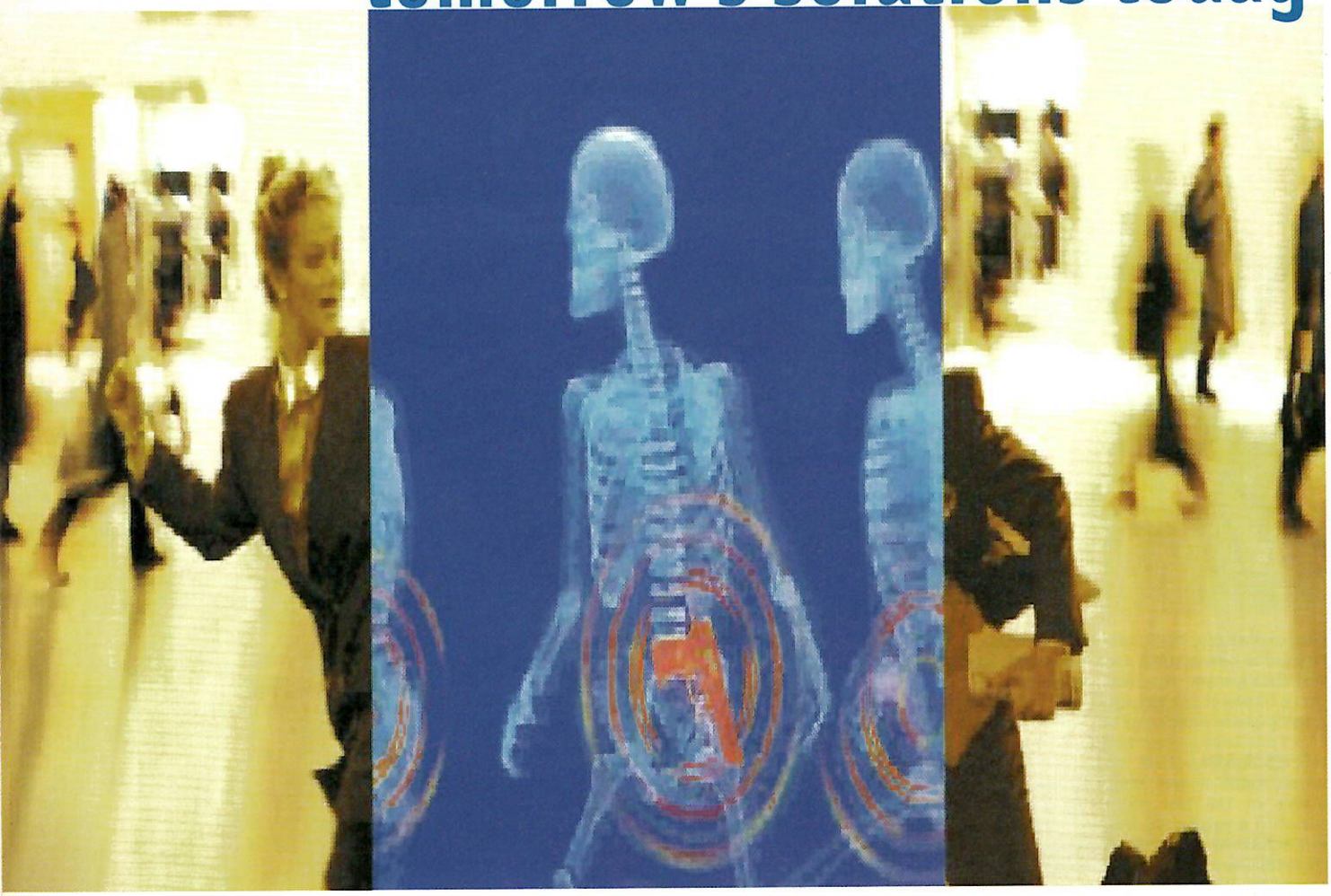
EMERGING TECHNOLOGIES

tomorrow's solutions today



September 11th has called into question our strategies for confronting terrorism both in the global arena of international politics and in the day-to-day preventative measures that are employed to protect civilians in their workplace, at their leisure venues and as they travel. The aviation security industry is being overhauled and many new technologies are surfacing to counter the threat. Philip Baum highlights some of the technologies, which six months ago were thought to belong to the distant future, and which are now already being tried and tested in airports around the globe.

X-ray machines and archway metal detectors are now common-place at airports in even the most impoverished of locations. They are perceived as the first line of defence in our efforts to identify armed terrorists and infiltrated explosive devices. But will the technologies of the 1960s be sufficient to counter the threats posed in the 21st Century?

Since September 11th we have been bombarded with 'perfect solutions' to tackle the problem. From biometrics to body scanning and explosive trace identification to lie detection, manufacturers have been quick to come up with methods of plugging holes in the system.

Passenger Screening

Scrutiny of the passenger screening process has been intense since September 11th and it intensified when Reid managed to board another American Airlines jet on December 22nd wearing shoe-bombs. The technologies on which we have relied so heavily failed on both occasions. Indeed, if we are to believe all the subsequent newspaper reports of other people boarding jets with weapons, either accidentally or in attempt to provide a journalistic scoop, the problem is even worse.

Reality is an archway metal detector does "exactly what is says of the label" – it detects metal. And only 'reasonable' quantities of metal at that, unless you want every zip or bra clip to cause an alarm. Therefore one can hardly be surprised that non-metallic items, such as ceramic and plastic weapons, small metal items, such as blades, and explosives can be carried through most checkpoints undetected.

There are, however, a number of products already commercially available that would enhance the passenger screening process.

Body scanning is one such method and its failure to be implemented as standard apparatus at screening checkpoints is due to government and passenger fears over radiation exposure and privacy issues.

If the claims of the manufacturers are true, radiation is a perceived problem rather than an actual cause for concern. MMC International claim that their CONPASS exposes passengers to 2.4 MicroSieverts (0.24 millirems) per scan, which is the same amount of radiation they will be exposed to by spending one hour in an aircraft at cruising altitude.

MMC's system enables the screening of both internal and external carries and has already proven its worth to customs authorities that have been able to detect drugs, swallowed in condoms, using the system. Despite the thought being somewhat unpalatable, I don't think we should exclude the possibility of the terrorist of the future carrying a threat item on board secreted internally.

The image presented on the screen does show the skeleton, so one could almost argue that the privacy issue is not a factor granted the absence of body form.

Rapiscan's Secure 1000 comes from an established X-ray stable. Unlike the CONPASS where the passenger is moved across the beam on a platform, the Secure 1000 requires that passenger stands flush against a wall whilst their "picture" is taken. The scan is completed within six seconds, with the X-rays themselves only penetrating 1cm below skin surface. The image does give very clear delineation of the body form, so opponents may have some justification in playing the "invasion of privacy" card, yet perhaps, in this day and age that is a necessary evil. Passengers could, of course, elect to be given a pat down search if overly modest.

The FAA has recently bought 5 Secure 1000's for evaluation at their Technical Center in Atlantic City, a process that should be completed within the next two months.

QinetiQ's millimetre wave camera has also had much publicity recently. Unlike the backscatter X-ray scanners that some people consider dangerous, the source of the signals for QinetiQ's scanner occurs naturally and is totally safe. And, because it takes moving pictures, it can allow people to pass through the security checkpoint without even being stopped. An airport gate can therefore let 60 people a minute through, without the need for several security guards and heavy costs.

It sees guns, knives, metals and ceramic devices through clothes and bags. It can also see plastic explosives concealed under clothing. Placed in a vehicle it can identify weapons carried by people on the street, and can detect illegal immigrants hiding in most lorries.

All of these body scanners conjure up images of the film "Total Recall". Yet yesterday's science fiction is today's reality, and a reality I firmly believe in.

Regrettably the traditional objections are nonetheless sticking, which has made it all the more important to improve the standard archway metal detector.

No doubt the most significant advance in recent months has been the launch of Quantum Magnetics' i-Portal 100. Indeed the product won the 2001 Aviation Security International Award of Excellence in the category of Security Technology.

Quantum has resolved one of the key drawbacks with the traditional AMD by displaying potential threats as coloured dots superimposed on a digital image of each traveller as they pass through the system's sensors. The precise location or locations of weapons on passengers are displayed on a computer screen, which allows for rapid secondary inspection of passengers. Independent tests estimate that the use of the i-Portal 100 system decreases the time required to scan passengers during secondary screenings by up to 50 percent and increases the accuracy and thoroughness of follow-on searches. The system also stores each person's image (showing possible alarms), which could

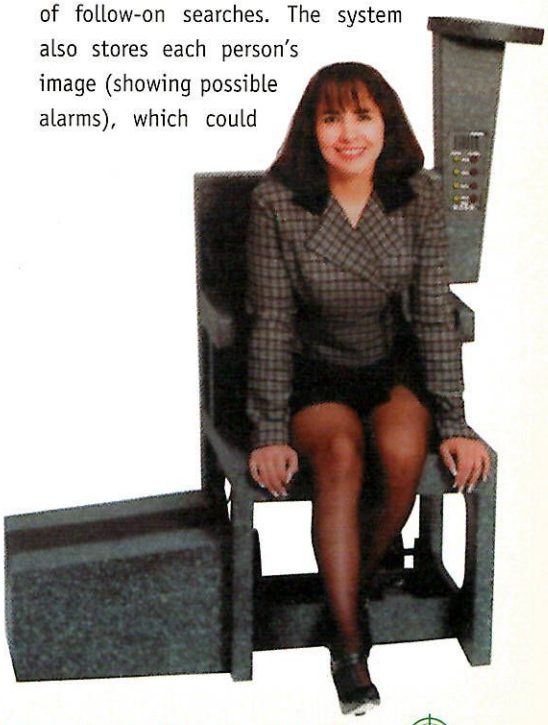
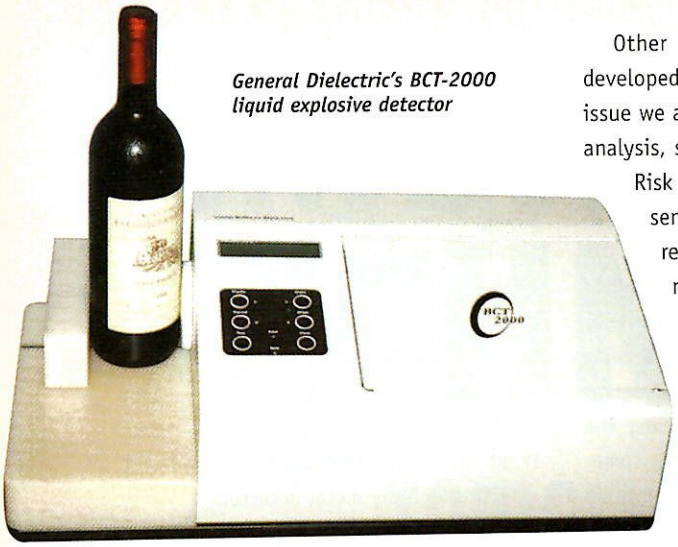


Image on facing page: MMC International manufacturers of the CONPASS body scanner. Right: Ranger's Body Orifice Security Scanner (B.O.S.S.)



General Dielectric's BCT-2000 liquid explosive detector

enable authorities to review passenger screenings at a later time.

Internal carries remain a problem however. Enter the Body Orifice Security Scanner (B.O.S.S.) from Ranger. What looks like a chair is actually a scanner designed to detect metal objects hidden in body cavities. Although more traditionally deployed in prisons to scan inmates and their visitors for weapons and contraband objects hidden in anal, vaginal, oral and nasal cavities, the product can enhance many an airport security checkpoint. It is no longer true to say that internal inspections are impossible, even if undesirable.

Typical objects being targeted are razor blades and knives, yet it also detects metal foils and objects such as detonator caps. Razor blades are of particular concern because they are difficult to detect in all orientations with walk-through devices. It has even been reported that prisoners are known to cut pouches in the insides of their cheeks to conceal razor blades.

Despite all the fears of terrorist bombs and all the focus on checked and cabin baggage screening, passengers themselves have remained unscreened for explosives. One of the most significant developments has been the introduction of walk-through explosive trace detection portals. Both Ion Track Instruments and Barringer have products commercially available. Indeed, Ion Track deployed their first EntryScan^3 to McGhee Tyson Airport in Knoxville, Tennessee in November 2001. Finally we have a technology starting to be deployed that is addressing this major loophole in our security system.

Other technologies are also being developed to screen passengers. In our last issue we addressed the way in which voice analysis, such as the system developed by Risk Technologies, can identify passengers who lie. And, in a blaze of recent publicity, a technology is now being developed by Honeywell that will enable the detection of a person who is lying through use of a high-definition thermal-imaging technique. In effect, attempted deceit can be identified by recording the thermal patterns from people's faces. But that's still in the future....

Baggage Screening

Post-Lockerbie there has been a worldwide focus on enhancing explosive detection capabilities in passengers baggage. CT is now widely used in the developed world and the leading X-ray manufacturers have made significant improvements to their own technologies.

Nuclear Quadrupole Resonance (NQR) is a technology being re-examined (the science behind it being a subject of an article in a future issue). One manufacturer, Thorlock, have had a system on test in Australia's Perth Airport and reports indicate that the scanner can reliably detect small quantities of explosives secreted away in typical hand baggage, including laptops. Similar in appearance to an X-ray machine, the NQR scanner has a conveyor belt to move baggage to the centre of the scanning volume. Each bag is then scanned by a precision pulsed, low intensity magnetic field. The detection system acquires data from the baggage in response to the RF stimulation. Signal processing techniques are then applied to the acquired data to determine the presence, or absence, of plastic explosives.

In the same vein, Quantum Magnetics have their QScan range of explosive detection systems. The QR 160 is a fully automatic plastic explosives detection system for cabin baggage, small parcels and mail, whereas the QR 500 is for checked luggage and mail sacks. Both can be used as either stand-alone systems or in conjunction with X-ray machines.

Automated threat image identification has long been an industry goal. Whilst most products test the compound of the item being screened, Advanced Vision Technology (also known as A-EYE) has developed a computerised screening process that imitates the human eye. The computer simply learns image shapes and forms and identifies threat items within three seconds of the image appearing on the screen. A-EYE works on any computer system and, unlike screeners, doesn't have off days. It can work lengthy shifts without the need for staff rotation and offers detection without distraction.

Technologies are also advancing for the screening of individual items. Take the seemingly average duty free bottle for example. Vodka? Wine? Whiskey? Or, perhaps, nitroglycerine? To aid in the identification process and determine whether a substance is alcohol rather than liquid explosives General Dielectric, Inc. has developed the BCT-2000. In a three-second test, the system inspects sealed bottles and non-metallic containers of liquids at checkpoints to find explosives, biological agents, chemical agents, and other haz-

ADT's QControl

ardous liquids. The BCT-2000 allows a guard to verify that each glass or plastic bottle contains the liquid listed on the label or stated by the person carrying it.

Cargo

In the post-September 11th era we live in and given the increased security consciousness of the world, the screening of cargo is now an essential part of any effective security programme. No longer can we rely on cop-out phrases such as "known shipper" as an excuse to circumvent the screening process. We featured the Discovery trace detection system developed by RAY Detection Technologies last October, yet it remains one of the few products deployed for the standard screening of palletised cargo.

Excited molecules are far easier to detect than static ones! Accordingly, Discovery stimulates the molecules through a process of vibration, heating and air jetting, thereby facilitating explosive, narcotics, chemical and biological agent detection. The net result is that huge containers containing significant quantities of dense material, being undecipherable on an X-ray monitor, are now screenable.

Integration

One of the objectives of any Security Manager is to effectively integrate the many security technologies at his or her disposal. Some manufacturers make that task easier by integrating different technologies into a single product.

One of the best examples of this is ADT's QControl. QControl is an integrated security checkpoint designed to enhance both security and passenger facilitation. Passengers are instructed through which channel they should enter by means of information screens at the entry point. Other information provided to the passenger includes notification of prohibited items, which items are safe to be X-rayed and what items need to be removed from pockets. Instructions how to place a bag on the belt are also given (a practice I strongly disagree with on security grounds, yet it is a fault of the regulator rather than the manufacturer). Should the AMD alarm, the passenger will be directed to a second portal for secondary screening. The X-ray machines and AMDs are incorporated into the design of the total system.

QControl is especially suited to American airports where exit channels are the norm. The system sounds an alarm should a person try to enter the sterile area through the exit lane, whilst allowing people to exit the area freely.

CEIA, better known as manufacturers of archway metal detectors, have recognised the need to combine the technology with that of access control thereby enhancing security at staff checkpoints. The integrated solution is their MetCard ID. Each staff or crew member is issued with a Freedom Card (that they can keep anywhere on their person) which carries their details in an encoded form. When they enter the portal a monitor displays an image to the security guard of the person authorised to carry that Freedom Card. If the image matches the person entering no further action need be taken. The monitor also displays the results of the archway metal detector scan and the computer stores all access information. At any time the authorities can then identify which staff are within the restricted

areas, what time each one entered or left and frequency of access. CEIA are also examining the possibility of incorporating facial detection technology into the system, whereby there would no longer be a need for a guard because the computer could identify whether the face of the person entering matches the face on the Freedom Card they are carrying.

SITA too are actively integrating passenger and baggage screening into their passenger facilitation products such as their self-service kiosks. Their IT-based solution goes well beyond satisfying basic positive passenger bag match requirements. It tracks bags from the moment they are checked in, through the screening process, until they are loaded onto an aircraft. And even beyond that....through transit points and right up until baggage delivery at the final destination.

The kiosks are designed to incorporate biometric technology to facilitate quick passenger identification, whilst enhancing border security through their ability to provide bio-data of passengers on board a specific flight to the immigration authorities at the destination.

Whilst I cannot say that I am excited about any system that asks people "yes" and "no" questions about their baggage, be they printed on a card or on a touch-screen, SITA have demonstrated the importance of developing new security solutions to compensate for the greater freedom afforded passengers by e-ticketing and other self-service options.

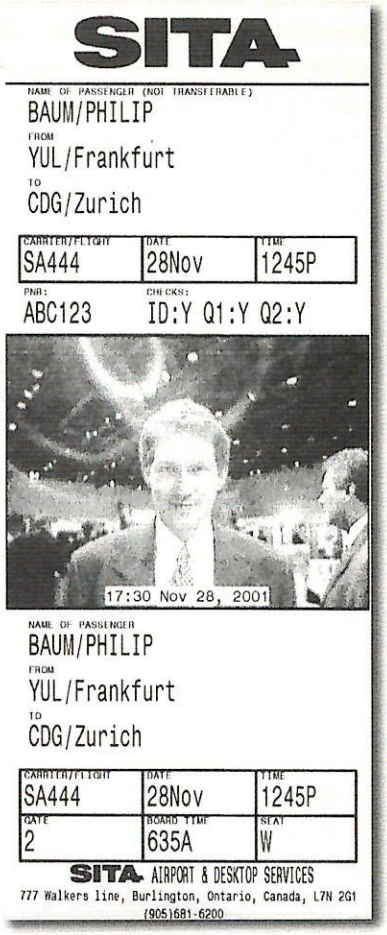
Aircraft

It is easy to forget that security goes well beyond the passengers and their bags. Airside access is also fundamental to any security programme...and not only at the larger airports. We witnessed the destruction that can be wrought by a single light aircraft being intentionally flown into a building on 5th January when Charles Bishop went on his suicidal mission in Tampa.

One new product that could (although Bishop was trusted to work at the airfield) have prevented that type of incident is the JetLock from Magal. JetLock is a wheel clamp that combines an electronic lock and wireless alarm, thereby preventing theft or improper use of light aircraft. That said, there is nothing to prevent it being used on commercial jets too. Each lock has its own unique ID number that responds to a personal electronic key.

All locks are connected to a control centre that records each time the lock is opened, closed or interfered with. Communication between the lock and the control centre is achieved through a data reader that can monitor all locks within a 50m radius. Should anybody attempt to move the aircraft with the lock still in place, the aircraft will simply spin round on the spot and forward motion will be impossible.

Another product that enhances aircraft security is Laser Guard's LGS System, being a hi-tech intrusion detection system that creates a virtual invisible fence. The sensors are embedded in a user-friendly, computerised system that records video images of all events. A complete system can include different types of sensors depending on customers' needs and the protected site structure.



It's one thing to secure an aircraft on the ground, something else to prevent the infiltration of weapons, explosives or other hazardous items on board. Security checkpoints have limited ability to effectively screen staff members entering the airside area, let alone their vehicles.

Mirrors are the traditional method of searching under vehicles, so in an attempt to provide a more effective solution Perceptics Corporation, a subsidiary of Northrop Grumman Corporation, provides the Under Vehicle Surveillance System (UVSS).

UVSS is a digital scanning device that displays an image of the underneath of a vehicle on a monitor so that it can be quickly screened by a security guard. The

Left: CEIA's MetCard ID
Above: SITA is integrating security into its self-service kiosks

technology can also be combined with a vehicle licence plate recognition system to provide an access control solution as well. The product is supplied either as a fixed, in-ground installation or as a portable system.

And, whilst on the subject of portable scanners, a number of X-ray manufacturers, including Vidisco and JME are supplying quick-deploy units for the X-ray scanning of unattended luggage or other suspect items.

September 11th has made us focus on a wide range of solutions to prevent similar attacks and there is no doubt that most of our efforts will be on the ground in order to prevent such people boarding in the first place. Yet there has also been considerable investment in the development of in-flight security systems. Reinforced cockpit doors are rapidly being installed and a wide range of in-flight CCTV systems are being proffered.

There have long been arguments for the deployment of systems such as AD Aerospace's Cabin Vu. Not only do they provide evidence in the ever-increasing number of disruptive passenger incidents happening on aircraft, but they can also be used to relay images to the ground given a security incident on board, such as a hijacking.

Granted the installation of reinforced cockpit doors the Cabin Vu product, and others like it, is now essential additional apparatus, as the flight deck must be able to survey the cabin before opening the door. Failing to do so negates any value there was in installing such a door in the first place.

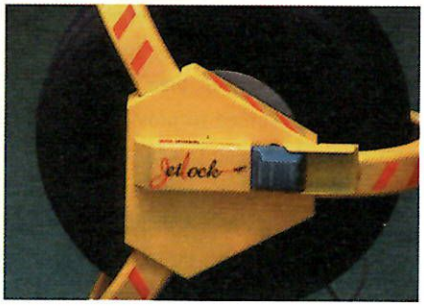
Terminal Security

Whilst most security checks are carried out either at screening points or in restricted areas, security is also a factor in public areas, especially inside and outside the passenger terminal itself.

Surveillance is usually effected by CCTV, a subject about which entire books could be written – even when it comes to emerging technology.

The beauty of some of the latest technologies lies in their automation and the combination of biometric solutions.

Digitally networked systems seem to be the order-of-the-day, such as the type of system which IndigoVision is currently



Magal's JetLock

installing in Brussels Airport. As part of the biggest video-over-IP system in the world, IndigoVision along with its partner Baxall, is currently installing 800 networked cameras. This will provide a live networked CCTV system that can also be monitored in real time by the police, fire services, baggage handling and customs and excise for a variety of different purposes, at different places and all at the same time

Loronix's BehaviorTrack detects people, vehicles and their movements. It signals to the operator when a certain area, gate or door is accessed, or when too many people are in one restricted area, or when people move through a checkpoint in the wrong

direction. It can detect people running through checkpoints, or spending too much time in a given area, and all such data can be recorded to provide statistical data from which reports can be generated.

Pelco, meanwhile, have successfully tested their PelcoMATCH facial recognition system at Fresno Yosemite International Airport. PelcoMATCH compares live video frames of individuals passing through a security checkpoint to a file of known suspects that include terrorists. A positive match, which can take less than one second to generate, sets off visual and audible alarms as well as notifying authorities via a computer network, modem or police radio. The view station monitor displays the 'live' photo besides the suspect's file photo, together with text indicating the recommended response procedure.

Biometric solutions are certainly the talk-of-the-town, yet whilst I support their integration at staff entrance points, I am somewhat sceptical about their suitability for passenger screening given that they will, by their very nature, only identify known criminals and terrorists.

The terrorist bomb is a major cause for concern in any public area. Whilst the early identification of unattended baggage may solve part of the problem, secreted threat items are of equal concern. The traditional receptacle for an improvised explosive device is the standard litter bin.

AIGIS have developed a bin that combines several blast protection technologies, including their TABRE System that prevents lethal injury caused from a blast and associated shrapnel. The bin absorbs the energy of the explosion without disintegrating reducing any injury to passers-by to no more than minor bruising.

AIGIS' blast-resistant litter bin

Communication

Most security staff will recognise portable radios, PA systems, intercoms and telephone systems as key elements of the security infrastructure. At the other end of these systems are the Control Rooms, in which there have been a number of changes that will improve the efficiency and effectiveness of console operators.

Zetron has developed such solutions based on the new generation digital switch system Acom. Previously used for Airport Traffic Control, this system provides a reliable and resilient means of providing effective and efficient communications throughout the airport. Advanced graphical screen-based consoles provide the operator with fully integrated communications systems capable of accessing radio, PA, Intercom, CCTV and telephone systems all from the one console. This technology is now allowing these systems to be distributed over a whole airport or even multiple airports.

Conclusion

I cannot end without emphasising that despite advances made, all the technologies in the world pale into insignificance if we fail to use the best technology available to us – the human brain. For all the detection capabilities and minimal false alarm rates, we must remember that not every terrorist is 'known', nor is every terrorist armed. Consequently it is the guards and screeners in whom we should place our faith, and if they are appropriately trained and of sufficient calibre, they will know how to use the state-of-the-art technologies to their best advantage. Fortunately, most manufacturers support that viewpoint. Unfortunately, I am not convinced that the legislators do.