

*America from its founding has provided a climate for its citizens to seek out innovative solutions to technical problems and directly enjoy the rewards these bring in the marketplace. While there are few bars on innovation, transitioning good ideas to marketplace success is very much more elusive and uncertain. The Army's Small Business Innovation Research (SBIR) Program, since its inception in 1982, has focused on solving this transition problem, i.e. the rapid and successful progression of innovative ideas through to the commercialization phase (in SBIR parlance: "Phase III").*



*The SBIR Program is also a major part of the Army's overall Science and Technology program. Through SBIR, small business innovators solve the Army's problems today and thus alleviate many of America's concerns tomorrow. Congress has steadily supported the Army in this by continuing to strengthen and expand the SBIR Program's dual-use and technology transfer opportunities.*

*We are proud to present to you a sampling of Army SBIR Phase III Success Stories for Fiscal Year 1996. These stories demonstrate the viability of the Army SBIR Program and illustrate the valuable return on the Army's investment in the small business community. Ever mindful of America's great contributions to science and technology, we also provide you a glimpse of some of the most famous innovators from America's past. It is our hope that the Army SBIR Program captures and furthers the spirit which drove these remarkable pioneers.*

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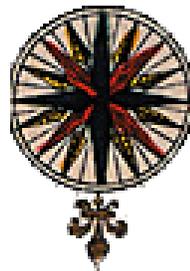
1772



**Settling America.** First permanent settlement in St. Louis, MO.



# The History of SBIR...



The United States Congress initiated the SBIR Program in 1982 to increase small business involvement in federal research and development (R&D). Recent SBIR legislation extended the program to the year 2000, emphasizing four objectives:

*Stimulate technology innovation,*

*Increase small business participation in federal R&D,*

*Increase private sector commercialization of technological advances developed through federal R&D, and*

*Increase participation by woman-owned and by socially and economically disadvantaged small businesses.*

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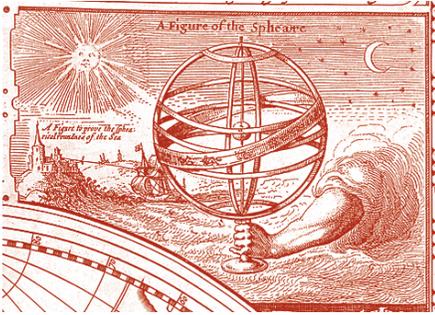
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1784

*Declaring Independence.  
Congress signs the Declaration of Independence.*



Archive Photos



## Successful SBIR research efforts move through three phases:

### Phase I—Feasibility Study

Phase I contracts are awarded to small businesses to study the feasibility of innovative concepts. The SBIR Program is competitive—approximately one in ten proposals is funded. Phase I awards are generally limited to six-month, \$100,000 efforts.

### Phase II—Development

Successful Phase I efforts may result in Phase II contracts for research, development, and prototype production. Phase II awards are for up to two years, with a funding ceiling of \$750,000.

### Phase III—Commercialization

Phase III culminates all SBIR initiatives. In Phase III, a product, process, or service developed in Phase II is marketed outside the SBIR Program. Small firms achieve Phase III success by private sector commercialization or through non-SBIR government follow-on contracts.



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**Improving Inventors' Rights.** In 1790, the first patent law was passed by the U.S. Congress.

# Quality Computer Chips

*Alternative System Concepts, Inc.*

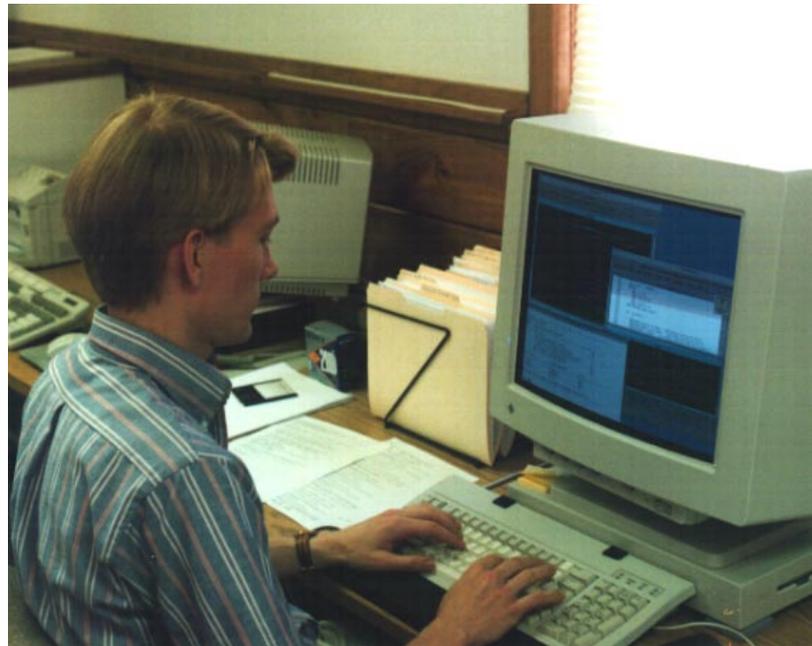
*U.S. Army Research Laboratory*

Computers use chips with millions of transistors. Traditional probes can't be used for testing the chips due to their dense features. ASC has solved this problem using a new technology called "boundary scan". Boundary scan circuitry acts like a virtual test probe.

Under the Army SBIR Program, ASC successfully developed the VBIT™ Boundary Scan Insertion tool that meets the Army's microelectronics manufacturing and testing needs for the 21st century. Microcircuit engineers can use such tools to reduce design time and cost.

*With the support of the Army SBIR program we were able to develop this technology into a product.*

Based on the VHSIC Hardware Description Language (VHDL), a DoD standard, designs can be cut-and-pasted from known good commercial off-the-shelf (COTS) parts, supporting component reuse. VBIT™ tools will allow reverse engineering of circuit boards and subsystems with outdated components.



## Impacts

- OEM partnership with Mentor Graphics
- One patent pending
- Sales to date exceeding \$300,000
- Commercially, ASC's VBIT™ licenses have been installed for over 75 design seats

1800

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*Navigating the Hudson.  
Robert Fulton propels a boat  
down the Hudson River by  
steam power.*



# Eliminating Biohazards

*Texas Research Institute Austin, Inc.*

*U.S. Army Research Office*

Some hazardous materials (HazMats) are so toxic that a few drops on the skin can cause serious harm, or even death. HazMat spill responders wear special protective clothing to prevent contact with these materials. To prevent accidental exposure during suit removal, the suit must first be thoroughly cleaned (“decontaminated”). Previously, soap, water, and a brush were commonly used during such decontamination procedures; however, it is easy to “miss spots” with this method - a potentially fatal mistake.

TRI Austin’s Decon-Check™ system combines nontoxic, biodegradable cleaners and thickeners with an ultraviolet disclosing agent which shows areas on the suit which have been cleaned. This system even works with notoriously hard-to-wet materials such as Teflon™.

The technology is available in the US and Canada. Customers include Eli Lilly, Monsanto, Union Carbide, McDonnell-Douglas, and the DoD Military Fire Academy.

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*We brought a new product to the industrial and municipal HazMat community and satisfied Army training needs.*

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## Impacts:

- First to provide immediate assessment of decon effectiveness
- Users include over 35 industrial and municipal HazMat teams
- 12 nationwide US distributors
- Generated \$13,000 sales in first six months

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# Reducing Computer Chip Waste

*Advanced Fuel Research, Inc.*

*U.S. Army Space and Strategic Defense Command*

AFR has developed a new compact, rugged FT-IR spectrometer for the semiconductor industry which could save millions of dollars annually in reduced material waste. High-speed electronics for the device were developed under an SSDC-managed, BMDO-funded SBIR Phase II effort. Critical interferometer hardware, and advanced analysis methods and software used in the spectrometer were developed with DOE and Air Force SBIR support, respectively. The spectrometer is vibration-tolerant, thermally stable, extremely sensitive, and, compared with extant systems, provides a 50-fold improvement in absolute accuracy in measuring film thickness of epitaxial silicon (ES) wafers.

Based on this technology, two new products have already been produced for the semiconductor industry. The first is an in-line tool which has demonstrated excellent speed and accuracy in analyzing ES wafers without interfering with or delaying the fabrication process. The second product is an advanced in-line mapping tool. Compared with commercially available tools, the prototype unit has demonstrated significantly improved accuracy in mapping thin ES layers used in the fabrication of computer chips.



## Impacts

- \$830K for 13 units sold to date, \$800K for contract with Gas Research Institute
- 4 patents, 5 pending
- Customers include SEMATECH, TI, W. R. Grace, Factory Mutual, ADE Corporation, and Applied Materials, Inc.

*These improvements will help the semiconductor industry grow to an expected \$331 billion per year by 2000.*

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*Moving forward in physics. American physicist John Henry constructs an early version of the electromagnetic motor.*

# At-Sea Search Operations

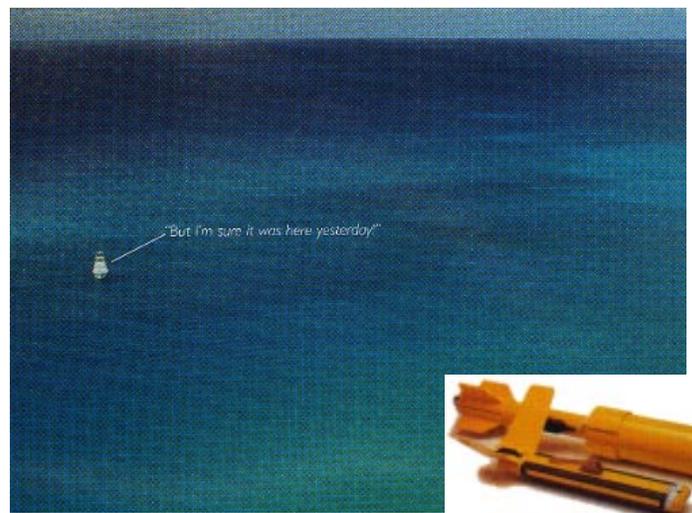
*Daniel H. Wagner Associates*

*U.S. Army Space and Strategic Defense Command*

As the recent tragic TWA800 incident shows, underwater searches are among the most frustrating and hazardous tasks known to man. Clues can lead one in dozens of directions covering hundreds of square miles of the ocean floor - where there are few landmarks to work from. Wagner Associates' MELIAN II Search System offers a solution to this difficult and hazardous problem. This comprehensive software tool is specifically designed to expedite at-sea search and recovery operations. MELIAN II can be used to plan the search with remarkable precision. During the actual at-sea search, it can assist by steering the search craft along specified turn diameters. It allows sonar, magnetometer, and metal detector data to be captured real-time, recorded and marked for easy retrieval, and provides on-demand full color data displays. Data analysis capabilities are also provided to assist in deciphering contacts and constructing recovery plans.

MELIAN II is a comprehensive software package which was initially designed for sidescan or magnetometer search/survey applications. It is written in C and is currently supported for the UNIX and X-windows computing environments.

*It's like finding a needle in a haystack. Only the needle is in four pieces, 1000 feet down, and the haystack covers 300 square miles.*



## Impacts

- Customers include nations such as Canada and Bangladesh
- A search consulting contract with a foreign client
- Sales to date exceed \$200,000

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# Critical Patient Care

*Microwave Medical Systems, Inc.*

*U.S. Army Medical Research and Materiel Command*

MMS has employed microwave technology in its ThermoStat 900™ system for in-line warming of physiologic fluids. This is the first time that passive microwave radiometry has been used for noninvasive measurement and control of the temperature of liquids in motion. The device provides in-line warming of blood and IV fluids to meet the needs of patients in operating and emergency rooms. When changes to inlet temperature or flow rate occur, the device responds quickly by adjusting the power level. Unlike conventional dry warmers which are inadequate at high flow rates, ThermoStat 900™ operates efficiently in these flow regimes.

Before ThermoStat 900™, rapid infusion required the use of a warm water bath (which has increased risk of contamination), resulting in increased pathlength and large priming fluid volume. In 1993, FDA granted MMS permission to market this system. Since then, MMS has continued developing a family of products to address related market needs, including portable devices for use onboard emergency vehicles.

*Maintaining a stable and normal body temperature is crucial to human survival, especially during life saving procedures.*



## Impacts

- Sales to date exceed \$1.25M
- Passive, noninvasive attributes allow for additional features and improvements
- MMS earned the 1995 Massachusetts Small Business Innovation Award for development of ThermoStat 900™

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*Improving Medical Treatments.  
Alexander Wood uses hypodermic  
syringe for subcutaneous injections.*

# Smarter & Faster Decisions

*SRS Technologies*

*U.S. Army Space and Strategic Defense Command*

*Effective display concepts were also conceived as a result of this SBIR project for non-real-time Army display applications.*



SRS has developed a software package to drive advanced computer displays for use by military and civilian decision-makers. Human-factors engineering principles have been incorporated in the system, for example, touch screens, color-coded alerts, 3D visualization, and expert system-type decision aids. The goal here is to produce information display technology which maximize the decision-maker's performance, but avoids "information overload".

While SRS' Phase III work has focused on Army problems, there is spin-off potential for a broad range of applications in private-sector and other government computer display and decision-making venues.

One such idea has matured into a prototype display, named Scrollodex (patent pending), which is an alternative to standard scroll bar displays for PCs.

## Impacts

- \$700 K sales of Phase III technology to Army
- Army customers include Program Executive Office for Missile Defense (Theater High Altitude Area Defense and Ground-Based Radar Program)
- Patent pending on Scrollodex prototype

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*Opening the Lines of Communication.  
Alexander Graham Bell  
invents the telephone.*



Archive Photos

# Motion Analysis Made Easy

*Integrated Sensors, Inc.*

*U.S. Army Aviation & Missile Command*

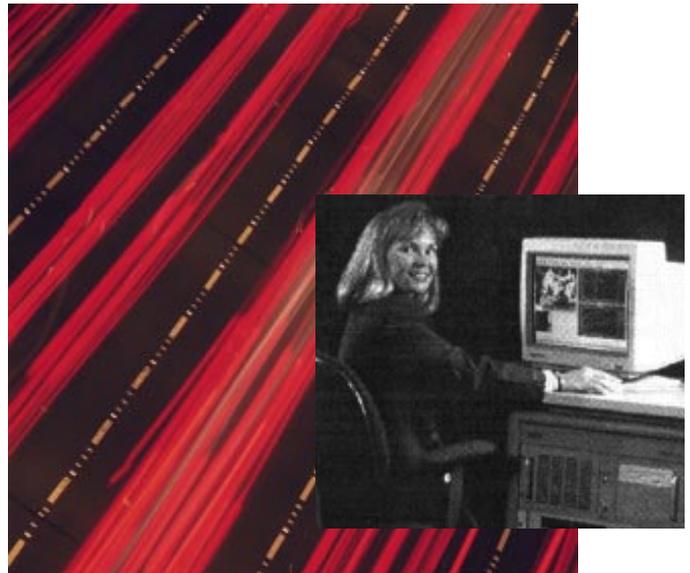
ISI has successfully combined hardware and software to create the easy-to-use turnkey motion analysis workstation *ImageExpress*. Detection, tracking, and image display algorithms were developed and incorporated into *ImageExpress*. *ImageExpress* may be used to automatically digitize monochrome or color images, and provides tools needed to analyze motions depicted in a sequence of live or pre-recorded video images at rates of up to 30 frames per second.

*ImageExpress*' easy-to-understand icons and intuitive graphical interface design make motion analysis easy. Quick mouse-driven plotting of point and line segment kinematics, fast playback of digitized and recorded image sequences, and automatic marked-object tracking (up to 50 marked objects per frame) features are provided. The current product is being sold to the international automobile industry, to high-speed process machine manufacturers, and to the DoD for munitions separation testing.

*Critical detection, tracking, and image display algorithms developed under an SBIR contract helped make the product immediately competitive in the marketplace.*

## Impacts

- ISI took this product from concept to first unit production in 22 months
- Production started in 1994; sales reached \$525K
- ISI secured a minimum guaranteed order of \$1.2M for 1995 and \$2.24M for 1996; sales expected to grow over the next three years



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1888

*Capturing the World on Film.  
George Eastman manufactures  
coated photographic paper.*



Richard Pasley

# Teleconferencing

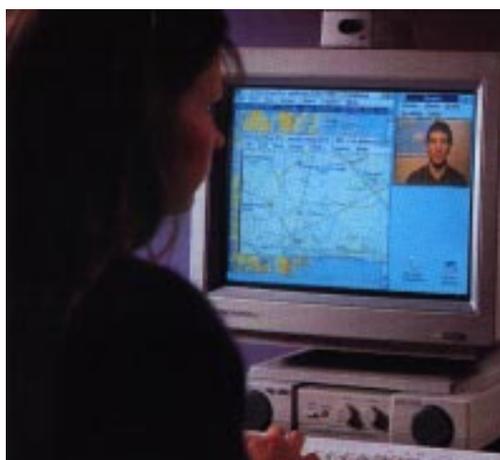
*Delta Information Systems*

*U.S. Army Research Laboratory*

Delta Information Systems has developed DESTEL, a low-cost personal desktop video teleconferencing system. DESTEL is IBM PC-compatible and allows two or more conferees to see and hear each other while collaborating on creating documents, spreadsheets, transferring files, and other tasks. Besides greatly reducing the need to travel, DESTEL can be used for one-on-one or group meetings, briefings, help desk/diagnostic/trouble-shooting transactions, and as an efficient means of accessing remotely located experts. Since it takes advantage of the Integrated Services Digital Network (ISDN) protocol, DESTEL replaces the telephone for everyday communication needs.

All of DESTEL's collaborative tools can be used during a given live audio/video session. Video images are displayed within a movable, scalable, and resizable window on the PC screen. DESTEL also lets users share programs running on their PCs with other conferees. Users can also share an electronic "whiteboard" in which flipcharts, images, or other screens can be loaded. Users can write on the whiteboard to annotate images displayed on the screen.

*Information can make the difference between success and failure, excellence and mediocrity. With telephones, computers, and electronic data transfer systems, information can be sent to others almost instantly worldwide.*



## Impacts

- Recently awarded a three-year \$15M Indefinite Delivery-Indefinite Quantity (IDIQ) contract with the Army
- Over 20 systems delivered to date
- Orders for over 150 additional systems anticipated

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1900

1902

*Listening from Far Away.  
R.A. Fressenden transmits  
human speech via radio waves.*



Classic PIO Partners

# Flying Safely

## *Prospective Computer Analysts*

### *U.S. Army Tank-Automotive & Armaments Command*



PCA's Expert System for Quality Assurance (ESQA) is a state-of-art Microsoft Windows-based tool for conducting quality assurance (QA) analyses of automatic test system (ATS) software. ATS software is used for testing electronics systems in the factory and field. Prior to 1992, DoD had no such automated QA tools for this purpose, yet invested some \$35 billion in ATS inventory from 1980-1992, and an estimated additional \$18 billion in testing software.

*ESQA not only reduces the time to analyze test software tenfold, but has improved the quality, safety, and reliability of our electronics.*

ESQA tests software against 23 metrics used to check code functionality, accuracy, and completeness. A quality assurance task once requiring many hours to complete now can be done in just minutes. ESQA automatically scans code, identifies existing structural problems, ensures that the test software can detect and isolate failed components, and ensures that repaired electronics systems will operate reliably and safely when re-installed.

ESQA has been used to analyze test software for testing electronics in systems ranging from automobiles to B-1B aircraft and Tomahawk cruise missiles. Time and time again it has found latent problems in test software which would probably never have been found by manual approaches.

## **Impacts**

- PCA plans to expand ESQA's domain to include operational flight programs for commercial and government aircraft
- Is in use at every continental US Navy and Air Force Depot - has been applied to more than 15 DoD and commercial aircraft types
- Over \$30M in contracts received from the Services; more than \$4M in commercial sales

1904

1906

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1912

1914



*Beginning Space Flight.  
Robert H. Goddard begins  
his rocketry experiments.*

# Automating Feedback

*LB&M Associates, Inc.*

*U.S. Army Simulation, Training, and Instrumentation Command*

*Feedback promotes discussion and self-discovery that will identify performance strengths and weaknesses.*

The Army is using the After-Action Review (AAR) process to gather feedback from unit training exercises. During AAR sessions, trainers use video displays and other AAR aids to help players establish cause-effect relationships and sift out “lessons learned” for the particular battle scenario treated in the exercise. One key problem is organizing information and producing AAR aids quickly after the exercise concludes.

LB&M has developed the Automated Training Analysis and Feedback System (ATAFS) to assist AAR trainers with this laborious task. ATAFS records AAR data as the exercise runs and provides the trainer a completely editable AAR presentation package immediately at the close of the exercise. While the exercise is on, ATAFS allows the trainer to observe events in near real-time as well as to examine past events. Voice communications can be played back synchronously with top-down views of unit activities. ATAFS will also provide a take-home AAR videotape for the training unit.



## Impacts

- DoD is currently beta-testing ATAFS at seven locations
- Customers include the Army and the Army National Guard
- Phase III funding has exceeded \$1.2M

1918

1920

1922

1924

1926

1928

*Studying Human Behavior.*  
J.B. Watson presents new studies in psychology focusing on human actions, feedback and rewards.



Peter Vandemark

# Performing Under Pressure

*Texas Microsystems, Inc.*

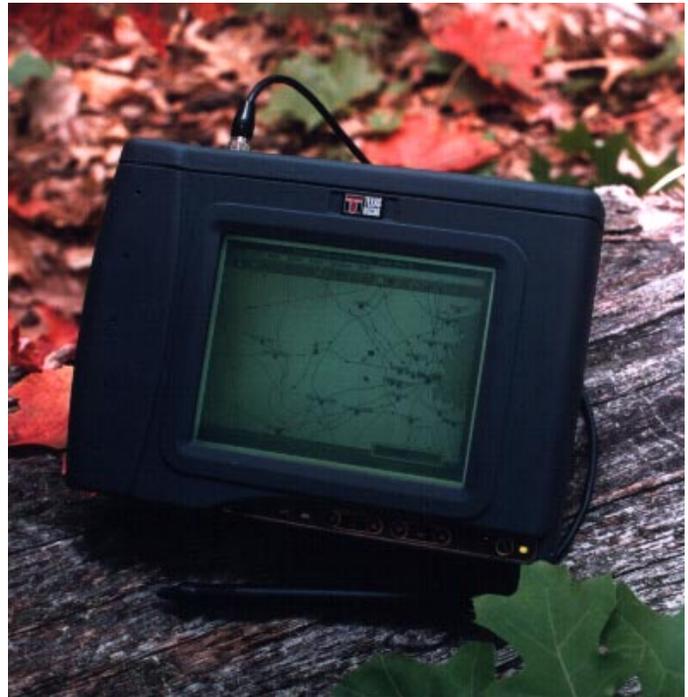
*U.S. Army Communications-Electronics Command*

*The “drop-it, bang-it, view-it-in-the-sun, use-it-in-the-rain, and toss-it-around” handheld PC.*

The Hardbody™ handheld PC is a commercial offspring of the “Soldier’s Computer”. The Hardbody™ fills a real market need for a rugged, reliable, handheld PC suitable for all-weather day/night field use. Though this is a pen-based Windows™ computer, any desktop Windows™ application will run on it without having to be pen-aware or pen-enabled.

At only 3 lbs 2 oz, the Hardbody™ sports the features of a full-blown desktop PC, including Intel 486DX processor running at 75Mhz, 8 to 32 MB of RAM, 260 MB hard drive, 2 PC card slots, and a full complement of serial, parallel, VGA, and keyboard ports. It can run up to 8 hours on rechargeable NiMH batteries.

Typical commercial field applications so far include aircraft flight-line maintenance, engine test support, mobile factory automation, on-site building inspections, and utility resource inventory support. A government contractor is being asked to deliver Hardbody™ PCs to support our troops in Bosnia in charting minefield locations and managing convoys.



## Impacts

- 167 units sold as of December 1995; \$650K in sales
- 500 more units delivered during first quarter of 1996; \$2.9M in sales

1930

1932

1934

1936

1938

1940



### *Understanding Pressure.*

*P.W. Bridgman conducts research on materials at pressures up to 100,000 atmospheres.*

# Defusing the Timebomb

*Intelligent Microsystems, Inc. (Scandura)*

*U.S. Army Communications-Electronics Command*

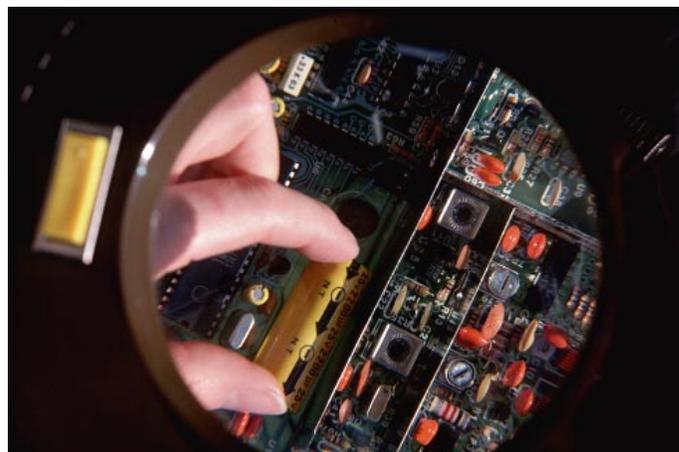
While not having the potential physical destructive power of chemical or nuclear bombs, software timebombs are everywhere inexorably ticking away, ready to explode at 12:00:00 PM, December 31, 1999, at which point the year digits will flip from 1999 to 2000. The problem is by no means trivial - it is estimated that up to 30% of the government's computers are unprepared for this "timebomb", and preparations could cost as much as \$30 billion. Within the DoD, this "Year 2000" problem is being handled as if it were a deadly "computer virus".

IMS-Scandura is tackling this software challenge and many more with its highly customizable Flexsys system. Flexsys contains code re-engineering, conversion, and integration capabilities to solve a wide variety of software problems - including the Year 2000 problem. Other recent SBIR-supported research dealt with process improvement in modernizing large Army software systems.

*You can't overestimate the advantages of easy to maintain software which is designed correctly the first time, minimizing the need for testing and re-design.*

## Impacts

- 600,000 to 1,000,000-line code conversion projects routinely completed on time and within budget
- Patent received for FLOWform display process
- Patent pending on "provably correct software design guaranteed to meet specifications"



1944

1946

1948

1950

1952

1954



American Stock

*Creating the Bomb.  
First Atomic bomb  
detonated near  
Alamogordo, N.M.*



# Legend

*These two pages contain a listing of the companies highlighted within this brochure. If you would like more information, please feel free to contact them directly...*

## **Advanced Fuel Research, Inc.**

Dr. Peter Solomon, President  
87 Church Street  
East Hartford, CT 06108  
Phone: (203) 528-9806 ext. 103  
FAX: (203) 289-7975  
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## **Integrated Sensors, Inc.**

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FAX: (315) 798-8950  
E-Mail: [krumme@sensors.com](mailto:krumme@sensors.com)

## **Intelligent Microsystems, Inc. (Scandura)**

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Home page: <http://www.scandura.com>





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### **SRS Technologies**

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FAX: (205) 971-7067  
E-Mail: stgset2@aol.com

### **Texas Microsystems, Inc.**

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E-Mail: julianh@texmicro.com

### **Texas Research Institute Austin, Inc.**

Michael Dingus, Senior Scientist  
9063 Bee Caves Road  
Austin, TX 78733-6201  
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<http://www.aro.ncren.net/arrowash/rt/>**





*“America is a land of wonders, in which everything is in constant motion and every change seems an improvement. The idea of novelty is there indissolubly connected with the idea of amelioration. No natural boundary seems to be set to the efforts of man; and in his eyes what is not yet done is only what he has not yet attempted to do.”*

*Alexis de Tocqueville, 1835*