



NEW PERSPECTIVES ON PORT SECURITY

An artist's rendering of one of the High Altitude Stratospheric Airships designed to bolster the nation's security with a wide array of innovative technologies

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NJIT RESEARCHERS ARE PUTTING A 21ST CENTURY SPIN ON A 19TH CENTURY technology to make the nation's ports and coastal waters safer. Airships — known today mainly for advertising flyovers at football games — are the core of a new coastal surveillance system in development for the Missile Defense Agency (MDA) of the U.S. Department of Defense. But the new models will bear little resemblance to their predecessors. These High Altitude Stratospheric Airships (HASAs) will be unmanned, stationary platforms 12 miles above the ground. At 500 feet long and 150 feet in diameter with a volume of five million cubic feet, the HASAs will be 25 times the size of a Goodyear blimp.

The airships will be equipped with an array of cutting-edge equipment for remote sensing, communications, and risk analysis of suspected threats — and that's where NJIT comes in. The university is partnering with StratCom International LLC to serve as the academic research and development base for the project.

NJIT's component of the project is under the direction of Donald H. Sebastian, vice president of research and development and director of the university's Homeland



Security Technology Center. Sebastian says the project is a natural fit for NJIT. “We have expertise in the whole range of applicable technologies — terahertz imaging, advanced materials technology for the airship skin, microelectromechanical systems (MEMS), intermodal freight transportation through our transportation centers, wireless telecommunications, and information-assurance systems. We’re also an agile university with a strong entrepreneurial character that allows us to respond quickly to an emerging need such as homeland security.”

While the airship technology is driven by important defense applications, the impact on civilian life may be far greater. When production can be scaled to meet the need of widespread deployment,



Donald H. Sebastian, director of NJIT’s Homeland Security Technology Center

the airships will become an important layer of our telecommunications infrastructure, empowering a wide variety of applications based on mobile, bi-directional exchange of voice, video and data — broadband access anywhere at any time. Closer in time, homeland-security applications ranging from first-responder communications for emergency response and command through border security and surveillance systems will be important markets for HASA technology.

Monitoring container traffic

One area of development that has been proposed to the federal Transportation Security Administration concerns “maritime domain awareness” — pushing the national boundaries out to sea where problem cargo can be identified and handled far from our populated port cities. The primary focus of the project is shipping containers, considered to be among the most serious potential threats to homeland security. More than half of all U.S. trade travels in sealed containers 20 to 40 feet long, piled by the thousands onto ships for delivery to ports, where they are often transferred, unopened, to trucks and trains for shipping to secondary destinations. Some six to eight million containers arrive in U.S. ports annually, and fewer than four percent are ever inspected for contraband or dangerous materials.

“The threat is a serious one, but container traffic is also one of the keystones of the global economy,”

Sebastian says. According to recent statistics, \$728 billion in goods were shipped in containers, accounting for nearly seven percent of the gross domestic product. Many American businesses are dependent on materials and components shipped from other nations. Equipped to scan quickly and remotely, the airships won't disrupt commerce.

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At an altitude of 70,000 feet, a HASA's advanced radar would provide surveillance coverage over a surface area of 500,000 square miles. Advanced sensory technology in each cargo container would be in communication with the airship to ensure the integrity of the ship's contents during transit. Unmanned air and sea craft would be controlled from the airship to provide additional surveillance and interdiction capabilities. The North American Aerospace Defense Command (NORAD) has rec-

ommended the stationing of 10 HASAs to cover all the continental borders of the United States.

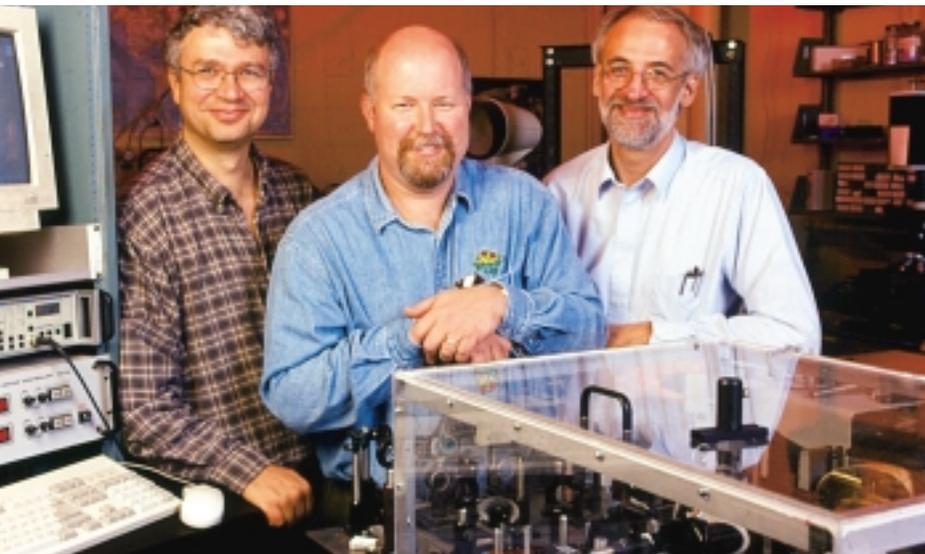
Spearheading the airship project is Lieutenant General James A. Abrahamson, USAF-Retired, chairman and CEO of StratCom International LLC, who directed both the Space Shuttle program and "Star Wars" Strategic Defense Initiative. He founded StratCom in 1998 and partnered with Lockheed Martin to develop HASAs for the telecommunications industry. But after 9/11, defense agencies took an interest in stratospheric airships. Last September, Team Lockheed Martin, which includes StratCom, won an exclusive \$40 million contract with the Missile Defense Agency for HASA design. Detailed plans will be submitted to MDA in June 2004 and, upon approval, the project will receive an additional \$50 million to build and launch a prototype airship by July 2006. The final phase of testing and evaluation through July 2008 will receive another \$9 million in funding.

Detecting explosives with terahertz radiation

A terahertz (THz) detection system that can be deployed inside cargo containers is central to the project. Already under study at NJIT, THz electromagnetic radiation can be used to detect and identify explosives and biological agents even concealed in sealed packages, since THz radiation is readily transmitted through plastics, clothing and other non-metals.

The team — John Federici and Dale Gary, professors of physics, and Robert Barat, professor of chemical engineering — has developed imaging tools designed to provide wide-area surveillance for concealed explosives. They recently received a Phase II Small Business Innovative Research grant with their industrial collaborators, Picometrix, Inc., of Ann Arbor, Michigan, for commercial development of the terahertz detection system. For the airship project, they will develop miniaturized systems that can be deployed inside cargo containers, as well as artificial neural network algorithms to analyze the THz images for the presence of explosives. Various types of explosive agents will be studied to develop recognition of their THz signature.

"Although the THz system would not be able to determine the contents of a sealed metallic container, it will be able to detect the presence and size



The NJIT terahertz detection team (from left) — John Federici, Robert Barat and Dale Gary

Stratospheric Airship Surveillance of the Continental U.S.

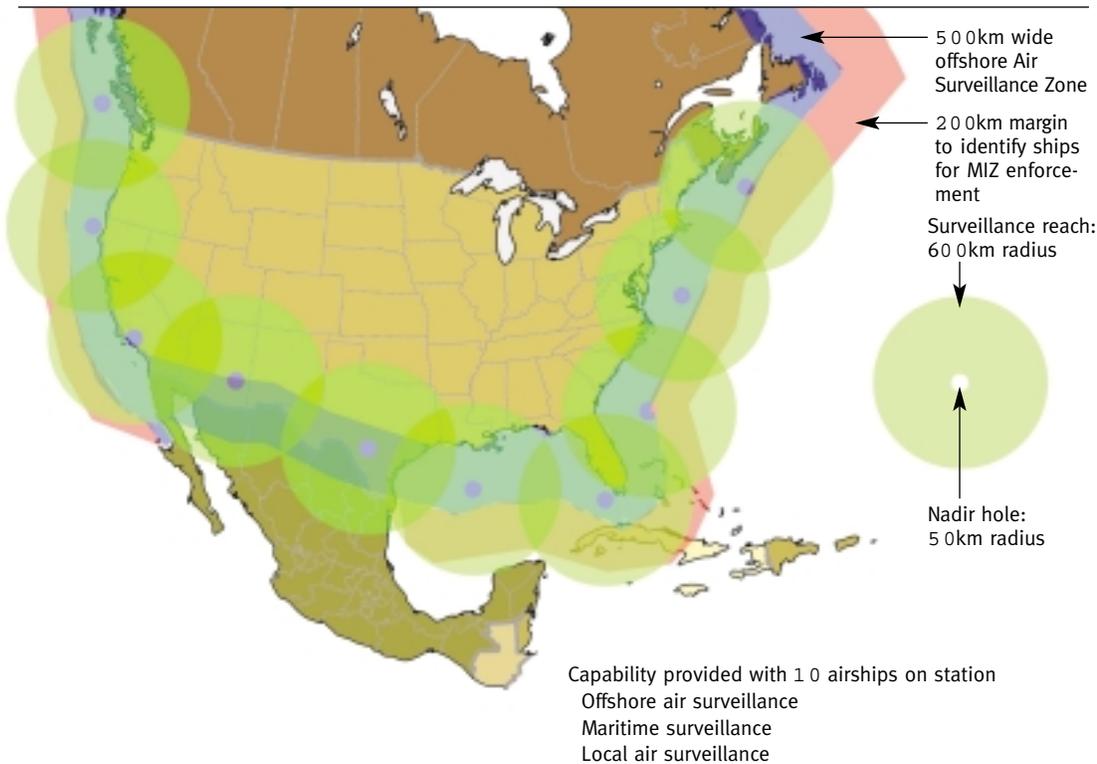


Diagram: MIT Lincoln Laboratory

of a metal container inside the cargo container,” Federici says. “Comparing images over time could suggest that a suspicious container had been placed on board.”

In-container and seagoing surveillance

NJIT will consult with partner, Secure Asset Reporting Services (SARS), on the development and installation of advanced in-container sensors. The team will expand upon the GPS-system developed by SARS for tracking maritime and other mobile assets with additional sensor technology to detect door openings, the breaking of container seals, movement inside containers, and chemical, biological and explosive threats. “We plan to see tracking and sensor arrays in every container entering or leaving U.S. waterways and on virtually all road and rail systems in the United States,” Sebastian says.

Technology against terrorism

Although by far the largest research initiative related to homeland security, the HASA project is one of some two dozen studies coordinated by NJIT’s Homeland Security Technology Center. Sebastian says that a public technological university has an important role in homeland security.

“We ran a survey last year in the New York Metropolitan area and found that nearly two out of three adults think it is likely that another act of terrorism will occur within this area,” says Sebastian. “The vast majority expect information and protection to come from the government, especially from scientists and technology experts in public institutions. We saw this as a mandate for NJIT to apply its resources and expertise to New Jersey’s homeland security.” ■