

Hot Off The Press: the latest technological offerings

The answers to many of our security woes are provided by some of the revolutionary technologies being developed by both the security giants and the ambitious, yet creative, manufacturing minnows. Philip Baum collates some of the products that are likely to have an impact on the safeguarding of the aviation industry in the not too distant future. Whilst there is no single silver bullet to counter all threats, technologies do exist that can significantly enhance the effectiveness of our aviation security regime.

Liquid Explosive Detection

The alleged terror plot to destroy aircraft operating to the United States from British airports using liquid explosives highlighted the need for passengers and their baggage to be screened for a wider range of threat items and substances than at the checkpoint of yesteryear. This fact was not lost on some of the industry's most respected suppliers – such as Rapiscan.

Rapiscan Systems' LTDS (Liquid Threat Detection System) automatically screens containers for the presence of liquid explosives and chemical weapons, using neutron inspection technology which is material specific.

The LTDS is effective at detecting concealed threat materials in sealed containers like bottles, cans and jars, and is designed for use at airport checkpoints. Sealed liquid containers, up to the size of a 2-litre soda bottle, can be inspected. The LTDS can identify a wide variety of liquid threats including explosives and chemical weapons with a fully automatic decision process. After the completion of a 60-second inspection cycle, the sealed bottle is identified as either CLEAR (green) or SUSPECT (red) on screen. If a threat is identified, the hazardous molecular compound is also named on

screen.

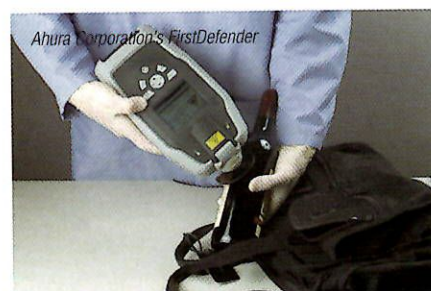
LTDS technology is material specific and benign liquids like water, toothpastes or other consumer items can be distinguished from real threats; for this reason LTDS provides an inherently low level of false alarm.

Quasistatic Tomography, Raman Spectroscopy, Quantum Cascade Lasers & Acoustic Technologies!

Another solution to the identification of liquids comes in the form of the **Ahura Corporation's FirstDefender**, which provides law enforcement authorities and security agencies with the ability to instantaneously identify chemicals, explosives and narcotics.

FirstDefender's technology has the ability to "look" through bottles and bags without the operator needing to open them. Using Raman spectroscopy, the unit interrogates a sample using a laser beam. The data obtained from the sample is rapidly analysed using complex algorithms and, within seconds, the user is presented with a clear answer as to what the substance is. The FirstDefender can even resolve the individual components of a mixture.

Another solution, this time based on acoustic technology, is the **HILDA Bottle**



Inspector from Spearhead Innovations.

Ultrasonic pulses are "launched" into the container and analysed in terms of "time of flight" (of the pulse) to extract physical property measurements. This computed value is compared with pre-measured values of materials' velocities in a database. Contents with material velocities loaded in the database are identified by name; others return a velocity value readily interpreted to be hazardous or non-hazardous. The database can be expanded and customised to suit user requirements.

HILDA identifies bottle contents in seconds and is small enough to deploy easily at security checkpoints.

Non-destructive and non-invasive acoustic measurement methodology is

based on years of scientific research into the measurement of an acoustic physical property measurement as a "fingerprint" to identify and classify liquids and bulk-solids. Furthermore, compared to X-ray screening equipment, the solution is relatively cheap at \$18,000 per unit.

Todd Research (as agents for Gilardoni in the UK) offers flammable liquids detection in the form of the hand-held **TR VETOCH**.

The unique construction, using Quasistatic Tomography, can distinguish water and water solutions from organic liquids through glass and other materials up to a thickness of 9mm without breaking the seal of the container.

Quasistatic tomography might sound like rocket science, but using it is child's play as VETOCH is simple to use: 1) Bring the sensor below liquid level, 2) Make contact with the wall of the vessel/bottle, 3) Push the button, 4) Red = flammable; Green = Not flammable!

Scientists at **Cascade Technologies**, a world-leader in the application of quantum cascade lasers (QCLs), have achieved ground-breaking performance with a sensor technology that has shown the potential to fingerprint explosives in a few milliseconds.

Whilst a commercially deployable product may be two years away, it may be worth the wait. It is envisaged that such a sensor would be capable of detecting explosives like the notoriously hard-to-detect TATP (tri-acetone tri-peroxide) and that this 'fingerprinting' system could take the form of a hand-held portable screening unit, as well as be deployed in airport portals or carousels, post rooms and check points.

Last, but by no means least, is **Mistral's DropEx Plus**, a new off-the-shelf detection kit for peroxide-based explosives, including TATP.

The sensitivity level (20 nanograms) surpasses that of many other available products. The testing process is fast and efficient, with results appearing in seconds.

General Explosive Detection Technology

The DropEx Plus identifies far more than just peroxide-based explosives - the more traditional culprits are also identifiable. So too have a number of other manufacturers



have also made significant strides in this area...

Scent Detection Technologies' Mini-Nose™ 1000 Series is a lightweight and hand-held explosives trace detector based on the company's patented High-Frequency Quartz Crystal Microbalance (HF-QCM) technology, which enables the detection and identification of a wide range of materials.

Designed to meet the most stringent requirements of explosives trace detection, the product delivers a combination of selectivity and sensitivity to all types of commercial, military, plastic explosives as well as improvised explosive materials. The Mini-Nose™ can be used at land, air & sea checkpoints to search for explosive material hidden or conveyed in baggage or cargo containers.

The **EGIS Defender** Explosives Trace Detection (ETD) system manufactured by **Thermo Electron Corporation** is based on their patented High-Speed Gas Chromatography (HSGC) technology com-



binated with Micro Differential Ion Mobility Spectrometry (DMx). With the combination of these dual technologies the EGIS Defender simultaneously detects plastic, commercial, and military explosives, TATP, HMTD and nitrates, in a lightweight package. Among EGIS Defender's most significant features is its ability to detect new and emerging threats through software upgrades, eliminating the risk of technology obsolescence.

Global's GT5000 is used for the detection of explosives residue using fluorescence to isolate the various explosive compounds currently used by terrorists and discriminate these from everyday compounds in public use. The system provides the user with a real-time view on screen of the area being examined. The screen shows two images that are overlaid, one showing the camera view and the other showing the fluorescence of the explosive residue with a digital outlining, both of the same view. An extensive range of explosive residues can be detected, and the library of detectable substances can be updated using the in-built web server.

The GT500 can be used to screen both containers and people. For example, by looking at the traffic flow of all passengers entering an airport, coming through immigration, or at the security checkpoint, without causing any obstruction to the flow of such traffic. Whereas current explosives detectors require a swab to be taken and analysed (and usually only effected on a random basis), the GT500 can be used for screening everybody, whilst they are on the move. Certainly one to watch...



The Rapiscan QXR1000

Baggage Inspection

Rapiscan Systems Real-Time Tomography (RTT) systems represent the state-of-the-art in X-ray tomographic imaging. Combining powerful but compact multi-source X-ray tube technology with high stability X-ray sensors and ultra-fast electronics, these systems enable the inspection of volumes the size of a match head, in all three dimensions, even at full belt speed. This is achieved using unique "no moving parts" multi-focus X-ray source technology.

X-ray technology is the basis of security at aviation checkpoints today; however, these machines are vulnerable to some categories of explosive threat. Many argue that, by enhancing the current X-ray infrastructure with Quadrupole Resonance (QR) explosives detection, the most critical weakness in security checkpoints can be addressed. A combined QR-X-ray system, such as the QXR1000 (also from the Rapiscan stable – in collaboration with QR Sciences), can provide for the effective detection of a broad category of threats.

TIP-enhanced X-ray (TRX) machines offer excellent image quality and, with a skilled operator, a good probability of detection for a range of non-explosive threats. The result of the QR technology upgrade would augment existing deployed X-ray technology by making it capable of automatically detecting explosives. The majority of the X-ray units already in use can be upgraded with the QR subsystem. The QXR solution leverages not only the capital investment made in X-ray systems, but also the years of training and operational protocols used by over 30,000 airport screeners.

Passenger Screening

There has been considerable focus on the screening of the passengers themselves by both the industry and the general media. Widely publicised have been the X-ray-based solutions, yet other options exist, based on either terahertz technology or millimetre wave imaging.

ThruVision has commenced installations and trials of its **T-4000** passive portable imaging system, based on terahertz

technology, at airports and rail passenger hubs in the US, Europe and the Middle East.

Designed with flexible portal screening applications in mind, the T-4000 is the first totally passive screening system for imaging concealed objects on moving people at a distance.

The T-4000 images passengers as they walk; they are not required to stand next to, or inside bulky screening enclosures. Passenger screening is therefore carried out without introducing screening 'bottle-necks' that reduce passenger throughput.

The system is entirely passive; passengers are not illuminated with any radiation such as X-rays or radio waves. Instead, the T-4000 operates by detecting natural radiation emitted by all objects and people. Importantly, anatomical details are not revealed; concealed objects are shown against a silhouette of the human form.

Usually confined to astronomy, the humble radio telescope or more specifically, millimetre wave imaging, has found its way to other applications, especially in the security industry. Using radio waves which, like visible light waves, are a form of electromagnetic radiation but with a different "wavelength", sensors are able to passively gather, collect and analyse the radio waves emitted by all objects to make visible images. In layman's terms, the

newly developed passive millimetre wave detection camera is able to see the millimetre signature of a human body and the silhouette of any foreign object that may be placed on the body, and with intelligent software, detect the differences between the two. This allows for the detection of all types of materials used in weapons and explosives including plastics, metals (both ferrous and non-ferrous), ceramics, composites and liquids. There are no radiation or privacy issues.

Currently the only concealed weapons detection system in the industry in production that purports to meet these objectives is the **BIS-WDS™ Prime** from U.S based **Brijot Imaging Systems**. Providing true stand-off threat detection, the BIS-WDS™ Prime incorporates a full motion CCTV image which is networkable into existing systems. The operator does not have to be in the vicinity of the camera to provide effective monitoring. Operating from a remote location, the operator has a myriad of choices in managing a subject – from asking the subject via speaker to remove a suspicious object, directing the subject to an isolation location, or employing other security management techniques at a standoff distance. There is no requirement for the subjects to stand still to detect suspicious objects, which allows for a greater throughput of traffic.

BIS-WDS™ Prime from U.S based Brijot Imaging Systems



Radioactive Material Detection

Given the world we live in, a previously unimaginable act could easily become part of a terror plan.

The **ORTEC Detective-ASP** Series of Advanced Spectroscopy Modular Pedestrian and Package Monitors offer detection and identification capabilities for the prevention of illicit/illegal movement and trans-shipment of radioactive materials in a wide variety of scenarios. They can detect and identify as "normal" any medical sources of radiation found routinely - such radioactive sources causing frequent alarms in other portal monitor technologies, slowing the flow of travel and commerce and otherwise being a nuisance to operators and pedestrians. Test results of the Detective-ASP show very low (1/10000) false alarm rates coupled with a high probability (>95%) that a "real"

source is both detected and correctly identified, whether "innocent" or threatening. This includes mixtures of sources, shielded or unshielded.


At the heart of every ORTEC Detective-ASP Modular Pedestrian and Package Monitor is high purity germanium (HPGe) as the gamma ray detector that provides an unmatched ability to identify and classify gamma-emitting radionuclides.

Containment

It's all very well identifying a prohibited item or questionable substance. What to do with it thereafter poses an additional challenge. Solutions are afoot...

Mistral presents the **protectTable** - a protected checking desk, designed to quickly and safely contain items that are identified as suspect and to protect





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against a possible explosion. Once an agent finds a suspect item, he pulls a handle and the suspect bag falls into a blast containment vessel, keeping the public safe.

Meanwhile, **Aigis** has launched its' latest isolation units – the **IU 1200**. This new unit is now available alongside its successful big brother, the Hold Baggage container, the IU 2000.

In airports worldwide, the IU 2000 has been used for a number of years: when a suspect bag, even an oversized item, is found, it is quickly and easily slid into the IU 2000, removed to a designated location, and the airport continues to operate, whilst EOD deal with the package in a secure environment.

The new IU 1200 replicates this procedure for Hand Baggage. It is practical and user-friendly and holds even the largest Hand Baggage. Aigis units are exceptionally thoroughly tested, so that even in the event of a blast being near the lowest and inner sides of their containers, staff and passengers close by can avoid injury.

All Aigis containers use the unique **TABREshield** technology that absorbs explosive blast. This technology also allows Aigis to provide external and internal building protection, including sensitive terminal infrastructure and blast-protected rooms for suspect bombers and baggage reconciliation.

Cintec produce a range of blast mitigating devices for use by EOD/UXO personnel known as the **Waterwall@System**. Filled with water, each device combines rapid deployment with highly effective blast mitigation capabilities and minimal logistic burden. The system has been successfully tested in the UK and elsewhere against variety of devices including hand grenades and car bombs. One component of the system – the EOD Blast Bin – is currently in service with the UK bomb squads having the capability of reducing the effects of a dirty bomb or similar device.

Sometimes it's the people who need to be contained...or, perhaps, protected from some form of chemical, biological or even nuclear material. With this in mind, **Beth-EI**, a leading supplier to NATO and other major armies of protection equipment

against the threat of nuclear, biological and chemical warfare, has launched its new **Cabinet Shelter**.

The patented Cabinet Shelter, which looks like an ordinary closet or wardrobe, can be quickly converted to an impermeable soft shelter by just pulling out the expandable front. There has already been considerable interest in the product from the airport community.

Temporary buildings have become common sites at high profile incidents and were even used at London Heathrow this August as terminals had to "house" passengers for longer periods of time than normal. Such constructions, often inflatable, have now become part of the security arsenal...



The **Aireflow Aireshelta**, from the **Aire Group**, has thick double-skinned side walls to make it exceptionally robust and has a constant airflow so it will stay up even if punctured. The company has also recently introduced the **Airetight Aireshelta** that has sealed beams made from the same material as rigid inflatable boats to make it super-strong and can be inflated in around one minute using a BA cylinder or electric pump.

Once up, the **Airetight Aireshelta** does not need a fan or generator to keep it inflated and is lighter and even more portable than the original. It can be quickly moved from place to place.

Intrusion Detection

It's all very well screening passengers and their baggage. Weaknesses in perimeter security, however, mean that such valiant efforts may all be in vain.

Advances have been made in fencing,



even the razor mesh ilk.

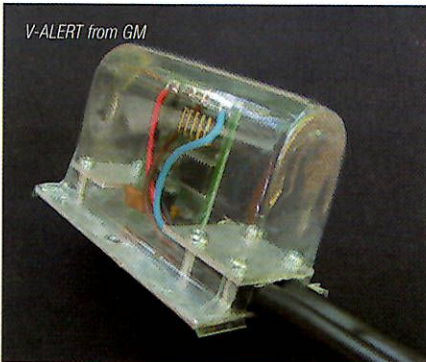
Birmingham Barbed Tape has recently introduced **Ultrabarb Razor Mesh**, which is manufactured using straight lengths of profiled steel blades crimped over 2.5mm diameter high tensile core wire which are then welded together in diamond shapes measuring 300mm x 150mm.

The advantage of the Ultrabarb blade is that the blades are more substantial and effective – 30mm tip to tip and 42mm centre to centre. This easy-to-install fencing solution comes in heights of 1.2, 1.5, 1.8, 2.1 and 2.4 metres. When erected it is difficult to cut or climb, has no secondary uses, cannot be unzipped and is even aesthetically pleasing.

Perimeter intrusion, however, goes well beyond the fence itself. **Magal** has long been renowned as one of the world's leading providers in this area and their **BVS-5000** Dual Technology Perimeter Intrusion Detection System combines two proven intrusion detection technologies in one system – it is a physical barrier and an intrusion detection system.

The perimeter fence is divided into several alarm sections. Each alarm section provides two alarm indications: the lower uses vibration sensor lines, while the upper uses a taut wire system. Any vibration or application of force to the fence will cause an alarm signal to be transmitted to the appropriate vibration processing unit and from there to the control room.

In a similar vein, **GM** has introduced the **V-ALERT** Perimeter Intrusion Detection System. The V-ALERT sensor replaces conventional fence-mounted vibration detection systems with sensors that are purely electronic.



The system consists of fence or wall mounted sensors that detect small changes in movement caused by intruders attempting to cut through the fence fabric, climb over the fence, or in the case of wall-mounted systems, attempting to break-through the wall.

The system employs GM's unique EDC (Electronic Detection Capability) technology that, together with the electronic sensor, has no reliance on moving parts to generate detection data - moving parts being a constant source of false alarms in competing systems. As a result the V-ALERT system does not suffer from false alarms even in extremely windy conditions.

The system also offers detection resolution every 3 metres as a result of each sensor having its own electronic ID. The V-ALERT system instantly converts almost any type of existing fence (eg. welded mesh, chain link) or wall into a highly reliable electronic intruder detection system.

Key Control

Whilst a fence, gate, bollard, barrier or door offers physical protection, such defences are purely cosmetic if the wrong person can access supposedly controlled zones.

Traka design and manufacture systems for controlling keys and associated assets. By ensuring users are accountable for the keys, more care is taken of the asset leading to significant improvements in asset utilisation and substantial reductions in cost.

The heart of the Traka system is the **iFob**, robust devices containing intelligent chips and which are stored inside Traka electronic cabinets. The iFobs can be either attached to existing keys or used as the key. The Traka iFob then becomes a key with a

memory to record where it was used and a key with a life span that expires after a pre-determined time. It is also a key that can't be copied.

Access to the Traka cabinet can be by the use of PIN, access cards, or biometrics to ensure additional security of use.

If the iFob is used as the key, it will only activate those pieces of equipment that the special Traka iFob readers allow. Furthermore as the readers contain an inbuilt clock, the iFob records the time of the event. These events are accumulated inside the iFob providing an audit trail of activity.

Another product in this area of security is **CIC's C.Q.R.iT®** (pronounced "secure it!")

CIC's C.Q.R.iT®



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CMEX-160190

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EDS-T10080

key control solution. The manufacturer has recognised the need for attractive design to be part of a security solution. As such, the modern look of the cabinet itself allows it to blend in with modern décor.

Identity & Personnel Control Solutions

Identifying known employees, known passengers and even known terrorists and criminals is a fundamental part of any security system. Passenger facilitation is also the aim of any airport or airline manager.

One of many identity-confirming solutions comes from **RCG**. With its expertise in biometric and RFID technologies, RCG has developed an **e-VIP Card** system that can facilitate speedy verification of passengers' identification and thus minimise the waiting time at airline check-in counters and immigration checkpoints.

RCG e-VIP Card is an RFID card that can store different kinds of biometric data of a cardholder. Typically, face and fingerprint templates are stored in the card; the card can also support other templates such as voice and handwriting templates.

However, in addition to verification of passenger ID, RCG e-VIP Card System can also position the cardholder. RFID readers deployed in the airport can pick up RF signals emitted from the e-VIP card, and the positioning data can then be returned to the e-VIP Card System for analysis. With the positioning software engine inside the system, the location of the cardholder can be identified in real-time.

Knowing where people are is also the objective of the **ITrac** system from **bconnected Ltd.**, which gives managers real-time control over airport security patrols and lone workers.

The technology has been designed as an improvement on traditional guard tour systems and is particularly suitable for monitoring individual staff patrolling perimeters and extended grounds at sites such as airports and storage areas.

The **ITrac** system can deliver instant alert notifications if a patrol is missed, or if a team member is unexpectedly absent – allowing managers to take action on the spot.

Sometimes it's management that needs to disseminate information at speed. **Vasona's Priority Alert Software System (PASS)** is a

scalable, real-time alerting solution, utilised for emergency alerting, and priority communication. **PASS** can be controlled from either a central or remote location, or through integration with security, surveillance and fire systems. Thousands of audio-visual and/or text alerts can be sent within seconds to PCs, public screens, PDAs, mobile phones, and pagers. **PASS** delivers targeted information by event, location and recipient, delivering simultaneous, unique messages based on who needs to know what, when and where.

Biometric identification has been the subject of many an article and we are familiar with fingerprint, iris, facial and hand geometry solutions. Hand vascular pattern recognition and voice analysis show considerable promise too. One new offering, however, is the **SignHear** signature verification system.

Developed by **Sign Assured Ltd.**, the **SignHear** system uses the sound of your handwritten signature to verify your identity. The images of signatures have been easily forged by fraudsters for many years past, giving rise to a varied range of hard-to-use security systems such as PIN numbers, passwords and a host of ID tokens. Signatures however are only insecure because the image can be replicated; the how-it-is-done is much more difficult.

It is this unseen behaviour of signing which **SignHear** captures and uses to verify its users. The combination of movements across a surface creates a set of sounds which is uniquely identifiable to the user, enabling replication from an image almost impossible. It is true that signatures do vary even when the same user signs the same signature again, though the pattern of 'how' the user signs remains very much the same and the robust algorithms of **SignHear** cater for this.

Inflight Solutions

Recognising that not all acts of interference with aircraft can be prevented on the ground, many are focusing their attention on securing aircraft inflight. Counter MANPADS technologies, cockpit doors and even the trusty restraint kit have all undergone testing and evolution, yet it is in the area of inflight surveillance and even actual remote aircraft control that developments have been most significant.

Ultra Electronics has just launched a new product line called **Horizon**, a dynamic aircraft

cabin surveillance system.

Essentially, **Horizon** makes situational awareness information available to the people that really need it by using cameras and sensors in the cabin and data links to transmit this information to the ground.

Horizon denies terrorists any advantage by using the latest plug 'n' play technology such as wireless covert/overt cameras throughout the cabin, PDA integration, motion sensors, secure video recording, local radio links and a satellite terminal to monitor the aircraft anywhere in the world. This technology constantly scrutinises the aircraft environment and personnel inside to detect anomalies and improve security onboard.

Horizon allows the real-time transmission of multiple imagery and data to a ground or mobile control centre. The forwarding of imagery to a mobile control centre allows rapid reaction forces and law enforcement agencies to view everything inside the cabin. The significant advantages of the **Horizon** system have led to it being selected by Sukhoi for their new SuperJet 100 programme. The system is also under evaluation by Tupolev.

And finally one of the biggest projects in terms of the use of technology to safeguard the industry – **SAFE**. The Security of Aircraft in the Future European Environment (**SAFE**) is a large integrated project designed to restore full confidence in the air transport industry. The overall vision for **SAFE** is the construction of an advanced aircraft security system designed to operate during on-board terrorist threat scenarios. The main goal of this system is to ensure a full secure flight from departure to arrival destination whatever the identified threats. This may involve a collision avoidance system and an automatic "go home" option should it be determined that a hijacker be at the controls. Eat your heart out ET....

Conclusion

The technologies featured in this article are just samples of the technological offerings now available. The absence of X-ray, CCTV, metal detection and a broader range of biometric and access control solutions, let alone the innovative options in the training arena, should not be taken to imply a lack of progress in these areas – it has been considerable in each and worthy of articles in their own right. Space simply precludes my mentioning them all this time around...