

AIRPORT SECURITY DETECTION CHECK – WHAT ARE THE REAL LIMITS?

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Summary: This article deals with one part of the ongoing project of the Air transport department of the University College of Business in Prague. This project aims to apply modern trends and knowledge in the process of detection checks at airports and thus to modify the screening sites on the basis of this knowledge. Partial goals of the project are behavioural detection and working environment. The text of the article itself deals with the boundary conditions of the project - about limits. These limits mainly concern the absence of the necessary legislative base in the EU. The aim of this article is to highlight important and rigorous marginal conditions in this area that do not allow innovative approaches to most scientific and other projects. That is why the project team of aimed at one of the outputs of the project also proposal for the direction of research activities in this sphere of civil aviation protection against unlawful acts. This article deals with this recommendation.

Key words: behavior detection, security checks, aviation security, working environment.

INTRODUCTION

Global demand for tourism, which gradually belongs among the largest and fastest growing economic sectors in the world, is growing along with the growth of living standards and globalization of national economies. A distinctive feature of tourism is its multidisciplinary character because it affects a large number of different sectors of human activity. In this case, we are talking about the so-called multiplier effect of tourism. The result is a significant impact on the balance of payments, employment and general socio-economic development of the regions concerned, which is reflected in the gross domestic product and investments in these regions (Palatková, 2014).

The tourism industry, however, in expanding faces the limits and constraints that can restrict and sometimes even make its development impossible. This includes in particular crime and security risks, political reasons, the visa requirement, insufficient infrastructure, quality of service provided, lack of attractions for tourists or environmental influences and constraints. A phenomenon that in recent decades has been more and more associated with security risks is related to significant air transport services in tourism and protection these services against acts of unlawful interference.

There are many tools to detect suspicious passengers at the airport in a wide variety of legislative measures or technologies used within the safety inspection. The air transport could not develop further without a constantly evolving modern technology and it is correct that this

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progress is visible in the security checks at airports. However, it should not be overlooked that the development in technologies has been moving the invention of terrorists and it is, therefore, important to be ahead of terrorists in the way that they are not able to deceive.

As has already been mentioned, it is now clear that to increase or at least maintain the effectiveness of screening at airports it is necessary to respond to a variety of scientific and other knowledge in this area and to apply them to the process of detecting passengers and other persons at the airport. Proof can be a whole range of projects initiated by private subjects, international organizations and, last but not least, scientific research organizations - universities and colleges. One of these projects is also a research project of the Air Transport Department of the University College of Business in Prague, which aimed to modify the security checkpoints. The project team, in analyzing the current state of the problem has investigated and found that the modification would be most effective at two levels. This is so-called Behavioural Analysis and Work Environment. Both of these primary objectives of the project are not related to each other, but according to the team's opinion, this is the best way to increase the effectiveness of screening controls at airports.

Psychological profiling is one of these ways because it is focused on symptoms that cannot be consciously controlled and hidden. It is clearly demonstrated by the case of Richard Reid, who in 2001 managed to sneak explosives hidden in his shoe (Federal Bureau of Investigation, 2016). After this incident logically security measures have been tightened and passengers have to take off shoes before passing the detection frame and shoes get through special scrutiny. Special security measures have been applied after each incident. After September 11 attack special doors have been installed in aeroplane cockpits, doors that do not allow intrusion of others. After an attempt in 2006 to blow several aeroplanes using explosives in a liquid form, the rules for bringing liquids on board have been tightened. Terrorists, however, in their ingenuity have no limits and try to smuggle explosives through security checks for example concealed on the body. Responding to these attempts there came a reaction in the form of implementation of controversial body scanners. All these attempts and incidents clearly demonstrate the fact that terrorists are always several steps ahead of experts on explosives detection and that to introduce additional measures or to invest in new detectors is not enough. Perhaps it would be better to deal with the airport security in another way and enhance it with another view - a view that cannot be deceived - psychological insight.

One of the results of the project will be a methodology that would allow the use of behavioural analysis in an international airport environment and respect for all operational, ethnical, ethical and other operational principles. In determining the boundary conditions of the project, however, the research team found that current EU legislation does not regulate these in screening procedures. The analysis of the EU legislation, which is described in other parts of this article, must necessarily have been one of the introductory steps of the team.

For the analysis of the legislation was used the method so-called Impact Analysis, which is used in managing changes and project management, or in strategic management. They are used to evaluate the planned impacts or assumptions in a project or change activity.

Impact methods are also used to compare different solution variants. The RIA (Regulatory Impact Analysis) method was used in connection with the sub-target of the project.

1. SAFEGUARDING INTERNATIONAL CIVIL AVIATION AGAINST ACTS OF UNLAWFUL INTERFERENCE

Air transport has now become one of the most important means of transportation in the context of international tourism and also international aviation. The current situation in this area must take into account many negative factors, based on ethnic, religious, political and other disputes. It has a negative impact on tourism development and especially has a negative impact on the air transport which appears to be highly sensitive to negative events in the world.

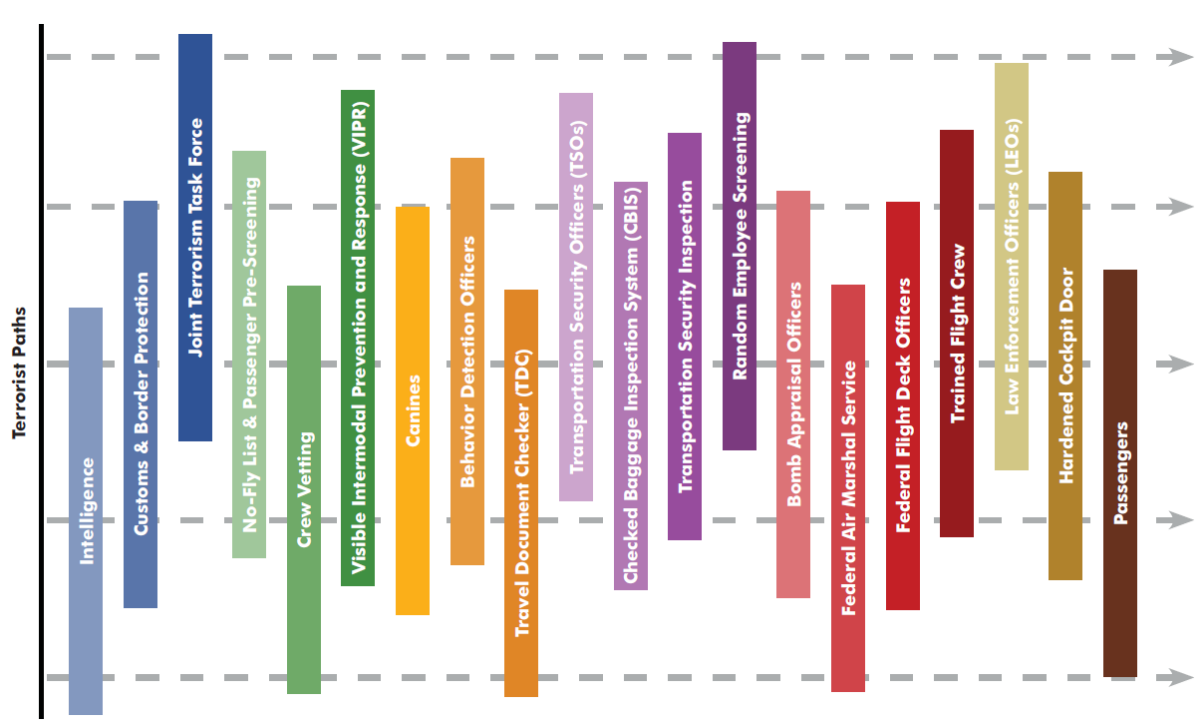
The primary objective of the safeguarding against acts of unlawful interference with civil aviation is to prevent the use of air transport for committing an unlawful act, which is contrary to the international law. Such actions include, for example, smuggling of prohibited articles, valuables, narcotics, further endangering passengers and the public on their health, and in the worst-case terrorist attack, or using the aircraft as a suicide tool (Koverdinský, 2014).

Protection against such acts developed over time and gradually reflected the threats, which at the time belonged to the most common in civil aviation. However, it should be mentioned that most of the measures implemented to protect against unlawful acts were generally reactive, i.e. as a response to the commission of an unlawful act, in order to prevent its recurrence in the future.

The basic document regulating the issues of civil aviation security is the Annex 17 to the Convention on International Civil Aviation "Safeguarding International Civil Aviation Against Acts of Unlawful Interference" (International Civil Aviation Organisation, 2006). This document defines acts of unlawful interference as "acts or attempted acts such as to jeopardize the safety of civil aviation, including but not limited to:

- unlawful seizure of aircraft;
- destruction of aircraft in service;
- hostage-taking on board aircraft or on aerodromes;
- forcible intrusion on board an aircraft, at an airport or on the premises of an aeronautical facility;
- introduction on board an aircraft or at an airport of a weapon or hazardous device or material intended for criminal purposes;
- use of an aircraft in service for the purpose of causing death, serious bodily injury, or serious damage to property or the environment
- communication of false information such as to jeopardize the safety of an aircraft in flight or on the ground, of passengers, crew, ground personnel or the general public, at an airport or on the premises of a civil aviation facility" (ICAO, 2006)

The policy of safeguarding against acts of unlawful interference deals with the aim of securing the safety of the crew, passengers, ground personnel and the general public. In operational practice it is implemented by a set of human and material resources and security operations forming according to Transport Security Administration (Transport Security Administration, 2012) under twenty-layer of security protection network (Figure 1) while the security check is one of the most important and most visible ways of preventing the access of undesirable persons or prohibited articles into the security restricted area of airports or on board an aircraft.



Source: (TSA, 2012)

Fig. 1 - Network-layer Security Protections according to Transport Security Administration

2. BEHAVIOURAL DETECTION

The current form of security checks at airports has not changed in the concept itself except for the great progress in the field of detection technologies. The fact that for several years the process technologies have been using the same principles can have a negative impact on the efficiency of security checks in the form of a narrow view of this problem (Kerner, Sýkora and Kulčák, 2003). As a consequence of this approach then the subject to the same priority of security check is, for example, an elderly lady going to vacation as a person who intends to carry out some illegal act, which of course may not be a terrorist attack. The basic shortcoming of this traditional concept is thus the fact that it only focuses on potentially dangerous objects that may be e.g. knitting needles of previously mentioned older lady, but it does not take into account the fact that well-trained people do not need to use such items to commit the act of unlawful interference (Háčik, 2006). The modern concept of security

checks at airports should, therefore, be based also on identifying potentially dangerous persons, not only on the principle of identifying potentially dangerous objects, such as it is today. This modern method provides several significant benefits:

- thanks to a new approach to the implementation of control its effectiveness is greatly increasing
- in the application of those principles, some activities in security checks of passengers and their cabin baggage are not necessary to be carried out randomly but targeted to specific persons with a certain degree of suspicion, which greatly accelerates the flow of passengers at screening points
- reducing of a negative view of passengers on security check itself, especially in terms of discrimination and ethical rules (Cooper, Heron and Heward, 2007).

Thus in this way screening of prohibited articles will not be cancelled. They will continue and it is also needed to pay attention to them and try to improve their reliability. One of the ways to improve security in addition to the behaviour detection of passengers is optimizing of security checkpoints by controlling ergonomic risks with regard to security screeners in relation human-machine-environment (Reason, 1997).

2.1 Behaviour Detection of Passengers

The detection of the behaviour of passengers, carried out on site of screening, or in a public part of the airport is one of the possible ways of passenger profiling. Applied behaviour detection involves monitoring of manifestations of the human body, which may indicate some dishonest intents. Some of these phenomena, however, can be sensually suppressed or modified (i.e. heart rate etc.). But there are also other human symptoms, which called “extrasensory”. These symptoms are not able to affect the human mind, or by any special training, so there is no way to prepare for the behavioural detection, which is based on these extrasensory symptoms. So for the maximum effectiveness of this kind of detection, it is necessary to choose these monitoring of such manifestations that cannot be affected by any type of training. Behaviour detection of passengers at airports could, therefore, become the basis for the modern concept of security checks. Based on the detection, individuals would be associated with the degree of potential danger and on this stage the thoroughness of the safety check would then be set, e.g. including a supplementary interview etc. It should be understood that even the recognition of almost zero risks of a specific passenger would not free the passenger from implementation of the appropriate level of security check.

Behaviour detection is successfully used today in various sectors. It can be used e.g. during police examination, but also at interviews to important positions. The actual operation of the airport, however, has rather specific conditions for the use of behaviour detection.

- Behaviour detection has not been generally used on a mass scale. In principle, it was used for tracking a particular person that was rated in higher amounts of physical symptoms. Thanks to a thorough monitoring the required efficiency and reliability of the detection result was guaranteed. At the airport, however, it is necessary to guarantee the monitoring of the behaviour of large groups of travellers. For example, waiting in the line to perform screening, or moving freely around the airport terminal.

- For the maximum efficiency of the analysis performed it was sometimes necessary to carry out the monitoring of selected physical symptoms by a contact method, i.e. measuring heart rate, blood pressure, etc. But for the applicability of behaviour detection in terms of the international airport, it is possible to carry out monitoring of the behaviour of passengers only by a contactless method, i.e. by a specially modified camera system, which nowadays still exist and there is no problem to modify them for the specific conditions at airports. Also, the additionally physical manifestations of passengers can be tracked only on uncovered parts of the human body. During the winter season (a period when almost the entire part of passengers' bodies is covered by clothes) is the best way to detect extrasensory symptoms on passenger's head, or on face, which are still uncovered (traveller women of Muslim faith are obliged under the transport conditions of the airline to prove identity and compliance with the travel document by revealing the face) (Recommendation of the European Parliament, 2009).
- All processors for the behaviour detection at an airport must be set so that they could accommodate the largest passengers' volume, especially at peak times and days. The screening checkpoint should reflect this orientation. The dynamics of the movement of passengers requires conducting the detection itself only in several seconds. After being set, the process will enable to maintain the smooth flow of passengers at a particular airport.

2.2 Analysis of European legislation

Application of behaviour detection in the process of security checks at airports also requires legislative regulation which will override the existing fundamental lack of existing concept. As mentioned, a person with a special training is able to commit an unlawful act on board and does not need to carry an item which is nowadays considered as "prohibited on board an aircraft." Such a person can harm the passengers or crew using a standard part of clothing such as trousers belt, shoelaces, etc. At present concept of security checks, such person has admitted on board an aircraft. In the modern concept applying behaviour detection, however, the level of risk for the person will be identified on the basis of extrasensory manifestations of the human body, indicating nonstandard behaviour. The fundamental problem, however, arises when based on the detection of the behaviour of a specific person a high risk will be detected, but after a thorough security check, no potentially dangerous article will be found. The remedy of existing deficiencies in the current security checks at airports may be adopting a new concept of security checks with the application of behaviour detection and the thorough integration into the standards for security checks in the particular state or the EU. Behaviour Detection is currently not incorporated in the legislation of the EU or the Czech Republic. Therefore, one of the complementary objectives of the project is the recommendation on the follow-up project in the direction for the subsequent application of the proposed methodology into practice. One of these recommendations will be a necessary modification and filling of the legislation about the possibility of introducing behaviour detection as one option of profiling. The main idea of the recommendation is described at the end of this subchapter.

In addition to the missing behaviour detection in the legislation of the Czech Republic national legislation and the international EU legislation, there will be a further requirement for its adjustment for possible full integration of the proposed methodology into practice. Commission Implementing Regulation (EU) 2015/1998 (2015) deals with the detection in 4.1.1. named as: "Screening of passengers". Subsection 4.1.1.2 says (2015): „Passengers shall be screened by at least one of the following methods:

- a) hand search;
- b) walk-through metal detection equipment (WTMD);
- c) explosive detection dogs;
- d) explosive trace detection (ETD) equipment;
- e) security scanners which do not use ionising radiation
- f) ETD equipment combined with hand-held metal detection (HHMD) equipment.

Where the screener cannot determine whether or not the passenger is carrying prohibited articles, the passenger shall be denied access to security restricted areas or rescreened to the screener's satisfaction. “

At this point, it is mentioned that the passenger is denied the access into the SRA zone only in the case when a security officer is not sure that the person is not carrying any prohibited article. However, as it has already been mentioned in the previous text, the committing of an unlawful act does not require any of these articles. Another essential point of adjustment such implementing regulation for the possible applicability of the proposed methodology will include the possibility of not allowing the passenger (or another person) to SRA zone in case of suspicion of dishonest intention. It is obvious that such a suspicion must be properly supported and should not be a mere assumption of a security officer.

For completeness, it would be good to mention that the issue of screening of cabin baggage is regulated in subsection 4.1.2.3, which is semantically identical (2015): „Cabin baggage shall be screened by at least one of the following methods:

- a) hand search,
- b) x-ray equipment,
- c) explosive detection systems (EDS) equipment,
- d) explosive detection dogs in combination with point (a),
- e) ETD equipment.

Where the screener cannot determine whether or not the cabin baggage contains any prohibited articles, it shall be rejected or rescreened to the screener's satisfaction. “

And in section 5.1.1. they deal with the screening of hold baggage (2015): „The following methods, either individually or in combination, shall be used to screen hold baggage:

- a) a hand search; or
- b) x-ray equipment; or
- c) explosive detection systems (EDS) equipment; or
- d) explosive trace detection (ETD) equipment; or
- e) explosive detection dogs.

Where the screener cannot determine whether or not the hold baggage contains any prohibited articles, it shall be rejected or rescreened to the screener's satisfaction.“

Therefore, if the proposed methodology would prove to be the most effective to achieve the goal by placing a focused behavioral analysis technology directly into the screening checkpoints, it will be necessary to incorporate this technology into approved technologies for its implementation, which is a very demanding and lengthy process. In addition, it is mentioned at this point that the passenger is denied entering the security restricted area (SRA) only if the security officer is not sure that the person does not engage in any prohibited item. However, it has already been mentioned in the previous text, that one of these objects is not necessary to commit an unlawful act. Another necessary point of the implementing regulation for the possible applicability of the proposed system will be the inclusion of the possibility of not allowing a passenger (or another person) to enter the SRA even if he/she is guilty of misconduct. It goes without saying that this suspicion must be duly substantiated and must not be merely a presumption of the screening officer. These modifications are no longer the subject of this project.

3. CONTROLLING ERGONOMICS RISKS

In the competition for the most advanced technology for detecting potentially dangerous persons and prohibited articles or speed up passenger flow by modification of procedures or changing screening workstations, there is sometimes overlooked a factor that ultimately decides to which extent the airline industry will be safe - it is a man with all their positive and negative qualities. The human factor is in the system of screening represented by the security screener. With regards to the key role of the security screener, the critical parameter of optimum is their reliability, which is represented by the performance and the error rate in the detection of prohibited and potentially dangerous articles hidden or forgotten in the baggage. So that this person can perform his duties with the highest degree of reliability, it is necessary to minimize external stressors and offer an optimal working environment with regard to the management of ergonomic risks (Chundela, 2013).

Prof. Schwaninger within the Center for Adaptive Security Research and Applications (CASRA) in Zurich, Switzerland deals with the human factor in the protection of civil aviation against acts of unlawful interference with a scientific application for software development, applied cognitive psychology and computer modelling of human-machine interaction (Schwaninger et al., 2016). In the study (Hättenschwiler et al., 2015a) he examined the relationship between knowledge of security screeners about the objects which do not represent a danger, and the number of false alarms in a simulated environment and the effectiveness of e-learning course aimed at detecting of such objects. In the article (Hättenschwiler et al., 2015b) he presents results of studies on factors that may affect the work of security screeners. Besides the complexity of the baggage contents and the method of loading it on an X-ray belt, the environmental factors are one of three main factors in terms of frequency of occurrence and of the potential impact on safety.

3.1 Analysis of European legislation

In this section, it is possible to include technical standards EN ISO having an international basis. These include standards EN ISO 26800, EN ISO 9241, EN ISO 6385, EN ISO 28802, EN ISO 15265 and EN ISO 11064-6.

Directive of the European Parliament and Council Directive 2006/42 / EC (2006) in section 1.1.6. Ergonomics states that the human-machine interaction must be under the intended conditions of use, the discomfort, fatigue and physical and psychological stress faced by the operator must be reduced to the minimum possible, taking into account ergonomic principles.

The key document in the field of research of ergonomics of workplaces in terms of potentially negative effects is „Priorities for occupational safety and health research in Europe: 2013-2020“ (Sas & Suarez, 2014) or Management of psychosocial risks at work (Stolk, 2012). According to these, although the workplaces in recent decades face the emergence of new threats and new hidden dangers, some negative factors still remain. Namely exposure to physical risks like noise, vibration, high or low temperatures, chemicals, repetitive movements, etc. These risks are not addressed systematically and according to this study, it is necessary to focus on their further research.

A study prepared by the European Agency for Safety and Health at Work EU-OSHA (2013) defines the elements of the physical environment of the workplace (inadequate equipment, lack of space, poor lighting and excessive noise) as psychosocial stressors that can affect the quality of work performed activities. Recommendations of this study are paying attention to testing of alternative proposals of systemic approaches to managing psychosocial risks and searching other negative influences of the working environment.

In relation to the operators of screening, there is also another important document EU-OSHA 2009 (European Agency for Safety and Health at Work, 2009). It looks at the issue as in the view of risks associated with human-machine interaction in the context of a socio-technical system of the relevant tasks. It discusses as well the area of human error and a reduction of system reliability, among which he ranks inadequate design of the site and its facilities, low level of training, inadequate equipment and poor climate conditions in the workplace.

4. CONCLUSION

Illegal acts have become more and more worrying in the old continent. Although the aviation system is well protected and attempts to commit terrorist attacks now focus on so-called “soft targets”. But it is not possible to relieve this area and make air transport more vulnerable. For this reason, there are current trends in the world that have helped to protect civil aviation against acts of unlawful interference. But there is one paradox. These trends are relatively simple nowadays feasible in terms of scientific knowledge, the used technologies, the organization of the new process itself and, last but not least, the people - personnel. The only area slowing down this progress is the speed with which the current European legislation adapts to the trends. This article, therefore, focuses only on the basic legislation on aviation

security and detection checks. However, many other documents need to be amended, but unfortunately, it has not fit to this article.

The team of the project has always been the primary goal of the proposed project to modify detection checkpoints by introducing a developed and proposed methodology for behavioural analysis of passengers and modify adaptation respecting ergonomic principles by reducing the impact of the human factor in this area. However, the rationale behind this article is to point out to the scientific community a potentially neglected part in this area without which the results of this and any other project cannot be applied. These are very narrow boundary conditions that do not allow innovation in this area. This article serves as a recommendation for further activities for safer air transport and life in the EU.

As has already been said, this article deals only with the marginal terms of the project and should only serve as a recommendation for similarly focused projects or the pursuit of other creative and scientific activities. Without solving a high-quality legislative base it is not possible to bring out the outputs of any single projects to common practice. The other sub-objectives of the project, the methodology for behavioural detection and the modification of screening checkpoints will be dealt in one of the other articles as soon as the project team has enough relevant data for publishing.

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