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SAFETY OF AIR TRANSPORT

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Abstract: This paper focuses on analysing the phenomenon of ensuring safety in air transport. It presents issues relating to protection of aircraft in the air and on the ground, as well as problems concerning mechanical protection of aircraft, Sky Marshal patrols, protection of parked aircraft and passenger and baggage checks.

Keywords: terrorism, aerial attacks, logistics, air transport, aviation logistics, air transport safety.

1. Introduction

Following the attacks on the WTC and the Pentagon, greater attention has been focused on flight safety in general, but primarily on protection of the entire civil aviation infrastructure. It has been known that aircraft are among safest modes of travelling around the world over short periods of time. However, there are accidents and catastrophes caused not only by the human factor or aircraft failure, but also by hijacking, the planting of bombs or the downing by MANPADS.

This paper aims to analyse issues relating to measures taken to ensure safety in air transport.

2. Security of aircraft in the air and on the ground

Since the hijacking of the four airliners on 11 September 2001, work have been continually carried out to enhance security measures by preventing unauthorised access to the cockpit. However, in 2011, the American journal *The Atlantic* wrote that a decade after the 9/11 attacks, cockpit entrance doors were still inadequately protected against unlawful interference.

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Accordingly, aircraft can be seized by terrorists in a matter of seconds – it just takes proper timing (Krawczyk, 2008).

Terrorists seated in first rows on the passenger cabin have an easy access to the cockpit when, for example, one of the pilots leaves to go to the toilet. They can easily force their way into the cockpit, lock the protected door and thus shatter any hopes of the passengers regaining control over the aircraft. In research, successful storming took a mere 3 and 5 seconds. The US Federal Aviation Administration (FAA) is aware of this, as are individual civilian air carriers. (Krzemień, and Wolniak, 2017; Wolniak, and Skotnicka-Zasadzień, 2017; Wolny, and Wolniak, 2018; Wolniak, 2018).

This is why the idea to design barriers between the cabin and cockpit was born. Meanwhile, restrictions imposed after 9/11 on cockpit access permit the crew to open and close the cockpit door only when necessary. In practice, pilots must occasionally go to the toilet or be served meals, hence opportunities to forcibly take control of the aircraft are numerous. Hence, every US airline has its own procedures regarding the opening of the cockpit door in flight (approved by the FAA). Although it is not regulated exactly how long the cockpit door may remain open, it is highlighted that it must be as short as possible, in any case not longer than 5 seconds. The reality is different though. In 2007-2010, the FAA received numerous complaints from passengers concerning cases when cockpit doors remained open for as long as 5 minutes during flight, which was simply unacceptable in the time of huge risks posed by terrorist attacks (e.g. hijacking) (Aleksandrowicz, 2010; Aleksandrowicz, 2009).

The problem was to be solved by the aforementioned physical barriers located between the passenger cabin and the cockpit door. These could be deployed when the need appeared to enter or leave the cockpit, thus hampering any terrorist actions. Although such barriers, e.g. made of a net, would not be impenetrable, they could buy the crew priceless time to react and lock the door. At present, aircraft do not have any protections of this sort for price-related reasons, but Delta Airlines (then Northwest) tested such barriers for 12 months in 2010. However, due to high costs and personnel complaints about obstructing in-air work, the idea was abandoned.

Furthermore, in view of stricter personal checks at airports and increasingly frequent presence of Sky Marshals on board, the International Air Transport Association (IATA) does not regard such protections necessary.

Let us examine the procedure of opening the cockpit door, which sparked a heated debate in the wake of the Airbus A320 crash that took place on 24 March 2015. A Germanwings airliner crashed in French Alps after the co-pilot,-Andreas Lubitz, 28, blocked the cockpit door from the inside, thus preventing access by the first pilot, who most probably had left the cockpit to go to the toilet.

The reinforced door in the Airbus A320 Phase2 meets all the strictest requirements. It is fitted with new locks, hinges and opening systems. Normally, a person who wants to enter the cockpit must ask for permission and the pilot in command of the aircraft, looking at a camera

image or through the peephole, decides whether to grant such permission or not. If the requesting crew member does not gain any response regarding permission to enter the cockpit, then he or she types in an emergency code and repeats the request to open the door. If there is no reaction from the pilot inside within 30 seconds, the door opens automatically. A problem appears when the pilot refuses access to the cockpit - then the door remains locked for further 5 minutes. This is crucial in the light of reports from the 2015 crash in question, as the first pilot was unable to enter the cockpit in time before the aircraft crashed into a mountainside in the French Alps (Liedel, 2003).

Thus, protections introduced after the 9/11 attacks to thwart terrorist attempts to hijack aircraft contributed to the crash of the Airbus A320 piloted by the co-pilot Andreas Lubitz, who most probably suffered from some kind of mental problem.

Poland's "flying sheriffs" service, as Sky Marshal patrols are dubbed, was established 12 years ago to work on board aircraft in flight. They look like ordinary passengers, but there is one difference – they are armed with short firearms which they will not hesitate to use if need be. Sky Marshals are recruited from Border Guards officers and undergo a four-week training course, which is successfully completed by only few (Madej, 2001).

Not many people have heard of Poland's Sky Marshals, as it is a top-secret unit meant to ensure safety on board aircraft in flight. Their service is especially important in the era of the threat of terrorist attacks. Passengers will never know whether there is "a flying sheriff" on board a given airliner because they operate *incognito*. However, the sheer awareness of their presence can help alleviate the fear. Decision as to whether an aircraft security officer (as the official name reads) is put on board an airliner is made by the President of the Polish Civil Aviation Authority. This adjudication is made based on reports on possible threats that arrive from various services. In Poland, the idea to form such a protection unit was put forward in the wake of the 9/11 attacks. Relevant preparations regarding the form of training and legislative framework, based on existing US and German programmes, began in 2004 (Avihai, 2009; Barber, 1997; Ciborowska, 2008; Elias, 2011).

The tactics, behaviour and flight number on which they will fly are shrouded in secrecy. Even statistics on the number of interventions made by Sky Marshals are top secret. As LtCol Adam Lasikowski, the Head of the Independent Standardisation and Training Section of the Commander-in-Chief of the Border Guard, says, only this level of secrecy allows "flying sheriffs" to be efficient.

Before a Sky Marshal candidate is accepted for the aforementioned four-week training course, his/her mental and emotional abilities must first be tested. There is then a shooting skills test. Many candidates fail by this stage, and every subsequent stage is harder, as physical fitness, unarmed combat skills and the ability to work under pressure are meticulously tested. A candidate can be returned to home unit on any day. To successfully complete the course, all the tests must be passed – not even one failure is allowed (Ghobrial, and Irvin, 2004; Glen, 2007; Harrison, 2009).

However, strong mental resilience and physical fitness are not the only conditions that Sky Marshal candidates must meet. They must also be of a proper age – not too young and not too old. It is worth highlighting that Sky Marshal duties are sometimes assigned to female officers. At present, it is said that the ranks of Sky Marshals include at least one woman.

An aircraft parked on an airport's apron is protected mainly against (Szubart, 2015):

- attempts to plant weapons, explosive devices, hazardous chemical substances or other objects on board that pose a threat to civilian aviation safety,
- unauthorised entry on board.

In Poland, ensuring security and safety of all aircraft, domestic and foreign alike, parked on an airport apron is the responsibility of the Aviation Security Service (ASS), whose guards protect the aircraft day and night.

The Aviation Security Service's duties relating to ensuring aircraft security on aprons include checking the passes of persons allowed access to the parked aircraft, as well as checking personal possessions, tools and cleaning agents taken on board to prevent weapons or explosives from being brought on board. The ASS is also tasked with apprehending and turning over to the Police or Border Guard, all persons who had brought or attempted to bring on board any weapons, explosives or other means that can endanger civilian aviation safety (Rajchel, 2010).

One must have a pass to enter the apron. Passes and permits to enter the airport's restricted areas (including the apron) are checked by officers of the Police, Border Guard and the ASS. When a person without authorisation to be on the apron enters the area, the Border Guard must check his/her identification papers and the ASS must escort him/her to the Police station at the airport, where the person's identity is verified and further actions are taken.

Although this section regards security of parked aircraft, it is worth mentioning that aircraft are also protected during takeoff, landing and taxing (in the taxiing zone) by the Aviation Security Service officers who patrol the areas surrounding the taxiing zone. Also, the entire airport area, as well as the surrounding ground on the inside of the perimeter fence is periodically patrolled by the Police and Border Guard (Żyliczy, 2015).

3. Protection of airports against terrorist attacks - baggage and passenger checks

In order to address the main topic of this section, the term "airport" must firstly be defined. Article 2(4) of the Act of 3 July 2002 on aviation law states that "an airport means a detached area on land, water or other surface which is either entirely or partially designed for handling takeoffs, landings, as well as ground or water movements of aircraft, including any buildings and fixed structures located within its premises that are entered into the airport register".

In Poland, there are 15 facilities (aerodromes) meant solely to handle civilian traffic (one capital and fourteen regional airports). Airports represent complex and huge organisations that are designed to provide passengers with the most convenient service conditions possible (Szymczak, 1989).

Let us focus on characteristic features of airport security and establish a catalogue of threats that can lead to crisis situations.

The Act of 22 August 1997 on the protection of persons and property defines areas and facilities subject to obligatory protection. The Act clearly states that "areas, facilities, equipment and transports important for the state defence and economic interests, public security and other material state interests are subject to obligatory protection provided by specialised armed protection formations or relevant technical protection measures". According to the Act, airports are such areas (Hoffman, 2006; Jałoszyński, 2008; Karolczak, 1995).

In the context of security and crisis management, airport operations must be considered in two areas. The first area regards appropriate takeoff, landing, parking and ground handling of aircraft. The second area regards handling of passenger and cargo traffic. The latter area is most vulnerable to terrorist attacks. In the era of terrorism, airports must be particularly well prepared to prevent these threats from materialising, and if they fail to do so - they must be able to carry out efficient counter and rescue operations.

Airport facilities and equipment subject to special protection include (Chudziński, 2017):

- air traffic control towers,
- passenger terminals,
- power generators,
- warehouses where aviation fuel is stored,
- water intakes,
- railway sidings,
- air conditioning and ventilation systems,
- hangars,
- aprons,
- other facilities and equipment considered relevant by the President of the Civil Aviation Authority or the airport manager for the purpose of prevention of acts of terror.

The most likely sources of crisis situations affecting airports and aircraft include terrorist attacks. Most attacks are followed by intensive legislative efforts aimed at preventing the threat with the letter of law. Truth is, however, is it sufficient to intensify the protection of airports and aircraft alike, and it goes beyond the hard work done by the authorities of a given state or airport manager. It primarily involves cooperation among all international institutions concerned, as the problem of terrorism is known to have a global reach. The phenomenon of reinforcing procedures related to passenger or baggage check-in has been observed since the

attacks of the WTC and Pentagon on 11 September 2001 so as to minimise the likelihood of acts of terror being successful (Chudziński, 2017).

However, from the institutional point of view, state institutions play the main role in ensuring security in any given country. Still, an airport is a special area where security matters involve not only state authorities, but non-state entities as well. Polish legal acts that regulate airport security matters include the aforementioned Act on the protection of persons and property, the Act on aviation law and the Act on crisis management (Laskowski, 2013; Marcinko, 2012).

Protection of an airport is about ensuring safety for all persons who remain within its entire area. It also includes passenger aircraft and aerodrome infrastructure. The aforementioned is the responsibility of officers of the Aviation Security Service, Police, Border Guard, as well as Surveillance Station personnel and operations services. They all represent a group of people who execute a common task, i.e. the protection of their assigned airport, by way of:

- access control,
- infiltration alarms,
- CCTV installations,
- aircraft security systems,
- perimeter fence security,
- entrance gate security,
- vehicle monitoring at the airport and parking lot management,
- baggage security checks (screening),
- baggage-passenger identification.

Airport operations in the area of security include aerodrome emergency services and protection against acts of unlawful interference. Safety is the fundamental criterion for creating new aerodrome facilities. Furthermore, passenger terminals must meet strict requirements regarding fire safety, tightness of protected zones and the ability to quickly evacuate passengers from those zones in the event of emergency.

Every airport in Poland has its own "Programme of the protection of the aerodrome against acts of unlawful interference", which the key document in force. The programme includes a description of the airport's security system and procedures for security checks of passengers and baggage bound for the aerodrome's restricted zone. It also describes all actions to be taken by the airport's security services, nominated post holders, institutions and organisational units present on site in the event of an act of unlawful interference (Barcik, and Simon, 2003).

An Aerodrome Protection Programme also includes annexes like, *inter alia*, "Aerodrome pass system instruction" and "Instruction for movements of persons and vehicles within the aerodrome”. The programme is aimed primarily at ensuring safety to passengers, flight crews and ground handling personnel, and to ensure protection of aircraft, baggage, cargo and aerodrome facilities against acts of unlawful interference (Wiak, 2009; Witkowski, 2000).

Airport protection is provided by security services assisted by operations/technical services and organisational units active in a given zone within the airport. Therefore, aerodrome protection services include the Police, Border Guard and Aviation Security Service.

Technical solutions designed to support airport protection against terrorist attacks generally regard two aspects: prevention of unlawful interference at the airport and prevention of such interference aimed directly against or happening on board aircraft. Therefore, in the technical context, the process of preventing terrorist attacks at aerodromes involves:

1. systems that support protection of aerodromes and aircraft against unlawful access and unlawful use,
2. systems that protect aircraft against being fired at or damaged during parking, taxiing, takeoff and landing, and when remaining in the aerodrome's controlled airspace.

Such technical systems play a key role in the process of preventing unlawful interference. These technical systems use the following assets:

1. Control of access to restricted zones.
2. Intruder alarm systems within the premises.
3. Closed Circuit Television (CCTV).
4. Protection of aircraft at parking stands.
5. Perimeter fence security.
6. Entrance gate security.
7. Baggage security checks (screening).
8. A Baggage check-in system which cooperates with the departure control system to ensure quick baggage-passenger identification.
9. Monitoring of vehicles at the aerodrome.
10. Parking lot management system.

It is important for all the aforementioned facilities and systems to be integrated to provide efficient protection against terrorist attacks.

Such prevention of terror-related threats requires applying all sorts of technical and organisational measures based on specific legal solutions. Although it is impossible to anticipate all actions that can be taken by potential attackers, international solutions that have been adopted to protect aviation and prevent terrorist attacks are relatively versatile. They are all aimed at effectively preventing terrorists from forcing their way into aerodromes and aircraft with dangerous devices or substances, and from attacking aerodrome facilities and aircraft situated there. The related technical devices are meant to ensure full monitoring of the aerodrome, effective protection of passengers, baggage, supplies etc. as well as to enable forecasting of threats and protect aircraft in flight against attacks. As it is known, 9/11 attacks were a breakthrough moment for airport security due to the enormous financial spending that took place thereafter (Benjamin, and Simon, 2003; Bolechów, 2002, Borkowski, 2006).

One can distinguish the following methods of baggage and passenger control (Brudzik, 2012):

- manual checks – applicable to passengers as well as hand and hold baggage,
- checks performed with the use of hand-held or walk-though metal detectors (passenger control),
- checks performed with the use of explosive trace detection equipment (passenger control),
- checks performed with the use of x-ray equipment – hand and hold baggage,
- checks performed with the use of x-ray equipment with TIP option – hand and hold baggage,
- checks performed with the use of EDS equipment – hold baggage,
- combination of all the above methods.

What is an EDS check? Provisions of law impose the obligation to apply EDS procedures at every civil airport. They have a material impact on the final outcome of the Baggage Handling System (BHS; in other words, a baggage transport system).

According to European Commission Decision EC K/2008 4333, which a classified document, it is obligatory to put Explosive Detection System (EDS) procedures in place. The EDS is used for hold baggage control. It consists of procedures and equipment that are essential to ensure an appropriate level of safety. Functionality of this system is defined under civil aerodrome safety regulations applicable to baggage and its contents (Burdzin, 2012).

Regulations and recommendations that provide the basis for baggage screening establish the classification of baggage that is taken on board aircraft. There are two types of baggage: cabin baggage, which is taken directly by a passenger on board of aeroplane and checked at security control stations, and hold baggage, which is handled at check-in stations (tickets and baggage check-in).

Before hold baggage is loaded into an aircraft, it must be checked whether it belongs to a passenger with a valid ticket, labelled with a bar code identifying both the passenger and destination, weighed to ensure appropriate aircraft balance and, most importantly, security checked to ensure it does not contain explosives or toxic substances. Once individual procedures are completed, hold baggage is transported to a baggage handling facility and then on to a specific aircraft in accordance with its destination. European Commission documents provide a detailed list of items that are not allowed in baggage. These items include flammable or explosive objects, as well as hazardous or toxic substances. These properties define baggage categories in the Explosive Detection System.

The baggage control process is as follows:

- the Baggage Handling System (BHS) delivers baggage to the control zone,
- contents are screened and visualised,

- operators of screening devices (Border Guard officers) check the contents (paying special attention to atypical shapes),
- the control process should involve a second operator to ensure appropriate verification of the baggage,
- manual checks are performed as required,
- if dangerous material is detected, it is neutralised.

As can be seen, the baggage handling system (BHS), fitted with screening devices and clearly divided into safety zones, is the same as the EDS. Considering the level of integrity of both systems, the above claim is justified. It is worth mentioning that in the BHS, baggage is categorised and identified at check-in stations, while in the EDS, baggage is controlled throughout the entire process. The EDS categorises baggage into specific groups that are subject to relevant types of checks. If it so happens that the system identifies a piece of baggage as one that failed a security check, then it is categorised for 1st level check.

Consequently, an x-ray screening device either assigns the baggage 'red priority' – automatically categorising it as potentially dangerous, or assigns it 'green priority' – meaning the baggage is safe. On completing the 1st level diagnostics, the baggage is sent to the 2nd level, where the operator decides whether to transfer it for a re-check or to put it on the conveyor to be loaded into an aircraft. This stage serves to verify the automated system by means of a human decision-making system. If an additional control is required after the first two levels, the baggage is sent to the 3rd level, where there is no automatic control, as the operator checks the baggage manually. If the baggage passes the check successfully, it is directed to the loading zone. Additionally, when leaving the 3rd level, the baggage may be, for various reasons, subjected to a manual check at a special station in the EDS. When any operator assesses the baggage as dangerous material, it is sent to the 4th level zone, where it is neutralised.

Since there are various security levels at a given passenger aerodrome, shortened forms of EDS checks can be practised. These differences arise primarily from the importance a given airport is and are regulated under the aforementioned European Commission Decision EC K/2008 4333.

4. Conclusion

In summary, the comprehensive identification of baggage described above makes it possible to trace its route to the final destination. In Explosive Detection Systems, such identification constitutes a link between dangerous baggage and its owner, with the corresponding data coded with bar codes. When a piece of baggage is checked in, the IT system is fed with data assigned both to the baggage and the person who checked it in, which makes it possible to ascribe it a special time slot and a unique identification number. So, before the baggage enters into

security check-in, EDS scanners located along the way scan the baggage's bar code and verify information about it. This rules out any possibility of introducing a piece of baggage without proper ID into the system. Right from the moment the code is scanned, the system identifies and programmes a detailed route for the baggage.

References

1. Aleksandrowicz, T. (2009). *Terroryzm międzynarodowy.* Warszawa: ŁOŚGRAF.
2. Aleksandrowicz, T., Liedel, K. (2010). *Zwalczanie terroryzmu lotniczego*. Szczytno: Wydawnictwo Wyższej Szkoły Policji.
3. Avihai, H. (2009). *Aviation Terrorism – Evolution, Motivation and Escalation.* VDM Verlag.
4. Barber, B.R. (1997). *Jihad contra McŚwiat*, Warszawa: Muza.
5. Barcik, J., Czech, P. (2008). Czy można zestrzelić samolot cywilny (Kontrowersje na tle polskiego prawa lotniczego). *Przegląd Komunikacyjny, 3*.
6. Benjamin, D., Simon, S. (2003). *The Age of Sacred Terror: Radical Islam's War against America.* New York: Random House.
7. Bolechów, B. (2002). *Terroryzm w świecie podwubiegunowym. Przewartościowania i kontynuacje.* Toruń: Wydawnictwo Adam Marszałek.
8. Borkowski, R. (2006). *Terroryzm ponowoczesny. Studium z antropologii polityki.* Toruń: Wydawnictwo Adam Marszałek.
9. Burdzik, R., Szymończyk, M. (2012). System bezpieczeństwa EDS w transporcie bagażu na lotniskach cywilnych. *Zeszyty Naukowe Politechniki Śląskiej, Transport, 74*.
10. Chudziński, P. (2017). *Analiza zamachów lotniczych w XXI wieku.* A BA thesis written under the scientific supervision of R. Wolniak. Katowice.
11. Ciborowska, E. (2008). *Wybrane przypadki piractwa powietrznego w Polsce w latach 80. Terroryzm, 1*.
12. Elias, B. (2011). Airport and Aviation Security. U.S. Policy and Strategy in the Age of Global Terrorism. *Journal of Strategic Security, 2*, 125-127.
13. Ghobrial, A., Irvin, W.A. (2004). Combating Air Terrorism: Some Implications to the Aviation Industry. *Journal of Air Transportation, 3*, 67-82.
14. Glen, A. (2007). Bezpieczeństwo powietrzne elementem systemu bezpieczeństwa państwa. In M. Jabłonowski, L. Smolak (eds.), *Zarządzanie kryzysowe w Polsce*. Pułtusk: Akademia Humanistyczna im. A. Gieysztora.
15. Harrison, J. (2009). *International Aviation and Terrorism. Evolving Threat, Evolving Security.* New York: Routledge.
16. Hoffman, B. (2006). *Inside Terrorism.* New York: Columbia University Press.

17. Jałoszyński, K. (2008). *Współczesny wymiar antyterroryzmu.* Warszawa: Amberit.
18. Karolczak, K. (1995). *Encyklopedia terroryzmu.* Warszawa: Spółdzielcza Agencja Reklamowa.
19. Krawczyk, P. (2008). *Istota terroryzmu lotniczego.* Warszawa.
20. Krzemień, E., Wolniak, R. (2017). Zarządzanie organizacją sieciową. Problemy logistyczne. *Zeszyty Naukowe Wydziału Zamiejscowego w Chorzowie, Wyższej Szkoły Bankowej w Poznaniu, 19*, 215-224.
21. Laskowski, J. (2013). Aviation terrorism – Characteristic of the Phenomenon. *Studia Humanistyczno-Społeczne, 7*, 133-163.
22. Liedel, K. (2003). *Zwalczanie terroryzmu lotniczego. Aspekty prawnomiędzynarodowe.* Warszawa: Wydawnictwo Jurysta.
23. Madej, M. (2001). *Międzynarodowy terroryzm.* Warszawa: Wydawnictwo Ministerstwa Spraw Zagranicznych.
24. Marcinko, M. (2012). Wybrane aspekty walki z terroryzmem w prawie międzynarodowym. *Forum Europejskie, 12*.
25. Rajchel, J. (2010). *Bezpieczeństwo w porcie lotniczym.* Dęblin.
26. Szubart, K. (2015). *Wojna z Kalifatem II: zamachy terrorystyczne w Brukseli, FAE Policy Paper, 6*.
27. Szymczak, M. (ed.) (1989). *Słownik języka polskiego, t. III.* Warszawa: PWN.
28. Wiak, K. (2009). *Prawnokarne środki przeciwdziałania terroryzmowi.* Lublin: Wydawnictwo KUL.
29. Witkowski, P. (2000). *Pojęcie terroryzmu. Cele i metody działań terrorystycznych. Ochrona osób i mienia. Vademecum.* Lublin.
30. Wolniak, R. (2018). Kultura bezpieczeństwa a kultura jakości. In D. Zwolińska (ed.), *Księga dobrych praktyk BHP*. Katowice: Wyższa Szkoła Zarządzania Ochroną Pracy, (CD-ROM), 55-64.
31. Wolniak, R., Skotnicka-Zasadzień, B., Zasadzień, M. (2017). *The assessment of service quality level provided by public administration in Poland.* PEFnet Brno, Proceedings. Brno November 30, 223-231.
32. Wolny, A., Wolniak, R. (2018). Ocena bezpieczeństwa obsługi pasażerów na przykładzie międzynarodowego portu lotniczego Katowice. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacja i Zarządzanie, 117*, 725-739.
33. Żylicz, M. (2015). Terroryzm lotniczy w świetle prawa międzynarodowego. *Państwo i Prawo, 9*.