

### NMAB Focuses on Materials Research for Counterterrorism

In the wake of the September 11 terrorist attacks, the federal government is reviewing many of its policies to strengthen defenses against terrorism and to help deter threats from terrorists in the future. As part of that effort, the National Materials Advisory Board (NMAB)—under the direction of its parent organization, the National Academies—is considering “smarter” materials and materials-related systems that could be used in counterterrorism.

One such effort involves technologies for aviation security. Although NMAB has been studying aircraft materials since 1951—and aviation security since 1988—the research continues with a much greater sense of urgency because the September 11 attacks involved hijacked commercial airliners.

“There’s an urgent need for characterization technologies,” said Toni Maréchaux, NMAB’s director. The Federal Aviation Administration (FAA) wants to ensure that every piece of luggage, both checked and carry on, is inspected, as well as cargo such as mail. So the FAA has directed NMAB to evaluate scanning technologies capable of doing the job. “This has become a top priority, and an expensive one,” said Maréchaux.

Maréchaux said, “American planes are built by private companies who must compete with overseas firms. For several years, airplane designers have emphasized weight reduction to reduce operating costs. Now, safety must be the primary concern.” Yet cost must remain a factor. “Sure, you can make an aircraft 100% safe, but who could afford to fly it?” As a consequence, “any improvements made to increase safety must also improve the func-

tionality of the aircraft, or reduce weight or cost,” she said.

One example, Maréchaux said, might be an airframe skin containing embedded sensors that control a self-healing process, in case the skin is punctured by bullets or ruptured by a bomb. The self-healing aspect would also extend the fatigue life of the material.

The same approach goes for materials and devices that could be used in civilian security efforts but that up to now have been too expensive for all but military or limited applications. For example, Maréchaux said, the NMAB has been asked to look into developing cheaper night-vision goggles and decontamination technologies that can be used by local firefighters and rescue workers. Some technological aspects of this research have been under way for some time at the NMAB, as part of the work of its Committee on Materials Research for Defense after Next (see *MRS Bulletin*, July 2001, p. 502). That effort is supposed to concentrate on U.S. defense materials needs some 10 to 20 years in the future. Now, however, speed is of the essence, and any technology that can be developed sooner—and can find value in counterterrorism—may receive a higher research priority and accelerated funding.

Maréchaux emphasized that because the federal research establishment is still reeling from the events of the past few months, many important issues remain undecided. As a result, there continues to be a vigorous and free-flowing discussion among the agencies about what needs to be done, and communications involving materials research are traveling in all directions.

“The Academies have charged NMAB to consider all ways to improve materials in response to threats from terrorism,” she

said. “At the same time, the individual agencies are asking us to undertake specific projects. We are up to the challenge, because 80% of what we do, directly or indirectly, is involved in counterterrorism.”

Among the top priorities for NMAB, in the wake of the anthrax attacks that began in October, are recommendations for ultrafast sensors to detect such pathogens, as part of a research effort for the Defense Threats Reduction Agency. “The government has been looking at such sensors for some time,” Maréchaux said; “but now, because of the size of the threats, we’re going to have to implement sensors that work in real time, with detect-to-warn capability. That’s a much more complex challenge.”

The FAA also wants new, ultrafast sensor technology for passenger screening, to cover such threats as nonmetallic weapons and nonconventional explosives. The more rapidly sensors operate, the less passengers will be inconvenienced, and the smaller the economic impact will be on the commercial aviation industry.

Other aircraft-related research efforts involve the development of safer jet fuel and post-crash fire-suppression devices. Some of this technology already exists, Maréchaux said, but is either too heavy or too costly to be economically practical.

Among the additional research in prospect, according to Maréchaux, is the development of environmental safety standards for biohazards. The anthrax contamination in the postal system has made such standards imperative. “We have to be able to assure the public that it is safe to return to these locations and environments after an attack,” she said, adding that the Department of Transportation is looking to fund this effort.

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