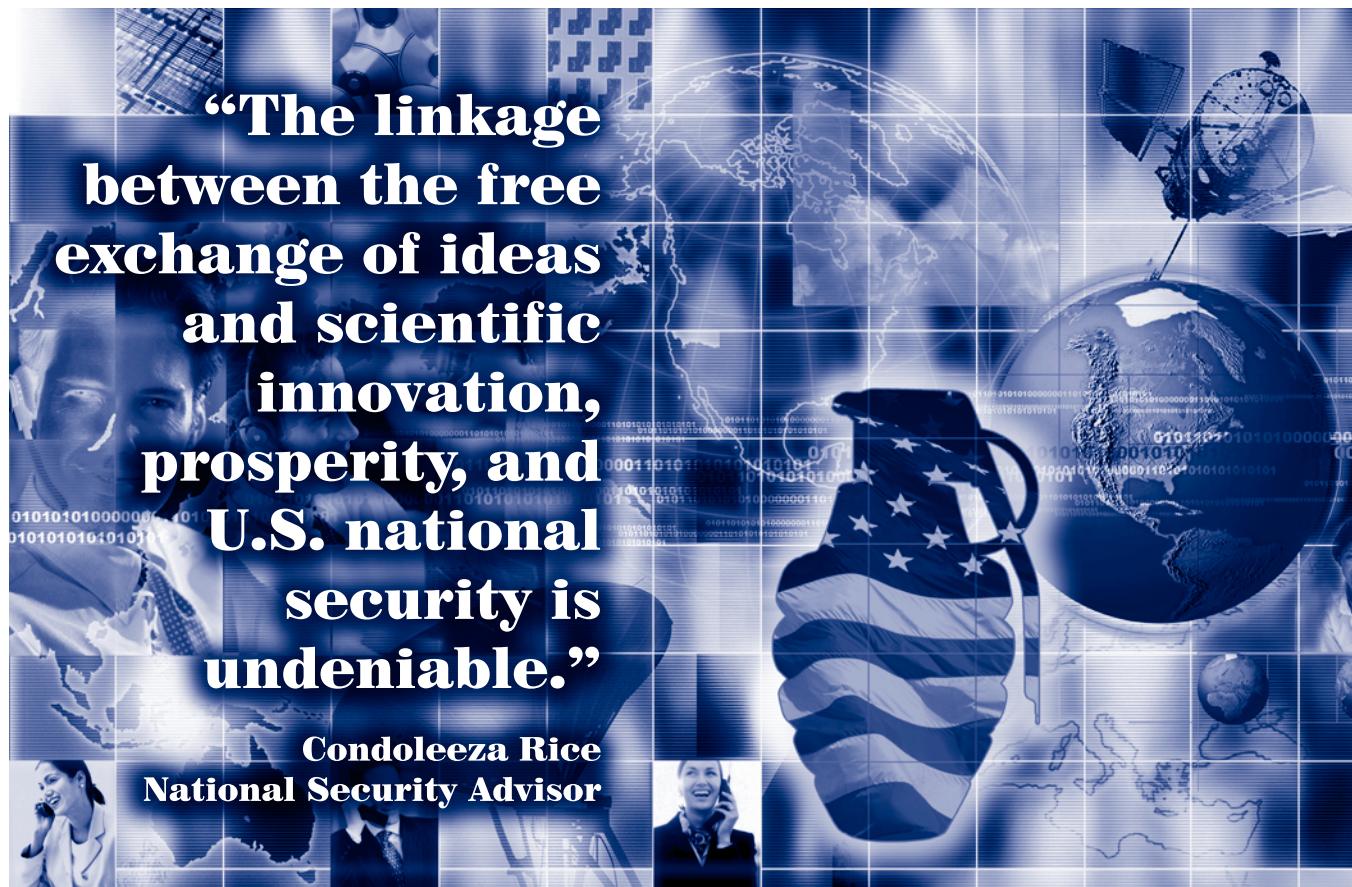


Technology Transition—A Critical Element in Homeland Security

Cynthia E. Gonsalves



Think about the battery in your watch. Defense helped develop it, then a commercial company produced it. That's “technology transition”—moving lab technology to a producer that implements it for military—and possibly commercial—use. The same happened with other defense technologies: computers, satellite communications, the Internet, GPS, just to mention a few.

The United States initially sought to transition defense technology to improve the competitiveness of American business. Over the past few years, technology has also moved in the other direction, as we have increasingly transitioned commercial technology into defense to maintain our forces' competitiveness in the battle space. And

now we need to move technology to help homeland security.

Defense and Industry: a Two-Way Street

Interestingly, industry was an impetus for coordinated and rapid defense technology transitions. Over a decade ago, accessing defense labs was a challenge. “What we did is spend an awful lot of time calling people,” says one Dow-Corning executive. In addition, the military services’ labs approached transitions differently. “There is no policy they could go by,” says the same executive. And finally, agreements took too much time.

Primarily to aid industry and enhance its competitiveness, Congress mandated in 1993 that the Department of Defense (DoD) establish an office of technology transition. In the decade since, defense has recognized its need for technology from the private sector. Of the total U.S. research and development (R&D) spending, federal

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R&D decreased from 36 percent to 26 percent in 2000. "DoD will rely on the private sector to provide much of the leadership in developing new technologies," according to the *Quadrennial Defense Review*. Today the Office of Technology Transition provides overarching guidance, with approximately 80 defense-related lab sites executing decentralized transitions in their mission areas.

The Take-Away for Industry

The good news for industry is that defense is developing technologies of potential commercial use, and the way to find that technology is through the DoD Office of Technology Transition.

Technology transitions enable new businesses. For example, in 1998, four former Army research lab personnel who helped develop a critical communications technology started Paratek, a privately held company that develops tunable solutions for wireless communications networks. Today that company has 54 employees; is making miniaturized tunable filters for lightweight, man-portable radios for both DoD and commercial purchases; and won the 2001 Army Technology Transfer Award.

Just as initially intended, defense technology transitions are making American businesses more competitive. A small California company, AXT, Inc., recently took a defense technology and captured 15 percent of the world market in a key component for integrated circuits.

But it isn't only individual businesses: entire industries, too, can benefit from defense technologies. Consider the airline industry. You may know that airports use fire-fighting foam, but what you may not know is that it was invented at the Naval Research Laboratory years ago. Here's another example. For years, airports have de-iced aircraft using large quantities of ethylene glycol and propylene glycol, substances harmful to the environment. The Air Force Research Laboratory recently developed a more efficient nozzle for de-icing, resulting in 75 percent less glycol usage. It is being used by the Air Force and the airline industry.

Let's look at the maritime shipping industry. After half the 40,000 cargo containers in Desert Storm went unused, the Navy funded Savi Technology, a company specializing in global supply chain security and asset management, to develop a radio computer tag that reports containers' locations and contents. Defense and industry now use it, with the latter's sales reaching \$20 million annually.

The Take-Away for Defense

Moving the other way, commercial innovations continue to help defense maintain its competitiveness in the battle space and stretch the defense dollar. For example, Silicon Design Inc., a maker of accelerometers triggering car

airbags, developed accelerometers for arming missiles, such as the AGM-114 Hellfire 2 and Patriot PAC 3. Several commercial technology inserts have extended the life of the P-3 aircraft and cut operating costs.

In other instances, Earth Search Sciences Inc., a commercial leader in remote sensing, is developing a space-based system that collects hyperspectral imagery of littorals for naval forces. And Pennsylvania's M. Technologies Inc., the industry leader in the smart weapons multiple carriage industry, developed a bomb rack that doubles an F-16's bomb load.

Speed is of the Essence

Whichever the direction, industry to defense or vice versa, technology transitions must be fast—and that's happening. On Sept. 10, 2002, the Air Force Research Lab transitioned technology for a CBU-107B air-delivered munition, a new capability that destroys a classified target set. The components were made by Textron, General Dynamics, and Lockheed Martin. The first munitions were available Dec. 17—just 98 days later—and subsequently used in Operation Iraqi Freedom.

The Take-Away for Homeland Security

"America's historical strength in science and engineering is perhaps its most critical asset in countering terrorism," according to a National Academies of Sciences report, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*. That same sentiment has been expressed by the National Strategy for Homeland Security and the DoD Combating Terrorism Technology Task Force. Much of the technology needed for homeland security must come from defense labs—and some already has.

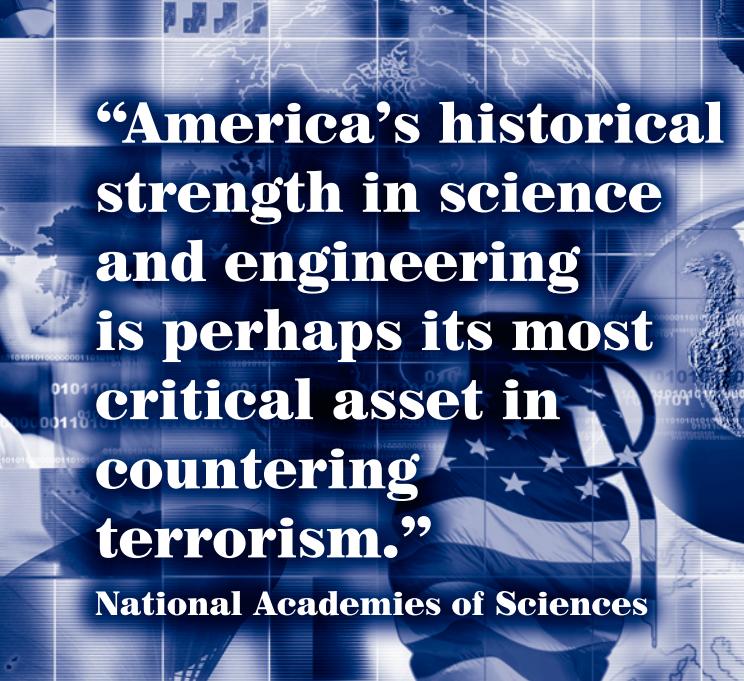
Detection

The Federal Aviation Administration uses a nuclear quadrupole resonance technology developed by the Naval Research Laboratory to detect bulk explosives. Among other advantages over x-ray detectors, the technology requires little image interpretation. The U.S. Postal Service uses an electron beam developed for missile defense to irradiate mail and kill anthrax.

Defense has also supported the development of a system that uses gamma-rays to penetrate the contents of containers that may have sides up to 6 inches thick. This capability could provide greater border security. And defense is developing technology for real-time detection and identification of biological agents—capabilities first-responders may need.

Information Security

The National Strategy for Homeland Security calls for the ability "to share sensitive information securely among all relevant government entities." The Naval Air Warfare Cen-



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National Academies of Sciences

ter Weapons Division, along with information security specialists Market Central Inc. and Radionics, Inc., developed a computer security system that uses an access card, code, and electronic switches to provide varying degrees of access. Unauthorized attempts to gain access can trigger access denials, alarms, and armed responses. Potential uses go beyond defense and homeland security and include applications in a variety of industries.

Consequence Management and Recovery

In the event of a terrorist attack, a building's ability to sustain a blast can make a difference in the number of lives saved. Research on such building attributes and bomb blast effects has been conducted by the Defense Threat Reduction Agency, and a National Research Council committee recently urged the agency to step up efforts to share its findings with the commercial design and building community.

Dealing with human injury is another area in which certain defense technologies may be applicable. The Army Medical Research Command and the American Red Cross have developed a haemostatic bandage that assists the clotting process and could conceivably prevent excessive loss of blood from deep cuts.

Value in Movement

As National Security Advisor Condoleezza Rice wrote, “The linkage between the free exchange of ideas and scientific innovation, prosperity, and U.S. national security is undeniable.” To have value, technology’s got to move. Within defense, the Office of Technology Transition enables the two-way movement that has historically brought value to both defense and industry and that has the potential to make a powerful contribution to homeland security.

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The Transfer of Intellectual Property

There are a number of ways to effect the movement of technology and intellectual property between the players.

One widely used mechanism is the **cooperative research and development agreement**. It has attracted companies that traditionally did not conduct defense R&D. The agreement allows Defense to provide personnel, facilities, and equipment to privately funded—or in-kind contribution—R&D efforts of interest to DoD. (Under one such agreement, a U.S. Army officer was assigned to Glaxo SmithKline to test an anti-malaria drug developed at Walter Reed Army Institute of Research.) Similarly, the agreement allows industry to provide funds, equipment, property, and personnel to such endeavors, and protect their intellectual property. Today, over 2,000 of these agreements exist.

Another mechanism is **educational partnership agreements**. These agreements provide personnel, technical assistance, and lab equipment to help today’s students become tomorrow’s engineers and scientists. Attracting them is becoming a critical issue for defense labs. These agreements also can yield near-term results. Working with the Air Force Research Laboratory, high school students in New Mexico designed a protective satellite door that opens and closes using magnets – an invention that was patented by the Air Force.

One of the most important transition mechanisms is the **patent license agreement** (PLA). A decade ago, many companies avoided federally developed technologies, even when available. The problem was they were available to anyone, and thus unprotected. Since then, Defense has increasingly filed for patent protection and today it holds 350 active PLAs. And while revenues from these agreements were almost nothing a decade ago, today they bring in over \$6 million annually, providing incentives for technical teams and more funds for labs.

Technology and intellectual property transition by various other means: the use of defense lab facilities by industry; conferences; small business innovation research; dual use technology development by defense and industry; and intermediaries, such as Montana State University’s TechLink Center, that arrange partnerships between defense and private sector companies.