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Jane's Airport Review

Body scans hit checkpoint glitch

Ben Vogel

Practical concerns still surround full-body scanners despite growing demand

International airports are engaged in a major overhaul of security infrastructure, after the unsuccessful 25 December 2009 attempt to blow up a passenger airliner prompted the Obama administration and other governments worldwide to push aggressively for the deployment of full-body scanners.

Figures from the US Transportation Security Administration (TSA) indicate that 450 Advanced Imaging Technology (AIT) systems will be installed at US airports by the end of 2010; 950 by the end of 2011; and 1,800 by the end of 2014. The total cost would be around USD3 billion over the period 2010-18.

Privacy and health concerns have been expressed, but questions have also been asked about how easily they can be physically installed at airports which often suffer from space constraints.

The effectiveness of AIT has also come under scrutiny, with the Government Accountability Office (GAO) reporting on 17 March: "While officials said [the devices] performed as well as physical pat downs in operational tests, it remains unclear whether the AIT would have detected the weapon used in the December 2009 incident."

Security experts argue that the backscatter rays can be obscured by body parts; may not readily detect thin items seen edge-on or objects hidden inside the body; and require a human operator to decide whether to conduct additional questioning or a physical search.

Appearing before the House of Representatives' Homeland Security Committee, GAO Director Steve Lord said that the TSA should conduct a new cost-benefit analysis before rolling out the scanners.

According to the GAO, it would cost around USD300 million to procure 1,800 WBI units, sufficient to cover about 60 per cent of screening checkpoint lanes at the highest-priority US airports. Also, as each unit requires three staff to operate it, the GAO calculates total manpower costs of USD2.4 billion over the next eight years.

A previous cost analysis from the TSA determined that scanners are a better option than conventional walk-through metal detector, and swab machines.

Size matters

AIT was among the technologies audited by the Department of Homeland Security (DHS) Office of the Inspector General (OIG). In its April 2010 'Evaluation of Newly Deployed and Enhanced Technology and Practices at the Passenger Screening Checkpoint' report, the OIG identified a range of undisclosed vulnerabilities in passenger screening at eight US airports.

"The number of tests conducted, the names of the airports tested, and the quantitative and qualitative results of our testing are classified," the report stated. "We have shared that information with the department, the TSA and appropriate congressional committees." The TSA is studying the results of the OIG audit "as part of its ongoing efforts to assess and improve passenger checkpoint screening".

Meanwhile, officials at space-restricted airport checkpoints are faced with the headache of installing the often bulky equipment while minimising the disruption to operations. Initial US recipients of AIT equipment include Category X airports (major international hubs), which tend to be airports with available space in their existing facilities. However, more inventive solutions are required for spatially constrained airports.

Initial orders have been confined to the two AIT devices approved by the TSA: the Secure 1000 Single Pose backscatter x-ray machine from Rapiscan Systems and the ProVision millimetre-wave (MMW) system from L-3 Communications. Both require an increased installation footprint at the checkpoint.

Roddy Boggus, executive vice-president for aviation at Gresham, Smith & Partners (GS&P), says that a previous standard '2 in 1' (two x-ray baggage scanners and one walkthrough metal detector) security screening checkpoint (SSCP) design with a holding station measured 22 ft wide x 44 ft long (7 m x 13 m). "The new AIT/AT designs with [disabled access] gate and holding station measure 28 ft 9 inches by 58 ft 2 inches for the L-3 ProVision product and 31 ft 9 inches by 58 ft 2 inches for the Rapiscan product," he adds.

"In both cases the 58 ft 2 in does not include the remote screening/monitoring room staffed by the TSA." This room must be an enclosed, private space housing the Lane Control Unit (computer, monitor and workstation). It must be no further than 13 ft from the AIT device.

In a presentation on 24 April at the ACI-NA Operations and Technical Affairs Conference in Orlando, GS&P Senior Associate Tim Hudson estimated that airports would need to find an extra 116 ft2 to accommodate the new checkpoint equipment; the AIT portal alone can add 1,400-2,000 lb (635-907 kg) of additional structural load, and the new multiview AT x-ray a further 1,200-2,100 lb.

Throughput is another issue associated with the AIT technology as it is introduced to new airports - checkpoint speed slows as passengers accustom themselves to the new processes. "This may also result in a need for additional space as a reaction to longer passenger queues," Boggus remarks. "Currently the TSA and industry looks for 200 to 240 passengers per hour processing speeds. Already we are hearing of a major airport with a speed of around 140 passengers per hour."

The TSA has demonstrated awareness of these matters, however, and is showing some flexibility. For example, it originally gave each airport a 30-day notice of impending AIT installation - this has since been lengthened to 120 days.

"I think there is a lot of awareness that something may need to be done but many airports we are talking to, are not sure exactly what that 'something' may be," Boggus tells *Jane's* . "Also the TSA seems to be much more accommodating than they originally let on and not requiring airports to 100 per cent comply with their original design sketches."

Regarding the technology itself, other platforms are being offered to join the ProVision and Secure 1000 as TSA-certified body scanners.

The passive MMW GEN 2 solution from Brijot Imaging, for example, integrates a full-motion video camera, an onboard computer and an automated detection engine. This is described as "human-assisted detection" by Brijot Chief Executive Officer Mitchel Laskey, as image interpretation still depends on input from the operator. "However, we will put a box around items that are potentially suspicious to assist the operator."

Unlike the TSA-certified full-body scanners, GEN 2 produces a pixellated image of the body. The body image appears as white with no anatomical details.

The scanner picks up items concealed beneath clothing by detecting differences between natural body heat emissions and waves emitted by hidden objects. It cannot look through the human body, so individuals being scanned must turn around in front of the scanner or be viewed by multiple machines simultaneously.

Increased demand

A mobile, battery-operated GEN 2 has been used since 2009 for secondary screening by the UK Border Agency at Heathrow and Gatwick, and at Manchester (the system is included in the Home Office Scientific Development Branch's Blue Book). Brijot is pursuing TSA certification for airport use at the time of writing. "We expect to be on the QPL [Qualified Products List] fairly soon," Laskey tells *Jane's* .

A static GEN 2 unit for use at an airport typically costs USD250,000 and optimum operating distance is 9-10 ft. "We implement our mobile solution in two configurations," adds Laskey. "Our longer-range standoff has a 10 ft 'sweet spot', and our extra-resolution system operates best at 4.5 ft from the subject."

In Italy, Elsag North America has installed two scanners at Venice Marco Polo Airport: a static unit that passengers must walk through, used for direct flights to the US and other sensitive destinations; and a mobile unit that can be deployed rapidly as needed at the checkpoint.

Yet GEN 2 is not what Brijot has in mind for checkpoint AIT. "We've recently introduced SafeScreen, which is our portal for whole-body imaging," Laskey says. "We've been in the TSA qualification process for two years - it's a multi-step process with the TSL. We expect to emerge from this process by mid-2010. We're also doing some selective trials around the country as there seems to be increasing demand for body imaging. In the very near term, I anticipate we'll be doing airport trials with regulators in the UK, France, Italy and other countries."

SafeScreen operates in the same 80-100 GHz frequency range as the GEN 2, and shares other features (such as human-assisted detection) with the legacy Brijot product. "I will tell you that SafeScreen utilises reflective optics, which enables us to resolve smaller items than we can in other products," Laskey says.

Power supply for the portal is 120 VAC/50-60 Hz/220 W. It operates best in environments where the ambient air temperature does not regularly exceed 26 degrees Celsius.

Scanning each passenger from head to toe takes eight to 10 seconds. "Based on the concept of operations, it will probably take 15 seconds to clear the machine," Laskey comments. The MMW radiometer produces eight frames per second - image resolution is approximately 3 cm x 3 cm.

Objects that are colder than the surface temperature of the subject are surrounded by a blue detection box; objects that are hotter than the surface temperature of the subject are denoted by a magenta detection box (blue and magenta are default colours and may be changed at the operator's discretion). The window frame changes to red for large objects and to orange for all other detections.

Operators would view the MMW image from a separate viewing room on a 19-inch monitor using a standard Windows XP interface; the fully integrated onboard Pentium-based processor enables standalone operation without external PC connection.

Laskey stresses that human factors have been taken into account in the development of SafeScreen. "It's all about training and continuous process improvement - we're spending a great deal of time and energy doing that," he says, adding that with the help of specialist software packages for training, it would take as little as one to three hours for TSA screeners to familiarise themselves with the system.

A similar approach is adopted by Iscon Video Imaging, which in February 2010 introduced a scanner with its patented non-ionising Thermal-Boosted Infrared Detection System. The scanner is undergoing testing by the TSA.

As with the Brijot system, the Iscon platform creates a temperature differential between clothes and a hidden object. It is available in two configurations - the 1000D body-screening portal and the handheld Game ChangeIR - for more selective scanning applications.

Handheld options

According to the company, the 1000D takes 30 seconds to conduct a full passenger scan.

Iscon Senior Strategic Officer Peter Harris tells *Jane's* that the system is suited for secondary screening at Category X airports. He remarks that primary screening would be more problematic: "When this technology [whole-body imaging] was introduced as a primary source of inspection, that's when it went sideways. Full-body imaging is better used for secondary screening."

The portable GameChangeIR could prove attractive for space-limited or smaller airports. It uses the same technology as the 1000D, and potentially removes the need for intrusive manual pat-down searches at the checkpoint. "Used in conjunction with a metal detector, it provides the operator with a sophisticated body scanning system at a fraction of the cost of other body-scanning portals," Harris claims.

GameChangeIR consists of an imaging display terminal as well as the specially designed handheld infrared scanner and platform for subjects to stand on for scanning. The device uses standard AC power, but power requirements can be adapted using converters or necessary transformers.

During scanning, it blows warm air from a hairdryer-style outlet that equalises the temperature to distinguish cold objects (displayed as dark areas on the display) from warm ones (denoted by light areas).

"The main advantage of the handheld Game-ChangeIR is that it does not scan the entire body, and it does not require passengers to step into a special portal or passage to undergo screening," Harris adds.

While Iscon awaits the outcome of TSA testing for the 1000D and GameChangeIR, it announced on 3 May a distribution deal for the sale of its scanning systems in the Chinese market.

Local distributor Beijing Ritchie Link Technology will provide sales and support for the Iscon systems to Chinese customers, including the aviation sector. Initial purchases of the GameChangeIR have already been made at the time of writing.

Jane's understands that the eqo MMW system from Smiths Detection, for instance, has been tested since December 2009 at the Department of Homeland Security Transportation Security Laboratory. "We expect to go into the operational test and evaluation phase imminently," says Bernhard Semmling, head of strategy and communications.

In the UK, operational evaluation of the system at two London airports (Heathrow Terminal 3 and Gatwick) is in progress.

Eqo resembles a standard walkthrough portal. It makes use of electronically sca-nned imaging rather than the mechanical scanning method used by other MMW systems. Miniature antennas covering the 2 m-high eqo panel emit ultra low-dose MMW energy around the individual being scanned. Variations in reflection generate a three-dimensional (3-D) image to reveal concealed materials. The high-resolution 3-D image is captured in real time and is variable down to 4x4 mm. Images are assessed by an operator in a remote location.

The capabilities of eqo and its open-plan design are intended to combat new-generation aviation security threats without compromising throughput rates, the company claims, as individuals need only pause to face the panel and then slowly turn around before exiting the portal.

"Immediate feedback [from Heathrow] has been very positive because eqo is layout-friendly due to its open-plan design," a company official claims. "Eqo is barely bigger than a standard metal-detector with a door attached to the end."

Semmling adds: "It makes quite a difference for the operators to have a big brick of equipment in the middle of the checkpoint, or have it neatly integrated into the normal working flow. A couple of [undisclosed] human factors aspects have arisen in the operational trial already that we hadn't considered in the design stage. Technically, our concept is to move towards a more automated object recognition - eqo does not identify explosive material, but shows up concealed objects. In this respect, automation would mean a real-time image indicating (by a frame or red box) where the concealed objects are."

Size and weight comparison between selected full-body portals and conventional walkthrough metal detectors

	Raspiscan Secure 1000 eqo	Smiths Detection	Iscon 1000D	L-3 ProVision	Brijot SafeScreen	Conventional metal detectors*
Weight (lb)	1,097	<880	<550	1,800	n/a	100 (approx)
Width (inches)	48.7	43	60	76.7	72	33-37
Height (inches)	80	78.7	95	99	84	86-88
Depth (inches)	36.5	39.4	77	104.4	54	23-26
Source: individual manufacturers, GS&P						
**The figures for walkthrough metal detectors are average dimensions*						

Processing speeds for AIT equipment versus conventional walkthrough metal detectors (passengers per hour)

Metal detectors	Millimetre-wave AIT	Backscatter AIT single-pose	Backscatter multi-pose	AIT TSA and industry desired rate	Reported rates in actual airport use/trials
~500	~200	180-360	~100	>250	120-140

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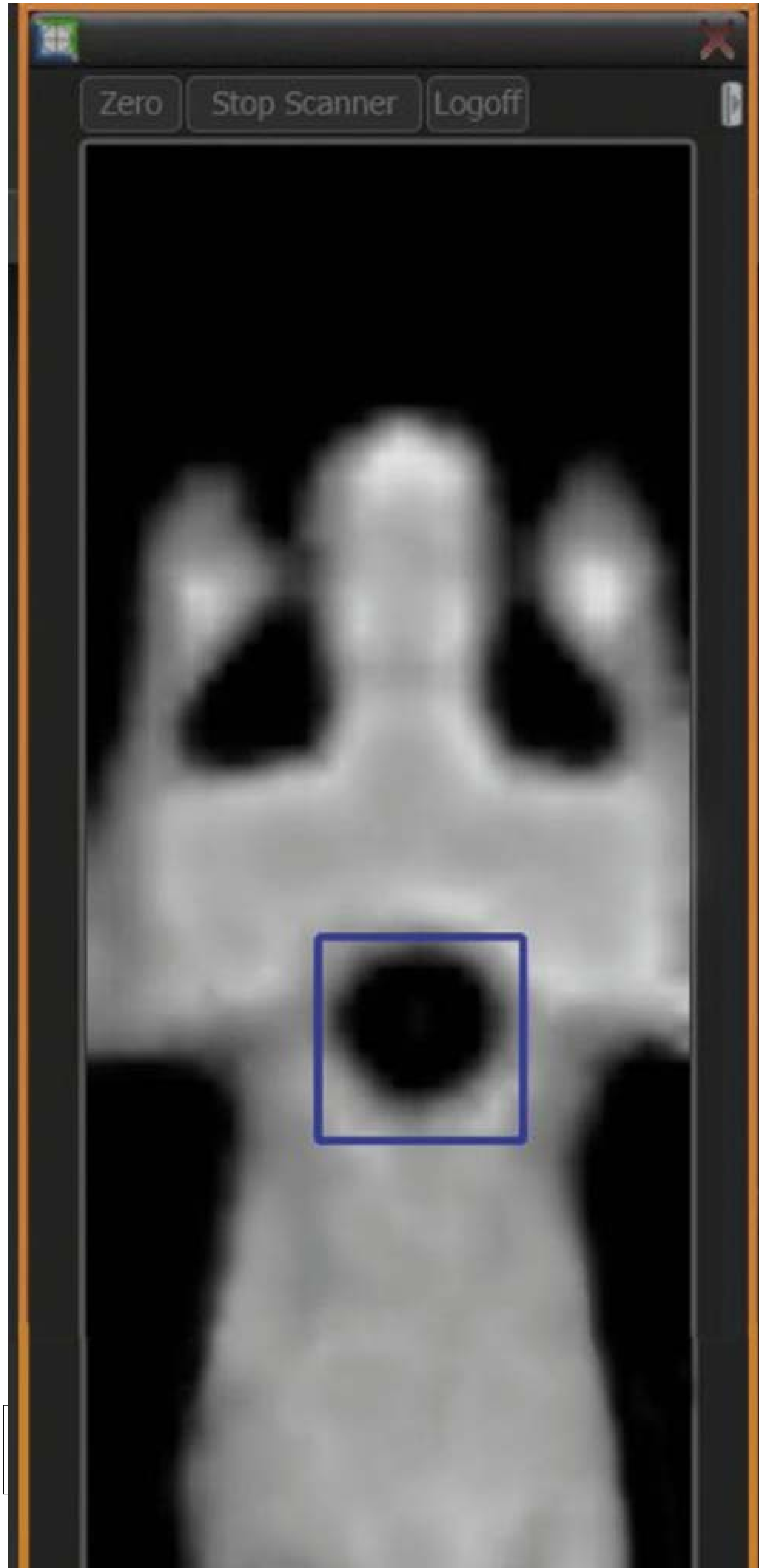
Source: GS&P					



The detection assistance boxes with the SafeScreen portal (pictured) aid the operator and reduce training time, according to manufacturer Brijot Imaging Systems. (Brijot Imaging Systems)

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The eqo MMW full-body scanner from Smiths Detection resembles a standard walkthrough portal. (IHS Jane's/Ben Vogel) 1354586

On entering the eqo portal, the passenger must pause to face the panel and then slowly turn around before exiting. (IHS Jane's/Ben Vogel)
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The Iscon 1000D takes 30 seconds to scan a passenger. (Iscon Video Imaging) 1354588