in the model. Edaptive successfully applied this capability to analyze complex systems of systems when they worked on the U.S. Navy E-2C Hawkeye program, modeling a multi-function control display unit. In addition to the E-2C, Syscape has been used by the Office of Secretary of Defense for a capability based assessment for the Future Vertical Lift (FVL). To give an example of how the software is used, Chawla said, “We have developed a Syscape plugin to import spreadsheets created by the stakeholders performing CBA. Once imported, Syscape permits CBA stakeholders to visualize CBA data

more intuitively, enabling them to do gap analysis more efficiently and effectively.”

Edaptive has greatly benefited from the development of this SBIR award and through participating in the Navy Transition Assistance Program (TAP). “Strategically, the company made a decision to remain small and focus on product development and innovation, because that is where our strengths are as a company,” said Chawla. Though they have not grown in FTE numbers, they have increased profitability due in part to this SBIR. In terms of the effect the Navy TAP had on Edaptive Computing, Inc., Chawla said, “The TAP training in the months leading up to the Navy Opportunity Forum helped us focus our thoughts and ideas into documents that we then used to market and sell our technologies. Those are the type of things that pay off in larger projects,” he reiterated. “Furthermore, the Navy Opportunity Forum provided interactions with potential Navy customers. It allowed us to have a one-on-one relationship with them, so we could learn how the Navy could use our products for their specific needs.” ◀

05

Geneva Aerospace

(Now known as L-3 Unmanned Systems)

Agency: Navy | 05/06 Navy TAP Participant

Visit L-3 Unmanned Systems online at:

www.L-3com.com/UAS

► Phase III Success: More than \$4 million in contracts from Navy, Army and Prime Contractors

"Knowing how to properly utilize our data rights was critical and gave us a deeper understanding of the definition of a Phase III contract and how best to handle Phase III opportunities. That was an incredibly valuable asset."

GENEVA AEROSPACE, located in Carrollton, Texas, was founded in 1997 by a group of experienced executives, missile guidance experts and aerospace engineers who were driven by what they saw as a lack of precision control and poor integration of intelligence systems in the UAVs of the day. Their first project, funded by the Air Force Research Lab, was a study of simplified control concepts for UAVs by adapting advanced autonomous control techniques classically used in missiles. This project led to the development of a significant portfolio of industry-leading products and services, including advanced flight control systems, communication systems, control stations, software and systems integration services.

In 2005, Geneva received two SBIR Phase II awards from the Navy. The first topic was, "Advanced Command, Control and Communications Solutions for UAVs," which was to answer the Navy's need for

"next generation" command, control, and communications technology that provide more autonomy, precision and network centric capability across a broad range of unmanned vehicles. The second topic was, "An Autonomous Fixed-Wing UAV Recovery System," which was to fulfill the Navy's need for an affordable and reliable system that will enable the recovery of fixed-wing UAVs onto small ship decks in high sea states.

Through their research and development, Geneva built upon existing UAV autonomous control systems (the computer that controls the tasks the UAV is to complete), to develop a network centric communication architecture that enabled the user to communicate from any government ground control system, using any government specified radio (data link). This work enabled the company to expand their communication architecture to be fully network centric, a valuable asset in the UAV market.

The company was also able to work with the Navy to establish an effective control station with human system interfaces that allowed an operator to effectively manage and control multiple UAVs from a single control station. With that piece complete, came the development of the autonomous landing system. "When you take all of those pieces and integrate them together you have the recipe for third or fourth generation unmanned systems," said Vince Longhi, director of Project Engineering for Geneva.

While working on both of these Navy topics, Geneva worked with Dawnbreaker through the TAP, presenting both technologies at the 2006 Navy Opportunity Forum. "We found the briefings and the education we received on data rights two





“Not only is there no need for a pilot to manually land the UAV, but with Geneva’s technology, we have removed the dependency on tracking systems and beacons on the ground.”

of the most valuable take-aways from our participation in the TAP,” said Longhi. “Knowing how to properly utilize our data rights was critical and gave us a deeper understanding of the definition of a Phase III contract and how best to handle Phase III opportunities. That was an incredibly valuable asset.” Longhi continued, “Another positive component of participating in the Navy SBIR program was the Navy’s aggressive support of us as a small business and in getting our technology out there, keeping it growing and keeping it alive. The ID/IQ contracting vehicle we received was an incredibly powerful thing for us as a small business.” Through support of the Navy and the hard work of Geneva’s staff, the company has experienced Phase III funding of more than \$20 million.

Essentially, the Geneva-developed technology has provided a means to quickly fill DoD UAV capability gaps. Their approach to UAVs has focused on the core command control communication system that drives UAV functions that work across multiple platforms. The platform agnostic nature of the Geneva system architecture is a differentiator for them. It is not a stovepipe solution, which works with only one particular type of UAV. Other benefits of Geneva’s technology were realized through their “objective based” control approach. The technology enables the operator to fly very complex and sophisticated UAVs through simple command interfaces, requiring

only a very small logistics footprint and very small ground support infrastructure. For instance, one of Geneva’s spin-off autonomous landing systems enables the autonomous UAV to land without any ground aiding systems. This provided increased reliability, increased operational flexibility, and reduced costs UAVs employing other landing systems. “Not only is there no need for a pilot to manually land the UAV, but with Geneva’s technology, we have removed the dependency on tracking systems and beacons on the ground,” said Longhi.

The technologies Geneva developed were key to the company’s acquisition by L-3 Communications in 2007, at which time they became known as L-3 Geneva Aerospace. “Based on where L-3 wanted to head and what their vision was, and where we wanted to head and what our vision was, it started to align very nicely into a good partnership.” The integration of Geneva into L-3 worked out well indeed. Geneva quickly contributed to advance L-3 into the OEM UAS marketplace by developing a family of UAS, leveraging their core technologies as enablers, and capturing the USSOCOM Expeditionary UAS program of record in 2009. Geneva now leads L-3’s newly formed Unmanned Systems division, and is developing and delivering a variety of UAS including small tube-launched expendable UAS, mid-endurance UAS, and medium altitude long endurance UAS. ◀

► Phase III Success: \$7.9 million in Phase III funding from the Office of Naval Research, SPAWAR and product sales

Although this SBIR topic focused on a single component of digital transmitting, which is still under development, the technology has led to more than \$7 million in Phase III funding for Hypres.

IN 2004, THE U.S. NAVY SPONSORED a SPAWAR SBIR Phase II, entitled *Digital Dynamic Pre-Distorter for High Power Amplifiers for Wideband Digital Radios*. This SBIR topic sought solutions for, "real-time adaptive digital pre-distorter circuits for bandwidths of 100 MHz or greater in the 2-2000 MHz frequency range." The pre-distortion, or linearization, represents a limitation in moving from analog to digital transceivers. The Navy was motivated to advance the state-of-the-art in wireless transmitting and sought to overcome the limitations of current pre-distorter circuits. To move the wireless innovation forward, they chose Elmsford, N.Y. based Hypres, Inc.

Founded in 1983, Hypres' core technical strength is digital superconductor circuit technology. The company has leveraged numerous SBIR and private investments to begin developing what will be an all digital transceiver. This SBIR played a major role in addressing the linearization function of the digital transceiver. For a radio frequency signal to be transmitted across some distance, a power amplifier must be applied. However, when the amplifier is applied, the original signal becomes distorted. Furthermore, when transmitting signals across a wide frequency band, current technology amplifies the signal by chaining a series of low power exciter signals, culminating in a high power amplifier (HPA). However, according to the SBIR topic solicitation, "this approach to reduce signal distortion wastes too much power and is too expensive." Hypres understood the challenge and proposed a new approach that would reduce size,

weight, and power. Through their Phase II from SPAWAR, Hypres participated in the 2005-06 Navy Transition Assistance Program (TAP) and presented the technology at the 2006 Navy Opportunity Forum.

Richard Hitt, president and CEO of Hypres, explained that current linearizer technology is a limiting factor in wireless signal transmitting. "To get a signal transmitted, you have to amplify its power to whatever it takes to move it, say 50 miles. The power amplifier needs a signal that has been linearized. A power amplifier distorts the signal it produces. To combat the distortion, HYPRES' technology deliberately distorts the power amplifier's signal in the opposite manner that the power amplifier produces. That way, when the signal finally goes through the power amplifier it comes out on the other side clean. Doing this makes the entire transmission part of the system more efficient."

The linearize function is actually compensating for the irregularities in the power amplifiers. "The challenge is that with current semi-conductor technology, linearizers are only able to do this digitally for relatively low frequencies and relatively narrow bandwidths. So as wireless networks go to higher and higher frequencies and wider and wider bandwidths, in order to carry more data, they essentially out strip what the linearizer function can do," said Hitt. "As such, since the linearizer function is limited, the power amplifier becomes limited, and then the networks become limited. To overcome this limitation, the Navy needs wideband linearization." Hitt continued, "We can do that with our chips. We have

the clock speed and processing power to dramatically improve the linearizer function.”

Hypres is confident that their technology will increase performance, and they recognize that the faster the move from analog to digital, the more quickly the system becomes cheaper to acquire, cheaper to deploy and easier to maintain. According to Hitt, “We have developed chips that perform familiar functions, analog to digital conversion, digital to analog conversions, but our chips run 100 times faster than the fastest semi-conductor.” This is important because the faster the chips run, the higher the frequency it can convert from analog to digital. At Hypres, they use their speed to convert signals directly from analog to digital, which semi-conductors cannot do. Their approach to technological development appears to be paying early dividends.

Although this SBIR topic focused on a single component of digital transmitting, which is still under development, the technology has led to more than \$7 million in Phase III funding for Hypres, and has opened the door to a significant commercial business opportunity. As a company, Hypres devises product concepts, Hitt explained, “So that defense and commercial products are similar enough that we can develop common components. From my experience, we’ve never had anyone provide enough money to solely focus on their product and not worry about anything else. We’re always piecing it together, and technological development requires a multi-year strategy and lots of pieces.”

This approach to product development has led to an opportunity to develop a product with a major cellular OEM. They signed an agreement in 2009 to build an all digital transceiver for the OEM system. According to Hitt, “As a direct result of solving the linearizer piece of the puzzle, we now have enough of the whole system proven that we can sign a short term development process to build the product with a real commercial customer,



and that is exactly what we are doing.”

Though they have long been considered a successful company, Hypres has experienced substantial growth since 2000 when the company leadership made a strategic decision to focus on wireless technologies. Prior to that decision the company had annual sales revenue of approximately \$3 million, whereas today, they average closer to \$10 million per year. Another strategic decision the company made was to become a participating firm in the Transition Assistance Program (TAP), whenever the opportunity was afforded them. “The TAP is great at pushing us to condense and focus our thinking, and positioning us to communicate the essence of what we’re doing,” said Hitt. “In terms of bang for our buck, it’s probably the best thing that we are involved in all year long.” And as for the culminating event of the TAP, the Navy Opportunity Forum, Hitt said, “The right people are there. You’ve got a good mix of senior management and senior technical people that visit you. People know you’re there, they are prepared ahead of time and meetings are already arranged. Not to mention the fact that it’s one of the few places we can go where the government people in the program offices are not only allowed to talk to us, they’re encouraged to talk to us.” ◀

Hypres is confident that their technology will increase performance, and they recognize that the faster the move from analog to digital, the more quickly the system becomes cheaper to acquire, cheaper to deploy and easier to maintain.

07

Imperium, Inc.

Agency: Navy

05/06 Navy TAP Participant

Visit Imperium online at:

www.imperiuminc.com

► Phase III Success: \$1.5 million through sales of Acoustocam

Imperium holds several patents with many pending and its technologies can be found in industrial, medical, sub-sea and biometric settings.

NOT ALL SUCCESSFUL Navy-funded SBIR technologies manifest themselves in successful Navy transitions. Sometimes they form the basis of very successful commercial implementations. This was the case for Imperium, Inc.'s ultrasonic technology for locating subsurface defects in aircraft structures. Ultrasonic detection of subsurface defects is a very effective non-destructive testing that uncovers minor flaws or cracks below the surface of various aircraft components. The Imperium, Inc. technology offers a very simple, easy to use video image that highlights areas of concern.

Identification of these defects through this technology eliminates the need for highly-trained specialists to survey the aircraft, thereby resulting in less downtime for the aircraft and less man-hours

for testing. The end-result is reduced maintenance, greater equipment availability and significant cost saving over the life of the aircraft. Finding hidden flaws in aircraft structures has traditionally been a highly complicated procedure. It required extensive training for personnel and resulted in a complicated process of data interpretation. The technology developed by Imperium has the ultrasonic capability that obviates the need for this level of sophisticated training, thereby offering a more cost effective solution to this pervasive issue.

Founded in 1996 by Dr. Marvin E. Lasser, chief scientist of the U.S. Army and former director of research for Ford's Philco Division, Imperium, Inc. is focused on developing and manufacturing advanced ultrasound imaging systems. The company's current client list includes, among others, Boeing, Airbus, Bell Helicopter, U.S. Army, U.S. Navy, U.S. Air Force, and NASA. Imperium holds several patents with many pending and its technologies can be found in industrial, medical, sub-sea and biometric settings.

Since the company's participation in the Navy Transition Assistance Program, which culminated in the 2006 Navy Opportunity Forum, Imperium has had a series of follow-on sales of its "Acoustocam" devices to various military and commercial customers including, NAVAIR, U.S. Air Force and the Boeing Corporation, to name a few. Imperium's sales of the Acoustocam have reached an excess of \$1.5 million – with the cost of each unit being approximately \$40,000. Additionally, ONR has provided a BAA Contract in excess of \$2.5 million for the development of a mine scanning capability and



Finding hidden flaws in aircraft structures has traditionally been a highly complicated procedure requiring extensive training and data interpretation. This ultrasonic capability obviates the need for this level of sophisticated training, thereby offering a more cost effective solution to this pervasive issue.



an underwater imaging solution as an extension of its basic ultrasonic technology.

CEO Bob Lasser said, "All of our implementations are built on our underlying ultrasonic technology. While we modify our implementations depending upon the customer's unique requirements, they are modifications of this basic technology. We benefited from the Navy SBIR program which funded the development of this non-destructive approach for identifying subsurface defects."

While these Navy successes are impressive, Imperium believes that the commercial market is much larger for its Acoustocam devices. "This underlying technology propels the company in its commercial sales efforts," said Lasser. "The military funding we received under this SBIR initiative has provided Imperium with a very effective technology with broad applications in the commercial aircraft field."

In February 2009, Imperium announced a joint project with Boeing Corporation for a wireless remote expert inspection system. Imperium's ultrasonic

imaging camera provides for remote, real-time, simple monitoring of potential composite damage. This handheld Acoustocam device provides a quick assessment of suspected subsurface areas for potential points of weakness. Not only is the handheld device simple to use, but its wireless capability provides access to remote, hard-to-reach areas of the aircraft. It also allows Acoustocam-trained inspectors to remotely inspect and review composite structures located at a separate facility in real-time.

"Imperium has been very aggressive in setting up a commercial infrastructure and sales organization to leverage its SBIR technology success. While the Navy represents an attractive market, the commercial applications far exceed those of the military. We have invested in an extensive marketing program, trade shows and a highly skilled commercial sales force to capitalize on this underlying technology. If it weren't for the initial Navy SBIR funding, we would not have this state-of-the-art technology to offer in the commercial marketplace." ◀

The military funding received under this SBIR initiative has provided Imperium with a very effective technology with broad applications in the commercial aircraft field.

Visit NuVant Systems online at:

www.nuvant.com

- ▶ Phase III Success: \$4.6 million from U.S. Army Research Office R&D Academic Institutions purchase of Arraystat technology for \$150,000

NUVANT SYSTEMS, INC., was founded in 1999 and is located at the Northwest Indiana Purdue Research Foundation Technology Center in Crown Point, Ind. A privately held firm, NuVant develops and integrates catalysts and electrolytes for stationary and portable fuel cells and has pending patents for inorganic fuel cell electrolytes operating between 250-400°C. The company has been involved in fuel cell component development since its founding and introduced patented array reactor technology that enables precise, accurate high throughput evaluation of electrode assembly components and fabrication methods under normal device operating conditions.

In 2005, NuVant was awarded a Small Business Innovation Research (SBIR) Phase II from the Department of Energy (DOE). The project title of this Phase II was "Improved Fuel Cell Cathodes Catalysts Using Combinatorial Methods." Through this topic, the DOE was looking for the development of a technology that would enable high-throughput

The 25 channel Arraystat potentiostat controls the parallel array fuel cell



evaluation of fuel cell cathode catalysts.

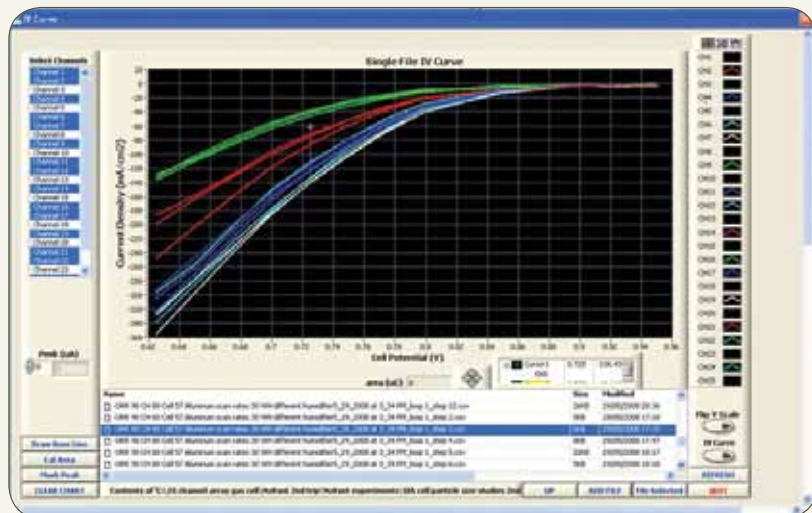
According to NuVant Systems, Inc. CEO, Dr. Eugene Smotkin, during a Phase I and Phase II from the DOE, the company was able to step-improve their Arraystat technology. The two key components of the technology are the multichannel Arraystat potentiostat, and the parallel array fuel cell. The fully automated multichannel potentiostat designed to control a 25-channel array fuel cell for high throughput characterization of fuel cell electrode components. The array fuel cell is a highly optimized segmented fuel cell that allows for precise control of reactant stream flow to selected segments of the array electrode system. And it was through that research and development work, that the company was able to construct and test a prototype. "We started out with contracts to build fuel cells for the Army," said Smotkin, but the company found that shouldering the cost of research was cost prohibitive, as it takes a good deal of time to cash in on the final product. "It was through participation in the DOE SBIR program, that we essentially developed the fuel cell testing technology from some preliminary data that we had gathered prior to the Phase I," Smotkin explained. "The DOE program allowed us to develop the first Arraystat prototype, which accelerated and reduced the cost of our catalyst discovery program and now provides sales revenues. It was the first product the business sold."

Since the development of the initial Arraystat product, NuVant's technology continues to evolve, said Smotkin. "There have been several improvements made in our technologies, as we continue to research and provide products for our customers." Some accessory options that have been developed

for the Arraystat include modular addition and control of temperature, humidity and mass flow control, which add to the advantages of today's technology over the initial product. The improvements and changes made in the Arraystat include a line of spin-offs including the EZstat and the Powerstat. These products are high performance potentiostat-galvanostats suited for electroanalysis, including high-speed cyclic voltammetry, chronoamperometry and chronopotentiometry. What sets these instruments apart from others is their ability to control temperature and mass flow. Further, NuVant's instruments are powered by National Instruments control cards, enabling end-users to write their own control software and easily integrate NuVant instrumentation with end-user research instrumentation. Recently, the EZstat and NuVant's single cell fuel cells were used at an in-situ spectroscopy workshop at Brookhaven National Laboratory.

Through its DOE SBIR Phase II award, NuVant was provided with the opportunity to participate in the DOE Commercialization Assistance Program (CAP), developed by Dawnbreaker. The CAP is designed to assist companies in developing the tools, such as a business plan, an executive summary and the presentation materials needed to obtain private sector funding. Smotkin said that NuVant's participation in the CAP "enabled the company to develop private partnerships, including subcontracts on other SBIR awards, and to begin the process of securing venture capital funding." And, he remarked that the documents the company developed through the CAP were "critical to the development of these partnerships." Smotkin also said that the program was helpful because it, "helped the company generate the model of having two parallel development paths to follow" and assisted them with organizing their plans to spin-off products, using the revenue to sustain the business.

It was the business plan that NuVant developed with Dawnbreaker staff that Smotkin spoke most highly of. "It's not just something you hand to an investor, but something that companies need to move their projects forward. Every company needs to have a plan. On that alone, I would recommend the CAP to other SBIR firms." He went on to say that the CAP, "Not only helped our company find a lot of holes in our business, but also assisted us in building a plan to remedy outstanding issues."



Smotkin said that NuVant's participation in the CAP "enabled the company to develop private partnerships, including subcontracts on other SBIR awards, and to begin the process of securing venture capital funding."

Phase III success did not happen overnight. It took three years to move from the initial DOE Phase I conception to the selling of the product. Since that time, NuVant Systems has gone from two employees to 14, has received \$4.6 million for additional R&D from the U.S. Army Research Office for development of their portable fuel cell technology, has had revenues of over \$500K in Arraystat product sales to the private sector and academic institutions, and continues to improve their products based on end-user feedback. The enhanced version is a robust modular device that enables versatile electrochemical, mass flow and temperature control of an array of individually addressable electrodes. In addition, fuel cell component evaluation instrumentation, NuVant now offers equipment and short courses to facilitate customer in-house preparation of fuel cell electrodes. ◀

► Phase III Success: \$12 million in funding from multiple sources including the Navy, Army and industry

Through the rigorous analysis and the formal presentation that was developed with Dawnbreaker support, Precision Combustion, Inc. has been able to more fully leverage funding sources.

The information gained through work with Dawnbreaker has been a major factor in various strategic choices for PCI over time.

AS ENERGY AND ENVIRONMENTAL ISSUES continue to challenge the country, both the DoD and the DOE have been preparing for the future by coordinating federal hydrogen and fuel cell technology efforts. Fuel cells use hydrogen-based fuels to produce electricity, offering increased efficiency, clean emissions, quiet operation and potentially long lifetimes, and are relevant to each agency's missions.

While potential fuel cell applications are plentiful and diverse, R&D is required to deliver the potential. Through their Small Business Innovation Research (SBIR) programs, both the DoD and DOE have been able to engage small, innovative firms such as Precision Combustion, Inc. (PCI) of North

Haven, Conn., to advance this transformational technology.

PCI, founded in 1986, is an energy innovator developing advanced catalytic solutions for clean and efficient use of fossil fuels for a variety of applications. Among these, PCI is developing Microlith[®] fuel reforming and fuel processing technology to allow fuel cells to use conventional fuels (e.g. diesel and military logistics fuels) instead of the hydrogen normally required. By allowing fuel cells to use the existing fuel delivery infrastructure, PCI's breakthrough eases use and substantially broadens the applications for fuel cells. Broadening the number of fuels a fuel cell can use also broadens the range of applications. PCI has applied for the service mark "We put the fuel in fuel cells."

PCI has received SBIR Phase I/II fuel reformer awards from both the Navy and the DOE, and through those awards received Dawnbreaker commercialization program assistance from both agencies. In 2004, PCI received a total of three Phase II reformer awards from the Navy (ONR) and the Army (ARL/TARDEC), directed to military applications for a logistics fuel reformer. In 2008, PCI received a Phase II award from the Energy Efficiency and Renewable Energy (EERE) department of the DOE for a water neutral reformer



for diesel fuel. Per Kevin Burns, PCI president, "It's important for a vehicular fuel cell to be able to operate without consuming water. We now can supply all the water our reformer needs from the fuel cell exhaust."

The company's Microlith®-based reformer technology has now been converted into compact and efficient fuel processors able to reform a wide range of conventional and unconventional fuels. Some of the difficult, unconventional fuels the Microlith® reforming technology can reform include sulfur-containing JP-8 for the military, Jet A, diesel, gasoline, E85, biofuels, natural gas and even volatile organic compounds from industrial processes such as painting.

Building on the research investments of the DoD and DOE, Burns said that, "The company currently possesses the leading compact fuel reformation technology in the world." Reaching this leadership position is the result of PCI's technical capability and its strategic decision in 1999 to diversify by developing fuel reforming/ processing for hydrogen generation. Burns explained, "The company could have disappeared without the fuel processor, because as our clean combustion markets shrunk in the early 2000s, our technical breakthrough in fuel processing opened a new set of customers and markets."

PCI also made another key decision – it decided to participate in the DOE Commercialization

Building on the research investments of the DoD, DOE and other agencies, Burns said that the company currently possesses the leading compact fuel reformation technology in the world.

Assistance Program (CAP) and the Navy Transition Assistance Program (TAP), each designed and contractually managed by Dawnbreaker, Inc. The CAP and the TAP are provided to SBIR firms to assist them in finding Phase III funding. The result has been substantial Phase III funding success, which in turn has enabled the company to create its world technology leadership position. Since 2006, PCI has amassed more than \$12 million in Phase III development support and prototype sales funding.



The numerous technology applications in the marketplace has allowed the company to tap a broad range of funding sources.

Through the rigorous analysis and the formal presentation that was developed with Dawnbreaker support, PCI has been able to more fully leverage these funding sources. "As a result," said Burns, "Both the substance of our analysis and our ability to communicate its impact to our prospects has helped us in deals with the government and in dealings with other companies." The Dawnbreaker interactions continue to play an important role in the company's success, Burns continued, "Their invaluable market feedback helped us to focus on advancing our technologies towards products. They provided knowledgeable and creative consulting guidance and encouraged us to focus and target our activities towards valuable outcomes. This was a major factor in various strategic choices over time, and it has paid off."

In just a few years, with the support of the Navy and DOE, and their respective assistance programs, PCI has grown to support over 20 employees working in the reformer area. They are a shining example of how the SBIR program can lead to major technological breakthroughs. Their success will continue to have a positive economic impact in Connecticut, the industry, and overall for the nation's energy needs. ◀

PCI fuel reforming technology is designed to "enable fuel cells to efficiently use conventional available fuels – a major factor in enhancing the opportunity for widespread adoption – while opening a range of new industrial applications"

10 Research Associates of Syracuse

Agency: NAVY | 05/06 Navy TAP Participant

Visit Research Associates
of Syracuse online at: www.ras.com

► Phase III Success: \$2.2 million in funding from a Congressional plus-up and a contract from Lockheed Martin

While most programs are anxious to accept funding brought by an SBIR firm, two things are needed. One is a specific need for the given technology and the other is a contracting instrument against which the funds can be applied.

IN THE EARLY STAGES of Phase II development efforts, most SBIR firms are primarily concerned with the development of their technology and do not necessarily focus on the transition challenges that lie ahead. Getting their technology adopted by the Fleet requires two things, successful achievement of their technical objectives and a contract against which organizations can commit their funds.

While this second element may appear as a minor issue, having a contract against which the Navy and other DoD organizations can apply their development funds is one of the most fundamental elements in the firm's transition process. Research Associates of Syracuse (RAS) encountered this challenge in 2008, when they received Congressional Plus-Up funding for their Electronic Systems Precision Feature Extraction Pre-Processor (ES-PFEP) technology.

According to Stan Hall, vice president of Operations at RAS, an innovator in the world of signals intelligence, network-centric operations and network electronic warfare training systems,

"While most programs are anxious to accept funding brought by an SBIR firm, two things are needed. One is a specific need for the given technology and the other is a contracting instrument against which the funds can be applied."

With the plus-up funding, RAS was able to secure a Phase III contract, in February 2008, with NAVAIR to apply their technology to the F-18 program. Since this was a continuation of an SBIR program, they were able to justify a sole-source award of \$1.1 million. RAS finalized the program specifics with NAVAIR (Tactical Aircraft Programs) in support of the F-18 Program Office (PMA-265) Electronic Warfare Integrated Product Team. As a key element of this program, RAS applied its ES-PFEP IMOP algorithms to provide improved situational awareness for the F-18. Successful completion of this work is expected to result in increased war fighting capability, survivability and situational awareness for the F/A 18 Super Hornet operating in the Network Centric Warfare arena.

Prior to this NAVAIR award, interest in the transition of this technology was shown by other entities looking to address the growing need for additional pulse discriminators necessary to aid in real-time situational awareness. RAS secured another Phase III contract from Lockheed Martin Systems Integration (Owego, N.Y.) for \$1.1million. This contract was focused on adding functions to the Common ESM Sensor for Air Defense (CESAD) System. This was part of a larger implementation, but the ES-PFEP technology was a key part of the award. Lockheed Martin was under contract to the Army Aviation and Missile Research, Development



and Engineering Center (AMRDEC) to implement this technology.

Through its research, RAS has developed algorithms that will reduce U.S. and Coalition losses by countering adversaries' advanced modulations and ensure detection of potentially lethal threat systems employing sophisticated modulation techniques to defeat U.S. electronic warfare, ELINT, and RWR systems. RAS' algorithms have been proven effective against modern emitters by exercising them against empirical data from emitter field collections. These algorithms are being implemented in reusable VHDL cores to facilitate incorporation into a wide range of airborne, ground, and sea-based platforms.

As a recognized leader in the design and development of ELINT/EW, IMOP and other feature extraction algorithms, RAS has the ability to provide new discriminators in the characterization of waveforms, which would significantly increase the number of applications and the performance of electronic sensor parameter measurement devices. The company's field programmable gate array (FPGA) implementation is considerably faster than a digital signal processor implementation.

Research Associates of Syracuse (RAS) is a privately held corporation with operations in Syracuse and Rome, N.Y. and has broad, in-depth experience in ELINT, electronic warfare, and radar measurements and systems. RAS ELINT experience includes sorting, track correlation, system distortion, equalization and compensation techniques, as well as the electronic warfare databases. Radar experience includes basic radar phenomena, radar signal collection and analysis, feature extraction algorithms, and real-time hardware implementations.

"Participation in the Navy TAP was helpful in providing the discipline and focus on the Phase III transition process for us and the Navy Opportunity Forum was most beneficial in exposing RAS technology to the prime contractors," said Hall.

"Additionally, SBIR firms need to recognize that one of the most important elements of the SBIR program is the data rights that allow prime contractors and DoD organizations to award a sole-source contract as an extension of the SBIR Data Rights. This approach allowed RAS to secure a no-bid award from NAVAIR and to apply its plus-up funds to an important Navy application." ◀



...RAS applied its ES-PFEP IMOP algorithms to provide improved situational awareness for the F-18. Successful completion of this work is expected to result in increased war fighting capability, survivability and situational awareness for the F/A 18 Super Hornet operating in the Network Centric Warfare arena.

► Phase III Success: More than \$30 million in continued research and development efforts

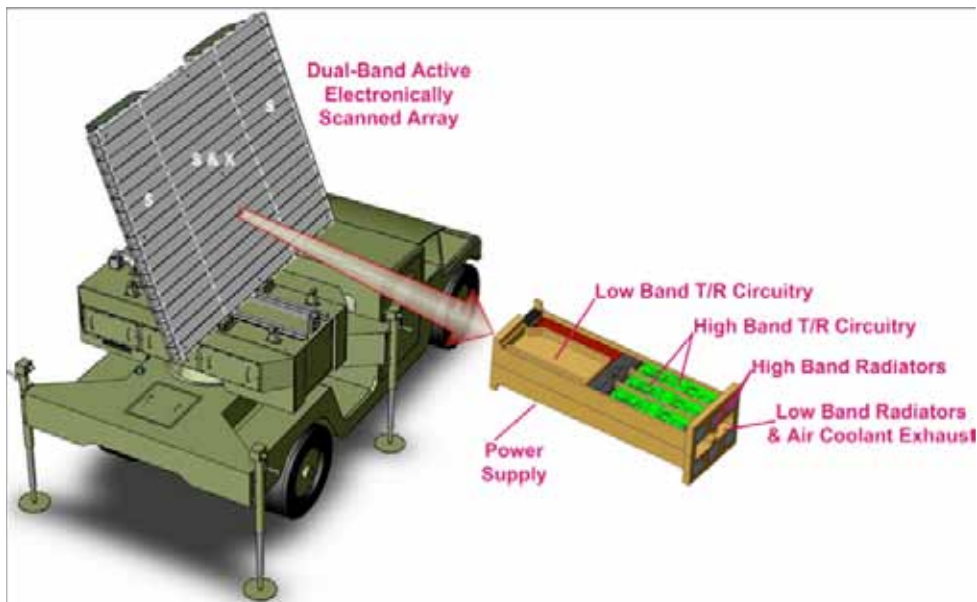
“With the assistance of the NAVY TAP program Sensis is transitioning innovative technologies to provide higher performance and lower life-cycle cost radar systems to the Armed Forces.”

ALTHOUGH ATTEMPTS HAVE BEEN MADE to push a multi-functional role on current radar technology, the frequency spectrums were found to be too restrictive for military use. This issue caused the Marine Corps to investigate what would be needed in the next generation of radars so that they would be operational in more than one frequency band. To overcome the current technological limitation, MARCOR sponsored SBIR topic, N03-164, entitled Multi-Band Air Defense/Air Search Radar, with a broad objective of enabling radars to operate in more than one frequency band so they can perform each of multiple functions, such as air surveil-

lance, target discrimination, and weapons cueing, in the optimum band.

Based in East Syracuse, N.Y., Sensis Corporation, a global provider of, sensors, information technology, and simulation and modeling to the world’s air navigation service providers, civil aviation authorities, airports, airlines and militaries, provided the solution. With 20 years of experience, Sensis clearly understood the challenge the Marines were facing and their team felt the problem aligned well with their core purpose: to provide distinctively elegant, innovative technical solutions in the service of humanity. Sensis Corporation won the Phase I, and subsequent Phase II awards, and began in August 2005 to develop an innovative yet practical solution for realizing active phased array systems capable of operating on two distinct frequency bands with uncompromised performance.

The Sensis technology enables the operation of radar sensors in two distinct frequency bands without compromising the performance in either band and provided the added advantage of using interleave time operation at one band, and within microseconds, operation at the other band. This innovation provides a number of benefits, said Brian Edward, lead engineer for



multiband systems. "With multi-band systems, one piece of equipment allows the operator to perform surveillance of targets of varying sizes and in challenging environments. For example, using the technology an operator can detect small, distant objects using the frequency band that is most advantageous for that purpose even in adverse weather, and then, using a different frequency band, targets can be precisely tracked." The technology also provides the ability to identify non-cooperative targets by utilizing the diverse frequencies to help the operator discriminate and determine the nature of that target. Edward continued, "What may be one of the most discerning features of the sensor is that, depending on the environment, if you are denied the use of one of the bands, the sensor is still of value – you can use the band that is available to you in that environment." The work developed under the USMC SBIR award is propelling Sensis into a position to provide an entire radar system.

The company's approach proved to be both innovative and successful. Sensis has received more than \$9.5 million in SBIR Phase III funding to develop the subject technology which has enabled Sensis to capture over \$21 million in Technology Development funding to date. Over the last four years, the company has grown, exceeding 500 employees while they were doing the initial Phase III work.

Today, the company employs 750 and has experienced meaningful revenue growth during the period following the 2006 Navy Transition Assistance Program (TAP). In addition to the engineering portion of their technology, Sensis was able to develop a more nuanced understanding of the SBIR program by participating in the Navy TAP. During their participation in the TAP, which is executed by Dawnbreaker, Don House had just joined Sensis as a business development professional. According to House, "I needed the type of education Dawnbreaker provided. It was very helpful." The Navy TAP also augmented the company's understanding of the technical data rights, and allowed them to educate their customers on the Phase III regulations. According to Edward, "Another element of the TAP was learning that

the company retained the intellectual property rights to items they developed. We were not as aware of data rights provisions prior to the TAP. For example, there was a patent made during the program and we were able to leverage our data rights appropriately."

In May 2009, the company won a competition that resulted in two vendors being selected by the Air Force for a technology development effort to mature critical technology elements intended for a long-range radar program that will replace the Air Force AN/TPS-75. One of the key elements is the transmit /receive module, having its origins under the USMC SBIR project.

"The modularity of our technology is really attractive to our customers," said Edward. "With the Sensis design you can use the dual band radar system initially or, if you don't need the capability right away, you can use the single band sensor. Then, later as threats/requirements change, the user can pull single band modules out, make minimal modifications, and drop in dual band modules, quickly and inexpensively adapting the radar to the new threat or requirement." This is accomplished without having to make major redesigns to the radar. Furthermore, the open technology and architecture features are attractive for life-cycle cost reduction reasons.

Sensis Corporation is continuing to mature their technology through additional research and development. They clearly met the objectives of the original Phase II effort and are well positioned to develop a complete, multi-band radar. According to Edward, an ingredient in their success with this technology was their participation in the Navy TAP. "The TAP refined our understanding of technical data rights and helped us focus on how to approach the challenge of transitioning technology to the field, either commercially or through the Department of Defense." All in all, Sensis Corporation's innovative engineering and focused business approach has resulted in more than \$9.5 million in Phase III funding leading to over \$21 million in further development funding, with the expectation that 2010 will bring several million more. ◀

Sensis Corporation won the Phase I, and subsequent Phase II awards, and began in August 2005 to develop an innovative yet practical solution for realizing active phased array systems capable of operating on two distinct frequency bands with uncompromised performance.

12 Solid State Scientific Corporation

Agency: Navy | 05/06 Navy TAP Participant

Visit Solid State Scientific online at:

www.solidstatescientific.com

► Phase III Success: \$22.5 million in contracts from the Navy, Air Force, Army, JCTD and OSD

As a leader in spectral sensing technologies...[Solid State] combines knowledge, phenomenology, hardware and software engineering expertise to create innovative and comprehensive spectral sensors from concept to prototype to production.

SINCE ITS ORIGINAL 2003 SBIR AWARD, topic number N03-008, for its "Passive Rocket Motor Identification," Solid State Scientific Corporation has experienced a continuing series of orders on its subsequent ID/IQ contract (NAVAIR N00421-07-D-0006). These orders have come from the Navy, Air Force, Army and the Office of the Secretary of Defense (OSD) including the JCTD (Joint Capability Technology Demonstration) initiative following the company's participation in the 2006 Navy Opportunity Forum.

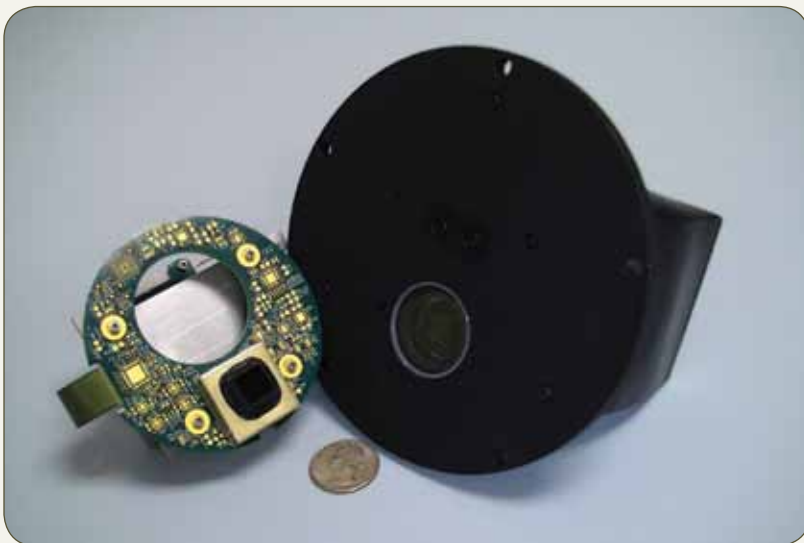
From its original SBIR, which established the phenomenology of the multi-spectral technology, there have been nine separate orders against this \$47 million ID/IQ. One order was from the Army for development of a sensor to integrate with ex-

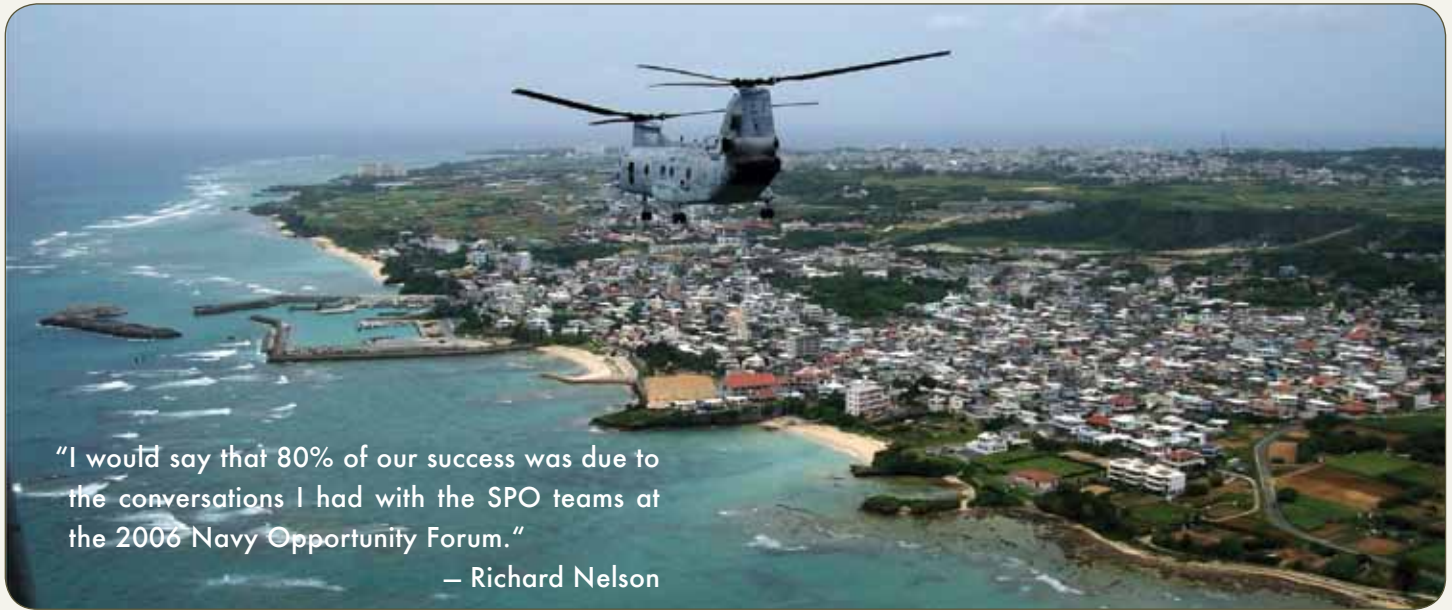
isting "missile warning sensors," and two orders that were the result of major support from the New Hampshire Congressional delegation. Another order was from JCTD for \$7.5 million, including \$2 million from OSD. These orders were for variations of the original multispectral sensor technology applied in a variety of different applications.

In April 2008, JCTD placed the most significant order (\$7.5 million) for the development of the Multi-Function Threat Detector (MFTD) module as a Hostile Fire Indication (HFI) sensor. The delivery order includes integration of the module into the AN/AAR-47 missile warning sensor in direct support of the FY08 Joint Capabilities Technology Demonstration. The Naval Air Systems Command in Patuxent River, Md. is the contracting activity.

According to Richard Nelson, vice president of Spectral Sensors at Solid State Scientific, all of this success spiraled from extensive discussions he had with representatives from DoD Program Offices (SPOs) at the Navy Opportunity Forum. "I would say that 80% of our success was due to the conversations I had with the SPO teams at the 2006 Forum," said Nelson. "That event brought the right customers from the various Defense organizations, such as Navy PMA-272 and Army PEO IEW&S, to our booth for extensive discussions. I personally spent over an hour discussing our multi-spectral sensors with Commander Rich Robbins, PMA-272 S&T, regarding the technology's potential to instantly detect and distinguish muzzle flashes among a wide range of battlefield events."

This ITAR-restricted technology addresses the military's need for instantaneous detection and re-





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— Richard Nelson

sponse to hostile fire from a wide variety of threats, including guided and unguided rockets, anti-aircraft artillery, RPGs and small arms fire. By identifying explosive projective threats, military units are able to correctly institute countermeasures. This technology is based on hundreds of simultaneous spectral bands from battlefield events over a relatively wide field of view. The threat identification algorithms detect, analyze and assess the potential threat and provide immediate feedback to the targeted aircraft. In an Air Force sponsored test conducted at Yuma Proving Ground, these sensors were successfully demonstrated against live targets onboard a NAVAIR AeroStar Unmanned Aerial Vehicle (UAV).

Solid State Scientific Corporation (SSSC) performs research for, designs, develops, and manufactures spectral-temporal sensors and high-throughput hyperspectral imaging systems for bands from the visible through the long-wave infrared. As a leader in spectral sensing technologies for US Department of Defense customers, they combine knowledge, phenomenology, hardware and software engineering expertise to create innovative and comprehensive spectral sensors from concept to prototype to production. Located in Nashua, New Hampshire, SSSC has designed, built, and tested advanced prototype hyperspectral imaging systems since 1994.

In addition, SSSC has pioneered simultaneous spectral-temporal sensing for real-time identification and tracking of energetic battlefield events for such applications as missile threat warning, bomb damage assessment, situational awareness, launch detection, and kill assessment. SSSC is dedicated to improving the detection, tracking, classification, verification, declaration, and identification of military-class targets in order to enable and protect U.S. war fighters.

"The rapid growth of Solid State Scientific over the past several years can be directly attributed to the Navy Transition Assistance Program (TAP) and the associated Navy Opportunity Forum. The TAP is the single most valuable thing a small company in this situation can do. The Navy Opportunity Forum is the best trade-show-like conference we have attended." Nelson reiterated. "Over the past three years, we have grown 25%-30%, largely through the expansion of this multi-spectral sensor program throughout the various military services. And, while we have concentrated primarily on fulfilling these military orders to this point, we fully expect that various commercial customers and governmental agencies could benefit from these threat detection systems as well." Primary candidates for commercialization of this technology would be commercial aircraft, executive jets and Heads of State. ◀

► Phase III Success: \$8.8 million in series A and series B funding

According to Krishnamurthy, "The Navy TAP is a top-notch program, run by a top-notch contractor."

VT SILICON HAS HAD tremendous success in securing equity financing based on its Navy STTR development activity. In June 2007, it received a \$3.3 million Series A round of financing from California-based Menlo Ventures for commercialization of its silicon-germanium based power amplifier technology. The funding was targeted for the company to design and produce prototypes of its new "intelligent power amplifier" chips for the next-generation of WiMax mobile devices. It has now received a second level of Series B funding from Menlo Ventures for \$5.5 million dollars for development of a fully integrated RF front end IC solution.

To provide some background on the company, VT Silicon is a fabless semi-conductor company, which designs and manufactures multi-band front end integrated circuit (FEIC) solutions for the mobile wireless broadband market. The company's products leverage novel linearization and efficiency enhancement technologies that enable original equipment manufacturers, original design manufacturers and reference design houses to manufacture broadband, highly-efficient, low-cost 4G devices. The company was awarded an STTR contract (\$650,000) in June 2004 for development of a high power amplifier using silicon-germanium (SiGe) semiconductor materials.

This technology provides distortion-prevention techniques – known as linearization enhancement (LET™), which are designed to accurately amplify the complex signals used by WiMax devices, without draining the battery. While important for specific DoD implementation, the commercial opportunity is considerably larger for the WiMax implementa-

tion. As part of the fourth generation (4G) cellular technology, WiMax is intended to provide significantly higher bandwidth and broader coverage for the next generation of mobile devices that will support such applications such as streaming video.

Through its participation in the Navy Transition Assistance Program (TAP) and the 2006 Navy Opportunity Forum, VT Silicon developed and then conducted a series of small demonstrations to commercial companies addressing the challenges of RF front-end development. These demos showed the technical readiness of this technology as well as the investments needed to bring this technology to maturity. This "road show," as Vikram Krishnamurthy, chief technology officer for VT Silicon, describes it, stimulated interest in the integrated silicon-germanium approach. The appeal of the VT Silicon technology is the combination of novel linearization technology along with digitally tunable RF architecture, enabling low cost fabrication processes, such as SiGe.

According to Krishnamurthy, "The Navy TAP is a top-notch program, run by a top-notch contractor. Couple the TAP with the Navy Opportunity Forum, and it is easy to see that VT Silicon was provided with the documentation and preparedness to proceed with our commercial road show. While the Navy offered several potential applications, we recognized the commercial opportunities for 4G cellular implementation were considerably larger. Without the Navy STTR funding, we would not have had a technology to address this evolving cellular challenge."

On the strength of these road show demon-

strations, VT Silicon attracted the attention of an industry veteran and seasoned high-technology entrepreneur, Mike Hooper, who eventually became the VT Silicon CEO. Hooper saw the potential of this lower cost approach and its ability for controlling distortion. Their proprietary LET™ permits higher power levels since SiGe can support both conventional bipolar transistors as well as CMOS. The LET approach can be implemented on the same chip as the power amplifier, providing cost and design simplicity advantages.

With Hooper's industry experience in power amplifiers, he was able to attract the attention of Menlo Ventures, a Silicon Valley venture capital firm with over \$4 billion under management. Menlo Ventures provides long-term capital and management support to early-stage and emerging-growth companies. With its initial Series A financing of \$3.3 million, Menlo Ventures provided the funds needed by VT Silicon to address the challenges of supplying highly integrated and lower cost chipsets for the next generation of 4G mobile devices. These chipsets can be produced less expensively when compared to current 4G devices using existing technologies (i.e. GaAs). These lower cost chipsets will allow WiMax and LTE™ (Long Term

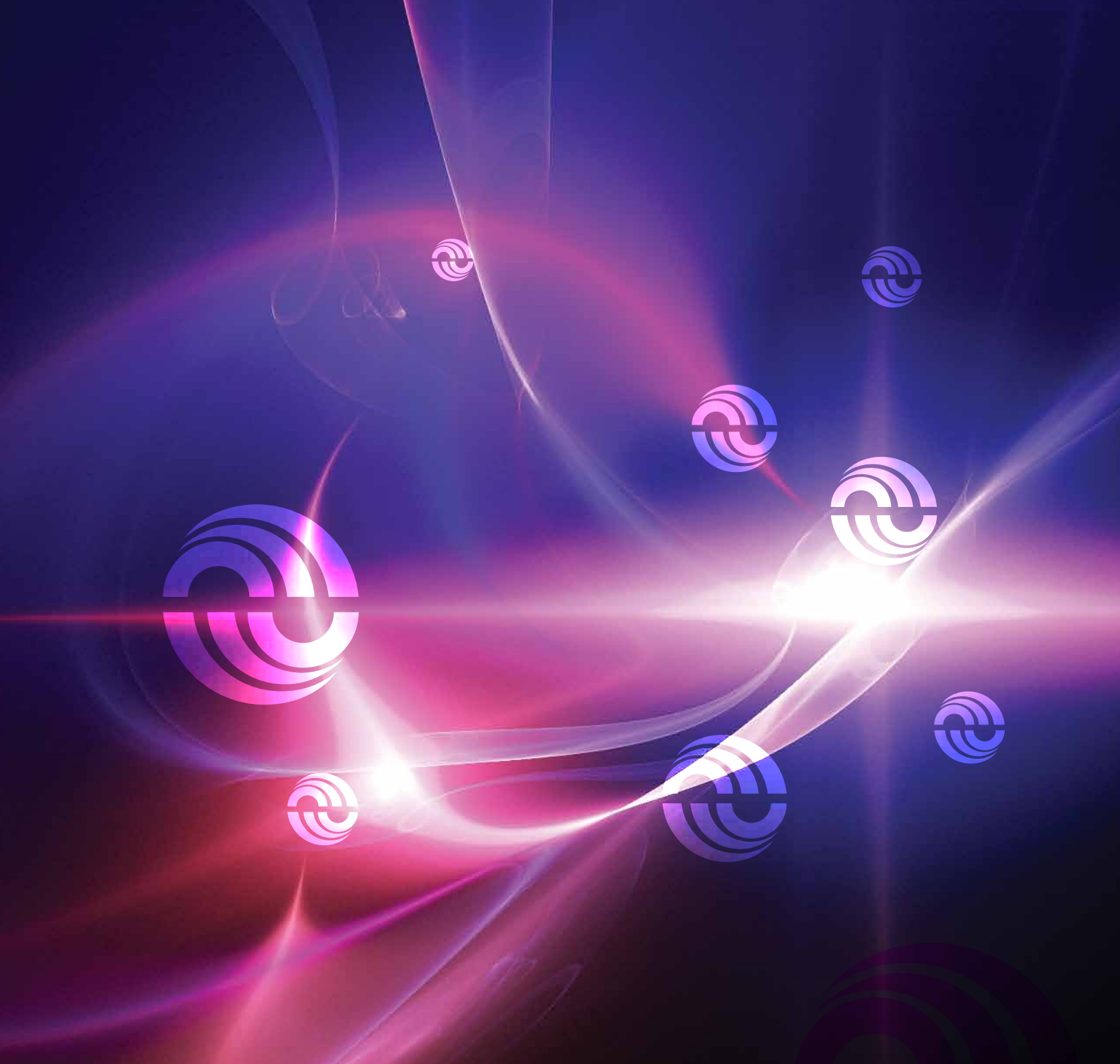
Evolution) to become the leading technology for mobile broadband applications.

The 4G technology requires a power amplifier that is more linear, for higher power levels, while providing better battery life. Each specific application needs to be optimized to balance its power, linearization, efficiency and other design elements. This 4G technology is slowly coming to market with Sprint and Clearwire Communications launching WiMax in selected cities at the end of 2009. Additionally, AT&T and Verizon will be launching LTE in a limited number of cities in early 2010. A national rollout is expected in 2011. Importantly, the VT Silicon SiGe technology supports both WiMax and LTE, thereby broadening the market appeal of its design.

"Through our continued development success, our relationship with Menlo Ventures has now grown with VT Silicon receiving a second level of Series B funding for \$5.5 million dollars in November 2008," said Krishnamurthy. "These funds will allow us to work with several vendors on their "reference designs" for developing fully integrated front end modules to meet the demanding requirements of both WiMax and LTE implementations." ◀



The Navy TAP is a top-notch program, run by a top-notch contractor. Couple the TAP with the Navy Opportunity Forum, and it is easy to see that VT Silicon was provided with the documentation and preparedness to proceed with our commercial road show.



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