

MADE IN GERMANY



quality branding

From X-ray to biometrics and covert communication to system integration, Germany has been leading the way in the development of technologies that serve to enhance the aviation security community. In the same way that German cars, German photographic equipment and German household appliances have become synonymous with excellence, so too its security manufacturers are ever enhancing their reputation for the supply of quality products. **Philip Baum** paid some of the key players a visit to report of some of the country's latest offerings.

The start was ominous. I could not find a single ATM (cash) machine that was operational in the arrivals hall at Hamburg airport. Furthermore, being a Sunday night, all the banks were closed too. Surely this was not Germany, home of efficiency and reliability? That was, however, where the negative experience started and finished!

Yxlon: coherent X-ray analysis

My first port of call was Yxlon International. Formed in 1998 as a result of a management buyout of the Philips Industrial X-ray Group of Royal Dutch Philips Electronics, the company is a relative newcomer to the aviation industry. Yet, with one of their XES 3000 systems currently being tested by the Transportation Security Administration in the United States, their hopes are high that certification will lead to their capturing a sizeable amount of the market.

Domestically, 2002 was encouraging with nine systems being installed at several German airports. Furthermore the Israel Airport Authority ordered one system, and has placed a tentative order for a further nine machines subject only to the first system proving reliable and effective.

Yxlon's objective was to develop an X-ray screening system that would combine high detection sensitivity with low false alarm rates. In the traditional three-level automated explosive detection screening configuration, where traditional X-ray examination is used at Level 1, operator image interpretation is used to inspect bags at Level 2 and enhanced detection (such as CT) is at Level 3, around 30-40% of bags are sent to Level 2 and less than 10% of the original input are screened at Level 3. It is therefore of the utmost importance to ensure that the number of bags being sent for physical examination is kept to an absolute minimum.

The XES 3000 is currently demonstrating low single digit false alarm rates. Such levels, despite high throughput rates, have been achieved as a result of the use of coherent X-ray scatter technology. In simple terms, each substance has its own molecular make-up (or fingerprint), which

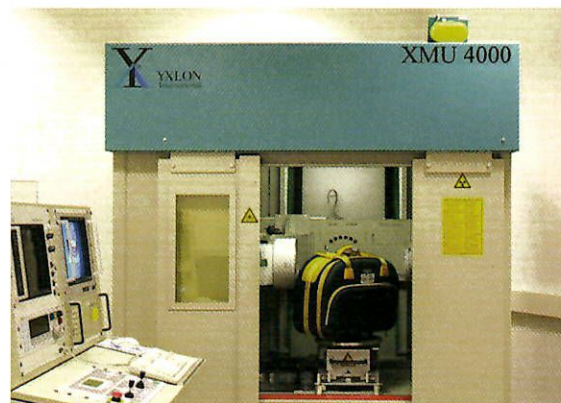
is identified when exposed to radiation. The totally automated (to the extent of the operator not even having a screen) process will alarm on the detection of suspect materials such as explosives, narcotics or any other material of interest.

This technique has resolved the problems caused by earlier technologies generating alarms when certain common materials including foodstuffs, such as cheese or chocolate, have been mistaken for explosives based on their apparent density or atomic number. Furthermore, as bags are screened in different overlapping slices through the bag, ensuring a full coverage, the potential for a "miss" is limited. Yxlon is equally confident in the system identifying the traditionally troublesome Detasheet as the more easily identifiable block of plastic explosives.

The solution is not cheap, with each system costing around €1.3 million, and the shipping, installation and maintenance costs must also be considered. The reduction in operator costs resulting from the automation of alarm resolution is potentially enormous and could quickly offset the initial expenditure. In any case, as I mentioned in my introduction, Germany goes for quality first. The cheaper solutions do not necessarily provide the best results. And one missed bag...

Yxlon has already started marketing its XES 3500 system that takes the XES 3000 technology a stage further. In this model the system limits the inspection analyses to the part of the bag that the Level 1 system has alarmed on, rather than attempting to screen the entire bag. This results in a significant increase in the throughput of the system. If, however, time permits and the bag is cleared before another bag is introduced to the machine, the XES 3500 will continue to screen the entire bag again.

Whilst Yxlon may be new to aviation security, it is not new to the X-ray industry. The company is one of the largest suppliers of X-ray based non-destructive testing equipment in the world. In this vein items such as car parts are individually screened for faults and imperfections. Yxlon has recognised that one system designed for this process also has applications for baggage screening. As a result their XMU 4000 is now being offered to airports; Munich has purchased two such systems.



Above: Yxlon's XMU 4000 enables the resolution of "dark alarms".

The XMU 4000 resolves the problem of "dark alarms" by enabling the operator to rotate the bag in the X-ray machine 360° utilising live X-rays that can penetrate up to 34mm of steel. If faced with a bag whose contents are hard to identify, the bag can be manipulated in different orientations so that it can be scanned from above, below or any side. Accordingly, bags rejected at Level 3 (often due to "dark alarms" caused by blocks that are impenetrable to traditional X-ray beams), can be scanned using an operator-controlled system, rather than being sent straight for physical search.

Smiths Heimann: explosive detection at the first attempt

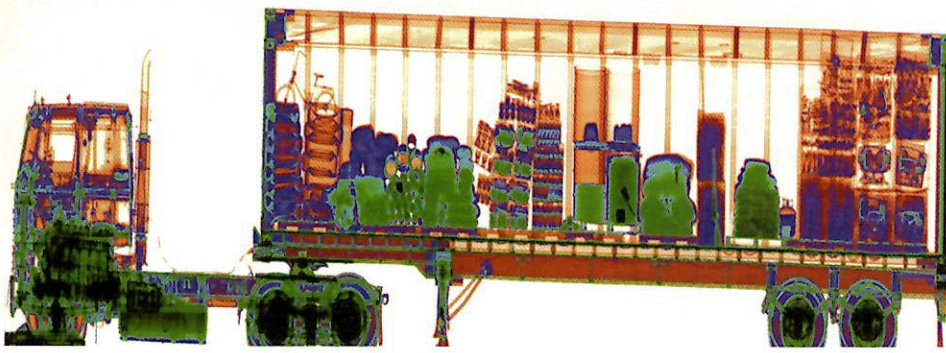
X-ray and Germany go hand in hand. Firstly, X-rays themselves were first discovered by a German physicist, Wilhelm Conrad Roentgen, in 1895. However, from an aviation security perspective, Germany is also home to one of the largest suppliers of X-ray equipment to the industry – Smiths Heimann.

Heimann was founded in 1946 by Prof. Dr. Heimann who had played a key role in the development of early television cameras. But it was only in 1970 that X-rays were introduced to the airport environment following the advent of international aircraft hijacking. The intent was to screen hand baggage alone.

In 1978 Heimann developed a system for the screening of checked baggage. Belgrade, and later the rest of Yugoslavia, became the world's first model of 100% hold baggage screening. A quarter of a century later other states are only now facing their teething problems.

In 1993 Heimann Systems was sold

On facing page: Integrating the various security technologies into the airport environment is where Siemens Dematic excel (Siemens Dematic)



Above: a Smiths Heimann HCV X-ray image

by Siemens to the Rheinmetall-Group, following EG&G's unsuccessful bid to buy the company. Last November the company was again sold, this time to Smiths Group for E375m. Smiths Heimann, as it is now called, now finds itself a bedfellow of Barringer (also recently acquired by Smiths and now known as Smiths Detection) in the Smiths Aerospace Division.

The Smiths Group was founded in 1851, making clocks and watches. Today, one of the top 100 companies headquartered in the United Kingdom, Smiths employs some 33,000 staff who generate sales of \$4.5 billion.

Whilst the fledgling Yxlon has eleven systems deployed, Smiths Heimann has some 25,000 machines installed in 150 countries. Approximately 70% of sales have been to the aviation industry. Almost all are branded "Made In Germany".

But Heimann isn't only about X-ray. They manufacture biometric solutions in the form of fingerprint identification and is the only company providing for the simultaneous scanning of all four fingers on one hand. Delta Airlines is using the technology as part of its system for carrying out background checks of employees. Heimann is also investigating passenger screening solutions, including millimetre wave imaging as well as X-ray-based solutions. On the training front, Heimann has shares in Security Training International whose Operator Training System is sold as an add-on service to Heimann X-ray machine users.

X-ray, however, remains the company's primary activity. The company produces the smallest machine in the world – the 3010 – for the screening of letter bombs up to huge cargo container systems, of which they have sold more than 100 world-wide, such as those built in Rotterdam and Hamburg.

The best selling product is the 6040 (all Heimann Systems are numbered according

to maximum bag dimensions that can be screened – in this case 60cms width by 40cms height). Most of the systems now have TIP (Threat Image Projection) technology incorporated and include some ergonomic design features that will hopefully enhance screener performance. Such features are the result of research, supported by Heimann, conducted as the University of Heidelberg. The networking of X-ray systems has also become a requirement at certain sites; in Atlanta, 30 of the 6040 systems were networked together.

When it comes to hold baggage screening, Heimann's 10065 EDS (explosive detection system) is now standardly deployed as a Level 1 screening system, supplemented by their 10065 HDX (based on X-ray diffraction) at Level 2, yet their 10080 EDtS is where the excitement is as this model could become the standard that other manufacturers will follow.

Responding to, and recognising, the criticism that airports are deploying the more sophisticated detection technologies at Level 3 which, in turn, could result in a suspect bag being loaded onto a flight if it were not detected by the more basic X-ray system, Heimann developed this system as advanced explosive detection that can be deployed at Level 1.

The EDtS (Explosive Detection Tomography System) is capable of screening up to 1,800 bags per hour and effects detection based on both "Zeff" (atomic weight) calculations, as in CT scanning, and Density, as in traditional X-ray. Unlike the CT scanners that have a rotating gantry that spins around the item being screened, the EDtS has five fixed scanners, thereby considerably reducing maintenance costs. Smiths Heimann claim that the system will offer a 50-60% cost saving on CT solutions, will be able to cope with bags double the height and weighs in at half the poundage of its CT competitors.

The first German systems were ordered by Bremen and Düsseldorf airports in January and are set for installation by the end March.

Naturally, TSA certification is the aim and it is hoped that a system will have achieved this goal within the next few months.

Heimann also proffers a "dark alarm" solution in the shape of its Hi-Scan 8380-3D. The most notable difference between it and Yxlon's XMU 4000 is that the Heimann system is smaller and produces separate multi-colour images. The Yxlon version, on the other hand, offers live X-ray viewing (the bag is continually exposed to the X-ray beam as it is manipulated) offering an unlimited, continuous number of black and white images.

Contrac: security screening on the move

Just down the road from Smith Heimann's Wiesbaden headquarters is another company with significant airport experience, albeit not from a security standpoint. Contrac GmbH have 90% of the global market share of airport buses (1122 buses sold, costing around €1/4million each) and have recognised the tremendous benefits that can derive from the integration of security screening checkpoints into their buses.

When one considers that each of their COBUS 3000 buses can transport 115 passengers and have a floor area of 24m², a lack of space is not the primary issue. Indeed, hand baggage X-ray machines, archway metal detectors and a room for the private screening of passengers can all be integrated into the 3 metre wide bus.

The SCAN 3000 (the adapted COBUS 3000), otherwise known as the Mobile Security Check Gate, was launched in 2001, the brainchild of Contrac's Managing Director, Jurgen Kamps. The first system was sold to Qatar Airways and delivered to them in Doha on 6 December 2002.

Whilst, as their geographic neighbours, they have elected to work with Heimann on the design, the buses can be supplied with screening equipment from any supplier.

The bus allows for aircraft to aircraft passenger transfers, eliminating the need for passengers to be processed through the airport for security screening. It also provides a means for screening aircrew, cleaning personnel and caterers alongside the aircraft, or potentially even en route

Far right: Contrac GmbH have developed the SCAN 3000 enabling the screening of passengers, crew and airport staff at the side of the aircraft. Inset: screening apparatus within the SCAN 3000

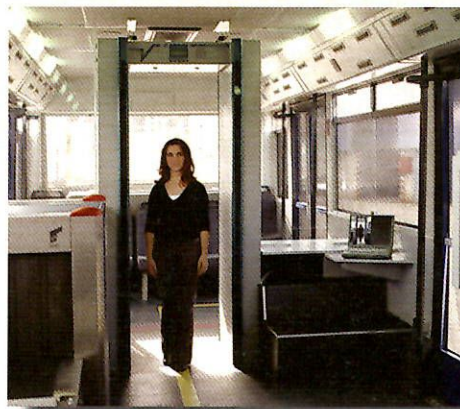
to the aircraft. Late passengers can be whisked to the aircraft and screened simultaneously and the bus could be summoned to an aircraft where a passenger, who has already boarded, is required to open his/her checked baggage for examination.

Qatar may only be the first installation, but others are likely to see the logic of the solution and more sales will surely follow.

ZN: facing up to biometric identification

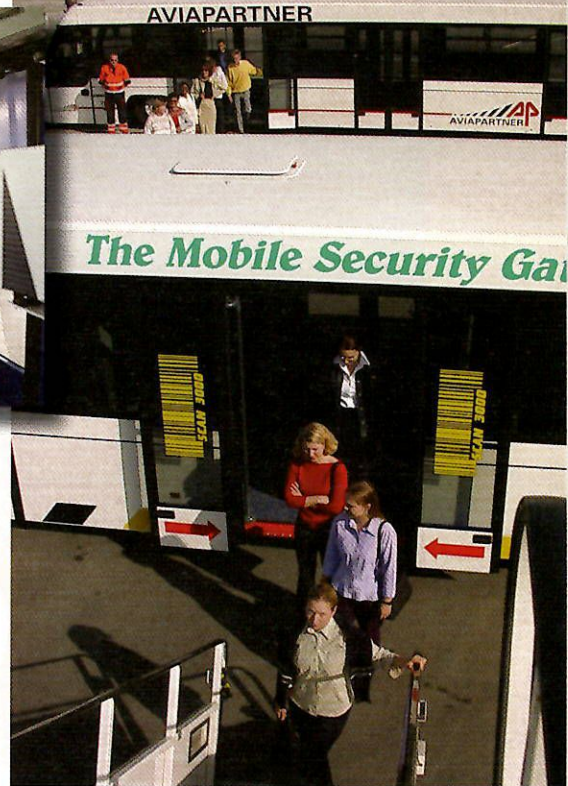
ZN is another company targeting the aviation security industry. The biometric company's roots lie in academic research effected by the Centre for Neuroinformatics at Ruhr-Universitat Bochum. The research, initially state-funded, ceased in 1997 and ZN has now, albeit still based on the university campus, had to be a commercial concern.

ZN's technology is based on facial recognition. They favour the approach as

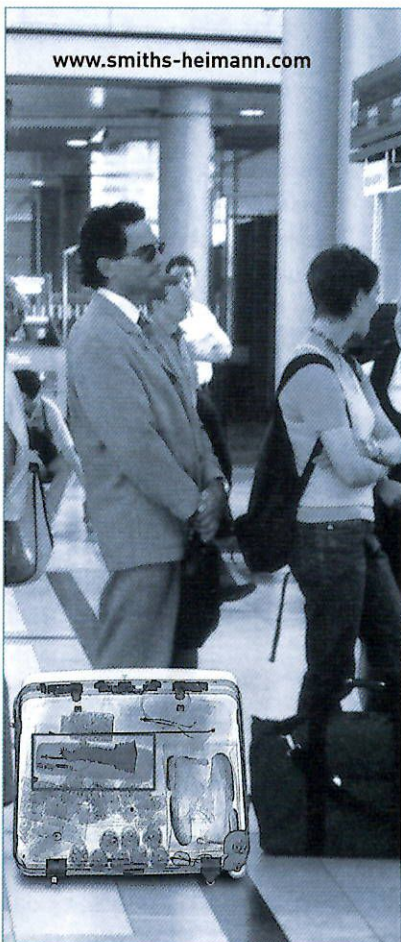


it most closely matches what we all do in reality – we recognise people by their faces. There are, however, different products designed for different applications, each one being based on ZN's patented "elastic graph matching", a procedure derived from human vision.

ZN-SmartEye is designed to pick out individuals from a crowd, such as known hooligans attempting a sporting event or known gamblers frequenting casinos. It is a non-cooperative system where the image captured by one of the cameras is compared against a database of many



images. Systems like this have, as ZN freely admit, their drawbacks. The cameras need to be placed in a position where there is a reasonable chance of obtaining a clear



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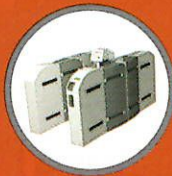
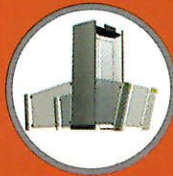
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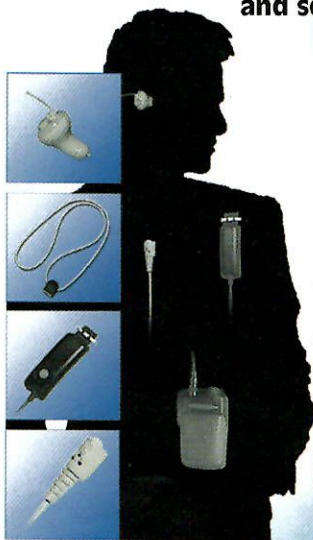
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KEEP YOUR SENSES OPEN

image of the face, not just of the scalp! For example, facing an archway metal detector or at the top of an escalator, both being places where people tend to look straight ahead for a few seconds at least.

The focus for the airport environment lies in another product: ZN-Face. This is a co-operative system used in verification scenarios, such as access control, whereby the person looks into a camera and the image is compared against the image contained on the database. In fact the person desiring to enter a restricted area also shows a proximity tag so that the system knows who should be entering with that tag. Berlin's Tegel is the company's first airport installation, with the remaining Berlin airports set to follow suit.

ZN-Phantomas is the third facial recognition system and functions similarly to ZN-SmartEye, except that the image it is being provided with need not be live. Used primarily in police installations (indeed I saw the system in use at Dortmund Police HQ), the software can compare indentikit images and/or sketches or photographs with a database of known criminals.

One other product developed by ZN, albeit not designed for aviation security applications, is their microDERM medical system that enables the early detection of skin cancers. The beauty of the product is that, like its security counterparts, it recognises features and changes in those features.

Micos: variable access control

Access control providers are incorporating biometric solutions into their own technologies, and Micos, an RAG Immobilien group company, is no exception. Micos specialise in complex security systems for a broad range of

industries, including airports.

Their multi-access control system MACS is tailor-made for the specific needs of a given airport, where the Micos system manages gate access control in accordance with flight schedules. This greatly enhances security for the processing and monitoring of boarding and disembarking operations.

Airline personnel are given temporary access rights (in accordance with flight schedules) for areas that are pre-registered with airport management. The system also helps airlines and airport operators to comply with the legal regulations pertaining to monitoring. In addition, the system directs passengers to the gate areas, thereby preventing entry into unauthorised areas.

Micos's multi-access control system has been in use at the Frankfurt airport since 1997.

CeoTronics: a word in the sky marshal's ear

CeoTronics are specialists in communications, their primary market being the sourcing of audio, video and data communications solutions for challenging situations. As a result they supply the police and military and the upper end of the market, such as the petroleum industry, nuclear power plants and, more recently, the aviation industry.

The company was founded in 1985, now employs 125 staff and has gone public. They make no excuses about their prices, which are higher than those of their Far Eastern competitors. But, they argue, if you are going to offer a three-year warranty on all products, effect 100% quality inspections and offer after sales support to your customers, you are going to have to pay for it.

CeoTronics communication systems are primarily based on

wireless, duplex technology whereby each person can talk simultaneously and there is no need to press a button to activate the system. It affords real conversation capability that is interception-free.

They entered the aviation industry with their CT-GateCom system that enables wireless push-back of aircraft. (I had no idea until my visit to their Rodermark headquarters that, every day somebody is killed by lightning strike in the Equatorial regions as a result of an aircraft being struck and the current running through the wiring to the ramp agent!) American Airlines and Lufthansa, via Globe Ground, have both bought systems that now enable their aircraft to push-back without the need for cabling that is in itself a hazard. Pilots simply communicate with their colleagues on the ramp through the trunked communication system.

From a security perspective, the system can be adapted for sky marshal usage. It is now feasible for sky marshals to be able to communicate with each other on board an aircraft or, indeed, with the Captain or other crew members through a wireless



Above: CeoTronics' CT-GateCom system enables wireless push-back of aircraft

communication system. Such technology affords the relaying of critical information in a timely fashion and provides for the co-ordination of any counteraction. The technology ensures that any incident taking place in one part of the aircraft will be known about elsewhere on board.

Background noise, such as engine sounds and passenger conversation, can be eliminated by a digital noise reduction method that ensures that the system only transmits when being spoken into. Naturally both the microphones and the ear-pieces are extremely discreet.

Given the overall cost of a sky marshal programme, I doubt that cost would be the deciding factor in any decision to deploy the technology. It is a relatively simple solution, based on some sophisticated technology, to enable a sky marshal team to indeed be a team rather than exposed individuals.

Initial trials, based on teams of up to six sky marshals, have encouraged the company to actively target this market.

Siemens Dematic: an exercise in integration and facilitation

One of the key buzzwords in any discussion about the deployment of security technology in an airport environment is "integration". How can different technologies, supplied by a range of manufacturers be brought together to provide a secure system?



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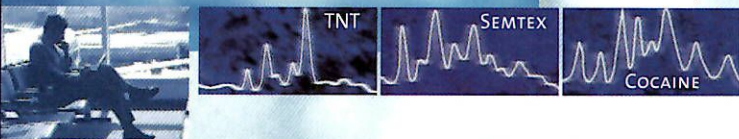


YXLON International is the world's leading industrial X-ray company. YXLON offers the highest level of security in diverse and large usage applications.

Utilizing the concept of detecting dangerous materials by using coherent X-ray scatter analyses, YXLON has once again achieved excellence by converting an innovative idea into a market-ready product.

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Few companies have greater credibility in this area than Siemens Dematic. And it is, no doubt, partly due to such a reputation that they secured the \$1.37 billion TSA contract, in conjunction with Boeing, to install and maintain explosives detection systems at the 438 U.S. airports serving commercial aviation. This followed legislation, enacted by Congress in response to the September 11 terrorist attacks, mandating the screening of all checked baggage.

Siemens Dematic has been directing the installation of the equipment, including the positioning of the machines, site preparation and field service. It will also continue to manage the field service through a long-term support agreement. More than 570 million air travellers and nearly one billion pieces of checked luggage pass through American airports every year, which gives one some idea as to the scale of the project that requires the team to complete studies of passenger movement, architectural designs, structural changes and to co-ordinate the supply of 1,100 explosive detection system (EDS) machines and more than 5,000 explosive trace detection (ETD) devices.

Siemens now employs more than 80,000 staff in the USA alone.

Albeit much of the focus is on the United States, Siemens Airports (the division that combines all the activities of Siemens AG in the field of airport technology and systems) is active around the globe. Siemens Dematic – a member of Siemens Airports – has 380 airport baggage and/or cargo installations under its belt, one of the latest being Madrid's Barajas Airport.


The company basically offers a one-stop shop for a multitude of technologies that combined together provides a total airport security solution. They will work with any equipment manufacturer and are keen to design solutions that facilitate the integration of tomorrow's technologies once they become available.

Modelling the effect of solutions is an integral part of the service. A subsidiary company, Synavion, that is 50% owned by Lufthansa, has developed Master Matching Process (MMP) – software that allows the airport to view the effect of the integration of technology on the flow of passengers and

baggage through the airport.

With "facilitation" being the other industry buzzword, the MMP's goal is to align the seemingly conflicting goals of maximum security and maximum efficiency. And, the real beauty of the product lies in its user-friendliness. Whilst most models/simulations have to be generated by computer technicians, MMP can be used by airport staff themselves.

Accordingly, if one were to initiate passenger profiling at the boarding gate or integrate a Level 4 technology (such as Yxlon's XMU 4000 or Heimann's Hi-Scan 8380-3D) to resolve "dark alarms" in the hold baggage screening system, the airport operator can utilise the programme to predict the probable effect of such changes.

Siemens Dematic was indeed the appropriate place to end my tour. All the companies I had visited had demonstrated amazing technologies that will play their part in aviation security systems around the globe, but the key is how they will all be joined together into a seamless solution. Siemens Dematic offer that key... 

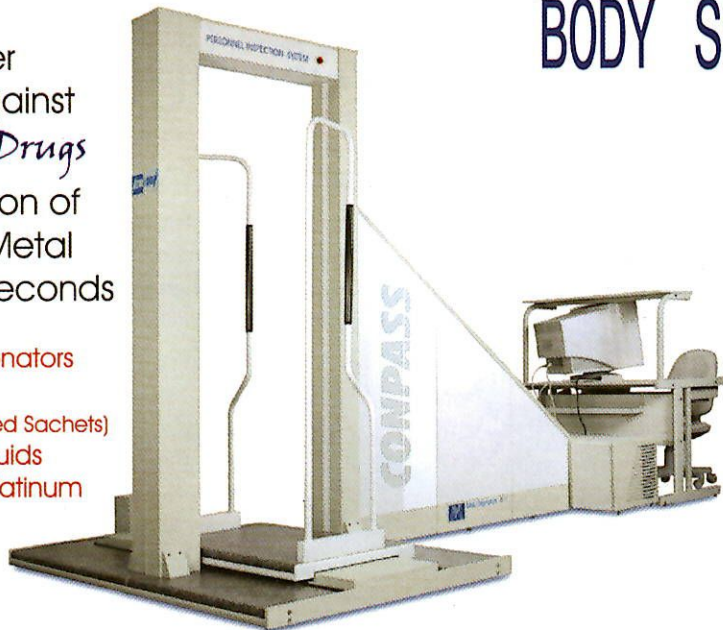


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