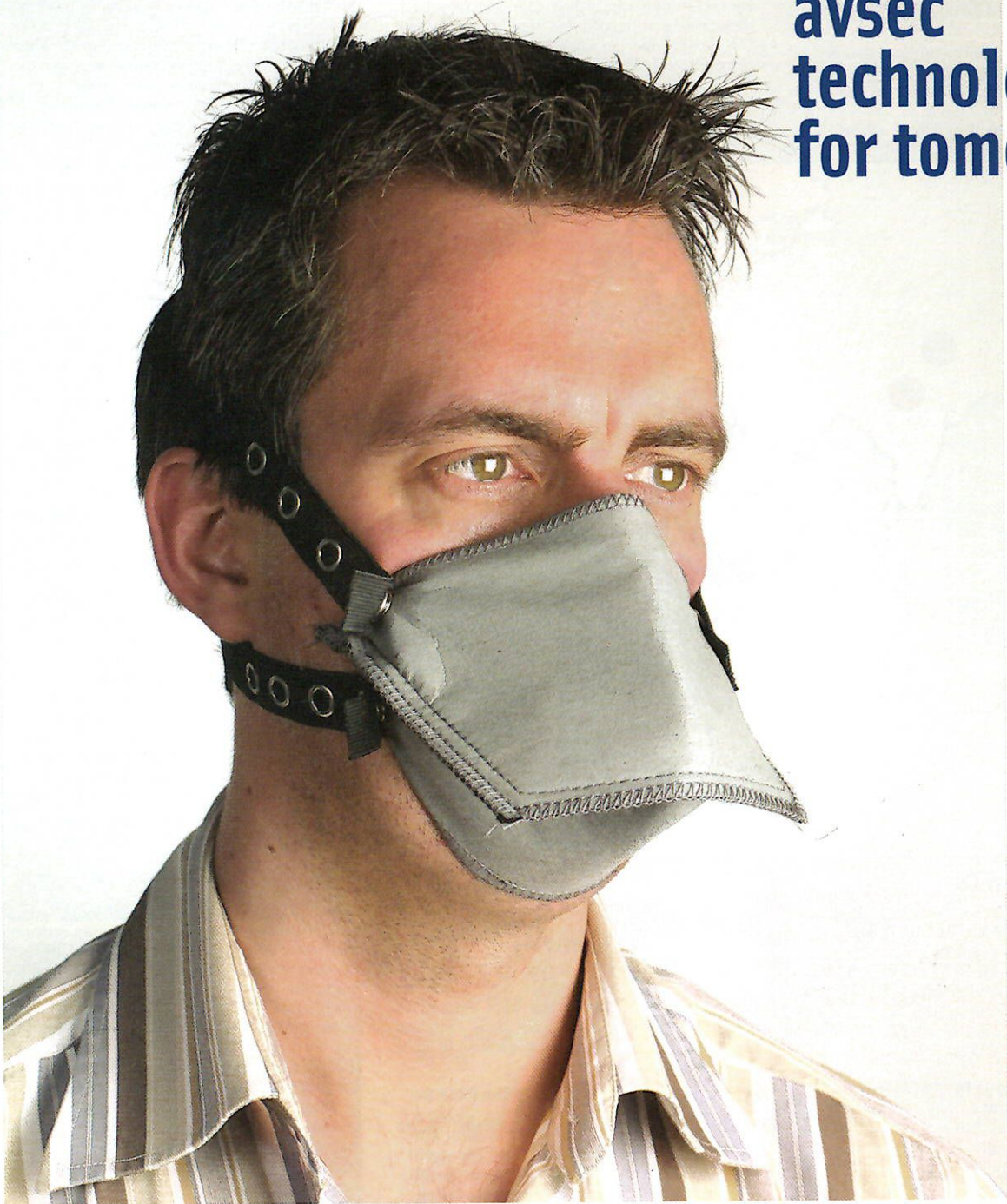


# ON THE HORIZON

avsec  
technologies  
for tomorrow



Behind the scenes, around the globe, manufacturers are researching new technologies to aid our efforts to combat the threat posed to civil aviation. **Philip Baum** reviews some of the products currently being developed that may become standard installations at airports and on board aircraft in the future.

Perimeter fences are no longer sufficient to control an airfield and need to be supplemented by remote monitoring and intrusion detection systems. Archway detectors and hand baggage X-ray machines are no longer sufficient mechanisms to effectively screen passengers and now need to work in tandem with explosive detection solutions and passenger X-ray or millimetric wave imaging equipment. And, photo ID cards are no longer deemed secure enough to control access to restricted zones of airports and need to be supplemented by biometric identification systems and anti-piggybacking gates.

This article is not intended to be a review of all the technologies currently being developed, but rather focuses on some of the products available today that respond to the threats of tomorrow.

And where better to start than the check-in?

### **Automated Check-in Systems**

Whilst automation seems to be key to everything we do, ensuring that security is not compromised in the process is obviously essential.

Fabricom Airport Systems has been working in collaboration with Dernier ID Ltd., a company that specialises in image verification systems, to develop and launch what it is believed to be the world's first truly automated airline passenger check-in desk.

The new style, high security check-in booths – part of the PasSecS (Passenger Security) system – have been designed to provide the same type of airport service, namely the issuing of boarding cards and the checking of baggage, as standard attendant-based check-in desks.

Logan Fabricom Ltd., a member of Fabricom Airport Systems, customised the baggage conveyor and weigh scales specifically for the new system, which is fully equipped with an eye-level touch screen for passengers to interact with check-in instructions; built-in baggage conveyor/weigh scales, passport reader,

*On facing page: The face of aviation security in the years ahead? Or rather a Zorflex mask from CCI for protection against the inhalation of chemical vapours.*



*PasSecS fully automated passenger check-in desk from Fabricom Airport Systems*

and a printer facility for issuing boarding cards and bag tags.

In terms of passenger and airport benefits, the PasSecS check-in booths are expected to significantly cut down on long queues at airport check-in desks, and provide an improved system of identifying known terrorists, whilst ensuring that passengers who check-in their luggage are the same passengers who board that aircraft.

What Dernier ID has done is to authenticate passengers boarding by integrating non-invasive facial recognition technology into the whole system. At the check-in stage, a high-resolution digital colour image is taken of every passenger, the image is then stored in the system's central database and printed onto, or attached to, their boarding card with a positive and unique identifier.

### **Passenger & Baggage Screening**

Integrating different technologies is widely recognised as being key to the development of a comprehensive security system. Quantum Magnetics are working on a number of such projects.

One system for screening hold baggage currently on trial in San Diego is their CTQ. It is aptly described as a "System of Systems" approach to explosive detection and uses both CT and Quadrupole Resonance (QR). The aim of the system is to fuse data from complementary systems to produce an EDS with reduced false alarm rate, and improved detection and throughput.

Another system of systems employing multiple technologies is known as the Advanced Technology Screening Checkpoint (ATSC) and is designed for

screening both passengers and carry on items for explosives and other weapons. Quantum is working with OSI Rapiscan and GE Ion Track to integrate several technologies into the ATSC. Operationally tested at Orlando Airport in 2002, it is currently being tested for detection effectiveness at an undisclosed (non-airport) site alongside a conventional checkpoint lane.

Meanwhile Quantum Magnetics has also developed the QR-Wand and QR-Shoe Scanner.

QR-Wand is a handheld detector, based on QR, that has been developed for detecting the presence of concealed explosives on the person. The system has been tested at various airports in the southwest of the USA. The QR-Shoe Scanner, in the post-Richard Reid era, scans shoes for the presence of explosives without the passenger needing to take their shoes off. At present the system is in development.

Methods of enhancing screener performance (as looked at in the last issue of Aviation Security International) are always to be embraced. And, three-dimensional imaging is one solution already on trial that may revolutionise security checkpoints of the future.

Rapiscan Security Products Inc. is better known as a leading supplier of high quality X-ray screening and explosive detection systems. Yet, in addition to their Conventional Cargo and Mobile inspection systems, Rapiscan have introduced Axis 3D – the world's first high speed, real-time, solid state three dimensional X-ray imag-



*Quantum Magnetics is developing the QR-Shoe Scanner*



*Rapiscan has introduced the Axis-3D, a three-dimensional X-ray imaging system requiring the operator to wear special glasses to view the images. The system is currently on trial at London Heathrow*

ing system. Scaleable from conveyorised hand baggage to ULD freight the Axis-3D's unique display format presents the screener with image processing functions in real-time with simultaneous display of organic and non-organic strip views and "birds eye" panning as well as the main display.

### **Passenger Reconciliation**

Passenger reconciliation at the gate is only truly effective if one can guarantee that the person who checks-in for the flight is the same person who presents at the boarding gate. CEM Systems has developed a Passenger Reconciliation module that allows airport security personnel to verify that the passenger who presents the ticket at the check-in desk is the same passenger who is boarding the plane.

The process is very straightforward with operators able to perform security checks in two simple stages through the capture and display of passenger images. The first stage involves capturing the passengers' image at the check-in desk. This image is then stored on the system for verification by security personnel when the passengers present themselves at a control post such as the boarding gate.

### **Boarding Pass Analysis**

Swabbing bags and passengers for the presence of explosives is both timely and invasive. Testing the passenger's boarding card however can achieve similar results in

a far subtler manner.

One new product that has just undergone trials in Canada is Scintinel's Boarding Pass Analyser. The boarding pass is inserted in a slot where it is picked up and carried through the device, any vapours produced being instantly analysed. Several different drug or explosive types can be simultaneously detected with extremely high sensitivity. In this way no filters, solvents or consumable items are needed.

### **Countering The "Dirty Bomb"**

Granted the activity of civil defence units throughout Europe and North America, it is somewhat surprising that the aviation industry has been slow to consider the deployment of technologies to counter the chemical, biological, radiological and nuclear threat.

US Customs however are now screening foreign nationals for radioactive materials and the technology to do so is inexpensive compared to most aviation security solutions.

Corus has devel-

*Scintinel's Boarding Pass Analyser is the latest concept in explosive trace detection technology*

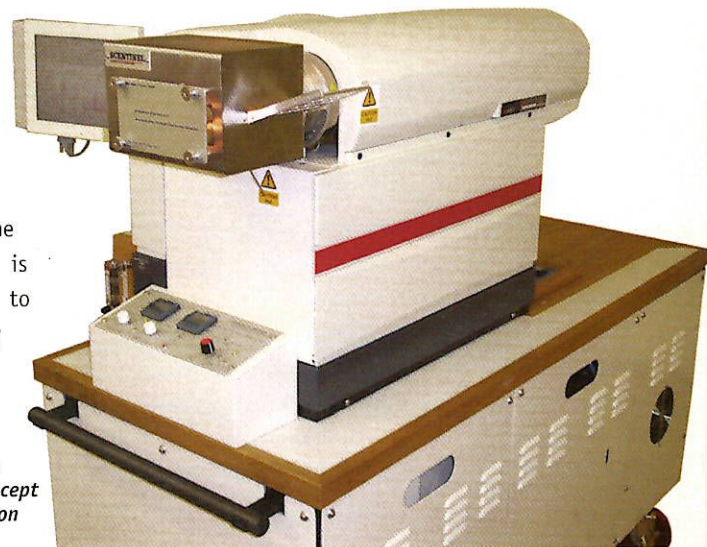
oped a compact radiation detection system, called Redeem, capable of detecting low energy radiation levels such as those found in 'dirty-bombs'. Dirty bombs typically contain a small amount of explosive together with some radioactive material which, when detonated, can contaminate a wide surrounding area.

Redeem is highly sensitive and can detect low level gamma radiation and even neutron sources, as packages or people pass within approximately four metres (thirteen feet) of the detection unit.

### **Airport Area Security Innovation**

Current perimeter security and access control systems have inherent flaws that allow intruders to hop fences, steal or fake ID cards, or follow closely behind authorised employees, all of which enable unauthorised personnel to gain access to restricted areas. Once behind the barrier provided by perimeter security, detection is difficult and intruders are likely to have access to all secure areas. Tightening security using conventional methods restricts the flow of personnel and vehicles that need to operate in those areas thus disrupting and slowing normal airport operations.

To combat these issues Eagle Integrated Solutions has developed an integrated area security system called SecurityOps Pro. It is a solution designed to augment and complement existing perimeter security to provide a more secure facility. By integrating several existing technologies, SecurityOps Pro is able to monitor the movement of



personnel and vehicles within restricted areas. The system then determines if unbadged or improperly badged personnel or vehicles are present. The system can be configured to automatically alert security personnel to any unauthorised intruders.

### Containing The Blast

It's all very well identifying a threat bag, but ensuring that it does not cause the intended damage is an altogether different challenge.

Sema, however, have developed two products, one for the ground and one for the air, that reduce the threat posed.

The Ground Bomb Killer (GBK) is a protection device, available in different sizes, that can be placed over a suspicious item without ever needing to touch it. The GBK avoids all the lateral effects of a blast, channelling it upwards. The Flight Bomb Killer (FBK) offers a similar solution on board an aircraft.

Aigis Engineering Solutions Ltd has recently introduced two new products specifically for the aviation security market.

The Tabreshield Isolation Unit 2000



*The Ground Bomb Killer is a protection device for securing suspicious items in the airport terminal*

is designed to contain hold baggage. It is a protective container, designed to be located at the end of the conveyor belt on which hold baggage is X-rayed or scanned. The unit is a vented soft metal structure

lined with Tabre (Aigis' patented material designed to counter the effects of an explosive blast), into which any baggage believed to contain a suspect device at Security Level 4 can simply be slid direct,



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requiring no human intervention. The container has a simple single locking device and ensures that any reasonably anticipated blast will be contained, and that no injury occurs to bystanders.

The container is built on a trolley, so that it can easily be towed to a safe location for further investigation, and the unit even allows for further X-raying of the suspect device.

The Tabreshield Isolation Unit 700 is designed to contain suspect items in the aircraft cabin. Current regulations require aircraft to reduce height to 10,000ft and usually also to divert, when suspect objects are found, at enormous cost, quite apart from the risk of the device being triggered.

The SDIU 700 is a small container, designed to be stored unobtrusively, but is also lightweight and easily mobile, so that it can be wheeled down the aisle to the device, rather than vice-versa. This has the advantage of minimising human intervention, reducing passenger concerns, and allowing the aircraft to safely continue

to its destination. The SDIU will safely "contain" the blast caused by up to 500 grams of explosives, or by ammunition, firearms or grenades in a way that ensures the safety of both the passengers and the physical integrity of the aircraft.

### **Chemical Attack Protection**

A disposable facelet mask, that would give airport staff and passengers short-term protection against inhaling chemical vapours, has been launched by Charcoal Cloth International (CCI).

The Zorflex® facelet mask protects wearers through a built-in layer of activated charcoal cloth that has a vapour-adsorbing microporous internal surface area of 7200m<sup>2</sup> – the size of a FIFA-approved football (soccer!) pitch.

Providing short-term protection against dangerous chemical vapours including ricin, mustard gas and tear gas as well as the nerve agent, sarin, in the event that they are discovered in an airport terminal, the facelet mask can be worn over long periods of time.

For easy and immediate access when chemical attacks are suspected, the masks can be stored in batches in specified areas, in a similar way to how hammers for breaking glass in emergencies are stored on trains or fire extinguishers are kept in buildings and transportation. Having the masks so quickly at hand could offer reassurance to airport staff and passengers, as the Zorflex® provides interim protection whilst people are evacuated or waiting for the emergency services to arrive.

### **Inflight CCTV**

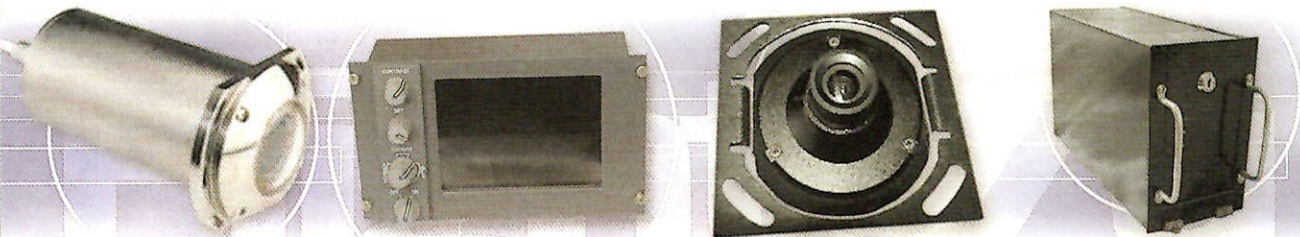
Not new but not widely deployed, inflight CCTV is yet another example of existing technology that can be adapted to the security needs of the aviation industry in its 100th year.

UK airlines are now required to have a 'system to enable the pilot and co-pilot to visually monitor the door area outside of the cockpit from their seats' fitted by 1 November 2003, and other authorities are likely to follow suit. Therefore the majority of passenger airlines worldwide

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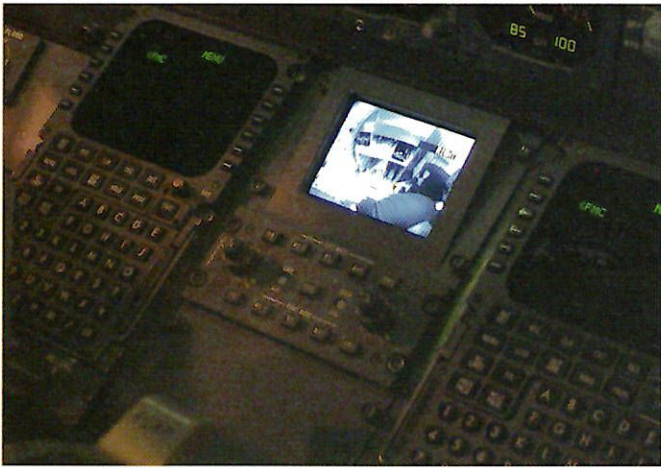
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AD Aerospace's CabinVu

will have CCTV systems, such as AD Aerospace's FlightVu CabinVu, installed by the end of 2004 and although most will only cover the flight deck door, some will be monitoring the entire passenger cabin.

Live viewing CCTV is however only the start. The future in this area lies with image recording and transmission. Systems such as FlightVu Witness will use digital video servers to record images from cameras located throughout the aircraft. These images will either be stored for later use or transmitted, via technology such as Boeing Connexion, to ground based security to enable co-ordination of activity such as identification of a suspect terrorist or other criminal.

AD Aerospace is one of the market leaders in this field and has produced the first video server certified for use on commercial airliners. The video server will record either the entire flight or be triggered by panic alarms operated by the aircrew. Images on the server will be identified by labelling with the date, time, camera and aircraft tail number. When an incident occurs "watermarking" facilities will identify the recording as first evidence and

therefore be admissible for use in court. The recordings could also serve to prevent litigation by passengers claiming wrongful identification and to establish the exact chain of events leading up to an incident.

### Surface-To-Air Missiles

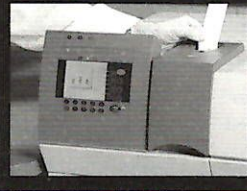
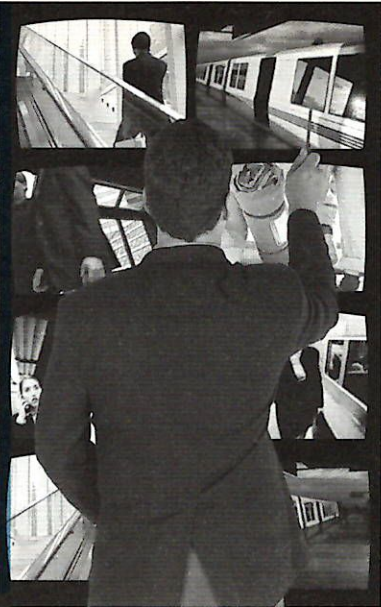
Surface-to-air missiles are one of the security threats we like to consider least. It's all very well securing an airport or screening passengers and their baggage, yet protecting an aircraft against a terrorist attack miles away from the airport seems an insolvable problem. Or is it?

Rontal, in Israel, has developed the Air SimGuard. This is a computer software programme that will aid air traffic control, airlines and government authorities predict the most likely source of a surface-to-air missile attack. Armed with knowledge that takes into account local terrain, weather conditions and aircraft type, decisions concerning the safest approach and take off route can be determined.

Air SimGuard consists of 5 modules, interlinked and synchronised:

Site Database and Geographical Limitations: A Digital Terrain Module (DTM) and

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alone  
won't  
tell  
you  
that



there is a **bomb**  
in that **bag!**



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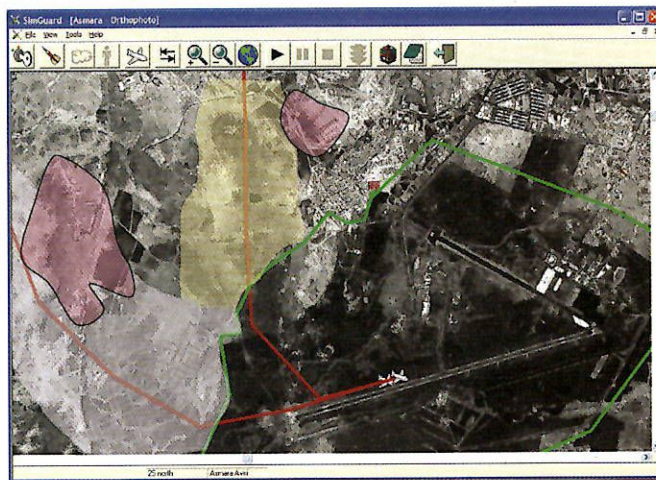
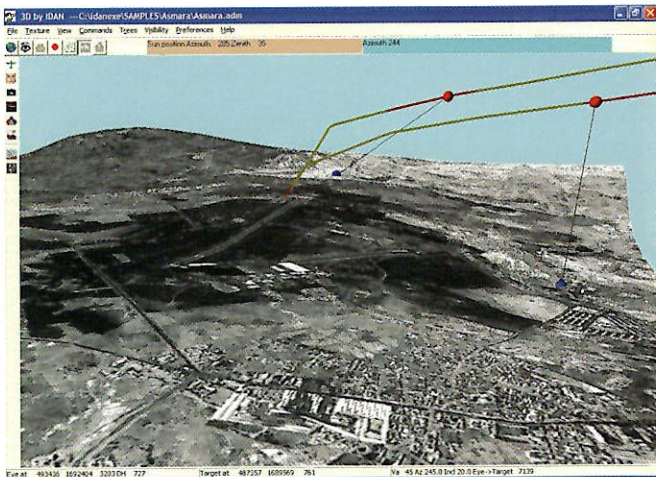
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Rontal's Air SimGuard provides a software-based solution to counter the threat posed by surface-to-air missiles

Digital Surface Module (DSM) provide the system with line of sight capability analysis and obscuration analysis between every two points on and around the airport area.

MANPADs Types, Performances and Limitations: Air SimGuard is using missile characteristics like kinematics and aerodynamic envelopes and launcher time delay to build a "foot print" on the ground of high-

risk areas, according to the aircraft flight path. It also gives the operator the capability to position the missile in a specific point or points and to analyse its threat on a given flight path.

Aircraft Types, Performances and IR Radiation Level: A predetermined menu allows the selection of various aircraft types (747,757, ATR, A-340 etc) and various climbing

profiles. The characteristics of each aircraft type and its performances during departure and arrival (take-off, climb approach and landing) influence the output "foot print" of the MANPAD envelope.

Airport Procedures and Intelligence Information: Most modern airports are using published procedures for arrival (landing) and departure (takeoff). These procedures could be analysed in order to reduce threat level or to concentrate surveillance efforts on specific and

limited areas. In some airports departure or arrival procedures could be modified in real time to provide a better and secure procedure. Intelligence information and other parameters in hands of the security officer may be inserted into the system in order to provide a comprehensive view of threatened areas.

Environment Conditions: External conditions like temperature, visibility, day or night and more, beside their influence on the aircraft and the missile performances play a significant role on the missile launcher capability to detect and acquire its target.

Air SimGuard provides airlines and airport security officers with a tool that integrates intelligence and operational information, and enables threat analysis. A modification to the planned flight route and/or vertical profile could be made (according to the potential threats) so the risk level will be reduced significantly. Furthermore, the airline security officer may consult with the flight crew regarding their takeoff path or plan its surveillance action before landing using the software.

### Blended Learning

Staff training is of paramount importance and a phrase the industry is set to become more familiar with is that of 'blended learning'.

Recognising the challenges to training that face an aviation industry under assault from terrorists, economics and uncertainty, the Southern California Safety Institute (SCSI) has unveiled the 'blended learning' concept.

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E-learning brings affordable excellence in training to anyone who has access to the Internet anywhere in the world, anytime they choose to log on, as long as they have a computer and an internet connection.

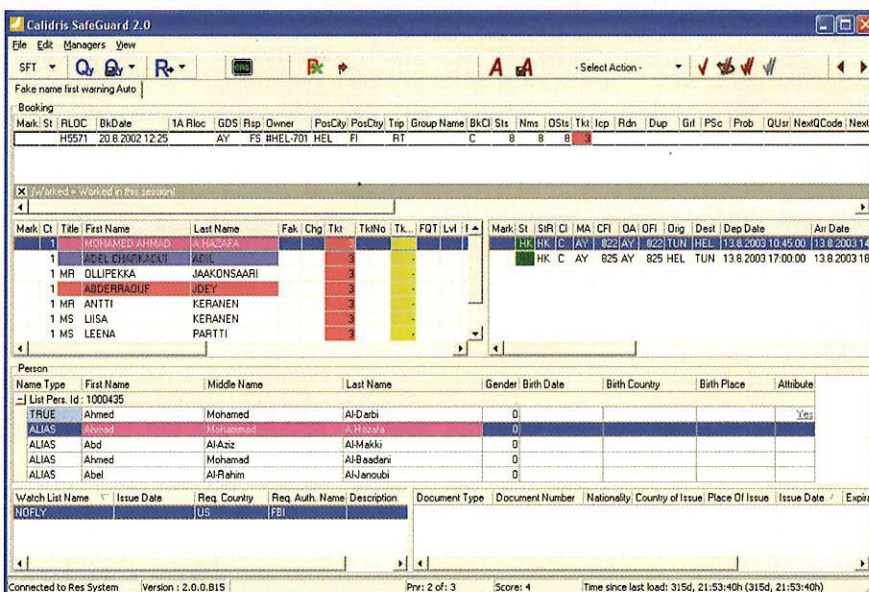
### Terrorist Identification

Much emphasis has been placed on the early identification of known criminals and terrorists. One technology, of Icelandic origin, is Calidris' SafeGuard.

The core SafeGuard system is designed to spot potential security threats as early and as accurately as possible, and to enable relevant action based on the findings.

The system can analyse passenger bookings well in advance of travel and thus enable airline staff to act on potential problems.

The solution uses sophisticated technology to match names in bookings with names on government watch-lists. Calidris has designed a set of algorithms, including the Interphone algorithm, which identifies target names with high accuracy, even in cases of different spellings or misspellings. This technology has already proven to be extremely effective in spotting duplicate bookings in international airline reservations.



*Iceland's Calidris has developed the SafeGuard system to aid in the identification of known criminals and terrorists*

### Computer Assisted Passenger Pre-Screening System

No review of security technologies would be complete without reference to CAPPS... or should I say CAPPS II.

The American administration has made it clear for years that it believes that the more knowledge we have about a passenger, the quicker we can process them through our screening system. And the solution has to lie in a computerised analysis of each and every passenger who makes a reservation or tries to board an aircraft.

The Transportation Security Administration has now contracted the Lockheed Martin Corporation to develop a computer network that will instantly authenticate the identity of every passenger, match their name against a government watch-list, and determine whether that person's background and

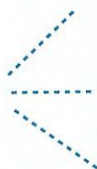
behaviour constitute a terrorist threat.

Much maligned by civil rights groups, the system will utilise commercially-available information, supplemented by the names of known terrorists, to rate each passenger using a colour code: Red for immediate threats; Yellow for people with questionable backgrounds; Green for the vast majority. The rating will be given to the airlines for decisions on whether a passenger should be allowed to board or be subjected to additional questioning.

There is no doubt that trusted traveller programmes must form part of the security infrastructure, but I just hope we don't rely on the computer to make the decision for us as, in the end, all of these technologies are just pieces of the jigsaw puzzle. ☺



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