

Airport attacks: The critical role airports can play in combatting terrorism

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Abstract

This paper uses a unique database of aviation terrorist attacks to analyse the phenomenon of airport attacks. The evolution of aviation terrorism is described with a particular focus on airport attacks, using empirical and historical data to form a factual baseline for historical analysis and policy recommendations. The authors make a distinction between acts of unlawful interference, the all-encompassing term the International Civil Aviation Organization uses, and actual terrorist attacks against civil aviation. While statistics demonstrate that airport attacks have been perpetrated steadily since the 1970s, with no major fluctuations in recent years, they also demonstrate that airport attacks may have the potential to become more lethal than ever before. Analyses and guidance are also provided on how to better protect airports, suggesting that the hardening of aircraft as targets has actually transferred considerable security risk to airports. To effectively secure the air transportation system, a three-pronged approach to aviation security is proposed, transcending airport security and reaching far beyond aviation in its scope.

Keywords

airport, aviation, security, terrorism

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INTRODUCTION

Since the dawn of commercial aviation, terrorists have used the air transportation system to both commit their attacks and to attack the system as a target in its own right. Airports in particular have stood out as relatively 'soft' targets for terrorist attacks. While aircraft have been hardened as targets over recent decades with

the gradual addition of enhanced security measures, airports by nature have had to remain public areas, at least partly accessible to anyone, hence making them preferred targets.

Airport attacks, along with aircraft attacks, belong to a specific aviation terrorism modus operandi (MO, ie method of attack) called ground attacks, which

have in effect been alternatives to other MOs including hijacking, sabotage and suicide missions. Airport and aircraft attacks are very distinctive by their nature, but often mixed and hard to differentiate given they have commonly occurred at airports. While launched from the ground, aircraft attacks specifically target aircraft, whether they are gated, taxiing, taking off, landing or cruising. Such acts have been conducted using guns, grenades, rocket-propelled grenades (RPGs), man-portable-surface-to-air-missiles (MANPADS) and other weapons. Airport attacks are acts in which individuals or installations on airport grounds are violently and specifically targeted. Targets can include terminals, check-in counters, boarding gates, passenger areas, vehicles, parking lots and other equipment or buildings, but excluding aircraft themselves.

Terrorist attacks committed against airports in 2016, namely in Brussels and Istanbul, have stirred the debate about airport security and what can and should be done to prevent this type of attack. The principles addressed in this paper are based on research material that includes a unique database of aviation terrorist attacks recently developed for a doctoral thesis. The paper describes the evolution of aviation terrorism with a particular focus on airport attacks, sets out facts using empirical data and offers guidance on how to protect airports.

AVIATION TERRORISM

Aviation terrorism can be defined as a political act against civil aviation carried out by non-state actors who systematically target civilians and intentionally use violence in order to create terror and coerce authorities, at times by making demands.¹ Understanding why terrorists have targeted civil aviation is crucial to devising

countermeasures to better protect the system and reduce the number of successful terrorist attacks against the sector. The academic and professional literature reveals seven fundamental reasons explaining why terrorists have targeted civil aviation. Namely, such attacks:

1. project a *global reach*, even if local;
2. generate the *rapid transmission* of information, increasing audience and impact;
3. depreciate the *embodiment of state power* that airlines and airports symbolise;
4. lead to *powerful economic consequences* beyond civil aviation;
5. have a *high lethal potential*, and a high probability of affecting nationals of several countries;
6. *impede interconnectivity*, disrupting global air transport; and
7. provide the *capacity* to instantly make a powerful statement to world leaders.^{2,3}

In his doctoral thesis,⁴ one of the authors crosschecked the evolution of aviation terrorism against changes made to the international aviation legal and regulatory framework. The research revealed that civil aviation conventions and protocols created specifically to disrupt particular aviation terrorism MOs have had mixed results. Nevertheless, the cumulative impact of international conventions and protocols seems to have ultimately created an overall deterrent effect resulting in a decline in aviation terrorism, especially noticeable as of the early 2000s. In order to answer the aforementioned thesis' research question, extensive research was conducted to gather in a single database every act of unlawful interference having been perpetrated against civil aviation between 1931 and 2016.⁵ All acts were subsequently categorised by MO: ground attack, hijacking, sabotage and suicide mission.

Table 1 summarises the composition of the database per MO,⁶ along with the number of corresponding deaths. There is a direct and consistent correlation between MOs and their respective number of deaths; the most used MOs have been the least lethal, and vice versa.

Another important category of the database was motive, precisely created to distinguish actual terrorist attacks from mere criminal incidents, based on the aforementioned definition of aviation terrorism. Out of all 2,071 listed acts of unlawful interference, only 635 could be definitively categorised as terrorist.⁷ Table 2 provides statistics on the MOs used to carry out those 635 terrorist attacks as well as their consequent fatalities. The same pattern applies here: the most widely used MOs have been the least lethal, and vice versa. The comparison of Tables 1 and 2 reveals that whereas a minority of acts of unlawful interference have been terrorist attacks (31 per cent), a large majority of total deaths are attributable to terrorist attacks (72 per cent). Furthermore, it is important to mention

that the 6,184 deaths from aviation terrorism have occurred in only 175 attacks (28 per cent) meaning that the other 460 attacks (72 per cent) caused no casualties.

For its part, Figure 1 illustrates the evolution of the aviation terrorism MOs for the 1960–2016 period. The 1931–1959 period is purposely excluded, given the extremely low prevalence of aviation terrorism before 1960, to concentrate on patterns of MOs occurring over the past 57 years. The graphic clearly shows that ground attacks and hijackings have been the MOs of preference for aviation terrorists. It also shows that the hijackings, sabotage and suicide missions have sharply declined to negligible levels since the 9/11 attacks; however, the number of ground attacks has not followed the same trend and continues to fluctuate on a pre-2000s pattern.

AIRPORT ATTACKS

Perpetrators have used the full range of possibilities to attack airports, from mass killings using grenades and automatic

Table 1 Unlawful interference statistics, 1931–2016

| <i>Acts of unlawful interference</i> | | | | |
|--|------------------|-----------------|------------------------|--------------|
| <i>Ground attack</i> | <i>Hijacking</i> | <i>Sabotage</i> | <i>Suicide mission</i> | <i>Total</i> |
| 536 | 1,308 | 174 | 53 | 2,071 |
| <i>Deaths from acts of unlawful interference</i> | | | | |
| <i>Ground attack</i> | <i>Hijacking</i> | <i>Sabotage</i> | <i>Suicide mission</i> | <i>Total</i> |
| 1,865 | 814 | 2,829 | 4,000 | 9,508 |

Table 2 Terrorist attacks statistics, 1931–2016

| <i>Terrorist attacks</i> | | | | |
|--------------------------------------|------------------|-----------------|------------------------|--------------|
| <i>Ground attack</i> | <i>Hijacking</i> | <i>Sabotage</i> | <i>Suicide mission</i> | <i>Total</i> |
| 338 | 221 | 56 | 20 | 635 |
| <i>Deaths from terrorist attacks</i> | | | | |
| <i>Ground attack</i> | <i>Hijacking</i> | <i>Sabotage</i> | <i>Suicide mission</i> | <i>Total</i> |
| 1,650 | 279 | 1,726 | 3,159 | 6,814 |

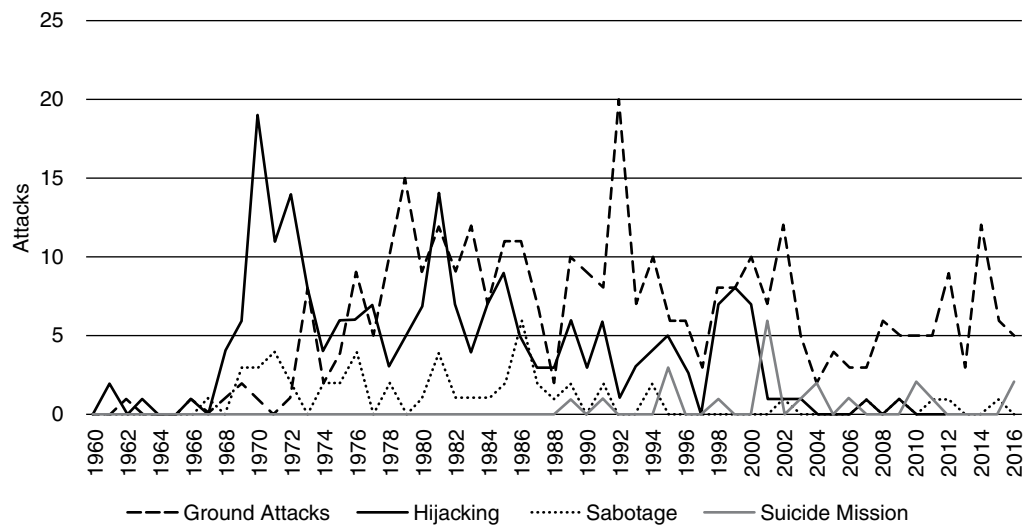


Figure 1 Evolution of aviation terrorism MOs

weapons to small homemade bombs exploding in parking lot garbage bins without injuring anyone. Attacking an airport is generally viewed as a substitute for attacks on airliners—a “poor’s man’s” hijacking, a simpler way to make a political point without running the risks.⁸ Attacks against check-in counters and offices can be considered symbolic attacks indicating which specific aircraft or countries terrorists would attack if security measures protecting airliners were less stringent.

For the purpose of this paper, the authors have isolated airport from aircraft attacks in the aviation terrorism database for analytical purposes. Table 3 reveals that terrorists have targeted airports 232 times between 1931 and 2016, that is 37 per cent of all terrorist attacks, causing a total of 468 deaths, or 7 per cent of all deaths from terrorist attacks. This trend is consistent with the ‘most used but least

lethal’ trend identified in the previous section.⁹

Contrary to some current popular beliefs, airport attacks are not a new trend. The MO goes back to the early 1970s and was first used by Palestinian groups. The first terrorist airport attack listed in the database occurred on 10th February, 1970 at Munich Airport, Germany. One Egyptian and two Jordanians affiliated with the Popular Front for the Liberation of Palestine (PFLP) attacked a bus carrying El Al passengers to their aircraft with guns and grenades, killing one and injuring 11.¹⁰ Through its ‘general command’ cluster, the PFLP was extremely active in aviation terrorism from the late 1960s to the late 1970s. Many authors attribute the emergence of both international and aviation terrorism to the PFLP, whose operatives proved particularly capable at hijacking commercial airliners carrying Israelis. Their objectives were to blackmail the government of Israel, namely for the release of Palestinian prisoners, and to internationalise the Palestinian cause.

On 8th May, 1972, PFLP operatives hijacked a Sabena Airlines flight, landing

Table 3 Terrorist airport attacks, 1931–2016

| | Number | % of all terrorist attacks |
|-------------|--------|----------------------------|
| of acts | 232 | 37% |
| # of deaths | 468 | 7% |

it at Lod Airport near Tel Aviv. Refusing to be blackmailed once again, the Israeli government mandated elite commandos to storm the airplane and release the passengers. The operation was successful: two hijackers were killed and the other two captured. One passenger died and five others were injured, but the government of Israel made the point that it would not be blackmailed through aviation terrorism anymore. This was a watershed moment for nascent aviation terrorism, the very first time a government launched a security operation to abort an act of unlawful interference while accepting the risk of collateral damage. It was also a watershed moment for airport attacks; the PFLP, which had mostly refrained from killing civilians in its past operations, did not anticipate the Israeli government's surprise move.

As a Marxist group, the PLFP maintained relations with several foreign revolutionary groups such as the Japanese Red Army (JRA) and the Irish Republican Army.¹¹

On 30th May, 1972, the PFLP delegated a three-member JRA cell to retaliate for the Israelis' surprise move of three weeks before and carry out the first full-scale airport attack in history. The JRA operatives flew on Air France to Lod Airport. While about 250 passengers were waiting at immigration, the terrorists pulled out automatic weapons and hand grenades from their carry-on luggage and fired at the crowd. Their attack killed 28 people and injured about 70 others.¹² The Lod Airport attack shares several characteristics with tens of other airport attacks, including the fact that people waiting in line to be 'processed' allowed terrorists to maximise the carnage of their attacks.

Figure 2 illustrates the evolution of terrorist airport attacks and their related deaths from 1970 to 2016. Except for 1983 (11) and 1992 (16), the number of terrorist airport attacks has consistently fluctuated between 0 and 10 per year. As for the number of deaths, it has oscillated based on the number and success of

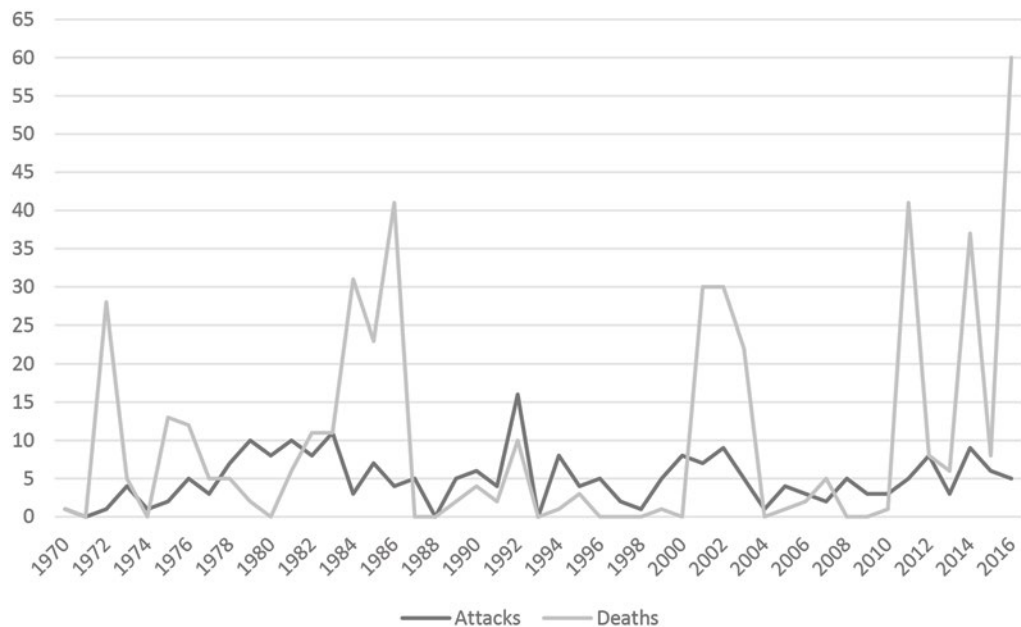


Figure 2 Evolution of terrorist airport attacks

airport attacks. Peaks are noticeable in 1972 (corresponding to the Lod Airport attack), between 1984 and 1986, between 2000 and 2003, and between 2014 and 2016.

The 1984–1986 peak is in part attributable¹³ to a coordinated airport attack by Abu Nidal Organization (ANO) on 27th December, 1985. First, four armed men attacked the El Al and Trans World Airlines check-in counters at the Rome Airport, firing guns and throwing grenades at a long queue of passengers. The terrorists managed to kill 16 and wounded 99 before the police killed three of them. Moments later, three terrorists stormed the Vienna Airport and threw grenades at passengers queuing up at the El Al counter, killing three and injuring 40. As St. John points out, these attacks were excellent demonstrations of the vulnerability of airport terminals.¹⁴ The 2001–2003 peak is for its part largely explained by airport attacks carried out in Sri Lanka by the Liberation Tigers of Tamil Eelam. The graph also shows that 2016 was the most lethal year for terrorist airport attacks so far, with 60 deaths, entirely attributable to attacks conducted at Brussels Airport on 22nd March (15 deaths) and at Atatürk Airport in Istanbul on 28th June (45 deaths).

PROTECTING AIRPORTS

The framework

Introduced in 1974, Annex 17¹⁵ to the International Civil Aviation Organization's (ICAO) Chicago Convention was intended to establish an evolutionary framework for a multilayered aviation security system that would form a defensive structure to deter, prevent and respond to various threats. Such a multilayered approach also improved the chances of intercepting a threat at the different stages of an ongoing attack. For example, a threat undetected at level 1 should be detected in succeeding

levels. The provisions of Annex 17 and its amendments can be categorised in five different groups: (1) general principles, organisation and administration; (2) airport operations; (3) aircraft operations; (4) aircraft in the air; and (5) international cooperation.

The most visible and tangible aviation security measures are deployed at airports. ICAO's Annex 17 lists the roles and responsibilities of airport operators regarding screening operations, prevention activities and activities in a rapid response to attacks. Airport operators are responsible for the coordination of agencies involved in aviation security. The senior airport security personnel also lead the Airport Security Programme (ASP), the airport security committee and prevention campaigns. It is also responsible for the development and implementation of emergency plans. ICAO member states must have authorised officials deployed at international airports to assist and deal with suspected or actual situations of unlawful interference with civil aviation.¹⁶ Annex 17 also requires that airport administrations ensure additional security measures for specific flights upon request from other states.¹⁷ Airport design and the infrastructure plan of the airport are also key components in the efficiency of security systems.

In reality, this translates into the ASP seeking to achieve the following core security tasks: (1) the pre-board screening (PBS) of travellers and their carry-on baggage; (2) the hold-baggage screening (HBS); (3) the screening of employees and crew, also known as non-passenger screening (NPS); (4) the control of access to the restricted areas through the guidelines of the airport perimeter security programme, which is complemented by the airport perimeter intrusion detection system (PIDS); and (5) the supply chain

and screening systems for cargo and mail. Trained officers, whose qualifications are regularly tested, perform all these activities. The boundary between a restricted area and a non-restricted area (landside area) of an aerodrome is divided by a primary security line. The landside area is where both travelling passengers and the non-travelling public have unrestricted access (eg public areas, parking lots and roads).

The objective of any security system is to delay or deter the forceful entry of intruders into a protected area to allow time for reinforcement units to come to the rescue. In the specific case of airports, the Annex 17 multilayered system aims to locate and address weapons or dangerous devices at the airport, precisely before they represent any risks to aircraft and their passengers. This hardening of the aircraft targets creates considerable security and procedural stress to the airport itself, hence the complexity of core security tasks. As security measures hardened the protection of passengers and aircraft, airport terminals and facilities became attractive soft targets for terrorists. Indeed, airport attacks are highly valued by terrorists because, for the most part, they need less preparation and sophistication than airborne attacks, can cause huge casualties and damage, and offer greater escape options. The statistics presented in the previous sections tend to demonstrate that using airports as 'filters' to better protect aviation may have indeed contributed to a decrease in the number of terrorist attacks against aircraft. But one may not be surprised that airports, as 'filters', have not witnessed the same declining trend in attacks.

Simply put, the principle that security in the air begins with security on the ground has proven to work; what is less clear is how the regulatory framework has adapted to the principle that securing

the air on the ground inevitably increases the vulnerability of airports and makes them attractive aviation targets. The use of early warning systems giving security teams sufficient time to activate checkpoints on airport access roads, shut down terminals and block entrance areas to stop attackers are but just a few ideas to enhance security at airports. The addition of bulletproof windows to protect people inside the terminal and delay entry to terrorists, designated high-protection areas where passengers and employees could take refuge rapidly during an active shooter situation are also concepts deserving of exploration.

'Cat and mouse'

The terrorism–security conundrum has evolved into a game of 'cat and mouse'. This applies, but is not unique to, the air transport system. On the one hand, states and security experts have continually reacted to acts of terrorism, coming up with new countermeasures, tactics, tools and processes to stay at least one step ahead of evolving threats. On the other hand, terrorists have continuously sought new and innovative ways to get around those new security measures while enabling them to proudly re-invent themselves with determination.

While security authorities must address attacks that have already occurred and make sure they cannot be repeated, they must put more efforts in the anticipation of the next terrorist innovation and act to secure vulnerabilities before terrorists launch a new attack. Unfortunately, this is very difficult to accomplish, for two reasons. First, such attacks are what Taleb calls 'Black Swans events'¹⁸ in the sense that they are rare, that they have a high impact and that people analysing them often use retrospective predictability (judging

an event with the advantage of hindsight). Although such terrorist attacks become readily explainable after the fact, they are exceedingly difficult for security authorities to imagine ahead of time, which in turn makes it extremely challenging to anticipate, prevent and thwart. Second, potential terrorists are not unreflective actors whose actions can be readily calculated, but are rather rational, resourceful and often ingenious human beings who are highly motivated to find any and every point of weakness in security and exploit it. Terrorists, like security authorities, are motivated to anticipate and outwit their opponent, but they do have the upper hand in the 'cat and mouse' scheme.

In summary, it is utterly necessary, but not sufficient, for security authorities to adapt their behaviour and measures based on past terrorist attacks. The current terrorist context demands this adaptation and security authorities must provide it, namely by assessing their performance, learning lessons and following best practices. But this process must be balanced with a major anticipation effort, precisely because the real danger lies in placing too much confidence in long-established security measures that persistent foes can patiently circumvent. In reality, such thinking multiplies the danger factor by prompting the illusion of security without actually providing any. The 'fighting the last war' attitude will always result in authorities lagging behind terrorists' tactics and innovation. A change in attitude is central because terrorist attacks, both generally and against civil aviation, continue to occur today and are likely to continue for the foreseeable future.

Standing up to airport attacks

Given the global nature of the air transportation sector, planning adequate security

at an airport is an extremely complicated, multifaceted and overwhelming task. Large numbers of people, laden with baggage and preoccupied with their own agendas, are concentrated in relatively small areas. Airports are generally left wide open to all who wish to enter, presenting potential suicide bombers with the opportunity to blow up their explosives inside terminals. As mentioned in a 2004 RAND study, the fact that matters the most is 'not the size of the bomb—it's where it's detonated.'¹⁹ One may argue that a passenger waiting in line to be processed at check-in, security or boarding is a 'sitting duck'.

The current screening checkpoints system is characterised by four fundamental facets, each well-intentioned but deeply flawed. First, it is focused on the detection of prohibited items; this is resource-intensive, akin to trying to find a needle in a haystack. Secondly, every single passenger is considered as a possible threat, even if an extreme majority of travellers do not pose any risk to civil aviation. This one-size-fits-all approach is time-consuming, expensive and inappropriate. Third, because authorities apply uniform and inflexible standard operating procedures, they become predictable and therefore become vulnerable to terrorist exploitation. Finally, as mentioned above, slow screening checkpoints unintentionally create chokepoints, which in themselves can represent a target, threatening the security of passengers.

A new system is required and should be based on the dual concepts of risk-management and randomisation, striving to be both swift and inconspicuous. New technology should be used to enable low-risk passengers to escape queues and walk uninterrupted through security without having to take anything out of their bags and pockets. The main objective should be to focus on high-risk passengers rather

than concentrating solely on objects. This would ensure that people who could pose a threat are screened more thoroughly, while low-risk passengers would enjoy an improved and expedited travelling experience. Such practice, however, inevitably comes with an implicit but strong 'profiling' component that, beyond its lack of objectivity, is politically and legally unacceptable in numerous countries, especially western democracies.

Because of the very systemic nature of air transportation, one must note that such security-driven changes would nonetheless have deep planning and operational implications reaching far beyond aviation security. Existing airport infrastructures have been planned and designed to meet the current needs and requirements of aviation security. Major changes to the existing model would create an immediate domino effect that would virtually impact all airport stakeholders and functional areas, including commercial management, engineering, information technology and safety. Furthermore, even if unilaterally imposed by regulators for the betterment of aviation security, such changes would come with a hefty price tag, in all probability being passed to passengers and/or tax payers one way or another.

Many of the world's largest airports are like cities unto themselves, employing thousands of people and processing tens of millions of passengers on an annual basis. Terrorists are in total command when deciding what, where, when and how to attack a target. They will typically assess during their planning phase where they will meet with the least security resistance, and they will find ways to circumvent the remaining defence systems. As such, countermeasures cannot only consist of a sporadic investment made only in response to a specific threat or an actual act of terror.²⁰ If security authorities aim

to effectively prevent future attacks against civil aviation, they must be able to anticipate a threat and develop a strategy to protect the system as a whole, reaching far beyond the airport. Such a preventive strategy should have three interlocking elements: (1) intelligence and warning; (2) prevention and deterrence; and (3) crisis management and resilience.

Intelligence and warning

Like terrorism, intelligence is a means to an end. For a state, this end can be political, commercial or security related. Security is relative, and therefore the purpose of intelligence is to attain a relative security advantage.²¹ The role of intelligence is to help maintain or enhance security by providing early warning of threats in a manner that allows authorities to implement a preventive policy or strategy in a timely fashion.²² The role of intelligence in preventing acts of terrorism is complicated by the difficulty in accessing encrypted communications channels used by terrorists, to counter their combat skills developed in numerous armed conflicts, and to adapt constantly and take into account the evolution of terrorist behaviours. Furthermore, Smelser writes that there are five sources of difficulty for intelligence analysts trying to pre-empt terrorists: (1) terrorists are mobile; (2) they rely on secrecy; (3) they are usually composed of radical groups; (4) they are recruited among kin, friends and neighbours; and (5) the intelligence and security communities do not always cooperate.²³

There has been significant progress in the intelligence community since the 9/11 attacks, that is the day it became evident that no single organisation had all the answers; however, preventing terrorist attacks remains a complex and thankless task because its action is not judged by its

effectiveness, but by its failures, such as those identified in the 9/11 Commission Report.²⁴ Therefore, the intelligence community needs to solve those malfunctions by developing stronger partnerships and obtaining the necessary tools to perform properly. Hence, these changes will enable governments and security authorities keep pace with terrorist groups which themselves are often highly motivated and tightly coordinated.

Prevention and deterrence

Prevention and deterrence are intrinsically intertwined. Some defensive measures help manage real security problems (ie hold-baggage screening), while others are more focused on managing the travelling public's fears and perceptions (eg sporadic police presence). Although it is impossible to develop a perfect security system seamlessly in phase with emerging threats and terrorist innovation, two things are needed to prevent and deter airport attacks: (1) a comprehensive understanding of one's vulnerabilities; and (2) comprehensive knowledge of opponents and their capabilities.

Large numbers of ground handlers, aircraft cleaners and maintenance personnel have unrestricted and unlimited access to the airside of airports. Despite screening of personnel, each of these individuals potentially has the ability to smuggle weapons and explosive devices into the sterile zones of their airport, sabotage aircraft by tampering with critical flight systems and so on. Furthermore, would-be terrorists can deliberately seek employment at an airport in order to gain insider access. The whole aviation security system is jeopardised if airport and airline employees cannot be relied upon. This was the case on 2nd February, 2016 when two airport employees handed

over an explosive-laden laptop to a passenger about to board Daallo Airlines Flight 159 in Mogadishu, Somalia. When the aircraft reached a certain attitude, the passenger detonated his bomb and was sucked out of the aircraft. The attacker was the only victim of the attack thanks to the captain, who managed to land the airplane safely.

Analysing and understanding threats and vulnerabilities is a process similar to those used by engineers who are permanently tasked to assess systems' anomalies that can potentially lead to failures. Their analysis and interpretation of results constitute an important step leading to problem solving. For airport security, such a systemic approach must include public area surveillance, identification of specific threats and vulnerabilities, crowd observation, social media monitoring and learning lessons from terrorist attack analysis. Because such large areas as airports cannot be sufficiently covered around the clock, multilayered ground surveillance radars and other new technologies can detect movement beyond and inside fence limits and alert personnel to security breaches instantly. Though these systems are costly and complex, they are required to offer meaningful security.

In addition to the cumulative effect of conventions, protocols and security measures, the general level of high-alert on which security forces have operated since 9/11 has certainly had a deterrent effect on aviation terrorism. Statistics point to a decrease in the number of terrorist attacks since 2003, while air traffic has grown at about 5 per cent annually during the same period.²⁵ After adopting deterrence as a goal, many best practices can be implemented to maximise their dissuasive effect: for example, increasing police presence to deter attacks, detecting suspicious behaviours or immediately

responding to active shooter situations to stop the assault. Another suggestion would be to proceed with proactive security questioning of passengers, which is considered by many experts as a more effective deterrent than the passive observation of behaviours. This process should always occur in plain view of the public to clearly demonstrate security presence as opposed to a subtler manner.²⁶ The main objective of deterrence is to convince terrorists that their attack will either be pre-empted or trigger a swift response by the authorities, which would then underscore the limits to carrying out their plan.

Crisis management and resilience

Terrorist attacks will inevitably continue to happen, and authorities assigned to protect the travelling public must constantly be aware of existing threats, devise ways to face the unexpected and learn how to cope with uncertainty, day in and day out.²⁷ Guihou and Lagadec contend that the pursuit of 'zero risk' that started during the final stages of the Cold War and abruptly ended on 9/11 is an illusion because risks can never be eradicated.²⁸ The authors suggest that the elimination of all potential risks is an unattainable goal and in fact never existed and will never exist, especially regarding the terrorist threat. Consequently, it is fair to say that the efforts to reach such a goal would not be practical from an aviation security perspective. Indeed, it might come with costly and detrimental trade-offs for the travelling public while jeopardising respect for the rule of law.

Hardening airport and aircraft targets to prevent terrorist attacks has proven to be an effective solution; however, experience has also shown that facing new threats is always an impetus to re-evaluate existing

procedures. For example, if authorities have an inflated perspective of their capacity as part of the organisation's culture, that can hinder implementation of overall strategies. Introspectiveness allows all parties involved in aviation security to evaluate if they efficiently work at detecting, disrupting or containing current and future threats to civil aviation. It can also create an appreciation of the sense of vulnerability among personnel, while giving them a chance to enhance better relationships with the travelling public. Such re-examination also offers a great possibility for authorities to emulate the industry leaders' best practices and learn from colleagues. Last, but not least, it is most important that first responders be well equipped and trained to make terrorist attacks less damaging, thus indirectly discouraging them.

When terrorist attacks are repeated, people ultimately learn to manage their fear. The travelling public as well as airport employees must then be educated in adapting and controlling their emotions in the face of terrorism. This is called resilience, a capacity to rebuild psychologically after a severe shock and regain fortitude. People and governments should acknowledge that terrorist attacks will continue to occur occasionally despite strong security mechanisms. A resilient attitude is at the intersection of keeping failures low and knowing what to do instinctively to keep the security system running. This will allow people to cope with fear and economic consequences emerging from terrorism. Such an attitude will also help properly balance the way government deals with information. As noted by Gregory Treverton: 'People want information, but the challenge for government is to warn without terrifying.'²⁹ The success of aviation security depends not only on laws and regulations, advanced

technology and effective operations, but also on the establishment of a culture of security that is ingrained in the public and civil aviation authorities. This consideration must be factored into future aviation security policies.

CONCLUSION

The current aviation security framework was ingeniously designed with multiple layers, with the main objective of better protecting aircraft against acts of unlawful interference. Statistics on aviation terrorism tend to demonstrate that this system has over time, and especially since the early 2000s, led to a significant decrease in the number of attacks against aircraft, such as hijackings and sabotage. Nevertheless, such a decline has not been seen with the incidence of airport attacks; their number have continuously fluctuated between 1 and 10 a year since the early 1970s, with no significant and steady decrease whatsoever since the early 2000s. Figure 2 showed that 2016 was in fact the most lethal year for terrorist airport attacks on record. Although the number of deaths from airport attacks since 2011 is still not unprecedented (similar 'waves' have been seen before), the trend will set a new precedent if it continues for a few years.

The fact of the matter is that aviation security creates considerable security stress to airports. Protecting the air begins on the ground, most particularly at airports, making the latter prime targets, either deliberately or by default. Security checkpoints in particular have become chokepoints offering potential prime crowd targets to terrorists. While technologies may offer solutions coping with such flaws, protecting airports cannot be rethought properly without adopting a systemic approach reaching far beyond the aviation system. Authorities must use intelligence

and warning, prevention and deterrence, and crisis management and resilience to maximise their efforts.

The desire and potential of terrorists to attack civil aviation, combined with the vulnerabilities of the air transport system and the ability of terrorist groups to easily cross borders, represents a continued threat. Although progress has been made in disrupting aviation terrorism, the basic features of civil aviation always make it an attractive high profile target for terrorists, meaning that it is very unlikely they will give up their focus on civil aviation in the foreseeable future.

References and Notes

- (1) For more information about this definition and the various attempts to define aviation terrorism, see Duchesneau, J. (2015) 'Aviation terrorism: Thwarting high-impact low-probability attacks', PhD thesis, Royal Military College of Canada, Kingston.
- (2) Acharya, D. (2016) 'Why Islamic State target airports: A global stage and variety of nationalities', *First Post*, 4th July 4, available at: <http://www.firstpost.com/world/foreign-passengers-a-global-stage-why-islamic-state-targets-airports-2871798.html> (accessed 15th July, 2017).
- (3) Azani, E., Atiyas Lvovsky, L. and Haberfield, D. (2016) 'Trends in aviation terrorism', *Herzliya, IS*, International Institute for Counter-Terrorism, August, available at: <http://www.ict.org.il/Article/1757/trends-in-the-aviation-terrorism-threat> (accessed 11th August, 2016).
- (4) Duchesneau, ref. 1 above.
- (5) Seven databases/lists of aviation terrorist attacks were consulted as potential sources to quantify aviation terrorism. None of them were considered complete or adequate, their common weakness being a lack of rigour at distinguishing purely criminal incidents from actual terrorist attacks based on the motives of perpetrators. All terrorists are also criminals by default, at least from a rule-of-law perspective, but not all criminals are terrorists. This lack of reliable statistics on aviation terrorism led the author to consolidate all entries of the seven consulted databases/lists. Some 7000 acts of unlawful interference against civil aviation were compiled into a

- 2071-incident consolidated database called *Global Aviation Criminal Incidents Database* (GACID) and covering the 1931–2016 period. All GACID entries were subsequently categorised in an array of classifications such as region, success, deaths, injuries and modus operandi.
- (6) Many acts of unlawful interference have been conducted using more than one modus operandi (MO). For example, many groups or individuals have attacked airports with the objective of hijacking an aircraft. To remain empirical, hundreds of entries were thus categorised as having several MOs, and statistics were compiled using what was considered as their main MO.
 - (7) This categorisation represented a challenge. Entry descriptions were often sparse, making it rather difficult to clearly establish the motives of perpetrators, especially when no claims were made. Additional research was often conducted to address this lack of clarity.
 - (8) Jenkins, B. M. (1989) 'The Terrorist Threat to Commercial Aviation', Rand, Santa Monica, CA, p. 7.
 - (9) Includes all airport attacks conducted as suicide missions.
 - (10) Schiavo, M. F. (2008) 'Chronology of attacks against civil aviation.' In Thomas, A. R. (Ed.) *Aviation Security Management. Vol. 1, The Context of Aviation Security Management*. Praeger, Westport, CT, pp. 142–260.
 - (11) See Atkins, S. E. (2004) 'Encyclopedia of Modern Worldwide Extremists and Extremist Groups', Greenwood, Westport, CT, p. 248; Mannes, A. (2004) 'Profiles in terror: The Guide to Middle East Terrorist Organizations', Rowman & Littlefield, Lanham, MD, p. 315.
 - (12) United International Press (1972) '25 die at Israeli airport as 3 gunmen from plane fire on 250 in a terminal', *New York Times*, 31st May.
 - (13) Other airports attacks causing tens of deaths occurred on 2nd August, 1984 at Madras Airport, India and on 30th October, 1986 at Cabinda Airport, Angola.
 - (14) St. John, P. (1998) 'The politics of aviation terrorism', *Terrorism and Political Violence*, Vol. 10, No. 3, pp. 27–49.
 - (15) ICAO, 'Annex 17 to the Chicago Convention on International Civil Aviation', 1st edn, Doc 8973.
 - (16) Akweenda, S. (1986) 'Prevention of unlawful interference with aircraft: A study of standards and recommended practices', *International and Comparative Law Quarterly*, Vol. 35, No. 2, pp. 433–446.
 - (17) ICAO's Annex 14, Aerodromes, and Annex 19 Safety Management also include important security-related principles.
 - (18) Taleb, N. N. (2007) 'The Black Swan: The Impact of the Highly Improbable', Random House, New York.
 - (19) Stevens, D., Schell, T., Hamilton, T., Mesic, R., Scott Brown, M., Wei-Min Chan, E., Eisman, M., Larson, E. V., Schaffer, M., Newsome, B., Gibson, J. and Harris, E. (2014) 'Near-Term Options for Improving Security at Los Angeles International Airport.', RAND, Los Angeles, p. 43.
 - (20) Flynn, S. E. (2004) 'America the Vulnerable: How Our Government Is Failing to Protect Us from Terrorism', HarperCollins, New York, p. 78.
 - (21) Gill, P. and Phythian, M. (2008) 'Intelligence in an Insecure World', Polity, Malden, MA, p. 1.
 - (22) *Ibid*, p. 7.
 - (23) Smelser, N. J. (2007) 'The Faces of Terrorism', Princeton University Press, Princeton, pp. 173–174.
 - (24) National Commission on Terrorist Attacks upon the United States (2004) 'The 9/11 Commission Report: Final report of the National Commission on Terrorist Attacks Upon the United States', authorized edn, 1st edn, Norton, New York.
 - (25) International Civil Aviation Organization 'Economic development', available at: <http://www.icao.int/sustainability/Pages/FactsFigures.aspx> (accessed 17th July, 2017).
 - (26) Price, J. C. and Forrest, J. S. (2008) 'Practical Aviation Security: Predicting and Preventing Future Threats', Butterworth-Heinemann, Burlington, MA, p. 49.
 - (27) For one of the best practical books on how to avoid surprises, maintain operations in case of catastrophes, and how to manage crises, see: Weick, K. E. and Sutcliffe, K. M. (2015) 'Managing the Unexpected: Assuring High Performance in an Age of Complexity', John Wiley, Hoboken, NJ.
 - (28) Guihou, X. and Lagadec, P. (2002) 'La fin du risque zéro'. Éditions d'Organisation, Paris.
 - (29) Mueller, J. and Stewart, M. G. (2011) 'Terror Security, and Money: Balancing the Risks, Benefits, and Costs of Homeland Security', Oxford University Press, New York, p. 14.