Government Security

- Federal/Homeland Security
- State/Local Security
- Transportation Security

bomb onto an airplane remains a concern.

Not long after last year's crisis, TSA began pilot testing a handheld technology capable of screening sealed bottled liquids for explosives. Pilots have been conducted at Miami International, Newark Liberty International, Detroit Metro, Los Angeles International, Las Vegas McCarran International, Chicago O'Hare International and Boston Logan International Airports.

The technology detects small quantities of vapors that leak from all bottles of liquid, no matter how tightly capped. It then conducts a chemical analysis that can differentiate between liquid explosives and common, benign liquids.

The first pilot tests looked at Fido PaxPoint detectors from Nomadics Inc., Stillwater, Okla. Testers also evaluated SABRE technology from Smiths Detection, Pine Brook, N.J.

Both Fido PaxPoint and SABRE explosives detection scanners provide mobile explosives vapor detection as well as trace detection for solid explosives. SABRE can also detect threats from chemical warfare agents, toxic industrial chemicals or narcotics.

While other companies participated in the pilot tests, Nomadics and Smiths Detection received contracts. At the beginning of October, TSA acquired 200 Fido PaxPoint units for $3.4 million and 23 SABRE units from Smiths Detection for $650,000.

9. **Passenger Screening Technology**

A new technology enables checkpoint screeners to look for concealed threats when screening passengers with casts, braces, heavy bandages or prosthetics.

Following a successful pilot test begun in April 2007, TSA has purchased 37 CastScope cast and prosthetics screening devices from Spectrum San Diego, a research and development firm based in San Diego, for $1.7 million.

CastScope uses X-ray backscatter imaging technology, which scans a narrow, low-energy X-ray beam over the surface of the object or body being inspected. Some of the beam is reflected or backscattered. The reflection can be detected, digitized and displayed on a monitor as a high contrast image that TSA screeners use to differentiate between medical equipment and prohibited items.

According to TSA's Web site, CastScope technology works fast, producing a computer-enhanced image within 2.5 seconds.

The large backscatter machine has been mounted on a movable platform and can be positioned easily in a convenient, private cubicle adjacent to the checkpoint.

CastScope emits less than 10 microRems of radiation per scan; a typical medical X-ray emits 10,000 to 100,000 microRems per scan. Two minutes of airplane flight exposes an individual to 10 microRems. In addition, naturally occurring background radiation exposes people to about 10 microRems of radiation every 15 minutes.

While overexposure to medical X-rays is generally considered harmful to people, no such concerns exist for backscatter X-rays. TSA notes that backscatter systems have not been shown to affect human health.

10. **Two Varieties of Millimeter Wave Imaging**

In April, TSA began testing an explosives and weapons detection technology called millimeter wave. All objects emit electromagnetic radiation called millimeter wave, and waves emitted by specific objects have unique signatures.

The human body, clothing, guns, ceramic knives and plastic explosives all emit different millimeter waves. Sophisticated electronics can differentiate between signatures and construct images of objects emitting the radiation.

This capability enables millimeter wave security devices to conduct what some call an electronic strip search. An imaging device can be set to filter out clothing and construct an image of the body as well as any materials concealed under the clothing such as knives, guns, ceramic weapons and plastic or conventional explosives.

TSA is interested in two types of millimeter wave imaging technology: passive and active. The passive technology creates an image of the body that is too vague and fuzzy to be considered revealing. So privacy is probably not an issue, but the image is clear enough to detect explosives and weapons on people.

Airports in Phoenix, Los Angeles and New York-JFK are currently testing active millimeter wave systems for TSA. In these tests, passengers selected for secondary screening at checkpoints are given the option of undergoing a pat down search or stepping through an active millimeter wave portal. The portal sends out millimeter waves, which are changed by the objects they pass through and reflect off of. Using this information, the portal constructs a surprisingly clear image of a person and any objects hidden beneath his or her clothing.

Because of privacy concerns, passengers are given the option of going through the portal, which is fast, or submitting to a pat down search, which is slower. The operator works from a remote location and does not see the actual person he or she is scanning.

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