problematic. Nevertheless, PTI is a useful tool to demonstrate an analytical decision making process for evaluating threats.

Bomb threats against aircraft in-flight offer a unique set of challenges. The pilot-in-command must evaluate the flight profile and, in discussion with corporate security and dispatch, decide whether to divert, return to the departure airport, or continue to the scheduled destination. This is where PTI may offer the best utility in that decision process. Detailed threats will likely drive the levels of response. With closed flight decks since 9/11, flight attendants must take charge and conduct any cabin searches directed by the captain. The crew can search lavatories and galleys without alarming the passengers. If a complete cabin search is warranted, passengers should be instructed to retrieve all carry-on items and to report any suspicious articles discovered during that process without disturbing them. Should a suspect item be located, the crew should handle it in accordance with Least Risk Bomb Location (LRBL) procedures, which are now an ICAO requirement. Aircraft landing with suspicious items must be directed to the designated 'Hot Spot' for resolution of the threat, as one would not want to bring a possible explosive device to the airport terminal.

"...threats with information involving the exact location of IED placement or aircraft tail numbers are handled as being more credible than calls saying, "There is a bomb in your airport" or, "There's a bomb on an airplane departing the airport"..."

Perhaps one of the most significant threats against a commercial aircraft in-flight occurred in 1972 when a specific threat against a Trans World Airlines flight over the United States resulted in its return to New York's JFK Airport, where a search by NYPD Bomb Squad's bomb sniffing dog named Brandy discovered a live improvised explosive device hidden in the cockpit's emergency medical kit, which was rendered safe only twelve minutes before it was set to explode. This resulted in the FAA establishing its Explosives Detection Canine Team Programme at major airports across the United States. Similar programmes have subsequently been established worldwide to assist in the detection of explosives.

Aviation continues to be a focus of international terrorist IED attacks with commercial aviation remaining an attractive target due to the large number of casualties and the worldwide news coverage resulting from these attacks. However, the effectiveness of passenger and baggage screening technologies have made these attacks significantly more difficult since the introduction of advanced screening technologies at airports following the bombing of Pan Am Flight 103 in December 1988. For airport and larger facility bomb threat searches, explosives detection canine teams remain one of the best search tools as

BOMB THREATS: ASSESSING THE COSTS

by Philip Baum

Whilst the industry should, naturally, err on the side of caution when responding to a bomb threat, it is impossible to completely disregard the economic impact of the decision to evacuate a terminal building or divert an aircraft pending inspection by an EOD (Explosive Ordnance Disposal) team.

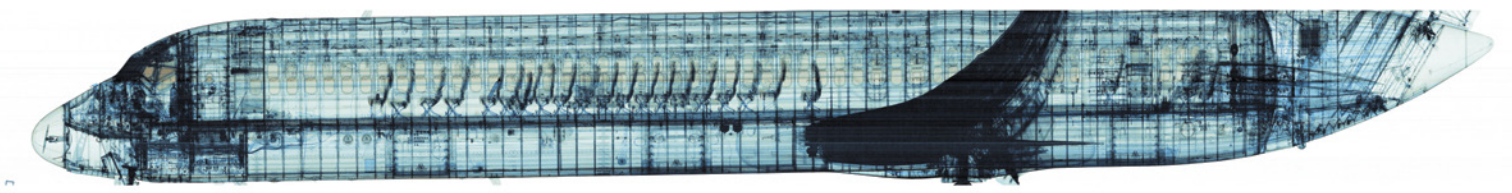
When the supposed target is an airport building, the authorities can search the area and resume operations reasonably quickly, in part because the volume of explosives needed to cause significant damage on the ground would be much larger - and therefore easier to find - than that needed to bring down an aircraft. Regardless, the impact on airline operations and passengers' travel plans can be immense; some of the costs are clearly determinable, such as the need to re-route passengers who might have missed flight connections, whilst others are harder to identify. For example, how many of the passengers impacted by the event will elect to choose an alternative mode of transport for their next journey?

What is clear, from an assessment of a broad range of incidents impacting aviation, is that the quicker one can resume normal operations, the less the damage to an airport or airline's reputation. This May, British Airways' operations were impacted worldwide by a computer failure; not only will there be claims for delays incurred, but the negative press generated by the mass media and social media transactions, will, often subconsciously, influence the decision as to which carrier people might choose in the future. The longer the incident lasts, the greater the unrest and number of tweets. Problems occur, but the need for speed in resuming normal operations cannot be underestimated.

The same is true for airlines responding to bomb threats. The reality is that, aside from the TWA incident referred to in Ed Kittel's article in this issue, I cannot cite a single incident of a there being a bomb threat against a specific flight and there actually being a bomb on board, even though the industry is being forced to respond to such threats on a daily basis. (There are examples, such as the Yemen computer printer plot, where intelligence, as opposed to anonymous threats, has indicated the presence of an IED.) Yet, when a threat is deemed to be 'specific' in nature, one cannot assume that, just because all previous threats have been hoaxes, this one is too.

Airlines have an even more challenging task than airports in their need to determine whether a threat is a hoax or not. As mentioned previously, the quantity of explosives required to cause a catastrophic event inflight is far less than that on the ground. Furthermore, the number of areas on board an aircraft where one can conceal a viable IED is huge; as we consider the insider threat, they often include areas which are hard to inspect using physical search, canines or explosive vapour detection technologies.

In a 2015 interview on Canadian television, former FBI investigator Brad Garrett said that each bomb hoax can



they are highly mobile and can 'go to source', alerting on a wide range of explosives threats. In addition, passenger screening canines can be used in checkpoint queues to passively screen passengers by 'sniffing' the vapour wakes trailing passengers as they progress though screening. Each of these tools should be employed in an integrated systems approach to apply the best combinations for the tasks at hand.

As our confidence grows in aviation security systems, terrorists evolve and adapt as well. This drives terrorist bombers to either use insiders with access to secured areas to introduce IEDs into airports by evading screening checkpoints and checked baggage security systems or switching their targets to the public side of airports in lobbies, at ticket counters or baggage claim areas, and even on the public side of screening checkpoints. In addition, there has been a notable surge in 'active shooter' attacks at airports. Future airport security designs will also need to address the full range of threats and consider innovative methods to mitigate threats.

"...a specific threat against a Trans World Airlines flight over the United States resulted in its return to New York's JFK Airport, where a search by NYPD Bomb Squad's bomb sniffing dog named Brandy discovered a live improvised explosive device hidden in the cockpit's emergency medical kit..."

The most important element of bomb threat management and analysis is proper prior planning. As terrorist tactics are constantly evolving, our response and training plans must evolve as well. Regular training and exercising of those plans ensure that aviation workers are prepared when a threat is received resulting in a smooth, well-coordinated response.

As noted in the US 9/11 Commission Report, "Private-sector preparedness is not a luxury; it is a cost of doing business in the post-9/11 world. It is ignored at a tremendous potential cost in lives, money and national security."

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cost airlines "several thousands of dollars" and that such incidents are also "a heavy weight both for the airlines, financially, and for law enforcement." Actually the cost, even to the airlines alone, can easily be in the tens or hundreds of thousands. IATA figures for the cost of a diversion as a result of an unruly passenger incident suggest that the minimum cost would be $6000, but that often the figure can reach $200,000; it all depends on the size of aircraft, number of passengers, length of flight (will it put the crew out of hours?), time of day (will an overnight become necessary?), divert airport (congestion and operating hours) and, overall, the length of the delay.

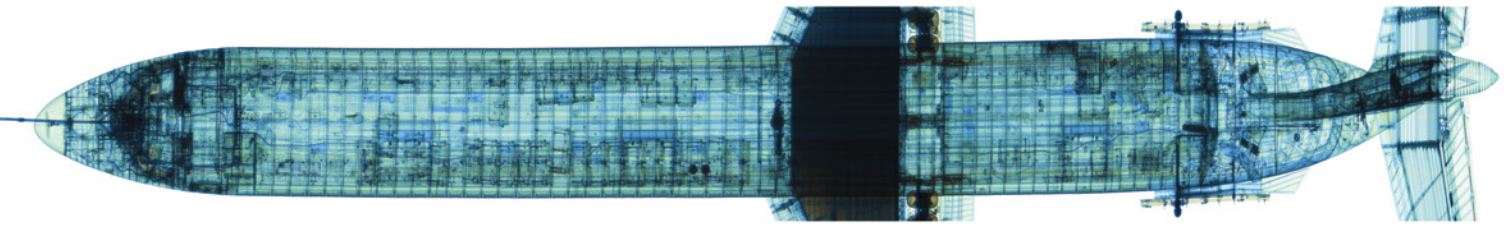
Unruly passenger incidents are, however, quicker to resolve than bomb threats. If an airline diverts, it is often airborne again within the hour once the perpetrator has been off-loaded. Airlines can normally recover from such short interruptions the same day. Most unruly incidents occur well into a flight, thereby making it rare to need to dump fuel. Bomb threats, however, can often be received on take-off, or shortly thereafter; one Swiss estimate of the cost of jettisoning fuel as a result of an aircraft being above the maximum landing weight suggests that, for an Airbus A330, it would be around 70,000 CHF (c. £56,000) without any other consequential costs (such as environmental taxes or private owner compensation). In other words, the upper figure of $200,000 quoted in respect of unruly passenger diversions is often well exceeded with bomb threats.

"...canines may be more effective than people, but what about those hard-to-reach areas? In the era of the insider threat, we need to ensure that aircraft are truly secure and we need to do so as quickly as possible..."

It is often the hidden costs which are forgotten. Few carriers even consider the cost of the air force response to an aircraft under threat; fighter jets are often dispatched to intercept the aircraft, an operation deemed to be part of their regular duties, and part of a state's national security, so usually ultimately funded by the taxpayer. So too the police response once the aircraft has landed.

Then airport landing fees have to be considered, the operational costs of handling passengers, their baggage and the subsequent re-screening process. Many aircraft are carrying perishable cargo, where air freight was specifically selected in order to get goods from A to B in the shortest possible time; the same applies to courier shipments where fees are refunded if a document or package fails to reach its destination on time. Flight catering may have to be repeated and passengers fed and, potentially, accommodated. And this is to say nothing of the core disruption to travel plans and the impact of the event on the carrier's reputation.

Some of these costs are unavoidable, others can be mitigated by an efficient and effective response. Much of this boils down to process, but the role of technology should not be underestimated. In response to bomb threats against airlines, canines may be more effective than people, but what about those hard-to-reach areas? In the era of the insider threat, we need to ensure that aircraft are truly secure and we need to do so as quickly as possible.



TUDOR SCAN TECH offers airports, and airlines, the opportunity to speedily resolve bomb threats through the use of X-ray technology to scan entire aircraft and, thereby, enabling the authorities to search areas inaccessible to personnel and canines. Here is an X-ray image taken of a McDonnell Douglas MD-80.