Trends of Increasing Safety in Air Transport

Luboš Socha[1], Vladimír Socha[2], Iveta Vajdová[1],
Lukáš Jambor[1], Monika Kimličková[1]

[1] *Department of Air Traffic Management, Faculty of Aeronautics, Technical University of Kosice, Rampova 7, 041 21 Kosice, Slovakia*

Email: lubos.socha@tuke.sk

[2] *Czech Technical University in Prague, Faculty of Transportation Sciences, Prague, Czech Republic*

Email: ing.vladimir.socha@gmail.com

The article deals with measures that are adopted in air transport to eliminate the commission of unlawful acts. On the basis of incidents in individual time periods, it is shown what measures have been taken on a timely basis to reduce potential risks and threats. There are also trends in the application of new technologies and their prospective introduction to security controls in aviation to eliminate the commission of an illegal act. At the end of the article, the results of the questionnaire survey of passenger satisfaction with the measures taken in the field of aviation safety are analyzed.

Introduction

In today's dynamic era, air transport is one of the important and key international link systems. It is imperative that the system be robust and able to eliminate potential risks and threats. These are closely related security issues. (Tobisová et al., 2017)

The principle of ensuring the safety of international civil aviation is one of the basic principles of international law. As already stated in the Chicago Preamble, the safe development of international civil aviation can contribute to the creation and maintenance of friendship among peoples, but its abuse may threaten general security. Today, issues of increasing security in civil aviation, both in the area of safety and security, receive considerable attention from international civil aviation organizations, ICAO (International Civil Aviation Organization), IATA (International Air Transport Association), and EASA (European Aviation Safety Agency).

Aviation Safety and Aviation Security constitute aviation security policy. Safety measures are being implemented to avoid accidents, while security deals with tools and measures to prevent the commission of an offense in an aircraft, in a terminal or near an airport. We can say that security is a part of safety. If a security breach occurs, it automatically means that safety aircraft will be compromised as well. (Hulínska et al., 2016)

The essence and goal of all security measures is to do everything in order to prevent an unlawful act against civil aviation and to prevent the transfer of dangerous objects to the Security Restricted Area and on board aircraft. Security measures tightening control procedures are introduced as a result of specific unlawful acts, mainly as a result of the terrorist attacks committed against civil aviation.

1. Measures taken to eliminate the terrorist threat

Terrorist attacks affect not only air transport, but the whole society. Aviation is an attractive target for terrorists, not only because it is a means of transport many people, but especially because there is a great interest from the media. Some international terrorism experts say that if the media were to lose interest in terrorists, most of the terrorist attacks would not even happen.

Responding to bomb attacks from 1955 to 1960, it was the requirement to inspect baggage loaded on board an aircraft. After the kidnapping in the early 1960s, an armed guard began to operate in the US for some selected flights. In 1969, the psychological profile of the kidnapper was created in the US, whereby passengers had to be traversed by a metal detector.

Between 1968 and 1972 there was a significant increase in aircraft hijackings that were linked to the mediatization and enforcement of political opinions of terrorists, or to the liberation of extremist faction members in exchange for the release of hostages. Mediation has had a major impact on people's thinking and consequently a reduction in demand for air transport. There was also a rupture of already-agreed holidays, which had an unfortunate impact on tourism development. As can be seen, terrorism does not only affect air carriers and passengers but can also affect remote destinations and their economy. (Oegele, 2010) During this period, 364 kidnappings were reported worldwide. Violent acts in 1972 led to major changes in security at airports. The FAA has issued a regulation obligatory to scan the hand baggage of all passengers. (Volner, 2008)

On December 21, 1988, after a bomb exploded in the luggage area of Boeing 747-121 from Pan Am, over Scotland's town of Lockerbie died all 259 passengers including crew on board an airplane and another 11 people on the ground. The response to this bomb attack was the introduction of X-ray scanning and baggage scanning. Another measure was that any luggage loaded on an aircraft must have its owner on board. This passenger baggage method is known as PPBM (positive passenger baggage matching). (Džunda et al., 2011)

In the 90s it was spent large amount of money and effort to research new technologies to detect bombs and weapons that would facilitate a more efficient control of passengers at the airport.

Until September 11, 2001, the goal of terrorists was to achieve political or other interests. For this reason, contingency scenarios have recommended crews and passengers to cooperate with terrorists and not to resist active resistance.

The Al-Qaeda terrorist organization on September 11, 2001, carried out attacks by hijacked aircraft on both World Trade Center towers (WTC) in New York, Pentagon buildings in Washington and Pennsylvania.

This terrorist act, which killed 2995 people and injured 6,000 people, had a significant impact on world politics and the economy. The impact of the attacks has hit the

world, whether it has been the adoption of various security measures at airports and aircraft, or the introduction of tough counter-terrorism legislation in many countries.

Many domestic carriers prohibit crews from dropping hijackers into the aircraft cockpit even at the expense of passengers

It has also been shown that passengers may not only be a passive element but that they can act actively and effectively, especially if they work with the crew. The army's options have also changed. In the event that the hijackers engage the aircraft, the army's command may decide to bring down the aircraft.

Furthermore, new security practices have been developed and procedures have been tightened, such as:

- to prevent unauthorized entry into the inner space of the airport,
- rigorous control of passengers, crew of aircraft and their luggage,
- strict control of cargo, goods, mail and other items carried,
- airplane construction to prevent penetration into the cockpit,
- the presence of an armed component on board high-risk flights, (čas.sk, 2017)
- creation of a list of risky airlines from countries supporting terrorism and their ban on landing at European airports.

In August 2006, at London Heathrow Airport, a group of terrorists had plans to blow up a number of airline flights on the deck that headed to the US and Canada by using liquid explosives. Therefore, the European Union has introduced new restrictions on the carriage of liquids in hand luggage. Under this restriction, passengers could only carry fluids in packages of less than 100 ml in a transparent, plastic closure.

On December 25, 2009, Nigerian Umar Faruk Abdulmutallaba failed to attempt to launch a bomb on board an airplane from Amsterdam to Detroit with nearly 300 passengers. The response to this case was to tighten security controls and carry out additional on-board checks for all passengers heading to the US. US authorities had specifically asked European airports to carry out a thorough scanning of baggage and personal searches.

On Tuesday, March 22, 2016, Brussels International Airport shook up two explosions in the morning. Another explosion was reported at the Metro station in Brussels. Explosions have claimed at least 13 dead in the airport, 20 in meters, and more than 200 injured.

New safety technologies have arrived at Zaventem airport in Brussels since November 2016. They allow the removal of tents in front of the departure hall, after to the terrorist attacks in March, which served to pre-screen passengers. The new "smart protection" security measure is a combination of new technologies and professionally trained staff. At the airport are located cameras capable of recognizing faces and vehicle registration numbers. A barrier emerged on the driveway to stop vehicles if necessary. The airport should train workers to be able to discern suspicious behavior irrespective of the age, sex and ethnicity of the passengers. In this case, the Belgians inspired one of the safest airports in Israeli Tel Aviv, where similar workers proved themselves.

Israel has reportedly warned the Belgian authorities only a few weeks before the combat attacks that there are serious safety deficiencies at Brussels airport. Problems at Zaventem airport have revealed Israeli officials responsible for security assessments at

individual international airports where flights from Tel Aviv are flying. At Bena Gurion airport in Tel Aviv, a terrorist attack never happened. After the attack on Lod airport, his predecessor, the whole security system and its technology changed. Agents in civilian are out in front of the airport and in the departure hall. It is enough to bring someone a cab with an Arabian driver or a suspected vehicle, to immediately address him, to take, to listen and to check his luggage. All passengers undergo thorough checks and detailed interviews with airport security staff. They ask passengers where they are, why they came to the country they were doing. They are trained to detect discrepancies in the answers and reveal possible deception. Signal jammers work to make it impossible to disarm the bomb in the luggage at a distance.

Similar measures are being taken by Israelis at the airports where they fly their aircraft and control safety standards there - as they did in Brussels. When flying an Israeli aircraft El Al from Vienna to Israel, the terminal must be completely empty, except for the passengers there can be no one else. Airplanes are civilian agents on all flights. The cockpit is not allowed even by flight attendants, it is hermetically sealed, and pilots are not at all out. It is also the only civilian airline that also has anti-aircraft missiles. (Ščurek, 2009)

Air carriers and airport operators must continuously improve security measures. Unfortunately, as history shows, most security measures are introduced only after a terrorist attack has been committed. (Vagner et al., 2017)

As part of security measures, the passenger handling process at airports nowadays mainly uses:

- frame detectors for detecting metal or

metal objects on the passenger's body,
- handheld scanners that serve as accessories to the frame detector,
- body scanners that serve for contactless control of the passenger by the security control officer,
- Handheld scanners that serve to search for explosives and liquids in the luggage of passengers. The bag is scanned while the content is displayed in color on the Security Controller's monitor.

Additional tools to increase the level of security control include:

- personal passenger's tour,
- use of special test strips to detect explosives,
- security check when entering the terminal.

2. Trends in improving aviation security

Minimize the risk of acts of unlawful interference is possible by introducing new technologies to the check-in process, new organizational and technical measures at the airport, reducing the illegal handling of luggage and passengers by preliminary assessment. (Koščák, Kolesár, 2015)

Due to the development of new types of weapons and the use of new materials for their production, such as plastic ceramics, plastic explosives and glass, it is essential to use new technologies in security controls. The solutions could offer for a long time known and market-offered personnel X-rays. Terahertz technology (Terahertz spectroscopy) may be one of the most demanding security systems at the airport. Their display systems can easily achieve high resolution at relatively long distances. This may be an important element

in the timely detection of the potential threat posed by hidden objects carried in luggage or under clothing. If a threat is detected in time, we can respond in a timely manner and not allow the abuse of dangerous substances and objects in the monitored premises.

Another new trend in biometric technologies could be the spectroscopy of the skin. It deals with human skin identification. Human skin is divided into several layers and each layer has a different thickness characterized by its uniqueness, it also contains other unique characteristics that are unique to every person. Spectroscopy is performed by selecting a portion of the skin to irradiate with light containing more wavelengths. The different layers of the skin reflect and break other wavelengths of light, the reflection being captured by the photodiode receiver and sent for further processing and analysis. (Secureflight program, 2017)

They also developed devices to detect the state of mind of man or his malice towards the surroundings. Malintend or "Bad Intelligence" is a system that identifies person by contact based on its behavior. It uses physiological and behavioral technology. Sensor system records nonverbal body effects such as heart rate, body temperature, breathing rhythm and more. If the sensors detected that some human factor is running away from the standard value, they will transfer these data for further analysis. After this analysis and evaluation, the person will be identified as suspicious and undergo further testing. The next steps include capturing facial muscle contractions. The device can recognize and measure the seven primary emotions of man and their manifestations. Further measurements are performed using the eye scanning device and pheromone technology to analyze body odor. The system should be able to recognize the

difference between a terrorist, an agitating and anxious man, and even a man who is more confused. If the system evaluates the person as suspicious, the security service will undergo further scrutiny.

With increasing claims for airport safety, the emphasis is now on the development and implementation of the Passenger Rating System. The system should be connected to check-in, security and search systems (SITA). The system has the task of collecting all passenger information from different sources in order to identify and identify their luggage. This information should be continuously supplemented according to the passenger's activities used for subsequent clearance and kept for security forces such as the foreign police.

The first system for assessing air passengers in terms of possible risks of acts of unlawful interference was created in the USA in the 1990s. After several improvements, the new program calls Secure flight. The essence of the system is that the passenger data obtained when buying a ticket is compared with the data stored in state and commercial databases. At the same time, the identity is verified, previous criminal activities are detected, but also whether the given passenger has no connection with the terrorists. "The development is aimed at introducing the iBorders system, which consolidates the reservation systems of airlines, state and travel agencies and directs them to the global distribution system (GDS) connected to the SITA network. The system is used for registration and control of foreigner when they enter individual states, ETA (Electronic Traveler Authorization). Another option is that passengers, using biometric methods, have self-service equipment at the Airport Connect Kiosk connected to the iBorders system. A

human face (skull parameters), fingerprint readings, and eye cornea can be used to identify the passenger and compare his identification parameters stored in the iBorders system. Additional passenger position control can be performed by identifying the position according to the signal emitted from the mobile phone when passing through the control units. A total of 19 different data will be gathered in the Member States' common central database. In the future, numbers and payment information, reservation information and ticket issuance, buyer's address, dealer information, luggage and aircraft seats should be added. When baggage is handled, a similar "Bag Manager" system can be used. The system will allow tracking of the luggage throughout its journey to the destination. Baggage data is loaded by radio transmission and handheld archiving devices. The luggage lug is attached to the luggage and the luggage is put into the Departure Control System (DCS) and the Bag Manager system. Loading the luggage ticket will begin the tracking process of the luggage. The bag passes through a security check, then goes to the packing center, where it is sorted and loaded according to the intended destination. Here it is recorded the precise location. The luggage is then loaded through ramps into aircraft and handheld loaders are confirmed in the system. Airplane position information is also recorded. All of this is sent to the target destination. There is a deployed service where you can locate your luggage with WAP, SMS or the Internet.

Unauthorized handling of passengers' luggage is a frequent problem for air travel anywhere in the world. Measures that minimize this phenomenon to a minimum are few. One of them is a clean registry of penalties for airport employees and staff of other entities operating on the airport grounds. Employees

should be more inspected by the National Security Authority when moving in sensitive areas. Sensitive areas are transit areas, screening room, aprons for aircraft and aboard airplanes.

3. Air safety assessment from the passenger perspective

On the basis of constantly tightening airport inspections at the passenger clearance process to eliminate possible offenses at airports or during flight, we conducted a survey by questionnaire surveys as passengers perceive the level of aviation security and are satisfied with the use of air transport and staff access. Questionnaire survey was attended by 180 respondents who answered the 14 questions relating to the safety of air transport.

The questionnaire survey found that more than 50% of respondents are concerned about flying, with 68% of respondents considering air transport to be safer compared to other modes of transport. A mediated air traffic incident will negatively affect only 14% of respondents in the air safety assessment, with 2% of respondents choosing a different mode of transport. Up to 97% of respondents receive positive security checks at airports, with 58% of respondents believing that security measures at airports are very strict and only 22% would accept tightening these controls. Approximately 69% of passengers were satisfied with access to security controls. Dissatisfaction with airport personnel access to security checks was reported by 31% of respondents. Everybody has access to the public section of the airport, so there is a great chance of intruder intrusion. Mainly for this reason, some airports have already introduced controls at the entrance to the so-called "landside" airport. If such controls were introduced at all airports, this would

contribute to greater safety, which 43% of respondents think, while this process of control would harass up to 35% of the respondents

Based on the questionnaire survey, we can say that passengers receive tightening security checks positively. It is important, however, to ensure that the introduction of new security rules and controls does not go into extremes, that fundamental human rights are violated and that there is no discrimination against security control personnel.

Conclusion

Elimination of possible risks and threats of air traffic offenses results in the search for new methods and instruments for their elimination and thus maintaining high aviation security. Taking into account the fact that technology is still advancing, we can say that nowadays security controls at airports are far higher than they used to be in the past.

Security control is not the only means of ensuring aviation security. At the airport, there are a number of safety features that the ordinary passenger does not even know, starting with the guard service provider, up to the integrated camera system. All these components of the safety measures are designed to ensure a smooth, trouble-free and, most importantly, safe operation of the airport.

The introduction of new security measures reduces the risk of an offense at an airport and an aircraft, but increases the time, mental and, in some cases, the physical burden on passengers. It is therefore important not only to tighten security controls, but at the same time minimize the time needed to carry them out. Airport waiting is very stressful for some passengers.

Despite all the incidents that have recently occurred in air transport, as revealed by the questionnaire survey, we can say that passengers have a positive experience with air transport and consider it to be one of the safest types of transport.

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