BATTLEFIELD PROTECTION

With the change to asymmetric warfare and the increased use of IEDs, soldiers in the field need different and more effective armored vehicles for their protection. Through a multiyear contract with the Department of Defense, researchers at Vanderbilt University School of Engineering are working to develop and test a new composite material that provides improved blast and projectile impact resistance in protective armor panels. The short fiber-reinforced cementitious composite is being put through rigorous testing, including extensive experimental studies, computer-based modeling, and simulation. This technology will help ensure our soldiers have access to the highest-quality armor while deployed.

NATIONAL DEFENSE SCIENCE AND ENGINEERING GRADUATE FELLOWSHIP

In 2013 and 2014, four Vanderbilt students received National Defense Science and Engineering Graduate (NDSEG) Fellowships through the U.S. Air Force Office of Scientific Research. Awarded annually to only about 200 students who intend to pursue a doctoral degree in one of fifteen supported disciplines, the NDSEG fellowship is a highly competitive three-year award that pays full tuition and fees and offers a monthly stipend. The purpose of this fellowship is to increase the number and quality of our nation’s scientists and engineers.

SMALL SIZE, POTENTIALLY BIG PROBLEM

Vanderbilt’s Institute for Space and Defense Electronics (ISDE), with support from the U.S. Navy Strategic Systems Program Office, NAVSEA–Crane, the U.S. Air Force Office of Scientific Research, the Defense Threat Reduction Agency, and the National Aeronautics and Space Administration (NASA), has discovered a potential problem for electronic devices: muons, particles that are generated by solar flares and cosmic rays. As semiconductors get smaller, the devices will become susceptible to muon interference. Recent experiments by an ISDE team of researchers have helped the semiconductor industry forestall muon susceptibility and failure. While consumers will appreciate more reliable cellphones or tablets, the real benefit will be felt in technology incorporated into space satellites, aircraft, operating rooms, and military systems.

VANDERBILT WELCOMES ITS NEWEST AND LARGEST ENGINEERING RESEARCH LAB

When you’re flying a military helicopter over hostile territory or providing emergency aid to disaster-stricken areas, knowing your equipment has undergone rigorous testing is crucial, but it takes lots of space and specialized equipment to do testing at full scale. In 2014, Vanderbilt University School of Engineering’s new Laboratory for Systems Integrity and Reliability (LaSIR) moved into 20,000 square feet of space in Nashville. Doug Adams, chair of the Department of Civil and Environmental Engineering, directs the lab in which researchers and students test advanced sensor systems that can rapidly detect early signs of failure in structures including aircraft, automobiles, and wind turbines. Adams’ research is supported by the U.S. Army, Navy, Air Force, and Marines, and he partners with several large defense contractors and equipment manufacturers.

$39.35 million
Awarded from DOD to Vanderbilt

Vanderbilt LaSIR facility is working with the Office of Naval Research on innovative sensing technologies for monitoring lightweight composite materials on next-generation cargo aircraft.
INSTITUTE FOR SOFTWARE INTEGRATED SYSTEMS

Founded in 1998, the Institute for Software Integrated Systems is a key national player in an effort to design the software-integrated systems that have become an essential part of human lives today—in consumer appliances, vehicles, planes, hospitals, schools, design shops, factories, space systems, and energy. Major sponsors of the institute include the Defense Advanced Research Projects Agency (DARPA), the U.S. Air Force, Army, and Navy, the National Science Foundation, NASA, the National Institutes of Health, and the Department of Education.

The Institute for Software Integrated Systems has received $136 million in funding since 1998. In 2013 alone, it received more than $24 million in extramural research funding. Below are a few examples of the work currently being conducted at the institute.

Tracking gunfire with a smartphone

A team of Vanderbilt computer engineers has made the ability to track gunfire with a smartphone possible by developing an inexpensive hardware module and related software that can transform an Android smartphone into a simple shooter location system. Six years ago, Vanderbilt researchers developed a system that turns the soldiers’ combat helmets into mobile “smart nodes” in a wireless network that can rapidly identify the location of enemy snipers with a surprising degree of accuracy. In the past few years, the team has adapted their system so it will work with smartphones.

Developing new military vehicles

Engineers at Vanderbilt have been awarded a $9.3 million contract over two years to continue their work to mature META tools that are part of a flagship DARPA Adaptive Vehicle Make (AVM) program. META is an open-source design tool suite used in creating, testing, and validating those designs. AVM is a portfolio of programs focused on dramatically reducing the costs and lead times involved in developing new military vehicles by radically transforming the existing design and manufacturing process. The META tools have been under development at Vanderbilt since late 2010 supported by an original $2.6 million contract with a $2.6 million supplement, and led by senior research scientists. These processes, methods, and tools allow rapid reconfiguration and analysis of the whole vehicle design. Vehicle components can be combined, added, or modified quickly, creating powerful capabilities for designers.

Advanced software development tools to meet changing military needs

Vanderbilt was awarded a $17.2 million contract from DARPA to accelerate the Android Mobile Middleware Objects (AMMO2) project. The new middleware developed at Vanderbilt provides the building blocks to allow smartphones to replace and expand the functions of the traditional tactical radios used by the military. Deployed with troops overseas, the DARPA-funded AMMO project is geared to help soldiers avoid firing on friendly troops, navigate back to base in unfamiliar territories, avoid potential ambush points, and protect civilians traveling with the troops. The AMMO project began in 2010 with a $500,000 contract from DARPA.

VANDERBILT WINS TOP PRIZE IN SECOND HURDLE OF SPECTRUM CHALLENGE

In 2013, Vanderbilt researchers submitted a prototype software-defined radio that can communicate in adverse spectrum environments and that won the top prize—$25,000—at the DARPA Spectrum Challenge Competitive Tournament. The event tested conditions directly applicable to military communications, where radios must deliver high-priority data in congested and often contested electromagnetic environments.

For more information, please contact Vanderbilt’s Office of Federal Relations:

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