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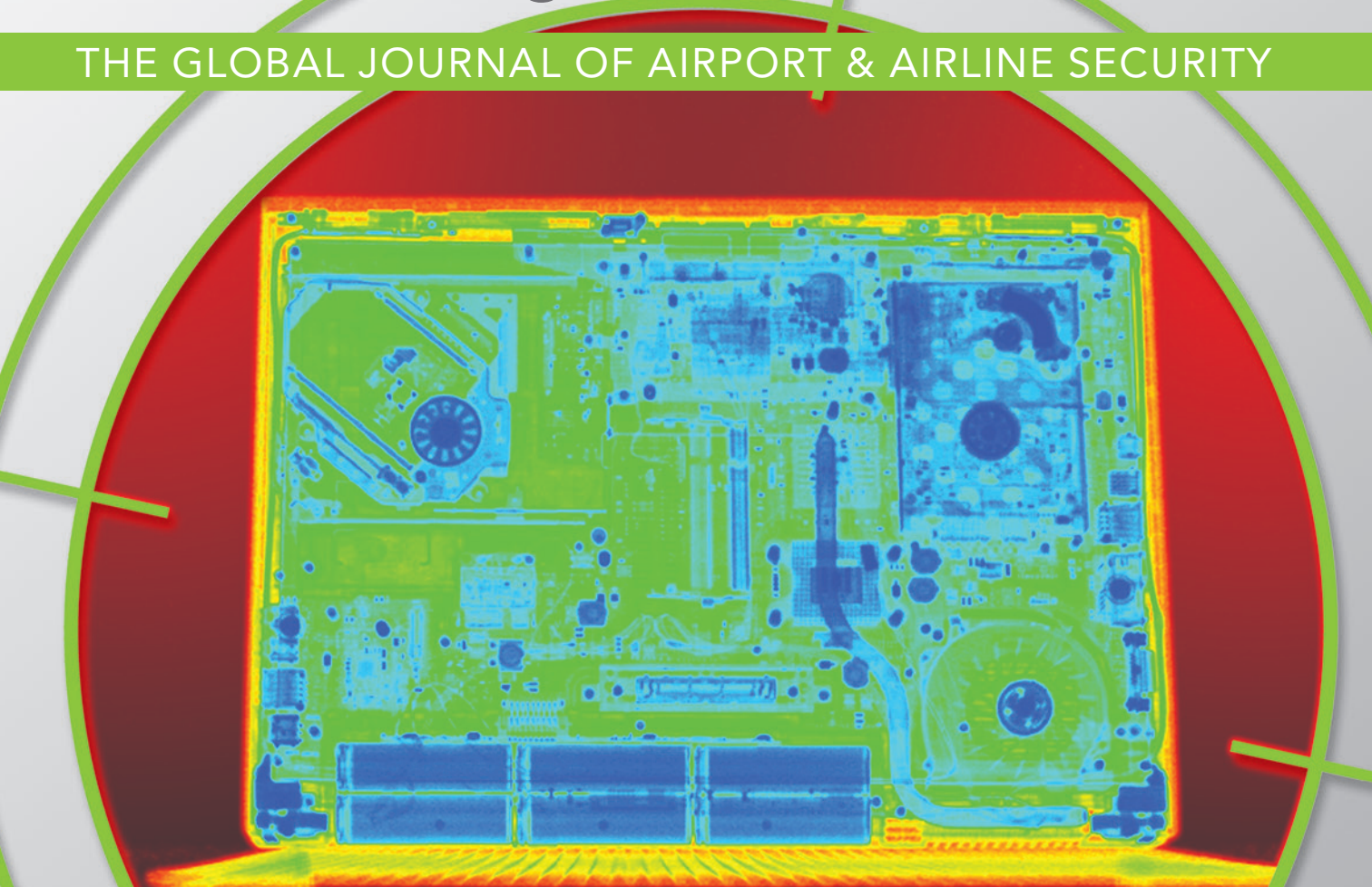

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Herbert Systems supplied their Herbert TRS tray return system to Smiths Detection for the upgrading of London Luton Airport (Credit: Herbert Systems)

SMART SECURITY:

IS IT REALLY 'BETTER SECURITY' AND A 'CHECKPOINT OF THE FUTURE'?

Six years after IATA rolled out its vision - 'Checkpoint of the Future' - of a more effective security screening process, offering enhanced passenger facilitation, **Steve Wolff** takes a look at the original plan, what has been achieved and where we still need to go. Nowadays, with ACI on board and the concept re-branded 'Smart Security', is it living up to its name?

As with many ideas, Smart Security (or 'Checkpoint of the Future' as it was originally known) was borne out of desperation. As air traffic rebounded after the Great Recession and security became more stringent after the 2006 UK liquid explosive plot and the failed 2009 'Underpants Bomber' attack, it became clear that two opposing trends were set to collide in a potentially calamitous manner. First was annual passenger traffic increase, projected by IATA to rise around 6% per year worldwide. Running counter to this was a slower passenger and bag screening process, dropping from over 300 passengers per hour (pph) before 9/11 to around 125 pph as new regulations added new burdens to checkpoint operations.

In 2009, US industry and government veterans, who played different hold-baggage screening roles, formed the Association of Independent Aviation Security Professionals and put together position papers to brief governments on how to improve the checkpoint process (also known as 'central search' or 'search cone'). IATA realised early on that their members needed a solution, and in 2010 engaged some Association members. The goals were 'simple': rethink the end-to-end security process to speed up the passenger screening checkpoint while improving effectiveness, reducing costs and space requirements and, oh, improving passenger convenience using available or near-available technologies. Thus the 'Checkpoint of the Future' programme was born.

Where We Were - the Original Plan

The checkpoint is much more challenging than checked bag screening. It must contend with a wide range of disassembled IED components, as well as disassembled firearms, that may be spread across – and be well concealed by - different passengers.

After much discussion, the small team of consultants came up with the following strategy, now known as Risk Based Screening, based on six critical elements:

- Use available data to pre-screen and segregate passengers into trusted, elevated risk and normal lanes subject to different detection requirements and standards. While known travellers could threaten an aircraft, it's unlikely they'd be trained in IED fabrication. However, the elevated risk screening standards must counter the broad threats and concealment methods trained terrorists could use.
- Equip each lane type with appropriately selected and configured technology.
  - » A rapid, low-cost process to screen properly vetted/ 'trusted' travellers.
  - » A combination of the best technologies configured to compensate for each other's weaknesses into an elevated risk lane.
  - » Speed- and cost-optimise an intermediate process to screen everyone else.
- Integrate pre-screening, scanner data and operator decisions into a comprehensive 'passenger security record' at least for elevated risk passengers.
- Devise a new flight-based screening process to consider all elevated risk passengers on the same flight as a single team-based risk entity prior to boarding and develop a procedure to resolve any concerns prior to boarding.

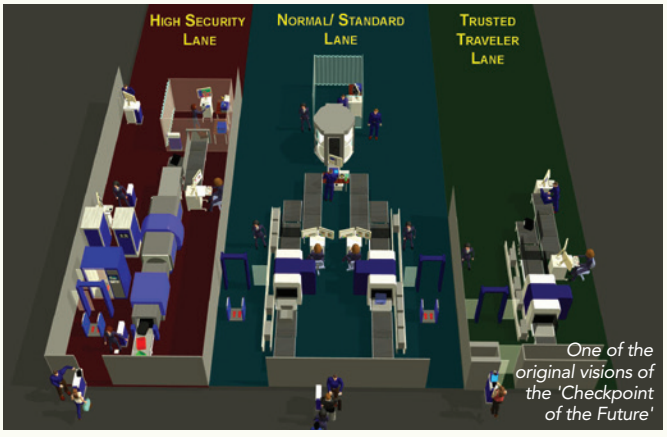
The team leveraged several historical developments to develop an end-to-end strategy.

1. In the mid 1990s, Northwest Airlines developed Computer Assisted Passenger Pre-screening (CAPPS) to analyse PNR data to determine which passengers' hold bags needed to be screened by CT systems back when the US considered 100% screening

to be impractical. It would have caught 11 out of the 19 hijackers on 9/11 had they checked in bags. The idea was to combine this with a 'risk query' to existing government databases and behaviour detection.

2. In 2002-3 a private industry initiative was developed by MDI and Rapiscan and validated by National Safe Skies Alliance: an Advanced Technology Screening Checkpoint (ATSC). Technologies were selected and combined into an end-to-end process to counter each other's weaknesses. Each passenger, along with his or her bags and divested items, was considered a single security entity, with data stored in a Passenger Security Record and a Combined GUI shown to a well-trained operator. This strategy formed the basis of the elevated risk lane.

IATA took the reports to the highest levels of governments worldwide and ICAO to agree on the overall strategy, though they also presented a far-fetched vision in which passengers would walk through three tunnels, carrying their bags, emerging fully screened and ready to fly; they were unofficially known as the 'Tunnels of Truth'. Under new leadership, IATA and ACI joined forces and rebranded 'Checkpoint of the Future' and 'Better Security' (being the ACI's original competing vision), calling it 'Smart Security'.



One of the original visions of the 'Checkpoint of the Future'

Where Are We?

In the US, Europe and Asia, there has been progress, via both airport-based, IATA and XP-DITE activities. However, the focus differs from region to region.

1) Passenger Pre-screening/ Segregation

The US embraced the known and elevated risk-based screening, developing PreCheck and 'selectee' categories, along with behaviour detection. In Europe, however, passengers are treated equally with a random subset sent to secondary search. The original 'Checkpoint of the Future' also called for biometric/ automatic access control to each of the checkpoint lanes. TSA has been trialling Credential Authorisation Technology (CAT), though today's passengers still show their identification to an officer. Some European airports have implemented passport and barcode readers at the checkpoint lane entrance.

2) Screening Standards

Ten years after the liquids ban, passengers must still adhere to the '311' rule, except for medical liquids. Multi-bottle liquid scanners proved unmanageable and too complex to rollout. Airports and passengers also became used to the liquids restrictions, further diminishing the drive to relax them. Two years ago, European regulators combined the original liquid detection standards with solid and homemade explosives requirements, issuing a new cabin bag screening standard, EDS-CB, aimed at vendors developing screening technology and airports seeking alternate bag divesting strategies. Manufacturers can submit technologies for certification to any of three operational scenarios: C1, where both laptops and liquids are removed from bags; C2, where laptops remain in the bag, but liquids are removed and C3, where both remain inside bags. An additional level, C4 aims at broader and tougher detection requirements but currently doesn't offer any operational benefits beyond C3.

3) Passenger Facilitation

Several European airports aggressively pursued this strategy. McDonald Humphreys, Herbert Systems, Smiths and other companies leveraged their hold-baggage experience, developing parallel bag divesting stations, automatic tray-return and baggage diverter systems to speed up bag handling. Following success in Europe, it is now being trialled in the US and Asia. However, bag repacking then becomes the rate-limiting step; a tougher challenge unless more items can remain inside bags. The opportunities for bag handling improvements recently led to two baggage-handling pioneers being bought by security technology companies.

"...companies leveraged their hold-baggage experience, developing parallel bag divesting stations, automatic tray-return and baggage diverter systems to speed up bag handling..."

4) Passenger/Bag Screening

Ideally each passenger with bags and divested items should be considered a single security entity. The original 'Checkpoint of the Future' envisioned boarding card readers to correlate scanner and operator data. Currently, baggage system contractors are using RFID to link trays to passengers. If expanded to passenger (and ideally hold-baggage) screening, it will allow a cohesive security picture for each passenger, replacing inspection of individual items in isolation. There has been great progress but we're not there yet.

Cabin Bag Scanners

The 'Checkpoint of the Future' envisioned the screening of elevated risk travellers to high standards, with others of lower risk screened less aggressively. The elevated risk lane combined CT and Quadrupole Resonance (an RF technique good for certain types of explosives). In the last seven years, QR never evolved as a screening technique, but CT has seen extensive development. Leading the charge was Analogic, with their COBRA cabin bag CT. The company ran several trials, both in the U.S. and in Europe, and learned key lessons, which are being addressed in their new, second generation ConneCT system. More recently, L3, Nuctech and IDSS have rolled out their first-generation checkpoint CT systems, but Analogic remains the only CT company currently on its second-generation design. MDI developed an alternate approach called X-ray Diffraction. Its XDi product should have lower false alarm rates, but the penalties are higher cost and lower throughput – potentially limiting it (as with hold-baggage) to resolving CT rejects. Rapiscan is taking a different approach: upgrading multi-view AT systems with energy-resolving detectors to better

differentiate materials and adding a built-in secondary sensor (possibly X-ray diffraction) to further reduce false alarms. However, costs and false alarm rates of such an 'AT-3' system may be similar to CT. As of 13 March 2017, no systems are listed as meeting the European C2 standards, let alone C3, though several CT systems are undergoing trials. TSA has yet to roll out their 'Accessible Property Screening Standards' (APSS), likely similar to the Europeans. In the meantime, they are testing systems to the existing AT-2 standards, with only the Smiths ATiX meeting European C1 requirements.

Passengers Scanners

After the Underwear Bomber, TSA rapidly rolled out body scanners (also known as AITs or Security Scanners), to find non-metallic threats on the body. Two different types (millimetre wave and backscatter X-ray) were deployed, but the public backlash to operators looking at 'naked' (albeit poor quality) images of travellers' bodies and slow inspection led the US government to demand Automatic Target Recognition (ATR) algorithms. These reduced privacy concerns, sped up the inspection process and better emulated the walk-through metal detector process from the operators' and passengers' perspectives. While backscatter X-ray was the better imaging technology (though by no means perfect), it was L3 that developed ATR and once its privacy and faster screening advantages became apparent, the backscatter X-ray systems were withdrawn and L3 became the only provider of certified (both US and ECAC) body scanners until the recent addition of the Rohde-Schwartz QPS200.

The new PreCheck process allowed TSA to revert to using metal detectors for trusted passengers, while AITs were used for most other passengers (the TSA later reverted to walk-through metal detectors for children under 12, military and seniors over 75). Europe remains less keen to widely deploy millimetre wave scanners based on their blind spots and extremely high false alarms, which create additional problems for secondary search, sporadically using them for secondary search after a metal detector alarm, along with a random component.

For screening 'elevated risk' passengers, today's protocols and systems are incapable of revealing cleverly concealed threats that well-trained terrorists might use. In the US,

"...Europe remains less keen to widely deploy millimetre wave scanners based on their blind spots and extremely high false alarms..."

such 'selectee' passengers are screened by the same primary technologies but subjected to an enhanced secondary search, using the same slow, manual methods (pat-down and EDT) available for any rejected passengers. In 2015, the US DHS Inspector General clearly demonstrated the fallibility of this overall strategy, with 95% missed detections during red team tests.

5) Security Data Integration

For baggage, remote display stations that show bag searchers where X-ray operators had concerns are widely used. For several years, TSA has been developing DICOS, an 'extensible, interoperable data format that enables security screening system integration'. However, the inability to track and correlate each passenger to their bags/trays, the lack of an elevated risk passenger screening capability plus privacy concerns means that the 'passenger security record' remains elusive.

London City Airport has deployed the Quick Personnel Security scanner, the R&S QPS200, from Rohde & Schwarz

So my rough overall grades for where we are today relative to meeting the original IATA 'Checkpoint of the Future' goals are:

Speeding up the checkpoint: B

While lane automation and PreCheck have sped up the process, passengers still have to remove electronics and bottles and shoes; so it may just push the problem downstream to the scanners themselves and to bag reassembly. The time per passenger will vary depending on how much – and how quickly – each passenger divests adding to throughput instability.

Improving security effectiveness: C-

This grade is generous, given the Inspector General's findings and remaining vulnerabilities, especially for elevated risk passengers. However, performance standards exist and new technologies are under development for bags (CT and XRD) and passenger screening (improved RF techniques), setting the stage for future improvement.

Reducing costs: F

New baggage handling system costs are substantially higher than standard conveyors; body scanners are roughly twenty times the cost of metal detectors and CT systems are likely at least twice the cost of AT X-ray. TSA's PreCheck has reduced costs for those passengers, but today's checkpoints are roughly ten times the cost of those used pre-9/11. Widespread deployment of new systems, rather than targeting them at elevated risk passengers, will increase costs.

Reducing space requirements: D-

Divesting and reassembly conveyors, along with bag diverters and more secondary search stations mean longer lanes, while body scanners (in the U.S. located alongside metal detectors) have increased lane width. Again, TSA is saving some space with its PreCheck lanes, though even more PreCheck passengers are unlikely to offset the width increases. The biggest potential savings here are to remotely relocate X-ray operators.

Improving passenger convenience: C

After initial confusion, passengers like the parallel divesting and bin-return systems, which allow more efficient operations at the front end, even if they have to wait at the end to collect and reassemble their items. Electronics, liquids, body-worn items and sometimes shoe removal continue to cause stress and the loss of items, while secondary search remains slow and frustrating for many passengers. Technologies meeting C2 and C3 standards along with new passenger screening methods under development should reduce this burden.

Where We Need to Go

Terrorists are broadening their strategies. It is no longer enough to merely screen passengers at a checkpoint. Experts believe that checkpoint lines themselves could be targets; so minimising queuing becomes of paramount importance. For baggage screening, CT – or similarly capable systems – would likely improve detection considerably and allow passengers to reduce or eliminate divesting, speeding up the bag screening process. For passenger inspection, new technologies will be needed to counter both externally and internally concealed threats, given the vulnerabilities of today's AITs. Some are under early development, but need more funding and accelerated development along with a streamlined testing process. Better technology-human integration via carefully designed Combined User Interfaces and remote screening in a calmer environment can improve security, reduce operating costs and lane width, saving space.

Some regulators are exploring the use of different inspection algorithms depending on each passenger's risk profile (so-called 'dynamic screening'). Of course, this requires that technology capable of finding all threat types and concealment methods of concerns be used on all lanes. However, it is 'dumbed down' for the vast majority of passengers, making it an expensive way to use the best technology – prohibitively so for many countries. The IATA studies found it more cost-effective to implement a separate elevated risk passenger lane with such technologies while using several lanes of less capable, faster scanners for screening other passenger categories. Also, passenger-screening technologies have high enough false alarms without this dynamic screening ability, rendering the overall dynamic screening approach dubious from an end-to-end security perspective. It will also increase processing speed variability and false alarm rates depending on the passenger, potentially lowering lane efficiency and raising operational concerns. However, a separate elevated risk lane strategy has passenger facilitation and potentially privacy concerns for those passengers. There's no ideal approach; the industry needs to decide where to compromise.

Regardless, elevated risk passengers and their bags need to be viewed as a single security entity. This will require common communications and imaging standards (e.g. DICOS) integrated with passenger and bag tracking to data-integrate individual inspection decisions. This has not happened yet. Also, a flight-based screening process is needed to scrutinise multiple selectees travelling on the same flight in case they constitute a potential terrorist team.

'Checkpoint of the Future' was originally designed to revamp the overall security process, reduce cost and improve the passenger experience; hopefully, whatever emerges will retain that strategy and vision. Six years on, we've made some progress but we're a long way away from that vision. Hopefully our adversaries – and annual passenger traffic growth – will give us the time we need to get there. ■

Steve Wolff is President of Wolff Consulting Services. He has over 30 years' experience developing and marketing advanced aviation security detection systems and was co-founder of InVision Technologies. He is co-inventor of several checkpoint integration patents and is consulting with companies and international organisations to develop new security technologies and processes.

Steve Wolff and the original 'Tunnels of Truth'.