

Department of the
NAVY
SBIR/STTR

Small Business Innovation
Research/Small Business
Technology Transfer



Success Stories
1999





Department of the Navy SBIR/STTR



Success Stories 1999

FOREWORD



In the last decade, small businesses have fueled the U.S. economy with their extraordinary innovations, lean organization, and unrelenting aggressiveness. This 1999 Navy SBIR Success Stories publication highlights a few of the many small businesses that have made contributions to the military and private sector through the Navy SBIR Program. These stories exemplify the value of the SBIR program and provide concrete examples of how small businesses have not only addressed the research and development needs of the government, but have produced tremendous results along the way.

Our intention in producing this publication is to highlight the successes of SBIR program participants and to heighten awareness of the SBIR program and the technology opportunities available to the DoD acquisition offices, large military prime contractors, and private industry. It is our hope that they will partner with small businesses and tap their reservoir of expertise, knowledge, and ideas to create cutting-edge technologies, products, and processes for the new millennium. Small businesses and their entrepreneurial spirit have always helped to make this nation great through hard work, determination, and risk-taking; their continued innovative contributions will certainly help maintain the DoD's technical superiority.

We encourage you to visit the Navy SBIR website at <http://www.onr.navy.mil/sbir> to learn more about the program or to view additional success stories. Also of interest on the website is a database of abstracts and summary reports for all of the Navy and DoD-funded SBIR efforts.

PAUL G. GAFFNEY, II
Rear Admiral, U.S. Navy
Chief of Naval Research

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INTRODUCTION

An Introduction to the Department of the Navy's SBIR Program

The SBIR program was designed to provide funding that would stimulate technological innovation in small businesses to meet government research and development needs. After more than 17 years of existence, the program has established itself as one of the most effective programs in the federal government for providing the technical advances that propel economic growth. Studies by Congress, the General Accounting Office, and the Small Business Administration have consistently produced very positive reports on the program. *Inc.* magazine has called the SBIR program "the most important piece of small business legislation yet enacted in our lifetime."

The SBIR program is a highly competitive three-phase system.

Phase I contracts focus on the evaluation of an idea's scientific and technical merit. It also supports small scale testing as appropriate. The base award for this phase is up to \$70,000, with a \$30,000 option if the project is selected for continuation into Phase II. Phase I usually lasts six months.

Phase II demonstrates an idea by building and testing prototypes. This second phase normally lasts two years. The Department of the Navy offers a Phase II base award of \$600,000, with a \$150,000 option.

Finally, Phase III supports either production or additional research and development by the DoD, federal government, a defense prime contractor, or the private sector. During Phase III, a company can receive either government or private sector funds, but no longer receives SBIR funds.

We measure the success of the Navy's SBIR program by the companies that transition their SBIR efforts into products, tools or services that benefit the Navy acquisition community. One important strength of the SBIR program is that once a company has received a Phase I award, the follow-on Phase II and III awards can be awarded in a non-competitive process since the competitive process already took place under Phase I.

In this, the first Navy Success Story publication, the companies have all reached the Phase III level of the SBIR program. For each story, we have tried to describe:

- The technology developed by the small business
- The need for the technology in the Navy
- The application of the technology to the military and private sector
- The Navy activity that sponsored the SBIR, indicated by the logo
- Additional information about the company

A description of the company's funding and follow-on revenues is also provided. In some cases, SBIR awards from more than one SBIR program contributed to the technology. However, the dollars in the SBIR revenues in each story are only those associated with the Navy's SBIR award. The dollar amounts are broken into:

SBIR Investment - the dollar amount the Navy SBIR program invested in the company

Project Revenues - the non-SBIR dollars invested in the company for products or additional research and development

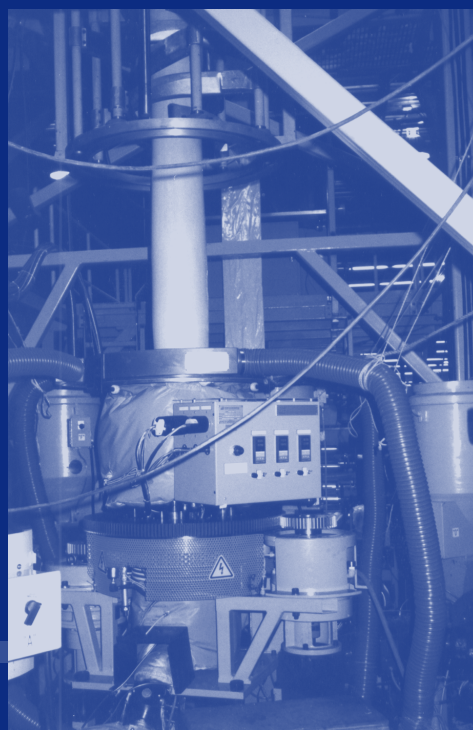
Projected Annual Revenues - the annual non-SBIR dollars the firm expects to receive over the next three years

If you would like to know more about the SBIR program, would like to identify the latest technology advances, or would like to participate in the SBIR solicitation, please visit our website at <http://www.onr.navy.mil/sbir> or contact one of the Navy program managers listed on page 50.

Visit our website at <http://www.onr.navy.mil/sbir>

INTRODUCTION

The Success Stories



How Good Is Your Data?



Knowing the margin of error associated with a target's location is critical to pilots and other system users under combat conditions. The Neural Network Figure-of-Merit Subsystem not only conveys how accurate the information is, but combines measurements from more than one data source to provide more precise target identification in both single and multi-sensor systems. Since conventional computers are unsuited for neural network algorithms, Accurate Automation developed the Neural Network Processor (NNP), the most advanced digital neural network hardware in existence, capable of more than 1 billion connections per second.

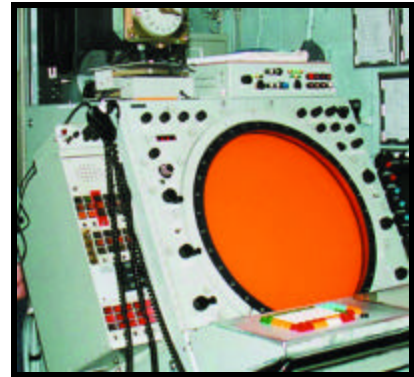
Applications

- Used by SPAWAR in its Shore Based Air Traffic Control System
- Licensed to McDonnell Douglas and Silicon Graphics
- Subcontracted to ARINC for the NISE East Shore Based Air Traffic Control Program

Benefits

- The Figure-of-Merit technology can be used to measure the performance of many types of commercial systems, including radar systems, communications systems, power grids and datalinks to other elements in a battle force.
- Accurate Automation has also developed a PC version of the Neural Network Processor.

NAVY TOPIC: N93-003 (ONR)



Effective engagement control
requires accurate data

**Accurate Automation has
received a \$3M,
5-year contract for
SPAWAR's Shore Based
Air Traffic Control
System.**

SBIR Investment: \$793K

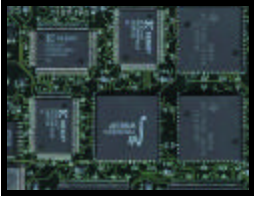
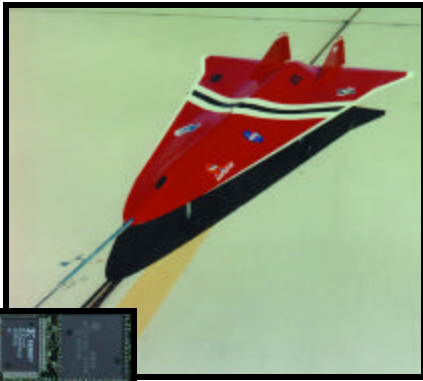
Project Revenues: \$2.5M

**Projected Annual
Revenues: \$1M**

Accurate Automation Corporation

Accurate Automation Corporation is a world leader in neural network technologies, with more than \$7 million in annual revenues. They have increased the number of employees from 8 in 1990 to over 30 in 1999. For more information, contact Richard M. Akita at (423) 894-4646 or visit the company's website at www.accurate-automation.com.

NAVY TOPIC: N90-008 (ONR)



LoFLYTE Waverider
(top) on ramp at Mojave
and the NNP (left)

**An expanded
version of the NNP,
developed for
NASA and
the U.S. Air Force, is
currently installed in
the remotely piloted,
jet-powered aircraft,
LoFLYTE.**

SBIR Investment: \$550K

Project Revenues: \$1.5M

**Projected Annual
Revenues: \$1M**

Neural Network Processors (NNP) for Autonomous Motor Control



Accurate Automation Corporation (AAC) has developed neural network software that provides motor control for pilotless aircraft and advanced flight control systems. This software is being used on LoFLYTE, a remotely piloted, jet-powered aircraft, designed to fly at MACH 6. For an aircraft to fly at these high speeds, rapid and constant adjustments have to be made to the flight control systems. The NNP and software developed by AAC allows the computer to make these adjustments quickly and accurately.

Now Used By

- U.S. Air Force
- Department of Veterans Affairs
- Lockheed Martin
- Boeing
- NASA

Benefits

- Use of neural networks in flight ultimately could help pilots fly in quick decision situations and help damaged aircraft land safely even with partially disabled controls.
- NNP is also used in sensor fusion, mission planning, fault diagnosis, and logistics.
- AAC has a \$477K licensing agreement with Silicon Graphics.
- The Veterans Administration uses NNP technology to help paraplegics make better use of their prosthetic limbs. The technology can override a person's slow or inappropriate manipulations of the prosthesis even as wearers age and lose some quick reflexes.

Accurate Automation Corporation

Accurate Automation Corporation has had commercial sales of the Neural Network Processor totalling more than \$1 million to governmental, educational, and commercial institutions. Accurate Automation is a world leader in neural network computing and hypersonic aircraft technologies. For information, contact Robert Pap at (423) 894-4646 or visit the company's website at www.accurate-automation.com.

Can't Take The Heat?



Advanced Ceramics Research, Inc. (ACR) has developed a new class of low cost composite materials, called Fibrous Monoliths, that can handle temperatures up to 3000 degrees Celsius. These materials are providing both a financial and performance benefit to military and commercial clients. In a jet engine application, the material is not only less than 20% of the cost, it lasts 3 times longer which eliminates costs associated with engine maintenance. In the oil industry this material is a stronger, cheaper replacement for drill inserts, but the real savings come from being able to drill longer without having to bring the drill up to replace the inserts.

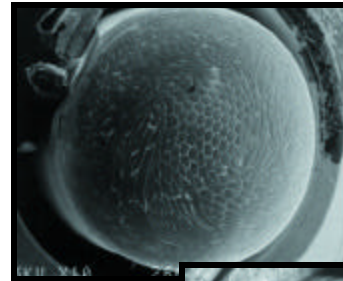
Applications (Prototype & Production)

- GE F110 Engine (Platform Nozzle) on F-14, F-15, and F-16
- *Standard* missile
- Several Raytheon missiles (Jet Vanes and Fins)
- Low cost candidate for rhenium materials
- Affordable Rapid Response Missile Demonstrator
- Lockheed-Martin's X-33
- Drill bits for oil and mining industries
- X-ray targets for medical CAT scanners

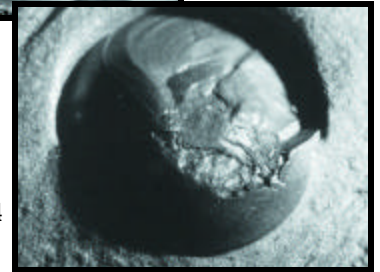
Benefits

- Superior oxidation and ablation resistance
- Excellent thermal shock, toughness and durability
- Very cost effective to manufacture
- Can greatly reduce maintenance costs

NAVY TOPIC: N87-137 (NAVSEA/NSWCCD)



ACR's drill
insert (top)
and competi-
tors (right)
after drilling
820 feet in 64
hours



**Advanced Ceramics
Research was founded with
this SBIR award in 1988 and
is now a thriving company
that has been very successful
in transitioning SBIR
R&D funding into
product revenues.**

SBIR Investment: \$ 500K

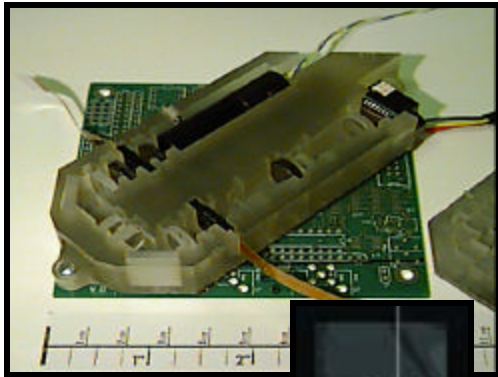
Project Revenues: \$3.4M

**Projected Annual
Revenues: \$15M**

Advanced Ceramics Research, Inc.

Advanced Ceramics Research, Inc.'s core business areas consist of advanced composite ceramic materials, rapid prototyping technologies for composites and ceramics, and production of high performance composite carrier products used for polishing computer hard drive disks. Company employment has grown from 3 in 1990 to over 40 in 1999, revenues have grown by 2,000%, and they have been listed by *Inc.* magazine as one of the fastest growing businesses for 1993 to 1997. For more information, contact Anthony C. Mulligan, President and CEO, at (520) 573-6300 or visit the company's website at www.acrtucson.com

NAVY TOPIC: N92-077
(NAVSEA/NSWCDD)



ULTOR sensor and
the image it produces

**The Navy's *Standard*
Missile program
has already funded
Advanced Optical
Systems over \$3M in
follow up work, with
another \$2.5M planned
for next year.**

SBIR Investment: \$614K

Project Revenues: \$3.2M

**Projected Annual
Revenues: \$3.3M**

Teaching Smart Weapons Good Judgment



Finding and tracking incoming missiles that are traveling at speeds over MACH 3 is an extremely difficult problem to solve. The Ultra Lethal Targeting By Optical Recognition (ULTOR) is advanced optical processing that will let smart weapons do just that. The system has been demonstrated to provide target recognition, clutter rejection, and highly accurate guidance signals. Using high speed, highly parallel optical processing, the system promises real-time engagement capability in a miniaturized package at an affordable price.

Now Being Considered For Use In

- Endgame guidance subsystem for Navy *Standard* ballistic missile interceptors
- Anti-cruise missile interceptors
- Land Attack *Standard* missile
- *Tomahawk* cruise missiles

Benefits & Applications

- Target recognition
- Guidance error signals for precise aimpoint adjustment
- Great resistance to break-lock provided by automatic reacquisition of correct target
- Relative altitude information
- Information provided rapidly for use in high-performance interceptors

Advanced Optical Systems, Inc.

Advanced Optical Systems, Inc. is a leader in the challenging field of optical target recognition and was founded to seek optical solutions to difficult military and civilian problems. The company has grown from 3 part-time employees in 1992 to 5 full-time and 8 part-time employees in 1999. In addition, their revenues tripled from 1998 to 1999, and they boast a highly qualified technical staff and exceptional laboratory facilities. For more information, contact Richard L. Hartman at (256) 536-5960 or by e-mail at Hartman@aos-inc.com or visit the company's website at www.aos-inc.com.

Clean Energy



Fuel cell technology is one of the most promising technologies for meeting energy needs into the 21st century. Based on the same technology used in spacecraft, fuel cells are inherently clean, quiet, and efficient. They can run off a variety of fuels to produce electricity, and the by-products are environmentally friendly. Analytic Power has developed many fuel cells including the FC-200 and FC-150 that operate on hydrogen and air to produce electricity and water.

Applications

- Development of a 50 kW natural gas system for Department of Energy
- Shipboard power:
 - Liquid cooled proton exchange membrane (PEM) fuel cell
 - Hydrocarbon fuel processor with autothermal reformer, selective oxidizer
 - 2.5 MW fuel cell power plant
- 3-10 kW natural gas/propane fueled power generator for residential home heating
- 25 watt fuel cell power supply
- Diesel fuel cell power plant for containerized kitchens
- 150 W and 500 W fuel cell power supplies with ammonia hydrogen generators
- Electromechanically driven heat pump for microclimate cooling applications
- Megawatt scale PEM power plants using chlorine caustic and UPS power applications

Benefits

- Highly efficient
- Pollution free
- Low cost
- Produce a low thermal signature

NAVY TOPIC: N88-022
(ONR/NSWCCD)



Natural gas/propane generator for home heating

Analytic Power was awarded a \$1.2M contract from a utility consortium to deliver 20 prototype systems, with an \$8M option for 600 more units. A follow on order for 10,000 units is planned for the year 2001 and estimated at \$40M.

SBIR Investment: \$553K

Project Revenues: \$2.84M

Projected Annual Revenues: \$50M

Analytic Power Corporation

Analytic Power Corporation is helping the military expand its use of diesel systems for power generation and pursuing fuel cell technology as a power source. Their spin-off, the American Power Corporation, is commercializing related natural gas-based fuel cell power plants. American Power has contracted with 14 domestic utilities, 1 Japanese utility, and 3 German utilities to develop a residential power generator based on fuel cell technology. For more information, contact David Bloomfield at (617) 542-6352, or visit the website at www.analyticpower.com.

NAVY TOPIC: OSD95-010
(OSD/ONR/NUWC)



**Soniwave™ underwater
diver communication**

**Analytical
Engineering, Inc.
has obtained 3
patents as a
result of this
SBIR award.**

SBIR Investment: \$475K

Project Revenues: \$750K

**Projected Annual
Revenues: \$1M**

Wireless Underwater Communication



A revolutionary wireless underwater communication technology that enables diver-to-diver and diver-to-surface communication has been developed using a dental sound conduction device for the scuba mouthpiece. The technology, composed of an acoustic mouthpiece and corresponding ultrasonic receiver, is the only system in the world that allows underwater communication without the addition of non-standard SCUBA gear. Divers who use Soniwave™ can clearly hear voice audio without earphones or other head-mounted equipment. Audio received from a Soniwave™ surface station is as clear as a telephone call. Hearing and speech is possible by bone conduction through the mouth by means of a patented acoustic mouthpiece.

Applications

- Sold to retail dive stores as Soniwave™ through the company, Trigger Scuba, Inc.
- Full-face mask systems currently under development for Navy divers

Benefits

- Improves the safety and mission success of military divers and civilian search and rescue teams
- Facilitates repairs and maintenance on ships and docks because divers can communicate easily with topside personnel
- Allows SCUBA instructors to communicate with students during dives

Analytical Engineering, Inc.

Analytical Engineering, Inc., incorporated in 1994, employs a team of highly skilled engineers and technicians and develops products that are either manufactured in-house or licensed out to large corporations. They have grown from 1 employee in 1994 to 10 employees in 1999. The company has been able to transition expertise developed under this SBIR into multiple applications that are now generating strong revenues. For more information on the company, contact Barry S. J. Czachura at (812) 376-6472 or barry@AEI-Tech.com.

Getting Out Safely



Punching out of an aircraft at 700 knots exposes pilots to forces beyond physically tolerable limits. CFD Research Corporation has applied advanced computational fluid dynamics to make ejection seats safer for the new generation of high performance aircraft, making it safe for pilots and crew to exit a disabled aircraft even under the most dangerous and challenging conditions. The company has also applied the knowledge and code developed under this SBIR to several software products for heat transfer, fluid flow, and other related physics areas.

Applications

- Used by Lockheed Martin, Raytheon, Intel, Motorola, Applied Materials, Samsung, MIT, Georgia Tech, and over 300 others
- Used by Martin Baker Aircraft, largest worldwide producer of ejection seats
- Used to design U.S. Navy's new generation of ejection seats

Benefits

- Reduces the time and cost of wind tunnel testing
- Allows designers to investigate novel designs in stabilization and drag reduction at minimal cost

NAVY TOPIC: N90-239
(NAVAIR/NAWCPAX)



Modeling the effect of rocket plumes on ejection seat aerodynamics

**CFD Research has used
this SBIR funding
to develop software
that is now used by over
300 organizations
worldwide.**

SBIR Investment: \$922K

Project Revenues: \$2.87M

**Projected Annual
Revenues: \$1.5M**

CFD Research Corporation

CFD Research Corporation has become a leader in applying the techniques of computational fluid dynamics to the modeling and simulation of complex aerodynamic processes, heat transfer, fluid flow, and other related physics areas. The field of computational fluid dynamics offers an excellent example of how basic science transitions to practical, life-saving applications. CFD Research Corporation, founded in 1987, has grown into a dynamic industry leader, employing 120 highly qualified personnel, and performing over \$10 million annually in contracts. The company currently licenses a variety of software, including CFD-ACE+, CFD-FASTRAN, and MDICE. For more information about CFD, contact Sami Habchi at (256) 726-4832, or visit the website at www.cfdr.com.

NAVY TOPIC: N95-095 (ONR)



CH-46 pilot using HINTS

**Introducing
an intelligent
interactive aircrew
aid for emergency
handling on the
next generation of
Navy helicopters.**

SBIR Investment: \$845K

Project Revenues: \$2.6M

**Projected Annual
Revenues: \$1M**

Let the Aircraft Tell You How It's Feeling



Hums Interface System for Helicopters (HINTS), developed by CHI Systems, Inc., is a system that automatically tells helicopter aircrews about the mechanical condition of their aircraft in a way that's easy to understand and use. HINTS enhances an aircrew's ability to handle mechanical emergencies of all types by providing quick access to concise, clear information. It gives the aircrew access to information not otherwise available in the cockpit, and tells them what's wrong and what to do about it. HINTS has considerable potential for application to all types of military aircraft, complex machinery, vehicles, and ships.

Applications

- Projected for installation in all new SH-60 R/S helicopters
- Installed on 12 CH-46 Helicopters

Benefits

- Provides electronic flight manual (NATOPS) and checklists
- Presents context-sensitive mechanical diagnostic data in real-time
- Facilitates timely and effective treatment of aircraft mechanical malfunctions
- Presents information including identification of problem conditions, diagnostic data, action recommendations, and related information on impact assessment and corroboration
- Reduces aircrew training requirements for memorization of emergency procedures
- Reduces an aircrew's need to watch cockpit systems, and thus lets them shift their attention outside of the aircraft (invaluable when flying in tactical situations)
- Reduces premature mission termination
- Helps update helicopter emergency procedures

CHI Systems, Inc.

CHI Systems, Inc., founded in 1985, is a leader in human factors engineering. Their primary business concentrations include custom systems development, industrial engineering, and applied research and development. For more information about HINTS or CHI Systems, Inc., contact Floyd Glenn at (215) 542-1400 or visit the website at www.chi-inc.com.

New Microprocessor Development Technology



CPU Technology's automated verification and validation technology provides a solution to electronic system obsolescence problems and preserves investment in proven software. Originally funded by the Air Force for the Phase I effort, the Navy funded the Phase II effort in order to help solve some of its most troublesome and potentially costly electronic obsolescence problems. This technology has been applied to the MIL-STD-1750 microprocessor that was conceived as a standard processor for military applications in the mid-1980's. Although many versions of this processor are now very outdated, they are embedded in numerous military systems, some of which are scheduled to last another 20 years or more. CPU Technology has applied their advanced design methodology to develop a modern system on a chip that is fully compatible with the original 1750 ISA but incorporates modern technology to increase system throughput and reliability.

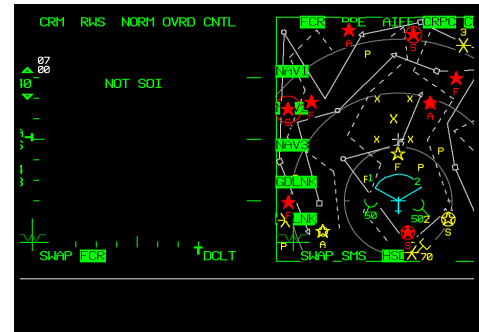
Applications

- Supplying CPU1750A-60 microprocessors for the Honeywell color programmable display generator for the Air Force's F-16 CCIP upgrade program
- Supplying AN/AYK-14 compatible processors to modernize obsolete Navy computers
- Validated modernization of mission critical electronics for increased reliability, safety, and performance in avionics and other applications

Benefits

- Modernizes legacy systems with compatible circuitry while retaining proven software is less expensive and lower risk than redesigning systems and rewriting software.
- Provides a permanent solution to obsolescence problems
- Reduces operational and support costs
- Increases system reliability and maintainability

NAVY TOPIC: AF93-158 (NAVAIR)



**F-16 Display Simulation of OFP
Running on CPU1750A-60
Virtual Prototype**

**CPU Technology
received a Navy Dual
Use award in 1997 for
\$4.3M for the develop-
ment of an innovative
solution to electronic
obsolescence problems
in the form of a
system-on-a-chip.**

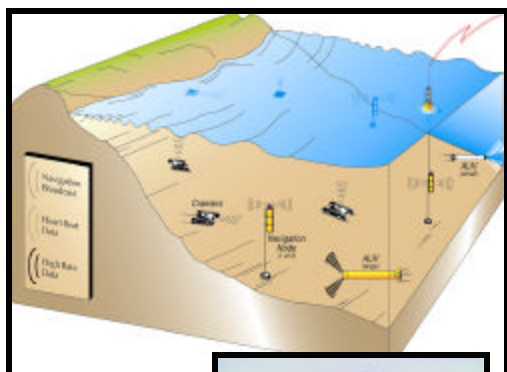
SBIR Investment: \$920K

Project Revenues: \$5M

**Projected Annual
Revenues: \$8M**

CPU Technology, Inc.

CPU Technology is a supplier of high assurance compatible systems-on-a chip and circuit boards to military and commercial aerospace and other industries. The company has over 35 patents issued or pending in the areas of system and processor design and complex system modeling. For more information, contact Richard Comfort at (925) 224-9920 or visit the website at www.cputech.com.



**Datasonics
Underwater
Communication
System**



**Datasonics has received a
\$5M 5-year contract from
SPAWARSYSCEN
and a \$2.2M contract
from ONR's Very
Shallow Water Mine Counter
Measures Program.**

SBIR Investment: \$683K

Project Revenues: \$2.3M

**Projected Annual
Revenues: \$2.5M**

Talking Underwater Without Being Overheard



Datasonics, Inc. has an underwater acoustic communication system that would extend Link-11 tactical battle group communications to submarines and other underwater equipment. Datasonics' telesonar could revolutionize littoral surveillance and warfare by linking underwater assets in a local area network. The technology has both defense (surveillance, weapons control, cooperative engagement, underwater reconnaissance, etc.) and commercial applications (obstacle avoidance, ship traffic control, low cost sensor fields for oceanographic research, pipeline monitoring, UUV control, scientific telemetry, and diver monitoring).

Used In

- SPAWAR/ONR Seaweb S&T Capabilities Initiative
- ONR's Very Shallow Water Mine Counter Measures Program
- NOAA Tsunami Warning System
- Autonomous vehicle control for Canadian Navy's Thesius, GEC Marcon's MARLIN, and Italy's CEOM
- Monitoring deep ocean cabling plows for Telecom Italian, France Telecom, and Cable and Wireless
- Monitoring gas pipeline corrosion for Norwegian Oil Co.
- Oil flow line stress monitoring for Petrobas, an Italian oil company

Benefits & Applications

- Allows highly reliable acoustic wireless communication
- Helps maintain security due to low probability of intercept
- Promises unattended deployment durations up to 5 years
- Replaces vulnerable cables and buoys
- Provides network node locations and alternate routing in the event of a node failure
- Uses identical nodes for economical, simpler manufacturing, deployment, and inventory
- Permits easy covert deployment of concealed sensor systems

Datasonics, Inc.

Datasonics, Inc., originally engaged primarily in special engineering projects, has become a leader in underwater acoustic technology. Employing approximately 50 people, they emphasize engineering and design capability. For more information, contact Dave Porta at (508) 563-5511, ext. 117 or by e-mail at dporta@datasonics.com or visit the company's website at www.datasonics.com.

Flexible, Affordable Signal Processors



The Multi-Purpose Processor (MPP), developed by Digital Systems Resources, Inc., is a commercial computer processor for signal processing applications aboard a variety of Navy platforms. The MPP is a state-of-the-art scalable signal processor with initial performance ranging from 320 MegaFLOPs per board expandable to over 40 GigaFLOPs per cabinet and is already installed on many Navy submarines. A variety of interface boards that support many standard and special military sensor and system interfaces have already been integrated with the MPP. The processor's capability can be readily expanded or reduced to suit application specific needs and to incorporate new technology.

Benefits & Applications

- DSR middleware licensed to the Navy and Lockheed Martin
- System development and procurement cost avoidance of nearly \$100M
- 200 times the computing power at half the cost of the MILSPEC unit MPP replaces
- Software transportability and reuse with an open system architecture
- Upgrades easily to the newest technology without redesign and recoding software
- Multiple "stovepiped" legacy programs merged into a single development employing the COTS MPP

NAVY TOPIC: N91-133,135 (NAVSEA)



Multi-purpose processor technology

**Complete
installation of the
Multi-Purpose
Processor on all
Navy submarines
is scheduled for
FY 2000, saving the
Navy over \$100M.**

SBIR Investment: \$594K

Project Revenues: \$82M

**Projected Annual
Revenues: \$20M**

Digital System Resources, Inc. (DSR)

Digital System Resources, Inc. can largely attribute their growth within the last five years to the MPP program and related Navy SBIR projects. The company now employs about 240 people, more than quadruple from five years ago. For more information about Digital System Resources or the Multi-Purpose Processor, contact Jan Aruscavage at (703) 263-2800, or visit the website at www.dsrnet.com.

NAVY TOPIC: N93-037 (SPAWAR)



Surveillance towed array sensor system

**Digital System
Resources, Inc. was
awarded an \$8.8M
contract with SPAWAR
in 1998 as a result
of the Coherent Spatial
Discriminator (CSD).**

SBIR Investment: \$777K

Project Revenues: \$4.8M

**Projected Annual
Revenues: \$5M**

Hearing Clearly in the Noisy Shallows



One of the most difficult areas for sonar systems to hear are in shallow areas, mainly due to the increased turbulence and noise. Digital System Resources has written software code that greatly enhances the ability of existing Navy sonar towed array systems to discriminate sounds in this noisy environment. The Coherent Spatial Discriminator (CSD) provides fully adaptive processing in large arrays and has made the goal of fully adaptive sensor processing for shallow water and near shore operations a reality. This technology has been especially effective in noisy littoral environments and implementation has proven to be technically straightforward and cost-efficient. The computational efficiency of the techniques shows promise for use in more challenging system applications such as radar, infrared, and communications.

Now Used In

- Surveillance Towed Array Sensor System
- Submarine towed arrays
- Advanced Deployable System (for evaluation)

Benefits

- Near-optimal detection performance
- Very low computational requirements
- Simple implementation in existing sensor systems
- Applicability to a range of sensor systems

Digital System Resources, Inc. (DSR)

Digital System Resources, Inc. has had tremendous success transitioning SBIR-developed technologies into Navy field systems. They expect revenues attributable to CSD research under this and related SBIRs to amount to over \$10 million. For more information, contact Bruce Gallemore at (703) 263-2800 or visit the company's website at www.dsr-net.com.

Helping Pilots See the Ground in Any Weather



Low-flying military aircraft have long needed a covert way of safely using terrain following techniques. The Adaptive Real-time Altitude Detection (ARAD) algorithms, developed by Dubbs & Severino, are a GPS-based terrain following and avoidance system that extrapolates the region immediately ahead of an aircraft and alerts the pilot to terrain obstacles. ARAD algorithms compare the present GPS-derived aircraft location with the Defense DTED data for the same region, and then extrapolate ahead of the current position to give the pilot adequate time to take evasive action. The system has widespread potential application in commercial aviation by providing a terrain avoidance system for use outside FAA controlled airspace.

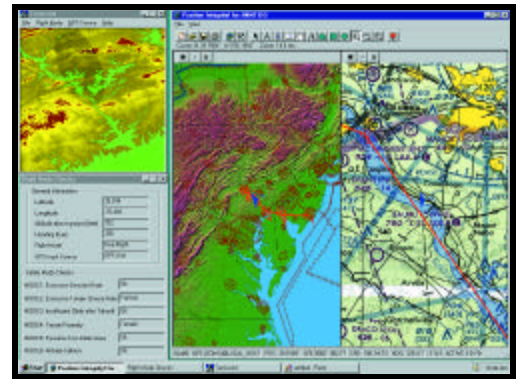
Integrated Within

- E-2C *Hawkeye*
- Marconi's *Skyeye* Unmanned Aerial Vehicle
- NASA/JPL Digital Earth Viewer
- SOCOM's Jagged Shadow Digital Call for Fire System

Accomplishments & Benefits

- Won 1998 Windows® World Open for Best Government Application awarded by Bill Gates
- Briefed CINCPACFLT Admiral Clemins and received Innovate Award
- Combines GPS with NIMA high-resolution maps
- Uses NASA JPL GeoTIFF architecture
- Provides up to 8 minutes warning of collision with terrain
- Produces no active emissions - extremely covert
- Provides a moving map during tactical operations
- Integrates JTIDS tracks over maps in real-time
- Increases E-2C crew productivity by 20%

NAVY TOPIC: N93-261 (NAVAIR)



The view a navigator sees from the
Pilot Alert System

**The Pilot Alert
System can save the
lives of military and
commercial pilots
and millions from
the cost of
downed aircraft.**

SBIR Investment: \$826K

Project Revenues: \$785K

**Projected Annual
Revenues: \$1M**

Dubbs & Severino, Inc.

Dubbs & Severino, Inc. has wide experience in digital chart and map preparation. For more information, contact Robert A. Severino at (949) 854-2643, or visit the company's website at www.position-integrity.com.



**Rocket plume of space shuttle
booster static firing**

**El Dorado's PCAD
computer model
helped NASA
demonstrate that
plumes from the
Space Shuttle Booster
firings caused no
undue public or
environmental risk.**

SBIR Investment: \$500K

Project Revenues: \$4.2M

**Projected Annual
Revenues: \$200K**

Reducing the Dangers of Smoke & Flame



Products of Combustion/Atmospheric Dispersion, or PCAD, is a computer model that predicts the products of combustion and downwind dispersion from open burning, detonation, or firing of propellants, explosives, pyrotechnics, and rocket motors. To evaluate product formation and dispersion from accidental chemical releases and fires, there is also the Hot Spills computer model that is now available commercially.

Benefits & Applications

- Predicts products of the combustion process, heated plume rise, and subsequent dispersion of the emission products
- Provides risk assessments and analyses for both expected and accidental operations
- Assists in obtaining environmental permits
- Assists by preparing Subpart XEPA Permit for: Tracor Aerospace, Aerojet, Thiokol, Hercules, Rockwell, Martin Marietta, Tracor Aerospace, Atlantic Research Corp., and Ensign-Bickford Corp.

PCAD Site Specific License Purchased By

- U.S. Navy, U.S. Air Force, and U.S. Army Missile Command (including INF Treaty compliance applications)
- NASA (including Cape Canaveral installations)
- British Ministry of Defense
- Canadian Ministry of Defense

El Dorado Engineering, Inc. (EDE)

El Dorado Engineering, Inc. is a leader in the modeling and prediction of plumes and combustion processes. Their expertise has been invaluable to agencies and corporations working to reduce risks and comply with environmental protection regulations. For more information, contact Ralph W. Hayes by e-mail at eldorado50@aol.com or by telephone at (801) 966-8288.

Stronger Composite Structures



Z-direction tape, Z-Fiber™, is a better way of reinforcing composite structures. It is a family of products for reinforcing polymer matrix composites through the thickness direction. In its simplest form, the product is a preform consisting of a foam sheet into which have been inserted small diameter (0.02 in.) pins or rods at a density typically on the order of 100 pins/sq. in. This preform is placed on top of the composite in the uncured state and the foam is compressed by applying heat and pressure, which forces the pins out of the foam and into the composite. The composite is then cured. The resulting composite has a three dimensional reinforcing structure as opposed to the two dimensional reinforcement typical of most composites. The pin-reinforced foam can also be laminated between two composite skins to create a sandwich core structure stronger and lighter than aluminum or Nomex honeycomb.

Applications

- Currently: Boeing, F/A-18 E/F *Hornet*
- Future: Lockheed-Martin's Joint Strike Fighter

Benefits

- The composite reduces construction cost by more than 50% and increases ultimate joint strength by more than 200%.
- Technology significantly reduces possibility of shock induced delamination.
- Lockheed's JSF airframe design incorporates widespread use of Z-Fiber™
- Wingbox testing performed at Lockheed shows that Z-Fiber™ substantially improves the battle damage survivability of composite airframe structures.

NAVY TOPIC: N86-132 (NAVAIR/NSWC)



**Z-Fiber™
used in F-18
inlet duct**



**Northrop Grumman
projects cost savings of
\$140M over the life of the
program from replacing
mechanical fasteners with
Z-Fiber™ on the F-18 E/F
engine inlet duct.**

SBIR Investment: \$528K

Project Revenues: \$2.7M

**Projected Annual
Revenues: \$20M**

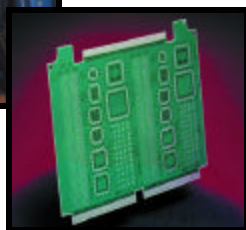
Foster-Miller, Inc.

Foster-Miller, Inc. has considerable expertise in polymers and composites. The company's Z-Fiber™ has been developed under multiple SBIR awards with total revenues of over \$8.7 million to date. Products range from small electronic devices to large construction equipment to custom machinery. Foster-Miller's spin-off, Aztex, is pursuing applications in commercial aircraft with Boeing and British Aerospace. For more information, contact Jay Boyce at (781) 684-4115, or visit the company's website at www.foster-miller.com.

NAVY TOPIC: N88-137 (NSWC)



**Manufacturing
of liquid
crystal
polymers for
advanced
interconnect
substrates**



**This technology
allows for the next
generation of thin,
small, high density, low
dielectric circuit boards
to be produced
at an affordable cost,
opening up many
new markets.**

SBIR Investment: \$500K

Project Revenues: \$2.7M

**Projected Annual
Revenues: \$3M-6M**

Cost-Effective Manufacturing Process of Polymers in Advance Electronics



Liquid Crystal Polymers (LCPs) provide superior properties when used as an interconnect substrate in film laminates on circuit boards and other applications. The problem until now has been the cost in manufacturing these components. Foster-Miller's versatile and cost-effective processing method makes the superior properties of LCPs available for many new applications. Examples of some of the applications include: high barrier films for food and beverage packaging; substrates for high density multilayer printed circuit boards; high performance tubing used in endoscopic surgery; barrier layers for cryogenics; and high temperature electrical insulation. This technology is being licensed to a variety of manufacturers for these and other applications. The value of initial licensing for electronic interconnection is more than \$1.5 million over the next three years. Additional licenses are expected to triple that amount within the same time frame.

Benefits

- Provides performance gains and cost reductions over current materials and systems
- Offers lower moisture absorption for higher reliability and longer life than current polyamide film substrates
- 50% cost savings at the same level of performance when compared to fluoropolymer materials used in current radar applications

Applications

- Defense applications include microwave circuit boards for advanced radar systems and flat antennae for phased-array radar.
- Commercial applications include: transmit/receive modules for hand-held phones, global positioning systems, non-contact collision avoidance sensors, and high-speed circuit boards for medical imaging systems.
- Future commercial applications are expected to include PC card plug-in modules for hand-held computers and other thin, lightweight computer applications.

Foster-Miller, Inc.

Foster-Miller has a business strategy of developing new and improved technologies under the SBIR program and then spins them off as subsidiaries for manufacturing, licensing, and marketing of the technology. Superex, one of Foster-Miller's spin-off companies, provides new technology for processing highly advanced liquid crystal polymer (LCP) products. For more information, contact Richard Lusignea at (781) 684-4209 or visit the website at www.foster-miller.com.

Realistic Environments for Training & Rehearsal



Geometrix, Inc. is developing a system that produces computer generated virtual environments from filmed scenes. Although the company is still working on the SBIR Phase II, they have already sold 30 units of the 3Scan™, which generates fully-textured 3-D models of objects placed on a computer controlled turntable in just minutes. The company's next product, SoftScene™ 3-D, will generate fully textured 3-D models from a handheld camcorder. These models are sufficiently accurate and robust for mission planning and rehearsal. Geometrix products also have a huge potential in other industries such as movies and television. Geometrix has been very successful at securing additional sources of funding and anticipates a potential market of over \$200M in the next 5 years.

Benefits & Applications

- Will be used in the Naval Air Warfare Center's Small Unit Tactical Trainer
- Generates virtual reality mission rehearsal databases within hours instead of weeks
- Enables a wide variety of simulation systems to be adapted from skills trainers to mission planning and rehearsal simulators
- Rapid military and emergency services simulation database generation, architecture, urban planning, virtual set generation, and forensic analysis
- Camera Matchmover, a new Geometrix product, generates six degrees-of-freedom camera position/orientation data by processing the camera's video output. This tool will provide a critical capability for automatically compositing 3-D special effects and 2-D live footage in film/broadcast production.

NAVY TOPIC: N96-012
(MACOR/NAWCTSD)



The 3Scan™
object scanner



In October 1999

**Geometrix was awarded
an Advanced Technology
Program (ATP) award of
\$3.8M from NIST. Half
of the funding will come
from a venture capitalist
group backing
Geometrix.**

SBIR Investment: \$690K

Project Revenues: \$1.2M

**Projected Annual
Revenues: \$30M**

Geometrix, Inc.

Geometrix, Inc. was started and incorporated with the award of this Marine Corps Phase I SBIR. Since that award in 1996, employment has grown from 1 to 15 and revenues have grown by over 400% with very rapid growth expected over the next 3 years. The company has been able to use this SBIR award to leverage substantial funding from private investors and the state of California. Geometrix is now cultivating a \$5M infusion from a venture capitalist group. For more information, contact Arthur Zwern at (408) 999-7499, or visit the company's website at www.geometrixinc.com



Active Tuned
Mass Absorber



**Hood Technology's
Active Tuned Mass Absorber
reduces the interior noise in
the rear of a DC-9 aircraft by
90 percent. Passengers can
now enjoy a pleasant flight
without having to shout to
the flight attendant.**

SBIR Investment: \$648K

Project Revenues: \$9.5M

**Projected Annual
Revenues: \$3M**

Saving Your Ears & Your Voice



Noise and vibration in aircraft cabins not only disturbs passengers; it adds extra wear and tear on the plane's structure and can interfere with military surveillance missions. A new system, developed under the Navy's SBIR Program by Hood Technology, controls interior noise and vibration, especially in propeller-induced sound within turbo-prop aircraft. The Active Tuned Mass Absorber (ATMA) does

for airplanes what shock absorbers do for automobiles. The ATMA reduces the source of the noise instead of trying to cancel it with more noise or vibration as other active systems do. The sophisticated yet simple system is composed of a computerized control unit and cylin-

drical absorbers made of adaptive damping rubber. The absorbers tune themselves to disturbance tones using a continuous feedback loop. More than 200 units of the ATMA have been installed on DC-9 and MD-80 aircraft and 45 units on the Air Force's MH-53 helicopters with more planned in the near future.

Now In Use Aboard

- DC-9s and MD-80s of Northwest Airlines, Midwest Express, Air Mexico, FinAir, Air Italia, and AirTrans
- Air Force MH-53 helicopters

Benefits & Applications

- Reduces aircraft cabin noise
- Reduces engine vibrations, saving wear and tear on systems and airframes
- Under consideration for air conditioning units on Navy ships

Hood Technology Corporation

Hood Technology Corporation is a leader in the field of vibration control. The company has used their expertise to design damping systems for everything from highly precise electronic manufacturing equipment to baby joggers. Hood Technology successfully developed many technologies and then licensed the rights to others that are better positioned to manufacture and market the technology. For example, Hood presently receives a 2% royalty on \$8M in sales through an arrangement with Barry Controls. For more information, contact Andy von Flotow at (541) 387-2288 or by e-mail at hoodtech@compuserve.com.

Following the Light



The Laser Centerline Localizer (LCL) for Carrier Long-Range Line-up Guidance for Aircraft helps aviators keep their heart rates down when they trap aboard a carrier. The system gives aviators a path of light they can follow safely until the tailhook catches Wire Three. Currently undergoing FAA certification, the Laser Centerline Localizer has significant potential for use at civilian airports that will benefit from the system's ability to provide definitive traffic separation on small, parallel runways. Other promising applications include installation on oil rig helipads and deployment for use during civil disaster relief operations.

Used Aboard

- *USS Constellation*
- *USS Carl Vinson*
- *USS Kitty Hawk*

Benefits

- Increased aircraft boarding rate saves the Navy an estimated \$22M per year.
- Low power but highly visible lasers illuminate approach corridors at long distances, and provide a centerline on final approach.
- Low signature makes the system particularly helpful during EMCON.
- Currently, 10 units have been purchased for demonstration at municipal airports.
- 1992 *R&D Magazine* award winner and 1993 Photonics Circle of Excellence Award
- Over \$2.4M in private sector research and development funding

NAVY TOPIC: N86-162 (NAVAIR)



E-2C *Hawkeye* landing aboard CV-64. (The Laser Centerline Localizer Long-Range Line-up System is visible as the gray box on the left hand side.)

"The most important advancement in naval aviation safety since the angled deck," commented a Naval aviator.

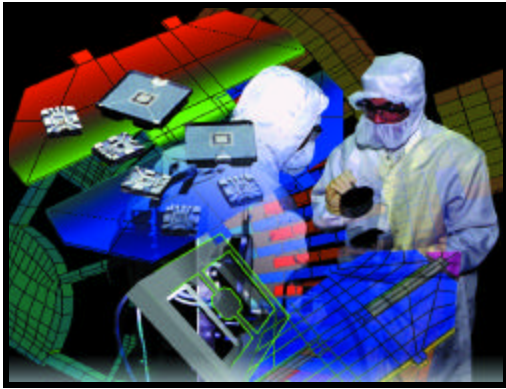
SBIR Investment: \$589K

Project Revenues: \$10M

Projected Annual Revenues: \$4M

Humbug Mountain Research Laboratories

Humbug Mountain Research Laboratories has sold the rights to the Laser Centerline Localizer to other companies. U.S. Aerospace has the rights for the civilian market and Laser Guidance obtained the rights for the Navy. Currently, Raytheon is now producing the LCL under license from Laser Guidance for all Navy aircraft carriers. For more information on the technology, contact Alan Vetter at (626) 303-2400, or by e-mail at alanvetter@aol.com.



Intellisense provides expertise in software manufacturing and consulting for MEMS devices.

From this SBIR funding, IntelliSense was able to develop a software product that enabled the company to expand and grow into a key player in MEMS software and also in the manufacturing and consulting of MEMS devices.

SBIR Investment: \$590K

Project Revenues: \$5M

Projected Annual Revenues: \$10M

Computer-Aided Design Software of MEMS



The need to reduce the size and cost of weapon systems has necessitated the miniaturization of mechanical and electronic systems. MicroElectro-Mechanical Systems (MEMS) is a new technology that allows typical mechanical sensors, even motors, to be put on a computer chip. IntelliSense has developed a software package that gives engineers a tool to design, simulate, model, and optimize MEMS before they even enter a manufacturing plant. This software, IntelliSuite™, promises to speed MEMS concepts into production efficiently and affordably. Commercial applications include aerospace, telecommunications, automotive safety systems, consumer devices (remote controls, video cameras, toys, sports equipment), medicine (disposable blood pressure sensors, body-movement monitoring, surgical instruments), robotics, and machine control.

Applications

- Used by engineers at Raytheon, Motorola, Hughes, Bell Labs, Air Force, and NASA
- Manufactured MEMS heat exchangers on Space Shuttle
- Manufactured MEMS actuator used in artificial eyes
- Navigational systems, weapons safing, arming and fusing, munitions, and platform stabilization
- DoD platforms such as aircraft, missiles, tanks, ships, avionics, gun mounts, stabilizers, shipboard and radial tracking antennae, and ejection seat stabilization systems

Benefits

- Provides a 60% reduction in development cost and 50% reduction in development time
- Accurate prediction of the behavior of complex devices
- Successful device development with minimal iterations

IntelliSense Corporation

Since 1993, IntelliSense has grown from 3 software engineers to a multi-disciplinary company, employing more than 40 engineers and scientists today. They were selected in September of 1999 as one of New England's 50 fastest growing technology companies with revenue growth of 680% over the past 5 years. The company has expanded into the design and manufacture of microfabricated silicon and optical devices, and is now a premier provider of MEMS design tools and manufacturing services in over 13 countries. For more information, contact James Marchetti at (978) 988-8000 or by e-mail at sales@intellisense.com or visit the website at www.intellisense.com.

[illegible]

ISERA was awarded a \$19.9M (ID/IQ) Phase III contract by the Navy for continued use, development, and implementation of the TOURS system.

Projected Annual Revenues: \$4.5M

ISERA Group, Inc.

22

NAVY TOPIC: N90-085 (NAVAIR)



**Environmental Stabilization System
used on P-3**

**LogisTech
has received over
\$515M in ID/IQ
contracts from
the DoD as a
result of technology
developed under
this SBIR contract.**

SBIR Investment: \$643K

Project Revenues: \$43M

**Projected Annual
Revenues: \$110M**

Better Ways of Storing Weapons



LogisTech Inc. is Environment Stabilization System (ESS[®]), a low cost, controlled atmosphere, storage facility for aircraft, support equipment, and weapons. All materials can be preserved and brought into a fully operational, ready-to-use condition within minutes. This system arrests corrosion through a dynamic dehumidification process involving a tailored application of dehumidifiers, air distributors, automated control systems, ducting, adapters, battery preservation systems, and computer hardware and software for data acquisition and reporting. ESS[®] was originally developed for NAVAIR, but quickly spun off to applications of all types.

Applications

- 436 systems installed, including 53 shelter erections and 73 building conversions
- More than 500 systems used by Reserve National Guard in 37 states
- EA-6Bs, F-14, A-6, TAV-8B, C-130, AH-64, M1 tanks, M113 family of vehicles
- Bradley Fighting Vehicles, small arms, and other weapon systems
- AV-8Bs at MCAS Cherry Point
- EP-3Es-16 flightline dehumidification carts
- 6 shelter systems at SPAWARSYSCEN Charleston

Benefits

- Preserves equipment in less than 5 minutes without modification
- Reduces maintenance requirements and increases personnel efficiency
- Eliminates moisture induced corrosion of metals that currently costs the U.S. almost \$300 billion per year
- Exceeds 8 to 1 cost benefit ratio for long-term preservation

LogisTech, Inc.

LogisTech, Inc. has increased their number of employees during the SBIR period from 10 to over 95. The company's demonstrated ability to produce a sophisticated, affordable system that meets the needs of maintenance and material management has attracted attention from other services, at least one foreign government, and the commercial sector. For more information, contact Frank Travis by telephone at (703) 921-1038 or visit the company's website at www.logis-tech.com.

Software that Makes Computer Code Upgrades More Affordable



The Navy has invested more than \$100M in graphical sonar signal processing application specifications for AN/UYS-2 sonar. Unless the graphical specifications can be reused, porting this code base to COTS processors would require redevelopment at today's software costs. Management Communications and Control, Inc. is capturing AN/UYS-2 graphical application specifications with the Autocoding Toolset in an effort to save the Navy millions. The DoD now has a tool to reuse this code base on COTS multi-processors without costly redevelopment.

Ready For Use With

- AN/UYS-2-based specifications
- Joint Strike Fighter code
- Satellite applications

Benefits & Applications

- Demonstrated a 10-fold reduction in cost to implement a SAR application relative to hand optimized coding
- Supports sonar, radar, C4I, imagery, and other computationally intense software
- Purchased by Lockheed Martin Astronautics for use in satellite applications
- Reduction of development costs by an order of magnitude for system developers with computationally intense embedded applications
- Further reduction in life cycle support costs
- Productivity gains make otherwise unaffordable software developments possible.
- Permits expensive code to be reused on commercial off-the-shelf systems

NAVY TOPIC: N94-165 (ONR)



Processed output from the SAR benchmark which was autocoded using MCCI's toolset

MCCI was awarded a \$4.8M contract in 1998 to upgrade the Passive Sonar System for the Navy's new Attack Submarine Program.

SBIR Investment: \$759K

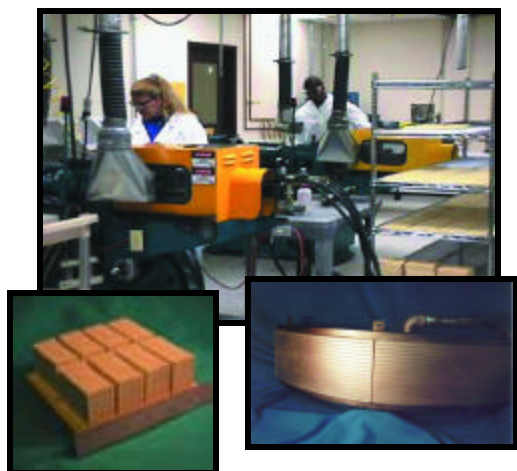
Project Revenues \$4.9M

Projected Annual Revenues: \$5-10M

Management Communications & Control, Inc.

Management Communications and Control, Inc. has focused on signal processing programming tools since their 1986 founding. The company develops and delivers data flow graph-based signal processing automatic code generation tools for the U.S. Navy. For more information about MCCI, contact Christopher B. Robbins at (703) 522-7177, or visit the website at www.mcci-arl-va.aa.psiweb.com.

NAVY TOPIC: N93-037/N95-083 (ONR)



MSI's manufacturing process
producing a projector array

These SBIR awards have enabled MSI to bring high performance, low cost injection molded 1-3 piezocomposite technology to Navy sonar and commercial medical ultrasound applications.

SBIR Investment: \$1.2M

Project Revenues: \$7.3M

Projected Annual Revenues: \$12.5M

Cost Effective Manufacturing of Transducer Materials for Sensors



The U.S. Navy has identified 1-3 piezoelectric ceramic-polymer transducer material as a key to improved performance and reduced cost of both Navy and civilian acoustic systems. These materials are used in 3-dimensional ultrasonic imaging, including medical diagnostics, nondestructive testing, undersea surveying, and in sonar systems used for detection, identification and classification of ships, objects, and mines. Materials Systems, Inc. (MSI) has developed an improved high volume injection molding process that greatly reduces the expense of manufacturing these materials in commercial quantities. They licensed some of this technology to a Fortune 500 company that expects sales to exceed \$100 million over the next several years. MSI used the proceeds from this license to scale up its internal piezo-composite transducer manufacturing capabilities and to help qualify the company's products for use in DoD and commercial sonar systems.

Applications & Benefits

- Large area arrays for submarine and surface ship sonar operating in <10kHz to >1MHz range
- Mine hunting sonar for a United Kingdom application
- Commercial injection molded and multi-layer piezoceramic (MSI-53HD) for use in medical ultrasound system
- Production of injection molding tools at less than one tenth the cost of conventional tooling
- Allows for forming the element array prior to composite assembly

Materials Systems, Inc.

Materials Systems' expertise in low cost ceramics injection molding technology has made them a leader in the production of highly sensitive piezoelectric composites. The new tooling techniques developed through participation in the SBIR program have not only enabled MSI to avoid the massive costs of conventional injection molding, but have given the company the ability to tool up rapidly and inexpensively. For more information, contact Carr Lane Quackenbush at (978) 486-0404 or by e-mail at ideas@matsysinc.com or visit the website at www.matsysinc.com.

Better Tracking of Military Systems During Training, and Test & Evaluation



When the DoD performs training exercises and tests new weapon systems, the location and movement of all the systems must be continuously tracked. This provides situational awareness during the mission for the pilots, those on the ground, and the range operation center. It also allows for analysis of the data after the mission. The R3 Ranging and Datalink Transponder is a compact, reliable transponder that provides the tracking and continuous feedback for these training missions and the test and evaluation of new systems. It provides a reliable communications hub of up to 200 miles for a single hop and up to 600 miles using up to three levels of relay.

Applications

- Over 450 R3 units are currently in use on DoD test and training ranges.
- The French Government contributed more than \$1.1 million toward modification to use the R3 on French ranges.
- Navy Extended Air Test System at Point Magu uses the R3 for tracking during testing and evaluation.
- Atlantic Underwater Test and Evaluation Center (AUTEC) uses the R3 for undersea warfare training and evaluation.
- Taiwan has purchased R3 transponders for one of its offshore test ranges.

Benefits

- Provides exercise control, range safety, and exercise reconstruction
- Can be installed on ships, fixed wing aircraft, rotary wing aircraft, target drones, and ground stations
- Improves transfer of important military information, vehicle position data, and specific vehicle data to a ground, airborne, or surface portable master station where the information is displayed in real-time

Microcom, Division of L-3 Communications Corporation

Microcom, founded in 1976, was acquired by Loral in 1995, Lockheed Martin in 1996, and L-3 Communications Corporation in 1997. Microcom has considerable expertise in airborne telemetry, data acquisition, video compression, and data links. For more information, contact Ralph Fratta at (619) 279-0411 ext. 3566, by e-mail at Ralph@conic.lmco.com or visit the company's website at www.L-3Com.com.

NAVY TOPIC: N88-226
(NAVAIR/NAWCMUGU)



**R3 enhances
range operations**

**The R3 transponder
is serving the United
States and allied forces
around the world with
over 450 units sold for
more than \$17M in
total sales.**

SBIR Investment: \$934K

Project Revenues: \$30M

**Projected Annual
Revenues: \$2M**



**FlexPDMS
ground station
and the
unmanned
aircraft it
controls**



Mission Research received a \$17.2M award from the DoD which uses the SBIR developed data management system to test and verify how well a radar system identifies various targets and threats.

SBIR Investment: \$667.6K

Project Revenues: \$14.3M

**Projected Annual
Revenues: \$1-4M**

Keeping Our Pilots Out of Harm's Way



Mission Research Corporation has developed a system that can manage all the sensors on a manned or unmanned aircraft from the ground. The Flexible Payload Data Management System (FlexPDMS) is a rugged hardware and software system that has been integrated on aircraft and in a payload ground station, and has been successfully deployed in several field operations. The system collects data in real-time and controls a wide range of sensor suites, monitors the health of the aircraft, and then uses a SATCOM telemetry system to provide a command and control link to the ground station. This system allows the military to fly missions in hostile areas and to collect data all while keeping our warfighters out of harm's way. It is ideal to support DoD field operations that may require long-range and/or low altitude flight missions.

Now Used By

- The Navy and Marine Corps during Fleet Battle Experiments
- U.S. Navy/Air Force Generic Radar Target Generator
- Naval Postgraduate School
- California Institute of Technology

Benefits

- Real-time data collection, management, telemetry, processing, and display capabilities
- Near real-time remote sensor command and control
- May be used with piloted or unpiloted aircraft
- SATCOM system allows over-the-horizon command, control, and data telemetry.

Mission Research Corporation

Mission Research Corporation, founded in 1970, is a highly diversified research and development firm with extensive technical and scientific expertise. Some of the company's clients include the Army, Navy, and Air Force as well as the Defense Threat Reduction Agency, DARPA, NASA, and the Department of Energy. For more information, contact Dr. Mark D. Fisk, (703) 339-6500 or visit the company's website at www.mrcsb.com.

Sampling Aerosols



The Navy and scientific partners can sample marine aerosols using an aircraft equipped with an MSP particle sampler, which is a high-flow-rate cascade impactor that collects particles within the respirable particle range in five size fractions. Eight of these impactors are packaged in an aircraft-sampling pod that allows samples to be taken from several locations in the atmosphere during one flight. The ability of the sampler to fly on an aircraft allows the Navy to relate atmospheric conditions more closely to marine aerosol chemistry. The cascade impactor or particle sampler, developed under this Navy SBIR, enabled MSP to devise a state-of-the-art cascade impactor suitable for the assessment of inhalable therapeutic aerosols such as asthma drugs. Impactor testing is already one of the methods required by the U.S. Pharmacopoeia to certify the reproducibility of inhalable drug forms. In the near future, many pharmaceuticals will be delivered directly to the lungs through inhalable, repeatable dose devices. MSP's impactor may become the standard for the pharmaceutical industry worldwide.

Applications

- Used by 14 pharmaceutical companies for R&D of inhalable, repeatable dose therapies
- Pharmaceutical research and production
- Installed on the Navy's *Pelican* aircraft used in Urban Warrior exercises in Monterey, CA
- Research into air quality, indoor and outdoor air pollution, air chemistry, and climate studies
- Environmental sampling

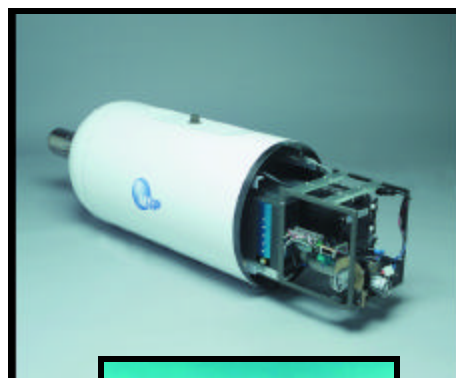
Benefits

- Lightweight precision sampling from aircraft
- Precise measurement of environmental aerosols
- Size distribution analysis of aerosol drug delivery systems

MSP Corporation

MSP Corporation is an applied aerosol/particle technology company that provides solutions to problems involving the generation, deposition, sampling, and measurement of small airborne particles in the 0.01 to 100- μ m diameter range. MSP has doubled the number of their employees and tripled their annual revenues since the beginning of this SBIR award in 1996. For more information, contact Daryl L. Roberts at (612) 379-3963, or visit the company's website at www.msppcorp.com.

NAVY TOPIC: N96-150 (ONR/NPS)



**Lightweight,
low-power cascade impactor for
aircraft sampling**

**MSP anticipates initially
selling 100 cascade
impactors to sponsors,
with additional sales of
250 impactors per year
for the next 20 years.**

SBIR Investment: \$545K

Project Revenues: \$950M

**Projected Annual
Revenues: \$2M**

NAVY TOPIC: N83-107 (NAVAIR)



IR-2000 Optical Hygrometer

**The Optical
Hygrometer has
been transitioned
into the Pilot
Alert System
installed on all
B-2 bombers.**

SBIR Investment: \$491K

Project Revenues: \$8.7M

**Projected Annual
Revenues: \$6M**

Fast & Accurate Humidity Measurement



OPHIR Corporation's IR 2000 Optical Hygrometer directly measures absolute humidity in harsh environments. It features wide range, high absolute accuracy, and great responsiveness, and is now commercially manufactured and sold worldwide. The IR 2000 technology has been combined with other SBIR projects for the development of a sensor that detects aircraft condensation trails. OPHIR's Pilot Alert System is the only lidar system currently on all full production B-2 bombers and has resulted in over \$30M in sales.

Applications

- Pilot Alert Systems installed in all full production B-2 *Spirit* stealth multirole bombers
- Important research tool for meteorological observations, boundary layer meteorology, cloud physics, airborne research, and related fields

Benefits

- Applicable to water vapor measurements in industrial gases, measuring humidity in clean rooms, and use as an integrated part of a process control system
- Suitable for harsh environments where conventional humidity sensors commonly fail or in situations where reliable, low maintenance, fast response is required
- Unattended operations eliminate costly monitoring
- Zero hysteresis
- No required aspiration
- Sustained operation above saturation
- Drift-free operation using dual wave-lengths
- Automatic correction for dirt and water on the sensor windows

OPHIR Corporation

OPHIR Corporation's critical expertise in atmospheric humidity instrumentation and the dynamics of the formation of condensation trails behind aircraft have made them the sole-source supplier (and U.S. Patent holder) for instrumentation to detect aircraft condensation trails. Founded in 1980, the company has shown substantial growth in the high technology arena. OPHIR Corporation received the Key Plan Delegated Source Inspection Award from Northrop Grumman Military Aircraft Systems Division for "sustained excellence as a supplier of quality products." For information, contact Joni Pino at (303) 933-2200 or visit the website at www.ophir.com.

Hands-Free Mobile Video Monitor



Developed by OPTICS 1 from their original helmet-mounted night vision goggle simulation device, the PT-01 Head-Mounted Display brings a new level of portability and mobility to a wide range of military and industrial applications. Incorporating commercial liquid crystal displays, a proprietary optics design, and innovative ergonomics, the PT-01 puts large-screen color video in sight while leaving the wearer an unobstructed view of the work at hand. The patented device minimizes fatigue and eyestrain. The PT-01 has already proved its worth on the C-17 production line, where inspection teams use it to eliminate foreign object damage in the final stages of production.

Now In Use At

- Naval Air Weapons Center China Lake
- Naval Air Weapons Station Point Mugu
- Eglin, Vandenberg, Edwards, Arnold, and Davis-Montham Air Force Bases
- Kennedy Space Flight Center
- Sandia National Laboratory
- Lawrence Livermore National Laboratory
- Boeing Company (C-17 program)

Applications

- Remote visual inspection
- Maintenance
- Law enforcement
- Medicine
- Mobile computing
- Film and television production

NAVY TOPIC: N89-186/N91-236 (NAVAIR)



PT-01 low cost head mounted display

**The PT-01 recently
appeared in the movie
Titanic, being used by the
operator of the remotely
piloted submarine.**

SBIR Investment: \$559K

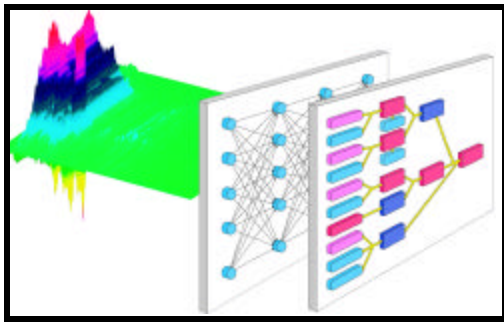
Project Revenues: \$2M

**Projected Annual
Revenues: \$1.67M**

OPTICS 1, Inc.

OPTICS 1, Inc. has successfully commercialized their head mounted display and is introducing a new high-resolution model at the turn of the millennium. The company combines optical and opto-mechanical design and engineering services to provide lens systems from prototype through production in visible, infrared, and ultraviolet wavelengths. OpTechs, a newly named division, specializes in head mounted displays such as the PT-01. For more information, contact Tim Jordan at (805) 373-9340, or visit the company's website at www.optics1.com.

NAVY TOPIC: N90-154, 162 (NAVSEA)



RIPPEN[®]
Signal
Processing
Development
Tool and
torpedo



**Raytheon states
that their cycle time for
initial missile
development has
been reduced from
36 months to 12 months
by using ORINCON's
RIPPEN[®].**

SBIR Investment: \$546K

Project Revenues: \$2.7M

**Projected Annual
Revenues: \$6M**

Better Signal Processing Software



Originating with a Navy requirement for detection and classification of new generations of ultra-quiet torpedoes and submarines, ORINCON's Real-Time Interactive Programming and Processing Environment (RIPPEN[®]) has shown its utility in areas as diverse as missile guidance and marine mammal observation. RIPPEN[®] provides a graphical programming environment for design, prototyping, implementation, testing, and operation of signal processing and information analysis software. It uses a hierarchy of neural networks and high-speed parallel computing to perform classification of targets impossible to classify with a single neural net.

Software Developed With RIPPEN[®]

- Installed aboard U.S. Navy *Los Angeles* and *Ohio* class submarines
- Used by Raytheon under the DARPA Affordable Multiple Missile Manufacturing Program
- Used in sonar systems under development by Thompson-Marconi for the United Kingdom

Benefits & Applications

- Antisubmarine warfare software developed with RIPPEN[®] improves processing of acoustic transients.
- Permits development of complex, real-time embedded software for defense application
- Permits faster development of image and signal processing software for target detection, identification, and tracking—shown to reduce development times by an order of magnitude
- Multi-platform (IBM and Macintosh) compatibility

ORINCON Corporation

ORINCON's software design toolkit is being used to benefit Navy, Army, and Air Force signal processing software. For 20 years, they have dedicated themselves to solving complex problems involving signals, images, information, and computers. The company has grown into a leader in the design, development, and evaluation of signal processing, communication, navigation, artificial intelligence, and tracking systems. For more information, contact Dave Whitmoyer at (619) 455-5530, ext. 223 or visit the website at www.orincon.com.

Seeing Problems Before They're Problems



NAVY TOPIC: N91-297 (ONR)

At some point in time, all mechanical systems fail. Being able to predict when the system will fail is of obvious importance to the DoD and private sector. ORINCON Corporation has developed automated computer-based systems for machinery health monitoring and fault prediction. These systems use vibrational patterns to assess progressive damage in rotating machinery and predict the potential for mechanical failure. This type of system can help save lives, reduce failures, and reduce maintenance costs by catching problems before regularly scheduled maintenance.



PCMCIA vibration acquisition system connected to existing on board cables and sensors

Benefits & Applications

- Used in AH-64 *Apache* and VH-60A *Blackhawk* helicopters
- Improved aircraft maintenance permitted by this system will:
 - Improve aviation safety
 - Increase aircraft availability
 - Enhance aircraft reliability
 - Reduce operations and maintenance costs
- Portable system offers greater flexibility and cost savings when compared to built-in systems in each aircraft.
- Commercial and general aviation applications
- Technology can be extended to any high-speed rotating machinery, like gas turbines for power generation

**Currently used
for vibration
management on
U.S. Army AH-64
Apache attack
helicopters**

SBIR Investment: \$49K

Project Revenues: \$2.9M

**Projected Annual
Revenues: \$8M**

ORINCON Corporation

ORINCON Corporation has successfully transitioned many SBIR-funded efforts into military and commercial products in areas such as environmental protection, drug control, health care, education, transportation, energy, and waste management. The company's employment and revenues have grown continuously at a rate of 20% for the last 5 years. For information, contact Dave Whitmoyer at (619) 455-5530, ext. 223, or visit the website at www.orincon.com.

NAVY TOPIC: N90-101
(NAVAIR/NAWCAD)



Digital image collected from
an altitude of 3044 feet

**A PSR-developed
specialized signal processor
digital camera was used
in April and September of
1996 during the U.S. Open
Skies Follow-on Sensor
Evaluation Program.**

SBIR Investment: \$677K

Project Revenues: \$2.3M

**Projected Annual
Revenues: \$2M**

What's Going on Down There?



Military aircraft often need to identify and monitor activity on the ground below them. The Common Aperture Multispectral Sensor, or CAMS, is a line-scanning sensor that simultaneously collects digital imagery over the far-infrared and visible spectral bands. Pacific-Sierra Research (PSR) has successfully transitioned image sensor technology research, initially sponsored by the F/A-18 Project Office, to the commercial marketplace. This unique processor converts a film-based AN/AAD-5 infrared reconnaissance camera to a fully digital system. PSR produced the system for Northrop-Grumman California under the sponsorship of the Defense Special Weapons Agency. The German Open Skies Program also uses the processor through a contract with Daimler-Benz Aerospace. Talks are under way with other nations (including Turkey, Greece, Japan, and Australia) for purchase of both the Open Skies and tactical versions of PSR's AN/AAD-5 upgrade system.

Now In Use Aboard

- Open Skies surveillance aircraft
- AN/AAD-5(RC) tactical airborne reconnaissance system

Benefits & Applications

- Immediate data availability, even in flight, due to digital format
- Improved performance, reliability, and affordability over wet film
- High resolution, multispectral performance for reconnaissance, treaty verification, and confidence building

Pacific-Sierra Research (An Operating Company of Veridian)

Pacific-Sierra Research, now an industry leader in advanced image sensor technology, transitioned out of the SBIR program after being purchased by Veridian Corporation in 1998. For more information, contact Till Liepmann at (310) 314-2385 or visit the website at www.psrw.com.

Passing Along The Light



Physical Optics Corporation has developed the Universal Remote Lighting system (URL), a highly efficient fiber optic lighting system ideal for use on ships, on airport runways, and in hazardous areas. Typical lighting systems aboard ships require frequent maintenance, operate poorly in corrosive environments, and require wiring and electricity at the light source. The system, developed by Physical Optics, runs a plastic fiber optic cable to a diffuser or luminator where the light is needed and the electronics are maintained in a protected environment.

Applications

- Used aboard *USS Porter* (DDG-78) for all navigation, signal, and task lighting, as well as visual landing aids and topside lighting
- Purchased by Ingalls Shipbuilding for installation on new guided missile destroyers
- Used as obstruction lighting, hazardous area lighting (explosive-load-and-pack facilities, paint booths, and toxic waste sites), and airport approach lighting
- Considered for use on LHD7 (large area well deck lighting), *USS Ronald Reagan* (CVN-76) and its sister CVN-77, and retrofits for earlier Nimitz-class carriers

Benefits

- Life cycle and maintenance savings complement the significant safety and low profile light emission advantages.
- Universal Remote Lighting (URL) systems reliably and efficiently deliver light from distant sources via low-loss plastic fibers.
- Systems can simultaneously control intensity distribution across the lighting pattern, vertical and horizontal shape of the light pattern and its cut-off, light color, and precise optical dimming.

Physical Optics Corporation

Physical Optics Corporation launched FarLight Corporation in 1996 as a spin-off company in order to exploit the enormous market potential of URL technology. This technology spawned a unique product portfolio, earned considerable revenue, and created 10 new jobs for highly skilled workers. For more information, contact Joanna Jansson at (310) 320-3088 or visit the company's website at www.poc.com.

NAVY TOPIC: N91-102 (NAVSEA)



Fiber optic
lighting
system used
aboard the
USS Porter
(DDG-78)



**FarLight now has
facilities for the design,
fabrication, and testing of
optoelectronic hardware
systems, subsystems, and
components as well as
for full beam-former
fabrication and testing.**

SBIR Investment: \$544K

Project Revenues: \$1.9M

**Projected Annual
Revenues: \$35M**

NAVY TOPIC: N90-176
(NAVAIR/NSWCDD)



Aircraft inspection using the MOI 307

Military and commercial aircraft are being pushed to extend their designed service life. The MOI system can rapidly identify defective areas in the skin, helping to avoid a potential catastrophe.

SBIR Investment: \$399K

Project Revenues: \$1.92M

Projected Annual Revenues: \$800K

Seeing the Metal Under the Paint



The Magneto-Optic Imaging (MOI) system, developed by PRI, lets aviation technicians get reliable, accurate images of an aircraft's metal skin, enabling them to detect cracks and corrosion beneath paint and other surface coatings. This new technology for nondestructive inspection is essential to the safe operation of any aging aircraft fleet. It uses a magneto-optic sensor to produce real-time images of defects in ferromagnetic and non-ferromagnetic metals. The MOI displays cracks and corrosion as visual images on a heads-up display or a video monitor. Probability of Detection studies at Boeing and Sandia National Laboratories show that PRI's MOI 303 is as reliable as eddy current probes. It's also faster and easier to use, reduces operator fatigue, and thus, enhances accuracy.

Applications

- Military aircraft: B-52 heavy bombers, KC-135 tankers, C-141 transports, P-3C maritime patrol aircraft, and C-2 carrier onboard delivery transports
- Civilian aircraft: all Boeing airliners, Gulf Stream executive transports, and Bombardier transports
- Used by American, United, Singapore, and CanadaAir Airlines; NASA; Mobil Aerospace; and Lockheed Martin

Benefits

- Improves both military and civil aviation safety
- Lightweight and portable
- Requires minimal training to operate
- Reduces surface crack inspection time by a factor of 10 or more

PRI Research & Development Corporation

PRI's focus is on research and development of new, innovative products marketed through strategic partnerships and licensing arrangements. The company's areas of technical expertise include high-speed electronics, specializing in wireless applications, and nondestructive inspection, specializing in magneto-optic imaging. The MOI system was developed through multiple SBIR awards from several federal agencies with over \$8M in total sales shared across all SBIR investments. For information, contact Sandra Simms at (310) 378-0056 or visit the website at www.pri-rnd.com.

Measuring Water Currents



When planning missions and adjusting sensors, the Navy needs to be able to accurately measure water currents. This capability is particularly important for near shore and mine detection operations. Through this SBIR, RD Instruments developed a line of inexpensive Broadband Acoustic Doppler Current Profilers (ADCP) for this purpose. ADCPs are used worldwide by military and civilian oceanographic communities and by the oil industry to measure water currents in oceans, estuaries, lakes and rivers. Systems have also been developed to provide navigation information to unmanned and manned underwater vehicles. The company offers a commercial product line and a body of technical expertise that can be adapted to meet a wide variety of needs the Navy may have in the future.

Applications

- Being used on Seal Delivery Vehicles
- Planned for installation on all Minesweepers
- Used on REMUS, a UUV system
- Used by Woods Hole Oceanographic Institute, Scripps, Shell Oil, and various foreign governments
- Available for shipboard, buoy, platform, and autonomous vehicle applications

Benefits

- More precise than conventional narrow bandwidth Doppler sonars
- Small, robust, and affordable current profiling sensors
- Significant reduction in systematic errors
- Shorter averaging times, resulting in fewer pings and less drain on batteries
- Finer depth resolution for a profile of the water column
- Factor of 50 to 100 improvement in velocity variance over conventional systems

RD Instruments (RDI)

RD Instruments' participation in the SBIR program has allowed the company to generate huge revenues from products developed and to maintain a higher level of technical expertise than would have otherwise not been possible through commercial sales alone. An associated company, MGD Technologies, Inc., is applying RDI's Doppler technology to channel flow measurement for use in pipes and sewer systems. For information, contact RD Instruments' sales department at (619) 693-1178, or visit the website at www.rdinstruments.com.

NAVY TOPIC: N85-003 (ONR)



The Workhorse Family of low cost, BroadBand Acoustic Doppler Current Profilers

RD Instruments has transitioned this SBIR to sales of over \$60M for the Broadband and Workhorse Acoustic Doppler Current Profilers.

SBIR Investment: \$531K

Project Revenues: \$60M

Projected Annual Revenues: \$12M

NAVY TOPIC: N86-086 (NAVAIR)



SEI's Durachute Thinpack emergency bailout parachute (left), compared to the old NB-8 parachute of the U.S. Navy (right)



Better Parachutes



Safety Equipment Inc. (SEI), a subsidiary of Simula, Inc., has developed an environmentally-sealed parachute system that increases safety and readiness while reducing maintenance requirements. The vacuum-sealed parachute uses patented technology and has attracted the interest of both aviators and airborne troops. This Navy SBIR has

drawn attention and contracts from the other services as well. The Air Force is currently evaluating it as a replacement for the parachute used on the C-130, with possible adoption for several other aircraft. The parachute for the Navy E-2C community also includes a life raft, survival kit,

and bailout oxygen kit incorporated into the parachute pack.

The Navy has awarded SEI a \$9.8M contract and has already purchased thousands of parachutes developed under this SBIR.

SBIR Investment: \$550K

Project Revenues: \$2.3M

Projected Annual Revenues: \$2.5M

Now Used By Aircrew Aboard

- P-3C *Orions* (2950 parachutes)
- E-2C *Hawkeyes* (168 parachutes)
- Currently tested for Air Force C-130

Benefits & Applications

- Smaller and lighter than conventional parachutes (17 lbs. vs. 25 lbs.)
- Hermetic seal significantly extends storage life and decreases repacking frequency.
- Usable by both men and women
- Single, adjustable chest strap permits quick donning

Safety Equipment Inc. (SEI)

Safety Equipment Incorporated has grown from a business that employed 12 people in 1996 to a thriving 150-employee corporation by 1999 and is well on the way to becoming an industry leader. During those three years, the company also increased manufacturing space by a factor of ten. For more information about SEI or the parachute system, contact Barry Shope at (828) 277-1979 or visit the website at www.simula.com.

Tracking Your Assets



Asset management has been an expensive, time-consuming concern that has long plagued the military. This was especially evident during the Gulf War when this task often required the opening of crates to determine the contents, or in many cases the reordering of supplies because they could not be located. If SaviTag had been available during the Gulf War, the U.S. could have saved an estimated \$2 billion. The Savi Asset Management System consists of a radio frequency identification (RFID) tag, a cell-phone sized interrogator that extracts information on the contents from the radio tag on the container, and a software system that shares the information over a networked database. Toyota has installed the Savi system to speed the entry, unloading, and departure of hundreds of truck deliveries per day, helping to manage the company's "two-hour-just-in-time" system. Savi won the 1994 SBIR Technology of the Year Award for this effort.

Now Used

- By defense Total Asset Visibility Office (JTAV), with Army, Navy, and Air Force participation
- Operationally in Kosovo, Bosnia, Somalia, and Haiti
- By a major Texas based computer manufacturer and retailer
- By the U.S. Postal Service
- At Toyota's Kentucky plant

Benefits

- Tracks in-transit locations of shipments
- Permits any container or vehicle in a hub or port to be located by a personal computer
- Remotely determines and displays the contents of containers
- Aids in rerouting shipments
- Obtains inventories in real time
- Saves billions by preventing lost or duplicated inventories

Savi Technology, Inc.

Savi Technology, used the Navy's SBIR program to develop the Savi Asset Management System. Savi has also enjoyed considerable success at commercializing their technology with \$185 million in contracts with the Department of Defense for radio frequency identification-based technology. Commercial sales in 1998 alone were between \$5 and \$6 million. For more information about Savi Technology, contact Fraser Jennings at (415) 328-4323 or visit the website at www.savi.com.

NAVY TOPIC: N89-064 (NAVSUP)



A soldier uses SaviTag 410 to read the contents of a shipping container

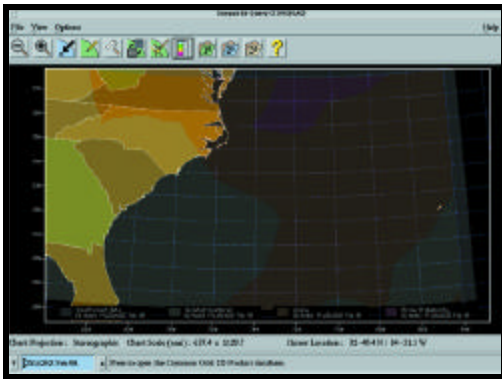
**SaviTag is now the heart
of the DoD's Total
Asset Visibility System
and is being used to
track DoD assets in and
out of Kosovo.**

SBIR Investment: \$2.5M

Project Revenues: \$65M

**Projected Annual
Revenues: \$40M**

NAVY TOPIC: N88-117
N91-124 (NAVSEA)



Xposure screen capture

**Xposure, developed by
Sonalysts under this
SBIR award, has been
incorporated into
wXstation™ and
has generated
combined sales
of over \$50M.**

SBIR Investment: \$545K

Project Revenues: \$5M
(%of Xstation™ Sales)

**Projected Annual
Revenues: \$15M**

Making a Complex Picture Clear



Xposure, developed by Sonalysts, Inc., is screen capture and presentation software that maximizes the power of UNIX-based systems for analyzing and briefing large amounts of complex data. Information and analyses aren't very useful until they're put into a clear, easily understood package. Xposure helps commanders achieve situational awareness through state-of-the-art software. This software allows UNIX operators to capture screen images that represent the results of analyses, organize the images into a briefing package, cut and paste images between briefings, present briefings manually or automatically, and convert images to a variety of other formats. The software is also provided as a module within Sonalysts' wXstation™ commercial weather analysis system, and has been sold as a stand-alone software package.

Now Used By

- U.S. Navy surface ships and submarines engaged in ASW operations
- U.S. Air Force and Special Operations Command
- United and Southwest Airlines

Benefits & Applications

- Usable with a wide range of UNIX systems and now included as a standard component in many Navy tactical decision aids
- Can be reliably appended to many military and commercial systems
- Enhances ability of Tactical Control Program (TCP) users to archive and present results of analyses

Sonalysts, Inc.

Sonalysts' participation in the Navy's SBIR program allowed them to expand their product line into the commercial market for high-end weather analysis systems. The expanded capability increased the value of the existing software and increased Sonalysts' market share. Support services sales are also providing substantial annual revenues. For more information, contact Robert D. Smith, Jr. at (860) 442-4355, ext. 403 or visit the website at www.sonalysts.com.

Software for Advanced Electrical Design



The L-Edit Pro™ is an affordable, technologically robust, yet easy to use software for design, simulation, layout, and verification of integrated circuit (IC), microelectromechanical systems (MEMS), and multi-chip module (MCM) applications. Developed by Tanner Research, it allows the designer to work across the spectrum of contemporary IC methodologies: analog, mixed-signal, digital, wireless RF, MCM, MEMS, etc. L-Edit Pro™ also reduces development time and cost, making exploration of high-risk, high-pay-off concepts more practical for all companies and allows smaller companies a better opportunity to be able to bid on DoD IC design requirements.

Now Used By Engineers At

- | | |
|----------------------|--------------------------|
| ■ AT&T | ■ IBM |
| ■ Boeing | ■ Martin Marietta |
| ■ DEC | ■ Motorola |
| ■ Ford Motor Company | ■ National Semiconductor |
| ■ General Electric | ■ Philips |
| ■ Hewlett Packard | ■ Siemens |
| ■ Honeywell | ■ Sony |
| ■ Hughes | |

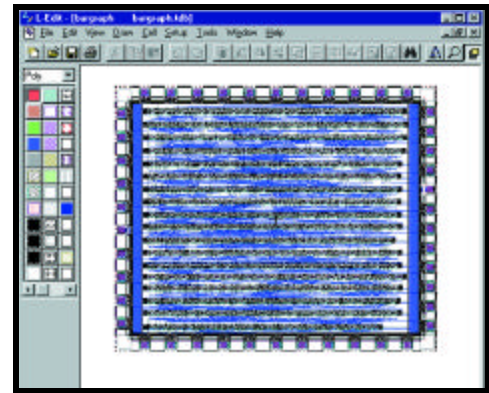
Benefits & Applications

- Reduces development costs of integrated circuits
- Permits exploration of high-risk, high-payoff prototype concepts
- Usable with chip layouts in more than one million devices
- Compatible with GDSII, CIF, and EDIF formats
- Runs on both PC and UNIX platforms.

Tanner Research, Inc.

Tanner Research specializes in software and hardware development and the development of tools for design, simulation, layout, and manufacturing of integrated circuits. The company has grown from 2 employees at the time of this SBIR award to 95 employees in 1999. Over 10,000 licenses have been sold in 35 countries and Tanner is on the 8th major release of L-Edit Pro™. For information, call Scott Wedge at (626) 792-3000, or visit the website at www.tanner.com.

NAVY TOPIC: N87-176 and
N89-161 (NAVAIR/NAWCWD)



Screen capture of Tanner
Tools' L-Edit Pro

**Originally released after
this first SBIR in
1988, Tanner Research
has sold over 10,000
licenses of L-Edit Pro™,
producing over \$17M
in revenues for
the company.**

SBIR Investment: \$199K

Project Revenues: \$17M

**Projected Annual
Revenues: \$3M**

NAVY TOPIC: N88-120 (NAVSEA)



Non-conductive coating for underwater connector backshells

**Texas Research
Institute/Austin, Inc. has
received official Notice of
Allowance and Issue Fee
Due from the Patent and
Trademark Office for the
Bond-Coat™ application.**

SBIR Investment: \$614K

Project Revenues: \$723K

**Projected Annual
Revenues: \$200K**

Keeping Bonds Intact



TRI/Austin, Inc.'s pioneering work in advanced materials has greatly enhanced the Navy's ability to deploy and operate reliable underwater sensors. Bond-Coat™ increases the reliability and life expectancy of underwater assemblies by coating the metal connector with a thin, electrically non-conductive layer. This layer increases adhesion between backshell and elastomer, which keeps the bond from coming apart because of seawater incursion.

Now In Use Aboard

- Surface ships and submarines throughout the fleet

Benefits & Applications

- Bond-Coat™ creates reliable bonds in harsh environments: 200% increase in product's service life in cathodic environments, 50% in non-cathodic environments.
- Cost savings of roughly 3 times typical life cycle cost
- Substantially reduces boot-bond failures
- Significant drop in underwater failures after adoption of the Bond-Coat™ process by the fleet in 1996
- Eliminates cathodic delamination common in installations with zinc cathodic protection
- Improves initial bond strength of the elastomeric boot material to the backshell
- Maintains bond strength at near-new levels for years
- Bond-Coat™ applications include underwater connectors, downhole assemblies, transducer housings, marine sensor packages, and critical rubber-to-metal bonds.

Texas Research Institute/Austin, Inc. (TRI Austin)

TRI/Austin, Inc. is Texas Research Institute's flagship company and conducts materials research and development projects for government and industrial clients. An international licensing agreement for the Asian market is currently under negotiation. For more information about TRI/Austin, contact Vince Newton at (512) 263-2101 or visit the website at www.tri-austin.com.

Reclaiming Old Explosives



Through several SBIR projects, TPL, Inc. has developed a variety of affordable and environmentally sound processes for reclaiming military explosives. The processes work on gun propellant, plastic explosives, RDX, and HMX. Not only are the processes environmentally friendly, safer, and more pleasing to the surrounding communities than storing explosive materials in stockpiles, but they actually generate revenue from the sale of reprocessed products such as fertilizer. TPL has built a plant at its Fort Wingate Demilitarization Facility and is now recovering a variety of explosives. The Tri-Service Demilitarization Technology Office has also funded TPL to build a mobile pilot facility that can be deployed to where the explosives are stored, avoiding the danger of moving these volatile materials.

Now Used By

- U.S. Army's Demilitarization Program
- Tri-Service Demilitarization Office
- U.S. Army Industrial Operations Command
- Talon Manufacturing Company, Inc.
- Slurry Explosives Company

Benefits & Applications

- Recycling explosives eliminates need to stockpile weapons, avoiding public safety concerns
- Cost effective and environmentally friendly reclamation
- Reclaimed explosives reprocessed into new weapons or commercial products
- Already saved the DoD over \$10M through explosive reclamation
- Recovered RDX and HMX used as perforating charges for oil wells
- Gun powder has been reclaimed into smokeless powders, gun propellants, and fertilizers
- Plastic explosives reprocessed into blasting agents for demolition

TPL, Inc.

TPL is one of the fastest growing companies in New Mexico and a leader in the field of energetic recovery and reuses. Through the SBIR program, the company has grown from one person to a thriving 85-employee company with more than \$7M in annual sales. For more information about TPL, Inc., contact the president, H.M. Stoller, at (505) 342-4412, or visit the website at www.tplinc.com.

NAVY TOPICS: N89-166, N91-104,
N92-095, N96-081 (NAVSEA/NSWCCRN)



TPL smokeless powder products derived from surplus gun propellant

TPL has developed a cost-effective, environmentally safe way to help the DoD dispose of the thousands of tons of explosives currently stockpiled across the nation.

SBIR Investment: \$1.5M

Project Revenues: \$48.2M

Projected Annual Revenues: \$10-15M

NAVY TOPICS: N87-254
(NAVAIR/NAWCPAX)



The Compact Environment Simulator

ViaSat's CCES system was used by the Navy and Air Force to ensure system performance in the Desert Storm and Kosovo conflicts.

SBIR Investment: \$1.25M

Project Revenues: \$64M

Projected Annual Revenues: \$5M

Affordable Testing & Training of Communication Systems



It is critical that our Nation's defense can accurately and quickly transmit information during air combat situations. One reason is the identification of another aircraft as friend or foe, something of great importance to the pilot. In recent conflicts like Desert Storm and Kosovo, this became even more complex because the communication was not only between various DoD component systems but also among our allies. Typically, these communication systems must be tested with live flights which are very expensive and making corrections at such a late stage of development is also costly. ViaSat's Compact Communications Environment Simulator (CCES) allows the DoD and allies to integrate, test, evaluate, and train these communication systems to ensure they work before a pilot is in combat. The DoD and major aerospace firms have awarded ViaSat more than \$60M for the CCES technology with a majority of the funding coming from the Central Test and Evaluation Investment Program (CTEIP) Office.

Applications

- U.S. Navy and Air Force Joint Communication Simulator
- Lockheed Martin purchased system to facilitate its in-house system integration, testing, and weapon system support.
- GTE, Inc. uses a derivative of CCES for advanced weapon and sensor system testing and evaluation.

Benefits

- Addresses concerns of availability, repeatability, controllability, and affordability over range tests
- Testing can be performed during system development so that changes are made early within the development life cycle
- Applicable across the life cycle of the system

ViaSat, Inc.

ViaSat, Inc. is exploring new markets and commercial applications for the following technology areas: cellular telephone network testing; satellite and complex network protocol testing; SIGINT/ELINT system integration and testing; and weapon and avionics system training and mission rehearsal. For more information about ViaSat, contact Jay Grove at (760) 438-8099 or visit the website at www.viasat.com.

Keeping Secrets Secret



Information security is vital not only to national security but also, as we live more of our lives in cyberspace, to the integrity of commercial transactions and the privacy of personal information. The Embeddable INFOSEC Product (EIP), developed by ViaSat, Inc., is a significant contribution to the art of securing information. Its combination of data security and diverse range of networking services makes this product unique in its field. The single 6U VME circuit board hosts a Type 1 encryption device integrated into a system that provides:

1. Numerous networking protocols (including TCP/IP, UDP, SNMP, ICMP, IGMP, DVMRP, Ethernet, LAP-B, and Multicast)
2. Full duplex operation at speeds up to T1 (1.544 Mbps)
3. Red side VME bus interface
4. Black side RS 422 serial interface

Now Being Integrated Into

- NATO Improved Link 11 (NILE)
- TACINTEL
- Advanced Digital Networking Systems (ADNS)

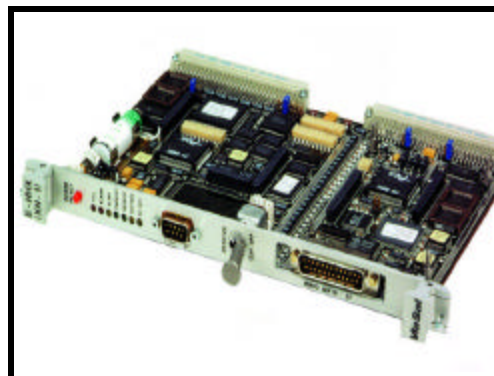
Benefits & Applications

- Easy integration into a system
- Reliability—mean time between failures in excess of 20,000 hrs.
- Electronic Key Management System (EKMS)
- Subscriber mode encryption services for workstation/computer systems
- Network encryption between local and wide area networks
- Data link mode encryption services for tactical TDMA networks, point-to-point links and high-speed, multiplexed data links
- Suitable for shipboard, airborne, shelter, or shore station (office) operations

ViaSat, Inc.

ViaSat, Inc., founded in 1986, designs digital signal processing and networking equipment for both the U.S. government and international commercial markets. Since 1994, ViaSat has received U.S. Navy funding for the EIP in excess of \$10 million. They were on the *Inc.* magazine 500 list of fastest growing companies in 1991, 1995, and 1996. They were also listed in 1997 as one of the "100 Best Small Corporations," by *Business Week*. For more information about ViaSat, contact Jerry Goodwin at (760) 438-8099 or visit the website at www.viasat.com.

NAVY TOPICS: N89-047
(SPAWAR/NCCOSC)



Embeddable Infosec Product (EIP)

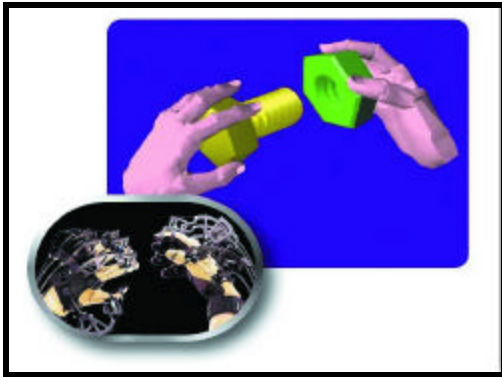
ViaSat is a company that started with the SBIR program and is now traded on the NASDAQ with a market cap of near \$147M and is a leading supplier of information technology to the DoD

SBIR Investment: \$515K

Project Revenues: \$10M

Projected Annual Revenues: \$3-4M

NAVY TOPICS: N96-T003 (ONR)



Grasp & arm force feedback system

**CyberGrasp™ was
named a 1998
Innovation of the Year
by *Computer Graphics
World* magazine and a
finalist for *Discover
Magazine's* prestigious
1998 Discover Award.**

STTR Investment: \$400K

Project Revenues: \$1.5M

**Projected Annual
Revenues: \$10M**

Virtually Hands-On



CyberGrasp™, a grasp and arm force feedback system, is a versatile and intuitive human-computer interface for use in 3D computer simulations and telerobotic applications. CyberGrasp™, developed by Virtual Technologies, Inc., can accurately measure the hand's position and exert individually programmable forces at the fingertips. Operators can "feel" telemanipulated objects as if they were manipulating real ones and can experience realistic force feedback through the most natural interface possible—the human hand. Although the company has still not completed the STTR contract, VTI has already sold 40 units. CyberGrasp™ promises to revolutionize the way humans interact with simulated 3D environments.

Now Used By

- U.S. Army (Threat Simulation Management Organization and TACOM)
- Air Force Human Effectiveness Directorate
- NASA (Ames, Johnson and Langley for training astronauts)
- NIST, Manufacturing Systems Division
- Lockheed Martin and Funuc Corporation, and Weizzman Institute of Science
- Stanford University, University of Pennsylvania, Washington State University and University of Osaka (Japan)

Benefits & Applications

- A whole-hand input device for use in simulation & training, telerobotics, mechanical CAD, and virtual reality applications
- Provides reduced training times, better dexterity, and enhanced safety
- Telerobotic applications such as underwater salvage operations, hazardous waste removal, oceanographic exploration, and telesurgery
- Allows computer-aided design (CAD) users to test and evaluate digital models for functionality, assembly/disassembly, and ergonomics, saving millions in product development costs

Virtual Technologies, Inc. (VTI)

Virtual Technologies, Inc., a Silicon Valley start-up founded in 1995, is a world leader in body-sensing and haptic feedback. The company just released VirtualHand Suite 2000, which allows for easy integration of CyberGrasp™ into third party applications. For more information about Virtual Technologies, contact the company's sales department via e-mail at sales@virtex.com, or by phone at (650) 321-4900 ext. 545 or visit the website at www.virtex.com.

Breathing New Life into Legacy Systems



Most computer electronics become obsolete within 18 months, but many DoD weapon systems are operated for over 30 years. This makes the process of providing spares for the electronics of these weapon systems very difficult and expensive. VisiCom (now Titan VisiCom) has a solution to the problem of computer hardware component obsolescence that involves capturing hardware functionality in a programmable device. This rehosting replaces electronic hardware's form, fit, and function at the modular level. Because the process captures hardware functionality in a technology-independent presentation, the new modules can be easily redesigned into new electronic modules and even have their functionality expanded. VisiCom calls this process "retargeting" and they have already successfully "retargeted" over 100 different electronic modules in several different military and OEM commercial systems. In most of these applications, one higher performance board replaces 10 to 40 older more expensive boards.

Used to Upgrade

- AN/UYK-44(V) Militarized Reconfigurable Computer
- AN/SPS-67 Surface Search Radar System
- NATO *Sea Sparrow* Target Acquisition System

Benefits

- Reduces the cost of spares by an order of magnitude
- Reduces the number of spares that need to be stored in inventory
- Can increase performance of system or free up space and weight for additional capability
- Allows the use of commercial off-the-shelf electronics to replace outdated military boards
- Avoids being locked into one supplier and greatly increases number of vendors that can supply hardware to the DoD

NAVY TOPIC: N96-001 (ONR)



Visicom's programmable board replaces over 30 existing boards on the *Sea Sparrow* Target Acquisition System.

VisiCom has been awarded over \$75M in Phase III contracts with the Navy to rehost many legacy weapon systems with improved, cheaper electronics hardware.

SBIR Investment: \$819K

Project Revenues: \$7.7M

Projected Annual Revenues: \$12M

VisiCom, A Titan Company

VisiCom is a hardware and software product innovator, value-added reseller, and systems engineering company. A deep technical expertise in programmable logic has been maintained by the company's participation in the SBIR program. Acquired by the Titan Corporation in 1998, VisiCom provides state-of-the-art hardware rehosting. For more information, contact Robert A. Holmes at (619) 457-2111, or visit the company's website at www.visicom.com.



Exploded view of feed region of the SMM antenna/phase-shifter showing PIN diode switches

The Navy has given WEO a \$1.8M contract, with a \$2.6M option, to develop an advanced photonically controlled broadband array.

SBIR Investment: \$638K

Project Revenues: \$2.2M

Projected Annual Revenues: \$750K

Low Cost Antenna Modules



Wang Electro-Opto Corporation (WEO) has developed a low cost antenna module for broadband and multiband phased array applications. This technology has been incorporated into what is currently the only low profile, platform compatible, structurally embedded antenna with a multi-octave bandwidth. The patented integrated spiral-mode microstrip antenna/phase-shifter gives this thin, rugged, low-cost module its distinctive characteristics. The module is adaptable to commercial products for GPS, mobile and personal satellite communications, cellular phones, wireless LAN, PCS, etc.

Now In Use On

- GPS and GLONAS (Russia's GPS system) receivers

Benefits & Applications

- Broadband—operates over 10:1 frequency range
- Low profile, with easy conformability to mounting surfaces
- High efficiency and multifunctional
- Polarization and pattern diversity alleviate multi-path fading
- Ultrawide continuous bandwidth phased arrays (time-division subbanding)
- Ultrawide instantaneous bandwidth phased arrays (subarray technique)
- Low cost multiband multifunction arrays to replace several arrays
- Retrodirective jamming against threat radar of unknown frequencies
- Digital modulation using phase shift keying (PSK) techniques for wireless communication systems with frequency agility and polarization diversity

Wang Electro-Opto Corporation (WEO)

Wang Electro-Opto Corporation has considerable technical expertise in the areas of photonically controlled phased arrays, broadband phased arrays, true-time delay (subarray technique), and photovoltaic control of RF switches. A spin-off company, Wang Electro-Opto Enterprises, was launched to tackle the global wireless market. For more information, contact Greg T. Thompson at gtthompson@weo.com, (770) 955-9311 or visit the website at www.weo.com.

Affordable Manufacturing of High Tolerance Composite Molds



Zivko Aeronautics, Inc. has developed an advanced manufacturing process that permits rapid development of lightweight, accurate molds. This process enables the manufacture of affordable, close tolerance composite structures for high performance aircraft and offers a solution to a perennial problem in instrumentation: packaging multiple instruments together in a way that permits each instrument its necessary inputs. Zivko's instrument fairing uses advanced composites and innovative manufacturing techniques to hold down weight and cost. It allows easier instrument change-out, more diverse payloads, and better sampling. The fairing system has shown its value aboard the *Pelican* during experiments like Urban Warrior, when it enabled the Navy to evaluate UAV concepts safely and affordably, exploring UAVs' ability to meet a commander's need for timely meteorological and oceanographic data.

Now Used to Produce

- *Pelican* Optionally Piloted Vehicle, currently being used by the Fleet
- Zivko's Edge 540-T aerobatic aircraft

Benefits & Applications

- Edge 540-T aerobatic aircraft offers an affordable option for aerobatic screening and training at a flyaway cost of \$192K.
- Optionally Piloted Vehicles offer safety, including ability to operate over urban areas, flexibility, reliability, and realism in the operational testing of UAV concepts.

NAVY TOPIC: N96-150 (ONR)



Zivko produced the modified
nose cone on the *Pelican*

**The *Pelican* Optionally
Piloted Vehicle,
developed in part by
Zivko, was used to test
Unmanned Aerial
Vehicle (UAV)
deployment
concepts during Fleet
Battle Experiment Echo
off the California
coast in 1999.**

SBIR Investment: \$400K

Project Revenues: \$735K

**Projected Annual
Revenues: \$1.8M**

Zivko Aeronautics Inc.

Zivko Aeronautics Inc.'s participation in the SBIR program helped the company develop innovative ways of fabricating master models and molds. The technology was used in the Edge 540-T aircraft and confirmed orders for the aircraft exceeded \$960K in only months. The technology is also being used by other projects that Zivko is currently working on for the DoD and the private sector. For more information, contact William S. Zivko at (405) 282-1330, or by e-mail at zivko@ionnet.net, or visit the website at www.zivko.com.

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For information on the Navy SBIR Program,
see the Navy SBIR Website at
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or the ONR Homepage at
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