

C. SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)



The purpose of DoD's Small Business Innovation Research (SBIR) program is to harness the innovative talents of our nation's small technology companies for U.S. military and economic strength. DoD's SBIR program funds early-stage R&D projects at small technology companies — projects that serve a DoD need and have the potential for commercialization in private sector and/or military markets. The program, funded at approximately \$540 million in FY 00, is part of a larger (\$1.1 billion) Federal SBIR program administered by ten Federal agencies.

As part of its SBIR program, the DoD issues an SBIR solicitation twice a year, describing its R&D needs and inviting R&D proposals from small companies — firms organized for profit with 500 or fewer employees, including all affiliated firms. Companies apply first for a six-month Phase I award of approximately \$100,000 to test the scientific, technical, and commercial merit and feasibility of a particular concept. If Phase I proves successful, the company may be invited to apply for a two-year Phase II award of \$500,000 to \$750,000 to further develop the concept, usually to the prototype stage. Proposals are judged competitively on the basis of scientific, technical, and commercial merit. Following completion of Phase II, small companies are expected to obtain funding from the private sector and/or non-SBIR government sources (in "Phase III") to develop the concept into a product for sale in private sector and/or military markets.

Objectives of the Office of the Secretary of Defense, Deputy Under Secretary of Defense (Science & Technology) (OSD DUSD (S&T)) SBIR program, which is funded at \$16.6 million in FY 99, include stimulating technological innovation, strengthening the role of small business in meeting DoD dual use research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing technology transfer through commercial application of DoD-supported research and development results. The topics selected for the OSD program encourage technology transfer with a focus on advanced development projects with a high probability of commercialization success, both in the government and private sector.

The FY 99 Program includes the following two and ½ year projects:

- Topic OSD99-001, Microsensor Information Assurance, has the objective of developing methods of information assurance for battlefield intersensor networks. This topic is managed by Army Research Laboratory and supports the sensors/electronics technology focus area of smart sensors.
- Topic OSD99-002, Novel X-ray Detection for Large Field of View Very High Resolution Computed Tomography Inspection and Evaluation, has the objective of developing x-ray detectors for very high spatial resolution computed tomography imaging and evaluation of large areas. This topic is also managed by ARL in support of the sensors/electronics technology area.
- Topic OSD99-003, Improved Breakdown Properties in Large Area SiC Devices, has the objective of developing a method to increase the power handling capability of SiC devices by eliminating, or at least reducing, the decrease in the breakdown voltage as the size of the SiC devices increase. This topic is also managed by ARL in support of the sensors/electronics technology area.

- Topic OSD99-04, Adaptive Instructional Systems, has the objective of developing an approach to design and implementation of computer-based training systems that dynamically adapt instructional methodology to individual differences in learning style and rate, capitalize on student strengths and match content and structure of training events to the student's conceptual structure. This topic is managed by the Army Research Institute in support of the human systems technology area of cognitive readiness.
- Topic OSD99-05, Development of Metrics and a Process for Mechanical Diagnostic Technique Qualification and Validation, has the objective of developing an approach, process and metrics to impartially evaluate performance and effectiveness of mechanical diagnostic techniques based on a particular Condition Based Maintenance (CBM) application. This topic is managed by the Naval Sea Systems Command laboratory at Carderock and supports the modeling and simulation technology area.
- Topic OSD99-06, Prognostic Enhancements to Diagnostic Systems, has the objective of developing prognostic algorithms and computer software applications that will readily support backfit into existing Naval platforms employing both SMART and conventional Command, Control, and Communications (C3); Human-System Interfaces (HIS), and sensor technologies as well as extensibility into new acquisition Naval platforms. This topic is also managed by the Naval Sea Systems Command laboratory at Carderock and supports the modeling and simulation and technology areas.
- Topic OSD99-07, In-Situ Corrosion Detection and Mitigation for Inaccessible Areas, has the objective of developing the technology, manufacturing method, and associated hardware and software, to non-intrusively apply an in-situ Impressed Current Cathodic Protection (ICCP) system to detect and subsequently mitigate corrosion at hidden or hard-to-access sites in shipboard seawater systems. This topic is also managed by the Naval Sea Systems Command laboratory at Carderock and supports the materials technology area.
- Topic OSD99-08, Integrated Mechanical Load and Condition Assessment for Mechanical Components, has the objective of developing technology to reduce the cost of integrating smart sensors with machinery and processes. This topic is also managed by the Naval Sea Systems Command laboratory at Carderock and supports the sensors technology area of smart sensors.
- Topic OSD-009, Electrophoretic Processing of Electronic Polymer Materials, has the objective of developing electrophoretic processing techniques for fabrication of bulk conductive, superconductive, and ferromagnetic polymers. This project is being managed by the Air Force Research Laboratory Munitions Directorate and supports the electronics technology area.
- Topic OSD-010, Phase Tunable Spatial Light Modulator, has the objective of identifying an innovative concept for a pure phase Spatial light modulator. This project is also being managed by the Air Force Research Laboratory Munitions Directorate and supports the electronics technology area.
- Topic OSD99-11, Silicon Carbide Power Transistors for High Power Transmitter, has the objective of developing Silicon Carbide power transistors that will enable high power pulsed transmitters to achieve a stable output signal. This project is

also being managed by the Air Force Research Laboratory Munitions Directorate and supports the electronics technology area.

The FY 00 OSD Program, funded at \$20 million, will fund topics in two technology areas: Cognitive Readiness and Smart Sensor Web. These are two priority technology areas in the investment planning strategy of DUSD(S&T).

Success Story

One example of a success story from the OSD SBIR program is Topic OSD95-010, titled Dental Sound Conduction Device for Scuba Mouthpiece. This project was managed by Naval Undersea Warfare Center (NUWC) in New London, CT. The SBIR contractor, Analytical Engineering, Inc. (AEI) is located in Columbus, IN. AEI has revolutionized wireless underwater communication technology by researching, developing, patenting, manufacturing, and marketing an acoustic mouthpiece and corresponding IC based single-side band ultrasonic transceiver for diver-to-diver and diver-to-surface communication. AEI developed the acoustic mouthpiece utilizing the magnetostrictive material, Terfenol-D, to perfect a low voltage transducer that is embedded inside a SCUBA diver's mouthpiece, allowing the user to hear through dental sound conduction. This is the only system in the world that allows divers to have underwater voice communication without the addition of non-standard SCUBA gear such as a full-face mask or mouth mask. Scuba diving communications capability will be available for Special Forces divers without full face masks (FFM). This will improve safety and mission effectiveness for military personnel. The Science Diving group from NUWC utilizes Soniwave communication for various underwater investigations and applications.

The acoustic mouthpiece based underwater communication developed by AEI is being sold to retail dive stores as "Soniwave" through the company, Trigger Scuba, Inc. Search and Rescue teams utilize Soniwave communication to greatly improve the safety of dive team members and improve mission success. Diving safety is improved for recreational Scuba divers through the capability of being in voice contact with their dive buddy. Underwater work, such as repair or maintenance on ships and docks, is more easily facilitated through the use of communication with topside personnel. Dive instructors are able to teach their students more effectively with Soniwave. Approximately 6 months after product launch, there were 120 Soniwave dealer stores in the United States, equating to nearly \$100K in sales. Projections show steadily increasing sales. A market study from the mid-1990's showed that there were 5.5 million certified Scuba divers in the world. In the late 1990's, an average of 1 million new people per year are certified or take introductory Scuba classes. If sales reach just 1% of new divers, sales will exceed 1 million dollars.

AEI developed in-house expertise and capabilities in several technologies during the Phase II contract. Capabilities and equipment include specialized transducer design and optimization, ultrasonic transceiver design, 3-D solids modeling and CAM, plastic injection molds, IC design, and CNC machining. These capabilities have greatly enhanced AEI's capability to win R&D contracts for rapid prototype development of electro-mechanical systems. AEI was awarded a Phase I SBIR contract in mid-1995 and a Phase II SBIR contract in late 1996. Two patents have been issued for AEI's underwater voice communication system, and other patents are pending. AEI was incorporated in November 1994. SBIR funding and other R&D contracts have enabled the company to employ 6 people. AEI's growth strategy is to employ highly skilled people to develop new technologies that will be licensed to large corporations for manufacturing and distribution.