



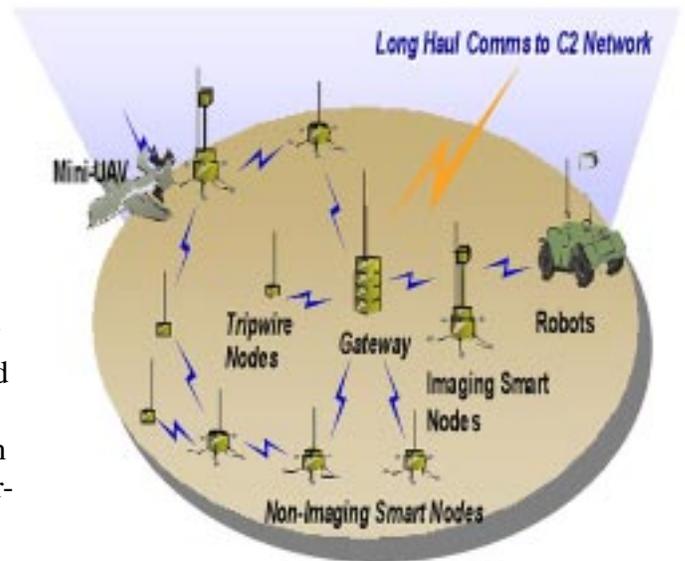
Sensors can track targets where soldiers can't go

ARL is working with the Army's Communications-Electronics Command to provide advanced unattended ground sensors that can detect and track targets in areas where soldiers cannot go.

A force of these unattended, highly automated sensors, dispersed by ground forces, helicopters, and artillery or integrated in small unmanned aerial or ground vehicles where mobility is required will take on the dangerous mission of gathering information for situation awareness and targeting.

These advanced sensor nodes connect into intelligent arrays and link to commanders to provide timely knowledge of terrain, battle space conditions and forces. These hosts of miniature, energy efficient, sensors are able to organize into highly intelligent stationary or mobile ad hoc networks. The network of sensors collectively detect potential

targets before activating more sophisticated, multi-sensor packages that locate, and classify or identify targets in spite of attempts to use camouflage, concealment and deception to defeat detection.



Ground sensors

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ARL shares SBIR awards with three small businesses

The Army Research Laboratory (ARL) and three small businesses shared Army Small Business and Innovative Research Phase II Quality Awards for 2002.

The winning companies are Mesoscopic Devices, LLC, Broomfield, CO; Capacitec, Inc. Ayer, MA; and TrellisWare Technologies, Inc., Poway, CA.

Mesoscopic Devices' research effort, "Fuel Supply for Portable Power," involves the development of portable fuel battery chargers for rechargeable batteries using miniature pumps and atomizers that enable compact battery chargers by providing very small fuel flow rates in highly compact packages. Miniature generators using this technology

would be up to 10 times lighter than the single-use batteries they would replace. The components also support portable power systems including fuel cells, miniature diesel engines and other advanced generators that will be needed in the Future Combat Systems. ARL's Army Re-

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Oil-free turbos weigh less, last longer, are more efficient

Oil-free turbomachinery is defined as high-speed rotating equipment, such as turbine engines, that operate without oil-lubricated rotor supports such as bearings, dampers and air/oil seals.

Recent technology breakthroughs in foil air bearings, high temperature solid lubricant coatings, and rotordynamic and mechanical system modeling and analysis enable the application of oil-free technology to larger, hotter, and more challenging military turbomachinery systems.

Compared to state-of-the-art oil lubricated systems, oil-free turbomachinery technology offers impressive system level benefits. For gas turbine engine propulsion systems found in Army helicopters and tanks, and military fixed wing aircraft, projected oil-free benefits include significant reductions in engine weight, engine maintenance, and life cycle cost while improving fuel efficiency.



Oil-free bearing

Foil air bearings are compliant surface hydrodynamic bearings that use air as the lubricant without the need for an external pressurized air supply. The bearings can operate at very high speeds, exceeding the capabilities of oil-lubricated ball bearings. For high temperatures found in gas turbine engines, foil bearings use a solid lubricant coating on the shaft to provide long-life durability during startup and shutdown.

High speed and high temperature foil air bearings have been demonstrated in the world's first oil-free turbocharger for diesel truck engines. Recently, foil bearings designed for the core shaft of a small turbine engine were successfully tested at representative engine conditions demonstrating the ability to operate in a combination of high speeds, sustained loads and elevated temperatures.

The high power density and low maintenance achievable through application of oil-free technology will benefit Army Future Combat System propulsion and power subsystems, and new unmanned air vehicle platforms.

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Unmanned ground vehicles pass another tough test

Over the past four years, ARL has led a government/industry team focused upon developing advanced technology for unmanned ground vehicles.

In November 2001, the team conducted a highly successful exercise at its Ft. Indiantown Gap Robotics Research Facility with scouts from the 4th and 28th Infantry Divisions operating multiple experimental unmanned vehicle (XUV) testbeds over rolling vegetated terrain. The team was challenged by Army leadership to conduct a similar exercise in terrain where the vehicles had never pre-

viously operated; the same set of circumstances that would be faced by future unmanned tactical vehicles conducting military operations.

The team arrived at the Army Night Vision Laboratory's A.P. Hill Facility the morning of Aug. 2, unloaded the XUV and, shortly after 9 a.m., the XUV began running the initial course of more than 4 kilometers that had been laid out the previous afternoon by an advance party. The vehicle was run between widely separated waypoints that kept it in low areas, often in tall grass to pro-

vide concealment. At times the grass was tall enough to obscure the sensors, causing the "bot" to autonomously back up and seek another route. The "bot" covered the course at an average speed of more than 7 km/hr.

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Cooperative agreement expert is 'Attorney of the Year'

The Army Research Laboratory's Patrick J. Emery, the Army's expert in the use of cooperative agreements that combine the research resources of government, industry and academia, has been awarded the Army Materiel Command's Joyce I. Allen Attorney of the Year Award for 2002.

Emery was presented the award by AMC Commander Gen. Paul J. Kern at the recent AMC Continuing Education Legal Program in Florida. In addition to a Certificate of Achievement and a personal plaque, Emery keeps the AMC rotating plaque for one year. The award commemorates Joyce I. Allen, who was an attorney for the Army Materiel Command.

This award recognizes the civilian or military attorney or patent advisor selected by the awards committee for outstanding accomplishments or professional achievements in the service of the legal profession and the community.

Emery was recognized for his innovative service in helping to implement ARL's very successful Federated Laboratory program as well as for his role as counsel to the ARL Collaborative Technology Alliances (CTA) program for the past two years. CTA is the follow-on to the Federated Laboratory program that represented an experimental approach in Army research and development. FedLab established a cooperative research environment for scientists and

engineers from government, industry and academia that flourished for five years.

CTA expanded the original three FedLab research areas to five and Emery, with his FedLab experience, was integrated into the CTA planning process. Among the improvements he recommended were extending the program from five to eight years duration and simultaneous competition for the award of research cooperative agreements and technology transition contracts for each of the research areas. The purpose of the technology transition contracts are to provide incentives to transition the research results while still performing under the cooperative agreement.

Col. Carrie Kendrick, ARL Chief of Staff, said "We were very confident Pat Emery stood a good chance of receiving the AMC Attorney of the Year Award for 2002. I have heard our customers describe Pat as supportive, focused, and finding the right way and the best way to achieve the best outcome. You have never met a friendlier and more poised professional than Pat Emery."

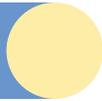
Emery has been instrumental in negotiating other joint research agreements in areas ranging from high performance computing to

electric gun technologies.

"Pat Emery is the ideal role model for all government attorneys to emulate. He is the consummate professional providing sound practical advice, listens to the needs of his customers, has a positive attitude and is proactive at exploring new avenues to expedite the research laboratory's goals and objectives," said Dr. Robert Whalin, Director of the Army Research Laboratory.



Emery accepts award from Gen. Paul J. Kern, Commander of the Army Materiel Command



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SBIR Awards

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search Office administered this SBIR contract.

Capacitec's "Snow Probe" is a snow-sounding probe that works in conjunction with traditional avalanche forecasting methods to help accurately predict snow slides. The system includes a penetration probe containing density, depth and temperature sensors that feed signals into a Palm Pilot. Stored in a backpack, the system allows soldiers operating in cold, mountainous terrain to better understand the science of snow, improve logistics and reduce loss of life due to avalanches. The Army Research Office also administers this contract.

TrellisWare has designed a "Mobile Frequency Hopping Communication System," that requires no fixed networking infrastructure or power controls and can operate despite the presence of strong inter-

ferers and severe multipath fading channels. This design delivers throughputs of 600 kbps while providing robust connectivity for airborne platforms and ground vehicles traveling at freeway speeds, even in dense radio frequency scattering environments.

Congress began the SBIR Program in 1982 to increase small business participation in federal research and development. SBIR research efforts go through three phases: Phase I, feasibility study that lasts up to 6 months and is funded for up to \$70,000 with an option for an additional \$50,000 available; Phase II, research and development up to two years with funding up to \$730,000; and Phase III, commercialization which requires funding from the private sector or non-SBIR program sources.

Annually, a distinguished panel of Army and industry experts selects winning projects from nominations submitted across the Army for the SBIR Phase II Quality Awards. The awards program recognizes top qual-

ity projects for their technical achievement, contribution to the Army, and dual-use commercialization potential. Throughout the year, the winners and their accomplishments are showcased at Army conferences and symposia.

The awards were presented at a ceremony at the Pentagon.

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