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## Impact of the Epidemic Threat on Changes in the Civil Aviation Security System due to SARS-CoV-2 Pandemic

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### **Abstract:**

**Purpose:** The purpose of this paper is to diagnose the impact of the epidemic threat on air transport as illustrated by the case of the SARS-CoV-2 epidemic, and to forecast possible changes in the civil aviation protection system.

**Design/Methodology/Approach:** An analysis of the evolution of the world's passenger traffic since 1945 in the context of changes in the world's civil aviation security system shows that the two major events of the 9/11 attack and the SARS epidemic have brought a decrease in the number of passengers carried. While the 9/11 attack entailed deep changes in the security system, the SARS epidemic has not resulted in deployment of additional safety measures. The purpose of the methodology employed, based on a system analysis, a trend analysis and passenger surveys, was to forecast changes in the civil aviation security system.

**Findings:** Empirical studies show that the current SARS-CoV-2 pandemic has been unprecedented in terms of a decrease in passenger numbers, so an analysis of the already deployed ad hoc changes as well as efforts to deploy additional security measures demonstrates the permanent character of those changes in the system of safeguarding civil aviation against epidemic threats. This conclusion is confirmed also by air passenger surveys.

**Practical Implications:** The study has practical implications for the direction of changes in the civil aviation protection system in response to the epidemic threats and implementation of additional safeguards.

**Originality/value:** The 9/11 terrorist attack brought changes in the global civil aviation security system. On the other hand, no lessons were learnt from the previous SARS epidemic and no additional safeguards were implemented against the epidemic threat. Interpretation of the study findings has allowed the authors to conclude that changes in the aviation system are made with respect to incurred events, and therefore an analysis of trends can be utilised in pro-active safety and security measures in the civil aviation.

**Keywords:** SARS-CoV-2 pandemic, safety and security of civil aviation.

**Paper Type:** Research study.

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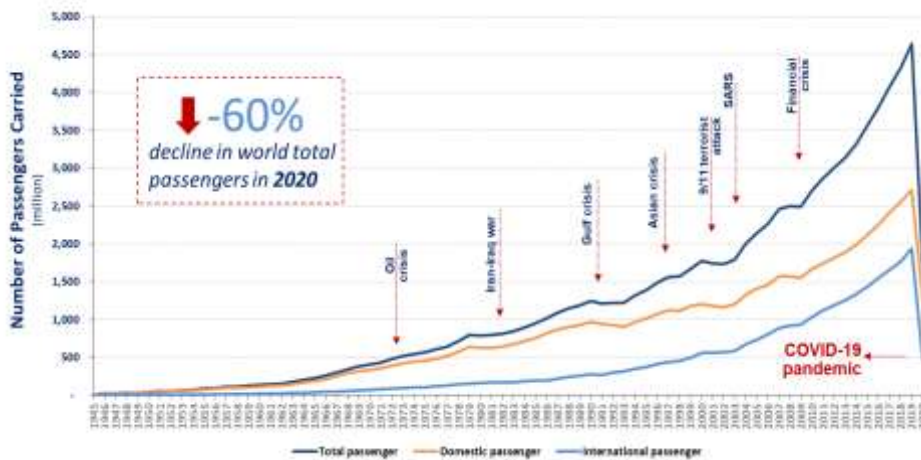
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## 1. Introduction

With its special character and functions, i.e., related to transfers, services, integration, location and acceleration, air transport is among every State's key mode, of transport. Uninterrupted development of air transport is a priority in transport policies of not only States but also - due to global links between supply chains and passenger traffic flows - the international community. Analysing trends in the development of air services in terms of passengers carried, one can notice that slumps in the global passenger traffic coincide with events that have no precedent in history. Interestingly, these events are of regional significance, but cause global effects.

All such events can be categorised into a certain security sector, not necessarily associated with civil aviation, e.g., the Iran-Iraq war (the military sector), the financial crisis (the economic sector) and epidemics in social sectors (Buzan *et al.*, 1998). Figure 1 shows the impact of selected crises on global passenger traffic trends.

**Figure 1.** World passenger traffic evolution 1945 – 2020.



**Source:** ICAO, <https://www.icao.int/Newsroom/Pages/2020-passenger-totals-drop-60-percent-as-COVID19-assault-on-international-mobility-continues.aspx>

The timeline includes events of importance to air transport, i.e., the oil crisis in 1973 which entailed a drastic rise in fuel prices caused by the embargo imposed on the USA by OPEC Member States following the outbreak of the Israeli-Arab war, the Iraq-Iran war in 1980-1988, the Gulf conflict in 1990-1991, the Asian financial crisis in 1997, the terrorist attack on the World Trade Centre in 2001, the SARS-CoV epidemic in 2003, and the global economic crisis in the financial and banking markets which took place in 2008-2009 following the slump on the high-risk mortgage loan market in the USA. The Y axis shows passenger traffic flows.

Only one of the above events causing clear falls and slumps in air services, i.e., the 9/11 terrorist attack on the USA, targeted specifically the safety of civil aviation. However, what is important to the analyses in this paper lies in three events directly related with the safety of air transport shown in Figure 1, i.e., the 9/11 terrorist attack, SARS and COVID-19.

While the 9/11 terrorist attack gave rise to significant changes in the civil aviation security system (for details see further sections of this paper), the previous SARS-CoV epidemic was not reflected in any new safeguards against negative effects on air services in the future. The negative impact caused by the other events shown in the figure was indirect and resulted in the overall economic situation and its effect on the airline industry.

## **2. Research Methodology**

Civil aviation security systems represent entities comprised of such elements as the safety environment, legal standards, institutions, and detailed forms of security which ensure the achievement of a defined safety level in air services, as well as interrelations between those elements. The application of the system analysis method, which involves an intellectual and logical division of the subject of the study (i.e., the civil aviation security system) into individual components in order to investigate their properties or structural features, as well as interrelations between them, allowed the authors to treat the studied phenomenon in the world's air services as a comprehensive system consisting of specific subsystems, and to consciously use a civil aviation security model with a specific level of resolution in organisational and procedural terms, expressing a specific aspect of operations in order to achieve the desired state of air transport safety.

As a result, this allowed capturing the changes in safeguards introduced after the 9/11 attacks. Combined with the method of analysis of trends in the evolution of air carriage of passengers, it allows making a probabilistic determination of the civil aviation security system's response to the SARS-CoV-2 pandemic and placing the anticipated safeguards in a specific place within the system. Anticipation based on changes taking place in the environment is essential for planning future growth strategies both in the case of individual business operators and the entire economies, sectors, and industries. Such anticipation is extremely difficult for several reasons.

Firstly, an analysis of phenomena taking place in the environment can regard either the environment's characteristics at a given moment or indicate the variability of the environment over time. In turn, an analysis of the environment's variability can concentrate either on the historical or future perspective. Secondly, one must be aware that phenomena taking place in the environment can differ in terms of duration as well as spatial, sectoral and market coverage. For this paper, trends were defined as either short or long-term regional or global trends, described most often in economic, sociological, or psychological categories, and affecting different business sectors

(Hajdas *et al.*, 2016). Based on the aforementioned methods, the authors analysed the crisis events with a negative impact on air transport in terms of passengers carried between 1945 and 2020 as shown in Figure 1, and illustrated, in Figure 2, the changes in the model of the civil aviation security system following the terrorist attack of 2001, as well as changes brought by *ad hoc* and planned long-term safeguards related with the SARS-CoV-2 pandemic in 2020.

The analyses of possible new safeguards in response to the epidemic threats were complemented by feedback from air passengers obtained because of a survey designed for this paper and conducted in a group of 113 passengers using air services during the SARS-CoV-2 pandemic. The survey was conducted at the Katowice International Airport between 29 March and 2 April 2021 among randomly selected passengers in their departure and arrival destinations. The passengers were asked 5 questions correlated with analyses regarding changes in the civil aviation security system due to the SARS-Cov-2 pandemic.

The question regarding an opinion about what more negative effects on the aviation industry, terrorism or the SARS-CoV-2 pandemic had, was correlated with the data shown in in Figure 1. The question about the passengers' subjective feelings regarding terrorism and the SARS-CoV-2 pandemic was meant to obtain opinions about the current pandemic situation from people who were during their air travel and faced with health checks, which allowed illustrating the public awareness of the threats. The next question was regarded an opinion about the effectiveness of the tools deployed to counter terrorism, which was correlated with the related changes and current model of the civil aviation security system as presented in Figure 2.

The other two questions were meant to learn the passengers' opinions about the effectiveness of the tools deployed at airports to detect persons infected SARS-CoV-2, and about *ad hoc* and proposed long-term safeguards meant to reduce the effects of the pandemic on the aviation industry in the future, which was correlated with the model of changes presented in Figure 3.

### **3. Civil Aviation Security System and Defined Threats**

Pointing to the 9/11 terrorist attack as a historical event that caused global effects for passenger transport, one should stress that it also brought global changes in the civil aviation security system in the form of new security measures, i.e. introduction of airport ID cards with a division into authorised access zones, background checks for persons with access to restricted airport zones, introduction of in-flight security officers on board aircraft, physical barriers in the form of bulletproof doors separating the cockpit from the passenger compartment, use of explosive trace detection equipment and liquid explosive detection equipment.

When analysing trends of changes within the civil aviation security system alone, one can notice that the evolution of civil aviation services is marked by points that changed the safety and security determinants in civil aviation long before the 9/11 attack, e.g., obligatory baggage reconciliation and unloading the baggage of a passenger withdrawn from flight, introduced following the 1988 Lockerbie terrorist attack. An aircraft became an instrument of political pressure and fight, seeking objectives and satisfying interests of individuals, groups and even States already in the 1960s, as a result of which the international community initiated a number of legal and organisational changes that are attributable to the beginning of international anti-terrorist law known also as the Tokyo-Hague-Montreal system (Siadkowski, 2015).

Indeed, aircraft hijackings were the primary events that triggered international legal initiatives leading to the establishment of a catalogue of defined threats referred to as acts of unlawful interference<sup>3</sup>. The broad definition of an AUI (as an act or attempted act such as to jeopardize the safety of civil aviation and air transport) and the catalogue of those acts was followed by the introduction of security standards understood as any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation (Annex 17, 2017).

It must be emphasised that standards introduced are independent from the defined level of risks of such acts. The attacks of 11 September 2001, in which aircraft were used as tools as well as targets of attack, represent the turning point which changed the principal paradigm associated with the protection of civil aviation against broadly understood terrorism. However, contrary to the general belief, civil aviation security is not limited to countering only terrorist threats.

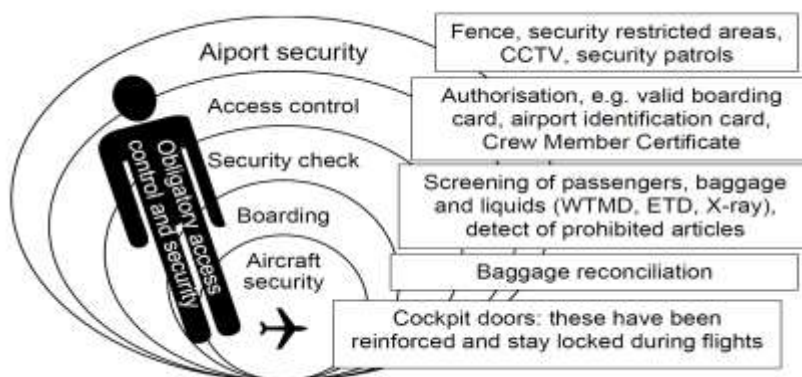
Figure 2 shows the structure of the universal civil aviation security system, including the most important elements deployed in the system following the 9/11 attack.

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<sup>3</sup>*The Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation (Montreal Convention), which was signed on 23 September 1971 and entered into force on 23 January 1973 defines acts that comprise the basis for the conceptual range of the term Act of Unlawful Interference. Article 1 of the Convention provides a catalogue of acts considered as criminal transferred to other acts of international law (Annex 17 to the Convention on International Civil Aviation: Security, Safeguarding International Civil Aviation Against Acts of Unlawful Interference (10th ed.), ICAO, Montreal, Canada 2017 p. 1/7/11) and defines an act of unlawful interference in civilian aviation as an unlawful and intentional acts involving: unlawful seizure of aircraft; destruction of an 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.*

Generally, whether at international level (Annex 17), EU level (Commission Implementing Regulation (EU) 2015/1998) and national level (Air Law Act, National Programme for Civil Aviation Security), the civil aviation security system is coherent, with the only differences lying in State-specific organisational conditions.

**Figure 2.** Main changes in the world's civil aviation security system following the 9/11 attack.



*Source:* Authors' own work.

Regulations create a whole subjective and organisational system which can be termed as an "obstacle course". The idea is to put as many detection points as possible along the path of a potential perpetrator to the aircraft. Accordingly, the widest ring of protection is airport security by means of technical barriers, perimeter detection combined with CCTV, and physical patrols conducted by security services. Access control is closely connected with the division of an airport into zones where access is restricted due to the need to be there and the necessary authorisation. Security check is the key point in the system which changes notably with every event that affects the security level (Siadkowski, 2020).

The standing rule is that access to the restricted zone requires checks of all persons entering the zone, regardless of their status (passengers, crew, maintenance, or other personnel). Passengers and personnel are subject to security checks with at least one of the following methods: hand search, walk-through metal detection equipment (WTMD), explosive detection dogs, explosive trace detection (ETD) equipment, security scanners which do not use ionising radiation (Skorupski and Uchroński, 2017). If manual check is not desirable, an operator may use ETD equipment combined with handheld metal detection (HHMD). Likewise, passenger's hand baggage is checked with at least one of the following methods, hand search, x-ray equipment, explosive detection systems (EDS) equipment, explosive detection dogs in combination with hand search and ETD equipment (European Commission, 2015).

Following the 9/11 attacks, changes in aircraft security were also introduced, including bulletproof doors which stay locked during flight to prevent unauthorised access to the crew. It is also a standard that flights exposed to a high risk of acts of unlawful interference have armed in-flight security officers, the so-called sky Marshalls.

In the practice of security measures, the above represent just a general framework which is complemented by a number of rules, e.g. regarding liquids checks introduced after the failed attacks in 2006 in London involving liquid explosives, or checks of electronic devices, which make the system much more effective and efficient (Skorupski and Uchroński, 2018).

Bearing in mind that every system is characterised by specific performance and effectiveness, and that full detectability is impossible to achieve, the respective methods are used in a manner that is random and unpredictable both for the security operator and the subject of the process (Uchroński, 2020). Despite the defined threats specified in the catalogue of acts of unlawful interference (see Footnote 3), historically known tactics of perpetrators, the *modus operandi* is continuously modified, which makes changes to the system rather proactive and reactive.

#### **4. Global Impact of COVID-19 on Selected Sectors of Economy Related to the Aviation Market**

The end of 2019 and the arrival of the COV-19 virus completely changed the face of the global social and economic system. Restrictions imposed on respective modes of transport almost completely halted people's migration worldwide. This could be seen, in air transport, where the pace and range of effects as well as the multinational character of those involved in that form of transport allowed the virus to spread fast and in various parts of the globe.

The phenomenon affected the world's economic systems on the scale that had no precedent since 1945, which is illustrated in Figure 1. In absence of any measures to counteract the spread of the infection, it is natural and obvious to introduce social isolation, which resulted in drastic restrictions on people's movements, including by air. For entities whose operations were based on passenger transport, the lack of demand for transport services entailed numerous financial complications and problems with the supply chain continuity (Serrano and Kazda, 2020). The slump in the transport market, in particular the carriage of passengers, can be seen clearly in the case of airports (Nizetic, 2020). Shown below are estimates regarding the impact of the Covid-19 pandemic on selected sectors of economy (Table 1).

#### **5. Civil Aviation Security System and Epidemic Threats**

The coronavirus pandemic would not have reached its scale so fast without the involvement of air services as a transmitter, allowing infected people to move between

all continents. Apart from the economic effects for the aviation industry (Godwell *et al.*, 2020), which was put on standstill by many governments during the pandemic, the outcomes will be far-reaching, with safeguarding the passengers against the biological factor becoming a necessary element of the transformation of security systems. While the aviation industry effectively tackled the terrorist threat by introducing and continuously developing new technologies, the biological factor exposed its almost complete helplessness as regards detection and spread prevention. Notably, the biological factor can be used for launching acts of terrorism (the so-called bioterrorism).

**Table 1.** *Impact of the Covid-19 pandemic on selected sectors of economy*

<b>Sector</b>	<b>Impact of COVID-19</b>
Air passenger traffic	An overall reduction of air passengers (both international and domestic) ranging from 60% in 2020 compared to 2019 (by the International Civil Aviation Organization - ICAO)
Airports	An estimated loss of approximately 64.2% of passenger traffic and 65% or over USD 111.8 billion airport revenues in 2020 compared to business as usual (by the Airports Council International - ACI)
Airlines	A 65.9% decline of revenue passenger kilometres (RPKs, both international and domestic) in 2020 compared to 2019 (by the International Air Transport Association - IATA)
Tourism	A decline in international tourism receipts of between USD 910 to 1,170 billion in 2020, compared to the USD 1.5 trillion generated in 2019, with 100% of worldwide destinations having travel restrictions (by the UN World Tourism Organization - UNWTO)
Trade	A fall of global merchandise trade volume by 9.2% in 2020 compared to 2019 (by the World Trade Organization WTO)
Global economy	A projected -3.5% to -4.3% contraction in world GDP in 2020, far worse than during the 2008–09 financial crisis (by the International Monetary Fund - IMF and World Bank)

**Source:** *Impacts of COVID-19 across industries by ICAO at:*

<https://www.icao.int/sustainability/Pages/Economic-Impacts-of-COVID-19.aspx>.

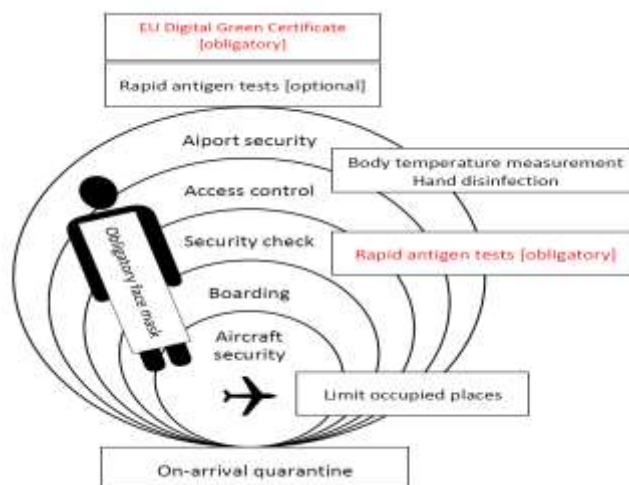
When analysing the events that had impact on the slump in the air passenger market, one could presume that COVID-19 is a completely new and previously undefined threat, and therefore its drastic impact on the aviation industry and lack of developed response procedures are justified. However, the aviation industry already had some experiences with epidemics such as SARS, shown in Figure 1, as well as swine flu, MERS, or Ebola or Zika viruses. They disrupted global air travel to a varying degree, but the effects of COVID-19 for the aviation industry are unprecedented and cannot be compared to any historical crisis after World War II.

Interestingly, previous epidemics and restrictions on movements of infected people by air have already been discussed in academic studies and research (Khan *et al.*, 2009). The way people travel by air will undoubtedly change, although it cannot be



fully predicted how the coronavirus will affect long-term travel and passenger behaviour patterns. Beyond all doubt, the screening system will be expanded (Suau-Sanchez *et al.*, 2020). These strategies will certainly become an integral part of planning and designing all terminal projects, allowing passenger terminals to be open and flexible to both expected and unexpected changes. Figure 3 presents changes in the civil aviation security system with respect to epidemic threats (the black colour marks changes introduced in response to the threat, and the red colour represents ones which, according to the authors, will become obligatory elements of the systemic changes).

**Figure 3.** Forecast changes in the world's civil aviation security system following the 9/11 attack.



**Note:** The black colour shows safeguards introduced in the civil aviation security system reactively. The red colour shows proactive safeguards which, according to the authors, will be introduced as a permanent response to the epidemic threat.

**Source:** Authors' own work.

As can be seen, elements of the system have remained unchanged with respect to the defined threats. However, those elements that are additional forms of control have changed and will continue to change. This said, it is necessary to distinguish between the elements which were introduced only for the duration of the crisis and the proactive ones introduced in response to the crisis after it has ended. In the public space, limiting the transmission of the virus is focused on social discipline by social distancing, wearing face masks and disinfection (Al-Maschhandani *et al.*, 2020).

Technological solutions involving detection of potential biological threats at airports are relatively scarce. As regards the reactive aspect, airports use thermal scanners and handheld thermometers to check arriving and departing passengers for higher body temperature and to decide whether they are fit for boarding. Such recommendation has been issued for airport managers by the Airport Council International (ACI),

pointing to screening checks as the primary method of detection (ACI, 2020) and offering, in collaboration with an external consulting firm, design packages for airport test centres (ACI, 2021). Legal instruments require passengers to produce results of a mandatory test for the presence of the virus conducted not later than 72 hours prior to their flight. Legal solutions which differ from State to State involve introduction of seating limits on aircraft and quarantine for people arriving from abroad.

Under standard conditions, passenger checks require a continuous and direct contact with a passenger, interference with their privacy (e.g., during a hand search) and verification of their personal belongings carried in hand baggage (Skorupski and Uchroński, 2015). In the situation of the epidemic threat, all these standard measures take a completely different dimension. On the one hand, security checks are obligatory in accordance with legal requirements, but on the other - it is also necessary to ensure the required protection of the personnel against infection.

These contradictory areas, which equally determine airports' operational readiness, have contributed to the need to verify the current internal procedures. The individual protection measures introduced, such as social distancing, face masks and disinfection, have forced some changes also in the technology of working at security check points. For example, a very close-contact and primary method of hand checks of passengers has been replaced with checks conducted by means of explosive trace detection equipment. Changes in the technology of working at security check points have also affected the feeling of security on the part of passengers and the effectiveness of the checks.

In terms of forecasting, the COVID-19 outbreak, which has produced the most significant outcomes for air passenger transport so far, will entail global changes in the civil aviation security system. The epidemic threats are accompanied by one more formal problem regarding the area into which the threats should be categorised – safety or security. It is important in so far as the area of safety concerns flight operations, whereas the area of security deals with such intentional and conscious acts of unlawful interference as terrorism (Siadkowski, 2013).

However, looking at the civil aviation security system, placing obligatory swabs for the presence of the biological factor in this latter area as a new form of a security check is to the greatest degree justified by the development of the dedicated technology, location of check points in the check-in process and experiences of security services.

At regional level, an initiative in movement has been already undertaken by the European Commission. Free flow of people, one of the four fundamental freedoms, is the fundamental right granted to citizens of the European Union under Treaties, as regulated in detail in the Directive (The European Parliament, 2004). The Commission proposes establishing an EU-wide framework under the name "Digital Green

Certificate" (DGC), which means an interoperable certificate containing information about the vaccination, testing and/or recovery status of the holder issued in the context of the COVID-19 pandemic.

A detailed scope of DGC information is set forth in Article 3 as one that allows the issuance and cross-border verification and acceptance of any of the following certificates, certificate confirming that the holder has received a COVID-19 vaccine in the Member State issuing the certificate ("vaccination certificate"), certificate indicating the holder's result and date of a NAAT test or a rapid antigen test listed in the common and updated list of COVID-19 rapid antigen tests established on the basis of Council Recommendation 2021/C 24/01 ("test certificate") or certificate confirming that the holder has recovered from a SARS-CoV-2 infection following a positive NAAT test or a positive rapid antigen test listed in the common and updated list of COVID-19 rapid antigen tests established on the basis of Recommendation 2021/C 24/01 - "certificate of recovery" (European Commission, 2021).

Introduction of the Digital Green Certificate seems to be a response to the problems faced by transport industries, including air transport, on the one hand, and a sign of concern to maintain the freedom of movement as one of the fundamental treaty freedoms, on the other. There are also some critics who claim that privileged social groups are being created who will be able to travel more easily. Undertaken in response to the specific COVID-19 treat, the initiative contributes to the solutions regarding the epidemic threat in general.

## **6. Passenger's Experience**

As demonstrated earlier in this paper, the largest changes in the civil aviation security system took place after the 9/11 attacks, which did not entail as large a regression in passenger transport as caused by the current COVID-19 pandemic. Surveys conducted among passengers showed trends regarding reevaluation of the threats defined as acts of unlawful interference and the dedicated security measures deployed within the civil aviation security system, following the 2001 terrorist attacks. The feedback obtained during the surveys, more than 96.3 % of passengers regarded the current COVID-19 pandemic as having a more negative impact on the aviation industry. Only 3.7 % of passengers pointed to terrorism. These opinions are correlated with the objective data regarding the number of journeys effected in air transport as shown in Figure 1.

The surveys have produced an interesting problem which clearly reaches beyond the scope of this paper due to the psychological aspects of the functioning of societies in crisis situations. The safeguards deployed after the terrorist attacks represented a determinant of security against threats of that type. The pandemics, however, redefined passengers' views about the dominant threat in the model of the civil aviation security system following the 2001 attacks. According to the results of the surveys, 96% of the respondents expressed concerns about becoming infected with the SARS-CoV-2 virus, whereas only 3.6% were afraid of a terrorist attack. As a result

of the unprecedented decrease in passenger flights and the restrictions on air travel, a change is becoming to be noticeable in the air transport security determinants.

The global model of the civil aviation security system and its security measures are shown in Figure 2. The number of terrorist attacks targeted against air transport, as monitored, and reported by many government and academic institutions, e.g., the Global Terrorism Database, shows that the system is effective. Passenger opinions are correlated with this data. 95.7% of passengers believed the aviation industry had deployed effective measures to counteract the terrorist threat. Only 4.3 % of the respondents disagreed.

As regards the objective data shown in Figure 1 and indicating an unprecedented slump in air transport because of the SARS-CoV-2 pandemics, passengers were asked about the effectiveness of the safeguards deployed in response to the epidemic threat. Unlike the terrorism, 97.4% of passengers believed the aviation industry had failed to deploy effective measures to detect persons infected with the SARS-CoV-2 virus, compared with the safeguards against terrorism. Only 2.6% of the respondents confirmed these tools to be effective. The respondents' opinion expresses their objective feelings regarding the area in question and is based on their own experiences and observations as well as a subjective assessment of the security level made while travelling.

Apart from the negative effects for air transport caused by the pandemics, and fears felt by the passengers who continue to use air transport regardless, the key issue in this study was to define possible methods of counteracting the transmission of infectious diseases through air transport. The problem in question has a much greater importance for the continuity of transport not only by air, but also in general. Indeed, the solutions deployed will be decisive for the development of air transport, which due to its international character shows the greatest sensitivity to all geopolitical and social distortions in each country.

The passengers surveyed could either propose any solution in the area concerned or choose an answer from the list, in which there were two changes in the civil aviation security system forecast by the authors, i.e., the introduction of epidemic passports containing information about vaccinations against infectious diseases, the holder's history of infectious diseases and valid tests for infectious diseases, and the mandatory pre-flight security checks meant to detect infected persons e.g., by means of quick antigen testing.

The authors based their forecasts on measures taken by State authorities to counteract the spread of COVID-19, which the latter were obliged to deploy at the Katowice International Airport as part of their professional tasks. Months of fighting the pandemic which the global community has not experienced before having allowed, as of now, developing only those measures to restore air traffic that are shown in Figure 3. For this reason, a clear majority of the respondents opted for the two forecast

changes, with only slight differences in favour of epidemic passports (77.5% of the respondents) compared to security checks for the presence of an infectious disease (75.7% of the respondents). The human civilisational development has been inherently tied with transport and the need to move. This was expressed in the survey findings, where the passengers pointed to the necessity to deploy solutions that would allow them to use air transport.

In summary, the passenger opinions obtained through the surveys are correlated with the data on the slump in air transport, unprecedented after 1945, in terms of passengers carried and the assessment of the efficiency of the safeguards deployed, both ad hoc and long-term ones.

## **7. Summary and Concluding Comments**

The study clearly demonstrated interrelations between the functioning of air transport and the jointly considered context of epidemic safety and civil aviation security. Both the historical data and the surveys conducted at the Katowice International Airport showed that civil aviation is a mode of transport that is very sensitive to any geopolitical and social disruptions. Also, due to the international character of this mode of transport, its functioning is strictly related with the global deployment of a systemic approach to ensuring the safety of flight operations. The epidemic threat, which has never been analysed in transport on such a wide scale, has redefined the safety and security determinants in air transport.

Due to the limited scope of this paper, the authors wish to refer the reader to comprehensive studies which correlate with the ones conducted for the purpose of this publication, which give foundations for wider reasoning on the said determinants (Siadkowski, 2011; Siadkowski, 2013). Faced with the practically continuous terrorist threat, several measures taken by State authorities were aimed mainly at ensuring appropriate effectiveness in detecting objects and substances which could be used for committing acts of unlawful interference during flight. This is the area where, historically, the greatest number of changes can be seen at legal, organisational, technical, and technological levels. The surveys conducted among air passengers confirmed the acceptance of the survey sample for the ad hoc and long-term safeguards against epidemic threats.

However, one can notice a relatively explicit response of the society to the new threat posed by the pandemic. Despite similar situations already experienced in the past, the effects of COV-19 have no precedent in history of air transport. The global model of safeguarding civil aviation against threats defined as acts of unlawful interference, in particular terrorism, after the 2001 attacks did not provide for deploying safeguards against epidemic threats. Passengers' concerns can be seen clearly in the survey findings. The passengers gave their negative opinion about the system of protecting passengers against infectious diseases in place at international airports. It must be emphasised that this globally unprecedented situation, the fall in the number of

passengers carried and, consequently, unprecedented financial losses suffered by the aviation industry (Wąsowska *et al.*, 2021) have changed and will continue to change the face of air transport.

Furthermore, the SARS-CoV-2 pandemic has shown that protecting the financial standing of the world's economies and ensuring free movement of people require equal counteraction against acts of unlawful interference and infectious diseases across the entire transport system. It must also be highlighted that these measures will have a significant impact on the development of technologies, the legal regime and consequently the passenger service.

Based on the already deployed solutions and ones that are being proceeded, and as a result of their systemic and trend analyses, the authors have presented ad hoc and long-term systemic solutions, as proposed in accordance with organisational and legal efforts made by national and EU bodies, as regards deployment of additional safeguards at security check points, as well as ones that extend beyond but are directly connected with air transport. Examples of those changes include the solutions that have been dynamically implemented over the past several months to counteract the spread of the COVID-19 virus at airports, such as social distancing, disinfection and quarantine understood as isolation of the infected and potentially infected.

The global vaccination programme and introduction of so-called COVID passports are further action which protect the public against that infectious disease. This is undoubtedly just the beginning of changes which are bound to be deployed in public transport, and in particular international transport. This study permits also drawing a conclusion which has a practical dimension and is directly related with the public opinion, which plays an important role in generating the demand for air transport.

The evolution of air passenger transport and its pace will most importantly depend on the progress in technologies which allow effective detection and counteraction of infectious diseases (Serrano and Kazda, 2020). Given the sharp fall in passenger traffic during the pandemic, it will play a key role in determining the progress in the field of the world's economy represented by transport.

## **References:**

- Act of 1 July 2002. Air Law Act. Journal of Laws 2020. 1970.
- Airport Council International. 2020. Airport Operational Practice Examples for Managing COVID-19, Montreal,7. <https://store.aci.aero/wp-content/uploads/2020/04/Airport-Operational-Practice-Examples-for-Managing-COVID19.pdf>.
- Airport Council International. 2021. Airport COVID-19 Testing Planning Tool. Montreal. <https://aci.aero/about-aci/priorities/health/airport-covid-19-testing-planning-tool/>.
- Al-Maschhandani, S.H., Al-Sharify, Z.T., Kariem, N.O. 2020. Investigating the spread of coronavirus (covid-19) at Airports and methods of protection. Journal of Engineering and Sustainable Development.

- Buzan, B., Wæver, O., De Wilde, J. 1998. *Security: A New Framework for Analysis*. London, 22-23.
- European Commission. 2015. Commission Implementing Regulation (EU) 2015/1998 of 5 November 2015 laying down detailed measures for the implementation of the common basic standards on aviation security. *Official Journal of the European Union*. L 299/14-18.
- Hajdas, M., Szabela-Pasierbińska, E. 2016. Methods of predicting trends in macro-environment. *Research Papers of Wrocław University of Economics* 459. DOI: 10.15611/pn.2016.459.22.
- ICAO. 2017. *Annex 17 to the Convention on International Civil Aviation: Security, Safeguarding International Civil Aviation Against Acts of Unlawful Interference* 10th ed. Montreal, Canada.
- ICAO Economic Development. 2021. *Impacts of COVID-19 across industries*. Montreal. <https://www.icao.int/sustainability/Pages/Economic-Impacts-of-COVID-19.aspx>.
- ICAO, Uniting Aviation. 2020. *World passenger traffic evolution 1945–2020*. Montreal. <https://www.icao.int/Newsroom/Pages/2020-passenger-totals-drop-60-percent-as-COVID19-assault-on-international-mobility-continues.aspx>.
- Khan, K., Eckhardt, R. et al. 2009. Entry and exit screening of airline travellers during the A(H1N1) 2009 pandemic: a retrospective evaluation. *Bulletin of the World Health Organization*. <https://www.who.int/bulletin/volumes/91/5/12-114777/en/>.
- Nhamo., G., Dube, K., Chikodzi, D. 2020. Impact of COVID-19 on the Global Network of Airports. DOI: 10.1007/978-3-030-56231-1\_5. In book: *Counting the Cost of COVID-19 on the Global Tourism Industry* 109-133. Publisher: Springer, Cham.
- Nizetic, S. 2020. Impact of coronavirus (COVID-19) pandemic on air transport mobility, energy, and environment: A case study. *International Journal of Energy Research*, 44(13).
- Regulation of the Minister of Infrastructure of 2 December 2020 on the National Program for Civil Aviation Security. *Journal of Laws* 2021, 17.
- Serrano, F., Kazda, A. 2020. The future of airports post COVID-19. *Journal of Air Transport Management*, 89, 101900. DOI: 10.1016/j.jairtraman.2020.101900.
- Siadkowski, A.K. 2013. Bezpieczeństwo i ochrona w cywilnej komunikacji lotniczej na przykładzie Polski, Stanów Zjednoczonych i Izraela. *Studium politologiczno- prawne*, Wydawnictwo Wyższej Szkoły Policji, Szczytno, 58, 409-420.
- Siadkowski, A.K. 2020. Bezpieczeństwo i ochrona w komunikacji lotniczej – technologie w obliczu nowych zagrożeń. *Bezpieczeństwo. Teoria i Praktyka*, Nr 3(XL). DOI: 10.48269/2451-0718-btip-2020-3-001.
- Siadkowski, A.K. 2011. Determinants of civil aviation safety in theory and empirical research. *Wydawnictwo Centrum Bezpieczeństwa Ruchu Drogowego*, Łódź, 28-56
- Siadkowski, A.K. 2015. *Prawodawstwo w ochronie lotnictwa cywilnego*. Wydawnictwo Wyższej Szkoły Biznesu, Dąbrowa Górnicza, 27-35.
- Skorupski, J., Uchroński, P. 2015. A fuzzy model for evaluating airport security screeners' work. *Journal of Air Transport Management*, 48, 42-51.
- Skorupski, J., Uchroński, P. 2017. A fuzzy model for evaluating metal detection equipment at airport security screening checkpoints. *International Journal of Critical Infrastructure Protection*, 16, 39-48.
- Skorupski, J., Uchroński, P. 2018. Evaluation of the effectiveness of an airport passenger and baggage security screening system. *Journal of Air Transport Management*, 66, 53-64.

- Suau-Sanchez, P., Voltés-Dorta A., Cugueró-Escofet, N. 2020. An early assessment of the impact of COVID-19 on air transport: Just another crisis or the end of aviation as we know it? *Journal of Transport Geography*.
- Uchroński, P. 2020. Analysis of psychophysical predispositions of persons performing tasks of security control operators. 35th IBIMA.
- The European Commission. 2021. Proposal for a Regulation of The European Parliament and of The Council on a framework for the issuance, verification and acceptance of interoperable certificates on vaccination, testing and recovery to facilitate free movement during the COVID-19 pandemic, COM(2021) 130 final, 2021/0068(COD), Brussels, 18-19.
- The European Parliament. 2004. Directive 2004/38/EC of The European Parliament and of The Council of 29 April 2004 on the right of citizens of the Union and their family members to move and reside freely within the territory of the Member States amending Regulation (EEC) No. 1612/68 and repealing Directives 64/221/EEC, 68/360/EEC, 72/194/EEC, 73/148/EEC, 75/34/EEC, 75/35/EEC, 90/364/EEC, 90/365/EEC and 93/96/EEC. *Official Journal of the European Union*. L 158.
- Wąsowska, K., Wincewicz-Bosy, M., Dymyt, M. 2021. The Impact of Covid-19 on Air Transport Operation in Poland. *European Research Studies Journal*, 23(2), 530-531.