

# AIRPORT SECURITY MANAGEMENT IN THE CONTEXT OF FIRE PROTECTION ON THE EXAMPLE OF THE CHOPIN AIRPORT IN WARSAW

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## Abstract

Airport security management is a rapidly evolving process which results in new regulations, new procedures or equipment and the acquisition of new skills for aviation personnel. The fire protection of the Chopin Airport in Warsaw serves as an example intended to show a pattern of activities of entities responsible for safety that clearly strive for perfection, and are comprised by the safety management process, which can be replicated by other institutions. The essence of the article is to identify the key factors that determine the safety of an airport on the example of the Chopin Airport in Warsaw. The article presents the results of own research. The analysis of expert interviews conducted with airport personnel responsible for security and officers of the State Fire Service showed the reality of airport security management from the perspective of the entity responsible for it. New directions of change and areas for improvement were thus acknowledged. The result of the interviews is the development of the author's concept of the improvement of tools used within the Safety Management System at the Warsaw Frederic Chopin Airport.

**Keywords:** safety management, Safety Management System, fire protection, airport security, aviation

## 1. Introduction

The safety of airline passengers and proper functioning of the Warsaw Chopin Airport depend primarily on a well-structured aviation safety management system. Knowing that a process is “a course of consecutive and causally related specific changes” (SJP), it can be concluded that the airport security management process is interdisciplinary and involves many spheres under the jurisdiction of the airport manager.

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Security management frequently becomes a source of contention. One of them is the question of the meaning of the terms “security” and “safety”. Most differences can be seen when translating concepts into English. For the purposes of this discussion, it has been assumed that “security management” is a broader concept, relating to both infrastructure security and the sense of individual security of passengers and airport staff. On the other hand, “safety management” refers to personal security, protection against harm and danger to the individual.

Many researchers disagree with the assumption that security can be managed. Management in general terms can be defined in various ways. To give an example, Stanisław Sudoł (2014) emphasises that one of the main components when defining management is that it is a process that occurs within an organisation. Taking into account Waldemar Kitler’s definition of security, it transpires that “public security, being a type of national security, is a process involving various activities (measures) in the field of national security [...]” (Kitler, 2014); it can be assumed with full responsibility that security management should also be identified with process.

The aviation industry is one of the recently introduced elements of the world’s transport system. Nevertheless, it is the involvement of aviation safety professionals that has brought air transport to the place in which it is today. Indeed, it serves as a role model for other means of transport in terms of safety. Firstly, this is the result of research aimed at improving the process of transport, and secondly, it is the ramification of experience and knowledge of personnel working on behalf of those responsible for rendering the movement of aircraft completely safe.

A number of standards and regulations, as well as the effectiveness of entities responsible for their implementation, occupy an important position in the airport safety process. What is enormously significant in this aspect is the well-functioning Safety Management System (SMS). The national and non-national (international, European) regulations allow achieving a desirable goal – a good airport security product. Nevertheless, the results of conducted research have shown that a crucial element, not included in the abovementioned system, is the airport fire protection, which is an immensely significant element when the technical specification of this form of transport and the number of users of aviation services are taken into consideration. Hence, in the author’s opinion, ‘fire protection’ should be a separate module interoperating with the module related to ‘Security Management’ and the module ‘Aviation Security’. Both internal bodies (such as the Airport Fire Brigade) and external ones, such as the European Union Aviation Safety Agency (EASA), are responsible for ensuring safety at the Warsaw Chopin Airport. The latter one is responsible for issues such as auditing and inspections and it also supervises activities aimed at ensuring the continuity of airport fire safety measures. The aforementioned SMS relates to the management of safety in its broadest sense (including fire protection) and to strengthening of the management process at Chopin Airport in Warsaw.

The level of safety in each case depends on factors that determine the emergency. From the perspective of the air transport customer, it is essential that the flight

and the entire process involved is carried out in a safe way. Conversely, from the perspective of the person responsible for safety, every part of the process should be carried out efficiently, effectively and safely. For the purposes of this discussion, the main focus is on fire hazards. This choice was motivated by the willingness to emphasise the importance of these activities being done in order to improve safety at airports.

Issues related to managing airport safety in the context of fire protection has undoubtedly found its way into various publications about ensuring airport safety. The essence of the problem of fire hazards is broadly indicated in the Manual of Airport Services, Part 1 – Fire Rescue and Protection, Fourth Edition of 2015 published by the International Civil Aviation Organization. The manual provides a comprehensive overview of a number of tasks and responsibilities, which must be developed by the service responsible for safety at a given airport, however, without concretizing it to specific airports, which definitely generalizes the imposition and compliance with these regulations. On the other hand, on the national level, a good example is the publication edited by Katarzyna Łuczak entitled “Safety Management in Civil Aviation” in which the authors mention risks associated with fire protection, but nevertheless to a much lesser extent than in relation to other hazards or risks associated with a fire at the airport. However, little research has been conducted in this area, and it has not been analysed thoroughly enough to determine how important the issue of fire protection is in the safety management for any airport, and how an important a place it occupies in the safety management system. In order to precisely determine the value of airport fire protection in the present paper, it was decided to choose a case study of fire protection at the largest airport in Poland which is at the same time at the one of the largest ones in Europe, namely the Frederic Chopin Airport in Warsaw. The choice of this airport was intended to prove whether fire safety has an impact on the choice of aviation services by a potential consumer of the Warsaw Chopin Airport. In relation to the above-mentioned determinants, it was decided to analyse the issues related to specifying the essence of fire protection in the process of airport safety management by the example of the Chopin Airport in Warsaw. Taking into account the results of the research, it should be noted that the findings of this dissertation are an introduction to further detailed research.

Therefore, with the above in mind, the research problem assumed the form of the question *what determines the level of airport security and to what extent does it determine the level of airport security in the context of fire protection on the example of the Warsaw Chopin Airport?* It was assumed that the research problem would be solved mainly through theoretical research methods such as analysis or synthesis, as well as through an empirical research method, i.e. an interview. The reliability of the research was ensured by experts selected for the interviews. This arises from their adequate knowledge and experience in the field in question. The research was conducted in environments that were diverse, yet similar with regards to the specifics of the implemented fire safety measures. Among experts

who participated in the research were those responsible for the comprehensive airport security management process, the fire precautions experts from the airport fire and rescue service and the experts from the State Fire Service. For the purpose of this paper, the aim of the study was to systematise the paradigms for achieving the state of safety at Warsaw Chopin Airport. The main objective of the paper is *to identify the key factors that determine the safety of the airport on the example of the Chopin Airport in Warsaw*. It was assumed that achieving this objective may change the perspective of conceptual approach and openness to new development strategies. A tool used to define to what degree given determinants influence the management of airport security in the context of fire safety was a Likert Scale. The use of the scale involved indicating the significance of a particular determinant which had to occur repetitively and regularly in every response or in the majority of them while doing the interview. It was assumed that the repetitive responses given by individual experts would provide an overview of the level of safety that becomes reduced under the impact of the occurrence of a given emergency. It was expected that those that were repeated most frequently in individual interviews were most relevant to airport security. An intermediate goal was also to highlight the essence of hazard recognition activities in a situation of an emergency, with particular focus being on the airport fire protection. As a consequence, it allowed the development of the authorial concept of improving security systems at the airport, which includes a proposal of modifications to the tools within the Safety Management System at the Warsaw Frederic Chopin Airport.

Taking into account the needs identified in the main problem, a comparative analysis of the two approaches was considered. A comparison was made between the perspectives of rescuers from the State Fire Service and the Airport Fire Service operating at the Warsaw Frederic Chopin Airport, as well as of personnel responsible for comprehensive airport safety management. The study was intended to show the determinants and contexts of the perception of the analysed problem in the pragmatics of the official tasks performed. The results of the study rendered it possible to identify the determinants of the airport security management process, factors that compromise airport security, cooperation between the Airport Fire Service and the State Fire Service, the identification of effective solutions ensuring airport security, and the highlighting of the essence of fire protection in the context of the attractiveness of using a given airport.

## 2. Methods

The main research method used to answer the main research question was the qualitative-quantitative method, i.e. an interview with experts from the rescue services and from those responsible for managing security processes within the aviation area. The research sample comprised 5 aviation industry experts and employees of the Civil Aviation Authority, 5 firefighters from the Airport Fire

Department of the Chopin Airport in Warsaw, 10 firefighters from the Airport Fire and Rescue Service from the Wrocław Airport S.A., and 5 officers from the State Fire Service in Łowicz. This methodology was used in order to verify and compare the content of various publications addressing the essence of airports security with the facts and the reality. By analysing the source, qualitative and quantitative results were obtained. The interview allowed obtaining results that may reflect the actual state of affairs, drawing conclusions regarding the sense of security and indicating factors responsible for the level of security of the Warsaw Chopin Airport (with particular emphasis on the airport fire safety).

Taking into account the diversity of those who took part in the survey, one can venture to say that they were sufficiently diverse entities related to airport fire safety (of course, with common characteristics such as ensuring safety) to achieve an unprecedented result and a broad spectrum of novel knowledge about the subject contained in the main objective of this publication. The questions stated to achieve the primary research objective of this study were:

- What factors do you believe determine effective airport safety management?
- Which factors, in your opinion, reduce airport safety, both in relation to passengers' sense of security and fire protection of airport infrastructure?
- How do you find the cooperation between the Airport Fire Service and the State Fire Service? Is it of a satisfactory level?
- Which of the existing solutions of good safety management practices is most decisive for the safety of airports in the context of fire protection?
- Does the well-functioning fire protection of Warsaw Chopin Airport contribute to its attractiveness? If so, why?

These questions are characteristic of complexity and they cover various research spheres in order to learn as precisely as possible about airport safety management in the context of fire protection. Since each of the questions addressed a slightly different area related to airport safety, and since the respondents did not belong to a homogeneous group, it was not considered necessary to obtain answers to each question from an individual respondent. It was assumed that all responses as a whole would provide sufficient data for analysis from respondents perceived as groups.

The main element and the primary concern of the interviews was an attempt to establish what were the experts' opinions and feelings about possible threats posed to aviation safety and fire safety at the Chopin Airport. The abovementioned opinions and feelings were believed to be supported by interviewees' professional knowledge regarding the subject. The results of the research were expected to point to new directions that the aviation industry should follow as there is a need to meet the demand of the airport being safe, taking into consideration two crucial aspects, namely a rapid development of this form of transport and an equally rapidly developing process of evolving threats. It should be noted that the same research conducted in a different research group may yield completely different conclusions and findings. The results obtained in this dissertation can be extrapolated to other airports as well.

### 3. Results

#### 3.1. Airport Safety Management System

Currently, airports play a very important role in the field of both passenger transport and air cargo carriage. Air transport is very popular all over the world, as it provides a much faster and safer way to travel as compared to other modes of transport. According to research by the *Aviation Safety Network*, even after the reduction in air traffic that was associated with the COVID-19 pandemic, there were far fewer victims and fatalities caused by aviation accidents and incidents worldwide than the number of fatalities from road accidents having occurred in Poland in the same year (Aviation Safety Network, 2022). It is worth considering what is the reason for a such high level of safety in aerial transport, which includes not only the very procedure of flying from point A to point B, but also a number of other important processes that constitute the whole (e.g. the process of ensuring civil safety or fire protection). Efficient and effective airport security management may be the answer.

According to the Aviation Law Act, an airport is “a demarcated area on land, water or any other surface in whole or in part intended for the performance of take-offs, landings and ground or surface movement of aircraft, together with the structures and facilities of a permanent nature located within its boundaries, entered in the register of airports” (Polish Journal of Laws from 2022 item 1235). Laura Attacalitea, Paola Di Mascio, Giuseppe Loprencipe and Costantino Pandolfi (2012) emphasise that “an airport is a place where an aeroplane take-off, landing and ground handling operations are carried out”. For an ordinary user, an airport may be associated with a special place intended for the take-off and landing of an aerial craft and this is indeed the case. However, the whole process of the proper functioning of an airport consists of many elements concerning both legal and organisational issues as well as issues related to the safety of people and aviation infrastructure. Furthermore, not only does fire protection concern neutralisation after an incident occurs, but also a number of tasks performed to prevent the development of a fire hazard.

The nature of the popularity that the aviation industry has carries a number of consequences. One of these is the provision of security at an appropriate level, by the relevant authorities. As Marlena Lorek explains in her publication (2018), “every airport facility must comply with security procedures, as this gives passengers an adequate sense of security”. This is very important for the passengers; otherwise they would not be willing to use this type of transport service, which is an important element for air carriers. Lorek also adds that “national economic efficiency and the benefits achieved depend to a great extent on the efficient functioning of the transport sector”. In turn, the efficient functioning of the transport sector is a consequence of an effective safety management process.

When characterising airport safety management, it is impossible not to mention the Safety Management System (SMS). SMS is the continuous improvement of



various safety-related spheres and the minimisation of risks to the lowest possible level. This includes fire protection of the facility. The Safety Management System applies to flight safety in both national and international terms. This system mainly focuses on the occurrence of emergencies that adversely affect the functioning of an airport and the improvement and enhancement of safety management performance (ULC, 2018). The system is an integral part of safety management in Polish civil aviation. Ricardo Pocheco, Elton Fernandes and Eduardo Marques Domingos highlight that ‘rapidly growing air traffic and increasingly unstable climatic conditions have put tremendous pressure on the safety management systems (SMS) of airports and airlines’ (Pocheco, Fernandes, Domingos, 2014). The authors emphatically indicate that this system needs to be resilient and skilful in adapting to ever-changing conditions due to both natural and technical factors.

Airport security management involves a multitude of entities with responsibility for specific areas. The whole process involves both the organisation of transport and the preparation of appropriate security procedures, including also security procedures. In his publication, Radosław Wiśniewski (2015) writes that the responsibility for the airport security falls not only on state entities but also on non-state ones and these two are dually responsible for that aspect. Article 186 of the Aviation Law states that ‘the protection of civil aviation against security threats is subject to separate legal acts’ (Polish Journal of Laws from 2022 item 1235). This underlines the importance of this type of security, and therefore, a separation of laws is needed for their clearer implementation.

According to Article 16(2) of the Aviation Law, the Minister responsible for transport supervises Polish civil aviation and the activities of foreign civil aviation in the Republic of Poland to the extent specified in the Act and other laws and international agreements (including the area of civil aviation safety) (Polish Journal of Laws from 2022 item 1235).

According to Article 20(1) and (2) of the Aviation Law, the central government administration body responsible for civil aviation matters is the President of the Civil Aviation Authority (ULC in Polish). The Aviation Law indicates a number of competences also related to safety management. Particular attention should be paid to the task of “supervising and controlling the observance of legal provisions on civil aviation and aviation business activities” (Polish Journal of Laws from 2022 item 1235). The supervision of civil aviation, inter alia in the field of safety, is carried out not only on the basis of national safety regulations, but also on the basis of EU regulations, i.e. European Union (EU) regulations and Acceptable Means of Compliance (AMC), Guidance Material (GM), as well as international regulations. As stated above, AMC and GM, which were issued by EASA, are treated as the additional guidelines supporting the process of supervising airport management. EASA is at the heart of the European Union’s aviation safety strategy and management. Monitoring is conducted on the basis of a systemic approach. It takes into account all areas and essential elements of the safety oversight system which are defined by the International Civil Aviation Organisation (ICAO). Particular

attention shall be paid to the inter-linkages between domains. Monitoring shall be organised in a transparent, efficient, effective, harmonised and consistent manner. The Agency analyses the results of its monitoring activities in order to identify the need for regulatory changes (Commission EU, 2013).

With regard to airport safety, concepts for development and appropriate responses to hazards should mainly be sought in EU regulations. Regulations such as the EU's Air Traffic Management Modernization Regulations or the Single European Sky ATM Research (SESAR) provide detailed and specialized knowledge of a "next-generation air traffic management system capable of ensuring air transport safety and efficiency throughout Europe in the long term" (SESAR, 2023).

In the paper by Zbigniew Grzywny, Andrzej Limański and Ireneusz Drabik (2018) it is noted that airports establish so-called airport security teams. The airport security team comprises in its structures, first and foremost, the airport manager or the person responsible for the security of the airport in question, as well as one representative of the Airport Security Service (ASS), the Airport Rescue and Fire Fighting Unit, the Police, the Customs Office, representatives of the air carrier committee and other entities that operate at the airport in question. The tasks of the Airport Security Service are defined in the Aviation Law in Article 186f. These tasks concern a sphere strictly related to the provision of security at the airport in question and the executive sphere of individual tasks. The entity responsible for security at airports is also the Border Guard (Polish Journal of Laws from 2022 item 1061). The Border Guard plays a major role in aviation security management in preventive measures, e.g. personal, border and baggage checks. It is an indispensable player in ensuring safety in civil aviation. Operational and reconnoitring activities performed by Border Guard officers contribute to increased security at airports.

The entities responsible for security base their efforts on activities related to countering threats. The total number of airports in Poland is 15. Each of these airports has a detailed threat analysis and contingency procedures in case of threats (ULC, 2022). Each of the possible threats and risks is adequately described and the services responsible for the airport security are prepared in the event of an incident. Zbigniew Grzywna, Andrzej Limański and Ireneusz Drabik (2018) state that "during the planning process, a number of threats are taken into account which, similarly to crisis management, are included in the threat grid (Crisis Management Act of 26 April 2007)". The identification of hazards in airport safety management is a very important element as it embodies the essence of the problem which could be the materialisation of some supposed negative event. Among the examples of safety hazards relevant to civil aviation are aircraft accidents, catastrophic accidents, natural hazards, errors in decision-making, or fire hazards. A significant solution for the aviation industry in the 21st century has been the Security of Air Transport Infrastructure of Europe project (SATIE). SATIE integrates key issues such as threat prevention, response and mitigation at airports with a parallel process of protecting systems, sensitive data and, above all, the



protection of passengers and their luggage (SATIE, 2020a). This is the result of a policy pursued by the EU and it aims at ensuring a balance between security and travel convenience. This project is a response to the phenomena of the digital revolution worldwide, which also affects security at airports. SATIE is an example to support the thesis that airport security management is a continuous process of improvement, in which threats are subject to a certain evolution and transformation. The main objective of SATIE has become the development of a 'toolkit' designed not only to protect people against a single threat, but also against predetermined scenarios. The 'toolkit' defined by SATIE consists of elements related to improving cyber-physical correlations, forensic phenomena and dynamic risk impact assessment at airports. Emergency procedures can be triggered simultaneously by an alert system to modify air/land operations, to alert emergency services, cyber security and maintenance teams for a rapid recovery. These solutions appear to be innovative. The SATIE project specifies that they will be integrated into a simulation platform to improve their interoperability and verify their effectiveness. There have been three demonstrations conducted within the project—in Croatia, Italy and Greece (SATIE, 2020a). Examples of documents that are outputs of the overall Project are the best practices for updating airport security standards and rules (SATIE, 2021a), the specification of data exchange, interfaces and log semantics (SATIE, 2020b), the SoA about airport security and expected improvements (SATIE, 2021b) and the specification of the overall security management cycle (SATIE, 2020c).

The results and best practices from the demonstrations provide a body of valuable information in the area of scientific research activities. They can be used as standardisation tools and to support the work of those responsible for airport security as an invaluable source of knowledge regarding the threats that can occur at each individual airport (SATIE, 2020a). The *Security of Air Transport Infrastructure of Europe*, as a project, will undoubtedly play a significant role in the airport security management system. SATIE together with the Safety Management System and other solutions/systems can result in synergies.

The issue of identifying the main determinants of airport safety is an open question and an area for continuous improvement. In publications related to the identification of the determinants that cause a decrease in the level of safety and updating existing problems, it can be noted that the authors of these publications often leave a certain buffer when it comes to the interpretation of the factors that determine safety. That is, the conditions that prevailed at the time of the identification of the given threats, e.g. COVID-19 pandemic, war, etc., are marked. Various types of development plans and strategies are also good examples, characterized by grace period, which is a good practice and an opportunity to learn more often about the environment of safety. An example of this type of document is the project of the "Policy for the Development of Civil Aviation in Poland until 2030 (with an Outlook to 2040)" issued by the Ministry of Infrastructure. An excellent illustration is provided by the various Crisis Management Plans issued at each level

of administrative division in Poland. In Crisis Management Plans of, for instance, municipalities, as well as strategies in aviation such as the aforementioned “Policy for the Development of Civil Aviation in Poland until 2030 (with an Outlook to 2040)” both opportunities and threats are often defined (not infrequently a good tool for presentation is a SWOT analysis), i.e. elements that can often be subject to change under the influence of various pressures (Ministry of Infrastructure, 2021). For the identification of factors related to both the issue of lowering the sense of security and those positively influencing it, regulations imposed by European Union bodies such as SESAR are important.

For an average air transport consumer, the best way to understand the essence of airport safety is to read the Civil Aviation Safety Bulletin published by the Civil Aviation Authority. Thanks to this, anyone interested and associated with aviation even to a small degree can learn about the basic issues of security and become curious about the more advanced ones, which may enhance the awareness among users. The author of this publication concludes that the Bulletin is an undervalued tool that is worth developing, as it is a good way to improve airport safety.

In conclusion, airport safety management is a continuously evaluating process. The changing global political and economic situation as well as the emergence of new hazards provide the basis for the continuous improvement of the safety management system in civil aviation, while yielding the technological improvement of airports. Issues related to threats that may be detrimental to fire safety and techniques to manage those threats are similarly changing. Also of huge importance in these processes is the need for well-qualified personnel at both the management level on the part of government and executive staff. All these factors contribute to airport security management. It is one of the most prominent elements of safe air travel.

### **3.2. Proper functioning of the Chopin Airport and aviation fire protection**

A well-functioning airport is one that provides an adequate level of security for passengers and airport personnel. At the Chopin Airport, similarly as at any other facility of this type, there is a number of regulations that ensure the proper functioning of the airport. According to the PWN dictionary of the Polish language, “functioning” is “fulfilling its function as intended” (SJP, 2022). The proper functioning of an airport should therefore be identified with such activities that correspond to the implementation of certain regulations in terms of both organisational issues and activities related to the materialisation of legal arrangements. The Civil Aviation Authority posits that the legal regulation of airports and landing grounds is specified in international regulations, EU regulations and national regulations (ULC, 2022).

Another determinant of the proper functioning of an airport is the level and the role of services related to the safety of the facility. Using the Fryderyk Chopin Airport as an example, the Airport Fire Brigade is of the greatest importance

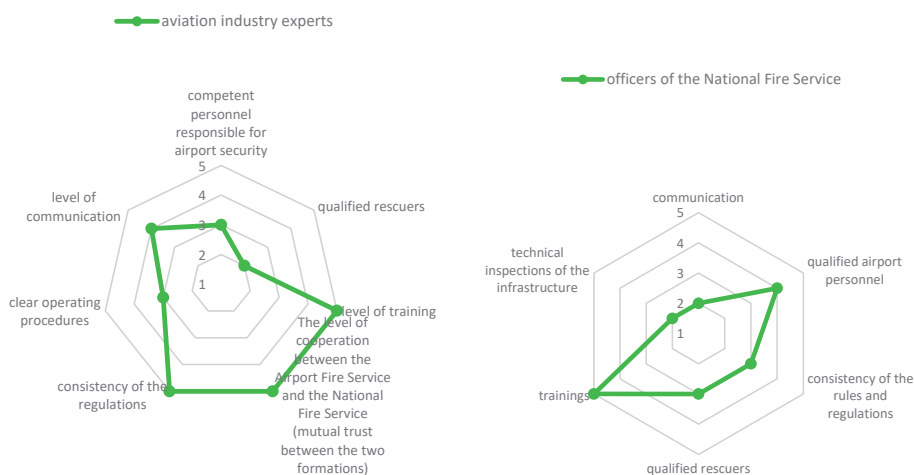
in terms of fire protection. Its activities are not limited to extinguishing fires, but they also include activities related to, among other things, prevention. It is noteworthy that both state and non-state entities are responsible for airport security (Wiśniewski, 2015). "In accordance with Annex 19 to the Chicago Convention and with EU law, the management of civil aviation safety is divided into two areas – those applicable to States and covering the State's responsibility for safety management and those applicable at the level of aviation organisations and covering their responsibility for safety management" (Łuczak, 2016). Each airport is a facility that is uniquely exposed to security imbalances by which, on the one hand, international regulations, in particular EU law, oblige the state to take control of the provision of security there, due to the strong need to protect the air travellers. On the other hand, state bodies implement assumptions that arise from national regulations, such as the Crisis Management Act.

In Part 8 entitled "Airport Operational Services" of the Airport Services Manual (1983) indicates that "the state authority that owns or manages the airport may, in certain circumstances, delegate the responsibility for the management of the airport, in whole or in part, to another authority. For instance, the authority providing air traffic control services may be directly or indirectly responsible for the performance of certain tasks".

The proper functioning of the Warsaw Frederic Chopin Airport is also possible thanks to the already mentioned well-developed Safety Management System. An SMS is a certain system that concerns the operation of any organisation, being in charge of safety risk management. At the Warsaw Chopin Airport, it is a series of advanced activities caused, among other things, by the complex infrastructure of the airport. An example of such infrastructure related to fire safety and to the risks affecting the safety of passengers and airport employees is the presence of numerous restricted-access passageways (due to the protection provided), which reduces the possibility of outsiders entering certain sectors of the airport. This clearly represents an important element of security at the airport that prevents unauthorised persons from entering areas that frequently ensure the continuity of airport operations, but it can also prove to be a barrier to assistance in the occurrence of some type of emergency or of door security failures. A malfunction of the access control system resulting in the locking of door locks can have negative consequences during an evacuation or potential rescue operation, i.e. emergency services may have difficulties in accessing a casualty. In response to such challenges, those responsible for risk management are constantly refining the system in order to reconcile all security issues and correlate them with each other so that they do not affect each other in a negative way. In such a way, the Safety Management System can effectively and efficiently improve the quality of the services provided and reduce the occurrence of risks, since the purpose of the system is to respond precisely to challenges such as those mentioned above. The SMS policy obliges organisations to place safety management as one of their priority tasks (FAA, 2022).

Aviation safety management is a very broad concept of protection against threats. A narrower category derived from safety management is aviation security. The person in charge of organising security in an aviation entity is the so-called Security Manager. However, the Security Programme for protection against acts of unlawful interference and modifications of the Security Programme related to the security level of the airport manager, air carrier, regulated agent, known consignor, registered supplier of in-flight supplies and air traffic service provider are approved by the President of the Civil Aviation Authority (Aviation Market, 2022).

“Methods and measures concerning airport security include training aimed at preparing airport employees for civil aviation security work” (Gąsior, 2011). The validity and reasonableness of the statement is also confirmed by the research results presented graphically in Figure 1.



**Figure 1.** Summary of the responses to the question: What factors do you believe determine effective airport safety management?

Training courses in every aspect are aimed at improving the efficiency and effectiveness of the work performed. This is particularly important in air space, where the exposure to hazards is high. Trainings in the aviation industry provide the opportunity to acquire both theoretical and practical skills needed to ensure aviation security. Airport security is a key part in the functioning of any airport. At the Chopin Airport, aviation security is mainly achieved by the Airport Security Guard, which performs tasks such as: “conducting passenger and baggage security checks; intervening in the event of an emergency at the airport; participating in rescue operations” (Warsaw Chopin Airport, 2022).

In security considered in more general terms, the main focus is frequently on social prevention activities. It is no different when it concerns aviation safety. *Safety* is achieved through prevention activities such as: technical security; organisational undertakings; emergency preparedness (Gąsior, 2011).

The aviation *The International Encyclopedia of Transportation* indicates that the main threats in aviation are: terrorism, non-ideological crime, and emotional/psychological indisposition and disorders (Vickerman, 2021). This is also evidenced by the expert opinions compiled during the research.



**Figure 2.** Summary of the responses to the question: Which factors, in your opinion, reduce airport safety, both in relation to passengers' sense of security and fire protection of airport infrastructure?

A high level of technological development is currently evident. Newly emerging devices are mainly characterised by their small size and mobility. The advancing technology has a significant impact on various areas of human life and is a very important structural element that is a subject of protection and is also an element that protects. The technical security systems present in the aviation area concern, among other things, people, property and premises, which are under the specific control and protection. This guarantees efficiency in ensuring security, due to the specific nature of the technical devices, which can both warn or alert of danger, as well as prevent crisis situations and threats and monitor given processes and phenomena. There are many solutions of this type in an airport. Securing the airport with various technical systems is one of the priority elements included in the airport security system. It is worth noting that systems alone do not fully influence security. A necessary (or perhaps priority) component is the appropriately trained and competent personnel operating the systems in question. The specificity of the operation of technical equipment used for airport security involves many components (Żmigrodzka, Krakowiak, 2018).

A properly functioning airport is one that can adequately respond to challenges of broadly understood aviation security and other matters. The Chopin Airport, in fulfilling the tasks imposed by international, European and national regulations, meets the requirements for ensuring security, which is the primary objective of the tasks implemented. All the above-mentioned issues and others are of key importance in terms of their impact on the safety of the Warsaw Chopin Airport.

Fire protection is a distinctive element of the security system. It is regulated by many legal acts, beginning with the Constitution of the Republic of Poland, in which in Article 5 it is specified that the task of the Polish Republic is “to safeguard the independence and inviolability of its territory, to ensure the freedom and rights of man and citizen and the security of citizens” (Polish Journal of Laws from 1997, No. 78 item 483, as amended). The primary legal act that governs the fire protection regulations is the Act of 24 August 1991 on the Fire Protection. This document specifies that fire protection involves the implementation of undertakings aimed at protecting life, health, property or the environment against fire, natural disaster or other local hazard by:

1. “preventing the occurrence and spread of fire, natural disaster or other local hazard;
2. providing forces and resources to fight a fire, natural disaster or other local emergency and to protect the public;
3. performing rescue operations by fire protection units” (Polish Journal of Laws from 2021, item 896 as amended).

As Andrzej Sęk (2014) rightly observes, “a well-organised fire protection in an enterprise is one of the factors related to the safety of an economic entity”. From the perspective of safety management, fire protection plays a significant role. Fire protection of a given facility determines the guarantee of responsibility and appropriate response of relevant units in the event of threat materialisation, taking control over it, minimising its effects but also issues related to preventing its occurrences comprehensively. The Fire Protection Act lists the following units to be responsible for fire protection:

1. “organisational units of State Fire Service;
  - a. organisational units of Military Fire Protection;
2. fire brigade company;
3. rescue service company;
4. municipal professional fire brigade;
  - a. district (municipal) professional fire brigade;
5. field rescue service;
6. volunteer fire brigade;
7. association of voluntary fire brigades;
8. other rescue units” (Polish Journal of Laws from 2021, item 896 as amended).

Fire safety and fire regulations need to correspond with the relevant regulations of building law. An important document in this respect is the decree of the Minister of the Interior and Administration concerning *the fire protection of buildings and structures* of 7 June 2010, and the Act of 7 July 1994 – *the Building Code*. Fire protection, which is included in the broadly understood competence of ensuring public safety, is the responsibility of the state. Thus, the overarching unit responsible for fire protection is the organisational units of the State Fire Service.

Fire protection comprises various elements. However, individual elements fall within the scope of responsibility of selected rescue units, whose responsibilities



are defined in their organisational regulations. At the Warsaw Chopin Airport it is the Airport Fire Brigade that is responsible for fire protection at the airport. It is an integral part of the national fire protection system. The Airport Fire Brigade operating at the Warsaw Chopin Airport “constitutes a fire protection unit within the meaning of the Fire Protection Act. It is a uniformed unit. Its employees must be qualified to perform the profession of a firefighter and have appropriate education and psychophysical abilities” (Such, 2021). The primary activities of the Airport Fire Service are to participate in rescue and firefighting operations at the Warsaw Chopin Airport and its surroundings. These are incidents usually related to aircraft accidents or technical failures of the airport. The unit secures the refuelling of aircraft with passengers and removes and neutralises oil spills. One of the main activities carried out within the framework of fire protection, as in other entities that are fraternal in their specificity, is the implementation of preventive activities, for which the support department of the airport rescue and firefighting service is responsible. This can be understood as a series of activities held by appropriately educated people to improve fire safety and security (Warsaw Chopin Airport, 2022; YELLOWPLACE, 2022).

Regulations concerning fire protection at the Warsaw Chopin Airport are included in one of the most important documents in aviation, the Act of 3 July 2002 – *Aviation Law*. Article 84 of the act states that it is the airport manager who bears responsibility for ensuring fire protection of the airport and airport facilities. One of the main duties of the airport manager is to establish and maintain a fire and rescue service to carry out activities on the airport premises (Polish Journal of Laws from 2022 item 1235). The Regulation of the Minister of Infrastructure of *relating to the preparation of airports for emergency situations and to the airport rescue and firefighting services* of 1 February 2022 (2022), indicates one of the most important competences of the airport manager. Namely, Article 4 states that “the manager of an airport where lsr-g [authorial remark – Polish abbreviation for airport rescue and firefighting service (orig. lotniskowa służba ratowniczo-gaśnicza) is organised shall guarantee the level of airport rescue and firefighting protection corresponding to the designated airport fire protection category”. Regardless of the designated category of the airport, the airport manager shall ensure that the airport rescue and firefighting service (in the case of the Chopin Airport in Warsaw, the Airport Fire Service) functions and performs its tasks in the following situations:

1. “during an aircraft accident, serious aircraft incident, aircraft incident or other occurrence;
2. when there is a reasonable suspicion that an aviation incident has occurred in the operational area of the aerodrome;
3. when an aircraft is planning or has reported to land at an aerodrome and there is an occurrence, other than the occurrence referred to in point 1, which affects the flight safety of that aircraft;

4. during incidents at the airport, other than those referred to in points 1 to 3, related to the fire protection of the aerodrome, including buildings located on the aerodrome” (Regulation of the Minister of Infrastructure, 2022).

The remit of the airport rescue and firefighting service can be limited to all activities associated with saving the life and health of people who are both passengers visiting the airport for a short period of time, as well as employees working there on a daily basis.

An important issue regarding fire protection of any airport is the category related to the dimensions of the aircraft and the airports that the aircraft can use, as well as the frequency of flight operations. Within the specifics of rescue and firefighting, it is the category of the airport that plays an important role. “The category of an airport as regards rescue and firefighting is determined in accordance with Table 1 on the basis of the longest aircraft normally using the airport in question and the width of their fuselage. If, after determining the category corresponding to the overall length of the aircraft, the fuselage width is found to be greater than the maximum width indicated in Table 1, column 3, for the category, the aircraft should indeed be classified one category higher” (Regulation (EU), 2014).

**Table 1.** Category of airport in regard to rescue and fire fighting

<i>Airport category</i>	<i>Total aircraft length</i>	<i>Maximum fuselage width</i>
(1)	(2)	(3)
1	from 0 m to 9 m exclusive	2 m
2	from 9 m to 12 m exclusive	2 m
3	from 12 m to 18 m exclusive	3 m
4	from 18 m to 24 m exclusive	4 m
5	from 24 m to 28 m exclusive	4 m
6	from 28 m to 39 m exclusive	5 m
7	from 39 m to 49 m exclusive	5 m
8	from 49 m to 61 m exclusive	7 m
9	from 61 m to 76 m exclusive	7 m
10	from 76 m to 90 m exclusive	8 m

Source: author's compilation derived from (Regulation (EU), 2014)

“Airports should be classified in terms of rescue and firefighting by calculating the number of aircraft operations performed during the three consecutive months with the highest air traffic rate in a year as follows:

- a) if the number of aircraft operations of the highest category normally using an aerodrome is 700 or more in three consecutive months with the highest air traffic, then that category should be the aerodrome category and
- b) if the number of aircraft operations of the highest category normally using the aerodrome concerned is less than 700 in three consecutive months with the highest air traffic, then the airport category may be one category lower than

the highest category of aircraft, even if there are large differences between the dimensions of the aircraft covered by the 700 aircraft operations”.

The category of an aerodrome is an important element of an airport's fire protection system. This is reflected in, inter alia:

- the minimum number of firefighting and rescue vehicles;
- types and quantity of firefighting resources (a defined list of what resources and in what quantity to stock at a given category of airport);
- the response time of the airport rescue and firefighting service;
- communication and alarm measures (Regulation (EU), 2014).

The airport manager is primarily responsible (according to the law) for the level of safety in the context of fire protection at the Warsaw Chopin Airport. It is the manager who is obliged to prepare a very important document, and namely an action plan in the event of an emergency. On the other hand, indirectly, the main entity that implements executive and preventive actions in the field of fire protection is the Airport Fire Service. The Warsaw Chopin Airport is the largest airport in Poland and one of the largest ones in Europe. The fire safety designation, i.e. the category assigned to Warsaw Chopin Airport, is '9'. This is evidenced, for instance, by the fact that a real 84-metre colossus – an Antonov aircraft (An-225) – landed at this airport in 2020 (Regulation (EU), 2014).

Well-educated rescuers and the equipment that they have at their disposal are vital when it comes to ensuring the safety of Warsaw Chopin Airport. The Regulation of the Minister of Infrastructure *on the preparation of airports for emergency situations and airport rescue and firefighting services* of 1 February 2022 specifies in detail in Chapter 3 what the preparation for the work of a rescuer in the airport rescue and firefighting service looks like. European Union and international law also indicate what skills a rescuer should have. Another key element is equipment. The Airport Fire Brigade operating at the Warsaw Chopin Airport, but also others, are famous for their iconic rescue and firefighting vehicles, such as the “Rosenbauer Panther GCBAPr 8x8 CA-7 with a 13,000 litre water tank and a 1,500 litre foam agent tank, and an auto pump with a capacity of up to 10,000 litres per minute (at 11 bar), equipped with two cannons – one roof-mounted and one bumper-mounted” or the “MAN TGS 33.500/Rosenbauer mobile evacuation staircase, enabling evacuation from a height of up to 8.5 m” (Regulation (EU), 2014).

The level of safety in the context of fire protection at the Chopin Airport is determined primarily by a well-functioning airport security system, which in the fire context includes the Warsaw Chopin Airport Fire Service. The efficiency and effectiveness of the actions undertaken by this rescue service can be reflected, for instance, in the response time, as ‘the rescue and firefighting service achieves a response time of no more than three minutes, with an operational target of no more than two minutes from the first call of the rescue and firefighting services, to any location on any runway in use, with optimum visibility and surface condition, and it is able to apply foam with an effectiveness that ensures at least

50% of the rate of application of extinguishing agents' (Easily Accessible Airport Regulations, 2014). This illustrates professionalism and the essence of what constitutes an appropriate approach and response to a hazardous situation. An additional advantage of effective operations are certainly the numerous prevention programmes and training courses, as confirmed by the survey results in Table 2.

**Table 2.** Answer to the question: Which of the existing solutions of good security management practices is most relevant to airport security in the context of fire protection?

aviation industry experts	officers of the National Fire Safety
Implementation, development and application of appropriate airport security regulations in accordance with EU requirements and numerous training courses	prevention programmes, training of airport employees and security of technical systems

The occurrence of a fire while people are in any facility is a major threat and causes a widespread panic. The Warsaw Chopin Airport hosts thousands of visitors every day. "The results of the first four months of this year are 28 percent better than in 2021, with over 952,000 passengers having used air transport in April solely. This represents an increase of more than 22 percent when compared to the March of this year" (Aviation Market, (2022)). The number of people making daily journeys using the Warsaw Chopin Airport, supplemented by flight attendants, yields a sizable sum of people exposed to the potential fire hazard and evacuation associated with such a risk. In the context of the Warsaw Chopin Airport, the firefighting rescue services, which are immediately on the emergency scene, are responsible for the evacuation. Evacuation from the site of an aircraft accident occurs with the use of transport means in the fastest and safest way possible (Airport Services Manual, 1983). The whole process of evacuation of the injured is coordinated by the manager at the aeroplane accident site (Airport Services Manual, 1983).

As for the identification of key factors that determine the safety of an airport, in his publication "Design of airports and airports" Piotr Nita (2014) considers (indirectly taking into account the sphere of fire protection) how important the technical conditions of a given airport is and how the facility is prepared in the event of the occurrence of a hazardous situation. The current state of knowledge regarding the process of identifying the key factors that determine the safety of an airport on the example of the Chopin Airport in Warsaw is based primarily on the safety policy of the Chopin Airport in Warsaw and on other documents of this type. Additionally, publications as the one devised by Dariusz Tłoczyński (2013), namely "Direction for the development of air transport", which includes such issues as the elements related to the impact of technological progress on the development and safety of this transport, also mentioned in the present paper,

or the regulations contained in the “Strategy for the Sustainable Development of Transport until 2030”, provide us with the necessary insight into issues related to understanding the essence of the problem, which is the complex process of identification expressed in the main objective of this publication.

#### **4. Conclusions**

Safety management in all its aspects plays a significant role in safety. The management process offers a favourable opportunity to systematise activities and to recognise challenges that may be encountered during the period of use of an airport. Safety management in the context of fire protection, presented on the example of actions performed at the Frederic Chopin Airport in Warsaw, is a set of important processes aimed at airport safety translating into its attractiveness.

Experience in the aviation industry, but also in other sectors, demonstrates that the identification of factors that cause safety hazards is a key element in the process of ensuring aviation safety. It is by a proper identification of unknown phenomena that it is possible to find, in a sufficiently short time, which of them may be of a critical nature and which can be qualified as less threatening or completely irrelevant.

Airport security management is the starting point for achieving a state of security at any airport. This is supported with the activities of the skilled executive cadre that implements airport security procedures, technical security systems or systems such as the Safety Management System, which are the mainstays of a good process intended to ensure airport security.

For the proper implementation of activities in the field of both air safety management and the resulting identification of risks and the indication of the key determinants of airport safety, it is necessary to take into account the relevant regulations issued on the national, European and international level. Their implementation, application and development contribute to an efficient safety management process also at the Warsaw Chopin Airport. In the context of fire protection at the Warsaw Chopin Airport, firefighting procedures, professional equipment at the highest possible global level and appropriate preparation of all procedures and functions are of key importance to the Warsaw Chopin Airport, which has been assigned ‘category nine’ in terms of rescue and firefighting scope.

The approach towards innovations and changes in the aviation industry plays a significant role. This is due to the dynamic development of this form of transport and developments taking place in the technological sector. This translates into both threats and opportunities related to the development of aviation safety. A proposal to improve aviation safety on the basis of the research undertaken is to propose improvements to the tools within the Safety Management System. The SMS is based on the tool of the obligatory Incident Reporting System, which operates according to the principle of reporting incidents by phone to the Port

Duty Officer or through SMS boxes located at the Warsaw Chopin Airport or by electronic mail. It is proposed to have this system improved by advancing towards technological mobility. A change in the mode of reporting incidents could rely on the digital transmission of information regarding incidents using a device capable of scanning QR CODE into the relevant SMS cell. After scanning the QR CODE, a person willing to report an incident via SMS could be redirected to a mobile application (an option for ANDROID and IOS systems) or to an online shop where the application can be downloaded. The SMS application, when opened, would suggest categories under which a passenger could report (EVENT, RISK, OTHER) and inform about potential safety clauses, as well as the fact that the report is anonymous and there are no consequences after its submission. QR CODEs could then be located in various places including the ones where the current SMS boxes are, on aircraft seats (so that they are in front of the passenger), on the airline ticket, in the airport facility, in airport food and beverage outlets or on websites linked to the airport, to the Civil Aviation Authority or to other such similar information distributors. It is presumed that this form of reporting is easier and more interesting, as there is a trend that the information circulation systems are changing from traditional to digital forms, which ultimately contributes to greater interest thanks to better accessibility.

Another proposal within the SMS mobile application is a reporting incentive system that can be easily implemented into the application, whereby points are collected for correctly reported incidents and the user receives certain benefits. There are a number of the benefits to be obtained by the airport, including faster reporting of problems, adaptation to the hectic pace of life and enhancing the attractiveness of the airport by introducing modern technology. At the end of the reporting process, the application can include a questionnaire for assessing safety throughout the transport process (on a scale of 1–5), as well as offering a ‘conventional’ option by using SMS boxes or telephone or webmail.

Taking into account the results of interviews with respondents from the aviation industry and officers from the State Fire Service, the determinants that affect airport security in the context of fire protection could be defined as well as the extent to which they may occur. The questions provide the result in the form of answers, from which those that were repeated by the majority of respondents have been then selected. In this way, it was possible to prove which determinants translate into a decrease in security and how they translate into effective management and their degree. This provides insight into the issues involved in improving the security elements concerned, and it contributes to the discussion of what further care and improvement is needed in the context of airport security management. The answers obtained from the interviews can also be used to develop new concepts on how the Airport Fire Service can cooperate with the National Fire Service. The results of the interviews also show the directions in which further efforts should be put, for instance by carrying out improvements were suggested by the interviewees. Undoubtedly, an added value of the interviews is the difference in



aviation security experiences among the two groups of respondents. This provided a metacontextual approach to the issue of airport security management.

Taking into account the major objective theme of identifying the key determinants of airport security using the Warsaw Chopin Airport as an example, it can be encapsulated as the “triangle of identifying the key determinants of airport security,” i.e. the three main elements that constitute the identification process and the elements frequently repeated in the present work, which include: 1) identification of risks/factors that affect the sense of safety, 2) a thorough identification of factors and circumstances at the time of the identification of risks (time, place and conditions) and 3) a systemic updating of factors that determine airport safety. This dissertation demonstrates that the identification of key factors for airport safety is based primarily on analysing the ever-changing conditions in the area of airport safety and the need for constant review and updating the state of what is one of the main products of the study.

The current status of key safety factors is, one would think, a rather trivial list that should be taken into consideration in any other process of identification. Obviously, any new identification process should also be based on new and potential risks that fall within the subjective perceptions. For this end it is important to conduct extensive research and to comprehend issues related to the improvement of the technological sphere, i.e. implementation of modern technologies.

In summary, the process of managing airport safety with particular emphasis on fire protection at the Warsaw Chopin Airport is influenced by the identification and prioritisation of the particular determinants which either contribute to the proper functioning of the airport or threaten it. Appropriate procedures implemented at the airport, professional employees and services, informed consumers and technical facilities can all translate into the safe use of airport services. The study also identified new directions for enhancements, such as improving the tools in the Safety Management System, as well as the elimination of aspects enumerated by the interviewees, which may prove to be detrimental to the level of safety at the airport. The Frederic Chopin Airport in Warsaw is a place where thousands of travellers make their journeys every month, which leads to the conclusion and implies that safety management, in the context of fire protection at this airport, is at a satisfactory level.

Nevertheless, this publication primarily compiles practices that currently bring effective and efficient benefits from the possible implementation of particular behaviours, such as the development of modern technology by highlighting the essence of having at disposal the proper equipment, which is both a protecting and protected object. Another main concept that emerged during the study is the area related to rescue operations and cooperation between the Airport Fire Service and the State Fire Service. It was indicated that their cooperation is at a satisfactory level, nevertheless there is a need to further improve this relationship. In order to contribute to enhancing the quality of cooperation between the Airport Fire Service and the State Fire Service, various studies should be carried out and a case study

should be executed during which it could be considered whether the inclusion of the State Fire Service in the national rescue and firefighting system would improve the relationship between the two units. As part of suggestions for conducting further research, it is also recommended that the knowledge from this publication could be compiled as a part of a study on the example of another airport, and that lessons learned and good practice comparisons could be compiled to identify any strengths or weaknesses of the airport in question as part of a comparative analysis.

## References

1. Act on Border Guards of 12 October 1990 (Polish Journal of Laws from 2022 item 1061, 1115).
2. Act on Aviation Law (Polish of 3 July 2002 Journal of Laws from 2022 item 1235).
3. Act on Fire Protection of August 24 1991 (Polish Journal of Laws from 2021, item 896 as amended).
4. Airport Services Manual, Part 8, Airport Operations Services (1983).
5. Attacalitea, L., Di Mascio, P., Loprencipe, G., Pandolfi, C., (2012). *Risk Assessment Around Airport*, SIIV – 5th International Congress – Sustainability of Road Infrastructures.
6. Aviation Market, (2022). <https://www.rynek-lotniczy.pl/wiadomosci/lotnisko-chopina-dzienny-rekord-odprawionych-pasazerow-podczas-majowki-14506.html>. [01.08.2022] [in Polish].
7. Aviation Safety Network, Statistics, (2022). <https://aviation-safety.net/statistics/>. [01.08.2022].
8. Civil Aviation Authority, ULC, (2022). *Uregulowania prawne dotyczące lotnisk i lądowisk (Airport laws and regulations)*. <https://www.ulc.gov.pl/pl/lotniska/przepisy-i-uregulowania-prawne/uregulowania-prawne-dot-lotnisk>. [01.08.2022].
9. Civil Aviation Authority, ULC, (2022). *Zatwierdzenie Programu Ochrony (Aviation security)*. <https://www.ulc.gov.pl/pl/ochrona/ochrona-lotnictwa/program-ochrony>. [01.08.2022].
10. Makowski J., (2018). *Narzędzie oceny systemu zarządzania (Management system assessment tool)*. Warsaw: ULC. [https://www.ulc.gov.pl/\\_download/bezpieczenstow\\_lotow/warsztaty\\_2018/Narzedzie\\_oceny\\_systemu\\_zarzadzania\\_Jozef\\_Makowski.pdf](https://www.ulc.gov.pl/_download/bezpieczenstow_lotow/warsztaty_2018/Narzedzie_oceny_systemu_zarzadzania_Jozef_Makowski.pdf).
11. Civil Aviation Authority, ULC (2022) *Analizy bezpieczeństwa (Safety Management)*. <https://www.ulc.gov.pl/pl/zarzadzanie-bezpieczenstwem/analizy-bezpieczenstwa>. [01.08.2022].
12. Commission Implementing Regulation (EU) No 628/2013 of June 28, 2013 on the working methods of the European Aviation Safety Agency for conducting standardization inspections and monitoring the application of Regulation (EC) No 216/2008 of the European Parliament and of the Council and repealing Commission Regulation (EC) No 736/2006, Article 3.
13. Constitution of the Republic of Poland (Polish Journal of Laws from 1997, No. 78 item 483, as amended).

14. Dictionary of the Polish Language, (2022). *functioning*. <https://sjp.pwn.pl/slowniki/funkcjonowanie.html>. [01.08.2022].
15. Dictionary of the Polish Language, (2022). *process*. <https://sjp.pwn.pl/sjp/process;2508456.html>. [01.08.2022].
16. Easily Accessible Airport Regulations (Regulation (EU) No. 139/2014), European Union Agency for Aviation Safety (2014).
17. Executory law of the Minister of Infrastructure of February 1, 2022 on the preparation of airports for emergencies and airport rescue and firefighting services § 4, item 1.
18. Federal Aviation Administration, (2022). *Safety Management System*. <https://www.faa.gov/about/initiatives/sms>. [01.08.2022].
19. Gąsior M., System ochrony portu lotniczego według zasad bezpieczeństwa przy ładunku cargo (Airport security system according to security rules for cargo). In: Sztucki, J., Gąsior, M., Zajac, G., Szczelina, M., (eds.), *Zarządzanie bezpieczeństwem lotnictwa cywilnego. Skrypt dydaktyczny (Civil aviation safety management Didactic script)*. Wrocław: University of Lower Silesia Scientific Publishing.
20. Grzywna, Z., Limański, A., Drabik, I., (2018). *Safety Management at Airports*, Gliwice: Silesian University of Technology Publishing.
21. Vickerman R., (2021). *International Encyclopaedia of Transportation*, London: Elsevier.
22. Kitler, W., (2014). Zakres bezpieczeństwa państwa (narodowego) (The scope of state security (national)). In: Gryz, J., Kitler, W., (eds.), *Identyfikacja, klasyfikacja, podział i uzasadnienie pojęcia, istoty, składników i zakresu bezpieczeństwa państwa (narodowego) (Identification, classification, division and justification of the concept, essence, components and scope of state security (national))*. Warsaw: National Defence Academy.
23. Lorek, M., (2018). Bezpieczeństwo w transporcie lotniczym (Safety in air transport). In: Lorek, M., Olejarz, T., *Bezpieczeństwo w transporcie lotniczym: wybrane zagadnienia (Safety in air transport: selected issues)*, Rzeszów: Publishing House of Rzeszów University of Technology.
24. Łuczak K., (2016). *Zarządzanie bezpieczeństwem w lotnictwie cywilnym (Safety management in civil aviation)*, Katowice: Uniwersytet Śląski.
25. Ministry of Infrastructure, Policy for the development of civil aviation in Poland until 2030 (with an outlook until 2040) [Draft dated 5.07.2021].
26. Nita, P., (2014). *Projektowanie lotnisk i portów lotniczych (Design of airports and air-ports)*, Warsaw: Transport and communication publisher.
27. Pacheco R., Fernandes E., Domingos E., (2014). Airports airside safety index, *Journal of Air Transport Management*, 34:86–92.
28. Security of Air Transport Infrastructure of Europe, (SATIE, 2020a). <https://satie-h2020.eu/index.php/about/>.
29. Security of Air Transport Infrastructure of Europe, (SATIE, 2020b). D4.1 – Specification of data exchanges.
30. Security of Air Transport Infrastructure of Europe, (SATIE, 2021a). D7.3 – Best practices for updating airports security standard and policies.
31. Security of Air Transport Infrastructure of Europe, (SATIE, 2021b). D7.6 – SoA about airports security and expected improvements.

32. Security of Air Transport Infrastructure of Europe, (SATIE, 2020c). D7.7 – Specification of a holistic security management cycle.
33. SESAR Wdrożenie (SESAR Implementation), <https://www.pansa.pl/sesar-wdrozenie/>. [14.02.2023].
34. Sęk, A., (2014). *Zarządzanie bezpieczeństwem przeciwpożarowym w przedsiębiorstwie (Fire safety management in the enterprise)*, Kraków: Andrzej Frycz Modrzewski Academy of Cracow.
35. Such, P., (2021). Powierzenie kierowania działaniami ratowniczymi na lotnisku osobom spoza Państwowej Straży Pożarnej w ramach systemu ochrony przeciwpożarowej lotniska (Entrusting the management of rescue operations at the airport to persons outside the State Fire Service as part of the airport fire protection system), *Kwartalnik Krajowej Szkoły Sądownictwa i Prokuratury*, 42, 2, pp. 59–80.
36. Sudoł, S., (2014). Podstawowe problemy metodologiczne nauk o zarządzaniu (Basic methodological problems of management science). *Organizacja i Kierowanie (Organization and Management)*, no. 1.
37. Tłoczyński, D., (2013). Kierunki rozwoju transportu lotniczego (Directions of development of air transport), *Economic Studies*, 143.
38. Warsaw Chopin Airport, (2022). *Airport Fire Service*. <https://lotnisko-chopina.pl/pl/lotniskowa-straz-pozarna.html>. [01.08.2022].
39. Warsaw Chopin Airport, (2022). *Airport Security Guard*. <https://www.lotnisko-chopina.pl/pl/straz-ochrony-lotniska.html#tab360>. [01.08.2022].
40. Wiśniewski, R., (2015) *Zarządzanie bezpieczeństwem cywilnych portów lotniczych w Polsce: uregulowania prawne, zagrożenia, system (Security management of civil airports in Poland: regulations, threats, system)*, Warsaw: Defense Knowledge Society.
41. YELLOWPLACE, (2022). *Description of fire protection activities at Okęcie Airport in Warsaw*. <https://yellow.place/pl/lotniskowa-straz%C5%BC-po%C5%BCarna-warszawa-ok%C4%99cie-okecie-poland> [01.08.2022].
42. Żmigrodzka M., Krakowiak E., (2018). *Systemy zabezpieczeń technicznych w ochronie portu lotniczego (Technical security systems in airport security)*, Warsaw: Publishing House of the Warsaw University of Technology.

## ZARZĄDZANIE BEZPIECZEŃSTWEM PORTÓW LOTNICZYCH W KONTEKŚCIE OCHRONY PRZECIWOŻAROWEJ NA PRZYKŁADZIE LOTNISKA CHOPINA W WARSZAWIE

### Abstrakt

Zarządzanie bezpieczeństwem portów lotniczych jest bardzo szybko rozwijającym się procesem, co przekłada się na powstawanie nowych uregulowań prawnych, nowych procedur czy wyposażenia i nabywania nowych umiejętności personelu lotniczego. Ochrona przeciwpożarowa Lotniska Chopina w Warszawie to przykład, który ma ukazać dążący do perfekcji schemat działania podmiotów odpowiedzialnych za bezpieczeństwo, ujęty w procesie zarządzania bezpieczeństwem, mogący być naśladowany przez inne instytucje. Istotą artykułu jest identyfikacja kluczowych

czynników determinujących bezpieczeństwo portu lotniczego na przykładzie Lotniska Chopina w Warszawie. W artykule przedstawiono wyniki badań własnych. Analiza wywiadów eksperckich przeprowadzonych z personelem lotniska odpowiedzialnym za bezpieczeństwo oraz z funkcjonariuszami Państwowej Straży Pożarnej pokazała rzeczywistość zarządzania bezpieczeństwem portów lotniczych z perspektywy podmiotu za nie odpowiedzialnego. Dostrzeżono dzięki temu nowe kierunki zmian i obszarów wymagających doskonalenia. Wynikiem przeprowadzonych wywiadów jest opracowanie autorskiej koncepcji doskonalenia narzędzi wykorzystywanych w ramach Safety Management System na Lotnisku im. Fryderyka Chopina w Warszawie.

**Słowa kluczowe:** zarządzanie bezpieczeństwem, Safety Management System, ochrona przeciwpożarowa, port lotniczy, bezpieczeństwo portów lotniczych