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EFFECTIVENESS OF PREVENTIVE SECURITY MEASURES AND CRIMINAL ACTS AGAINST CIVIL AVIATION

Summary. The development of measures in civil aviation protection against illegal acts is based on the analysis of incidents, which can be divided into four development stages. Before 9/11, civil aviation entities were mostly reactive; only new threats warranted a proactive approach to mitigating air threats. The present article's aim was to analyse the development of methods for checking passengers and objects intended for air transport. The analysis of selected incidents, control processes, and the level of security achieved confirm that the implemented security methods and proactive approach to working with air traffic risks are a suitable compromise between passenger comfort, technological development of detection devices, and processes at the airport.

1. INTRODUCTION

The field of air transport is constantly responding to new technologies and ancillary equipment to protect the airport environment against possible hijackers without increasing the time required for transit and handling operations. Assessment factors include vulnerability, critical approach to protected entities, occurrence likelihood, and cost.

Regulation 300/2008 [1] defines a higher level of cooperation between aviation entities and a uniform interpretation of Annex 17 of the Chicago Convention for the States of the European Union on common rules in the field of civil aviation security. States may take especially stringent measures while maintaining an objective and non-discriminatory approach. A necessary condition is the requirement of proportionality to risk. Member states shall inform other member states, through the European Commission, of more stringent measures.

Article 2 of the regulation defines the implementation of aviation security measures for all airports located in the territory of a member state and all entities providing services to the interior and exterior of an airport. The material scope of the regulation does not differentiate between different categories of airports regarding their size, number of passengers, nature of air traffic, or frequency of flights. The solution would be to impose alternative security measures on each airport operator according to the airport's categorisation, by Recital 9 of Regulation 300/2008 and Article 4 [1], as well as in accordance with Regulation 1254/2009 [2].

Another important measure is the EU - One Stop Security initiative [3] in the field of aviation security, which recognises the security measures' equivalence in one state as at least equal in its security outcome to measures applied in another state. The measures applied in the participating countries vary considerably, despite formal uniform security measures at the airport level.

Process analyses in the areas of check-in, passenger security checks, security staff training, passenger boarding, and baggage retrieval are possible entry points for bringing prohibited articles

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onto aircraft. Airport security processes are implemented to prevent the introduction of prohibited articles – as defined in Commission Regulation (EC) No 820/2008 of 8 August 2008 – that may be misused to commit acts of unlawful interference that jeopardise civil aviation security in accordance with ICAO Annex 17 [4, 5]. Attacks against civil aviation can be classified as attacks on planes, airports, and airline buildings, according to the intended goal. It is important to evaluate whether the illegal act bears the hallmarks of terrorism. Hijackings may not always be associated with terrorism, while the sabotage of an aircraft or an armed attack on an airport may be a terrorist act. Hijacking is historically the most widespread illegal act in air transport. Between 1950 and 2021, hijackings accounted for 30,197% of all attacks on civil aviation. Between 1970 and 2021, there were almost 893 hijackings worldwide [6]. The motivations for hijacking are personal motives, hostage-taking, political reasons, being a refugee, or ensuring the aircraft arrives at a specific destination.

However, even for hijackers whose primary purpose is to re-route to another state, it cannot be ruled out that their motivation is politically, socially, religiously, or otherwise criminally motivated [7]. If hijacking is a form of protest, there is no direct threat to the passengers' health or lives. From 1950-2021, 81.2% of hijackings were politically, ethnically, nationally, or religiously motivated [6]. In other 4.5% of cases, the motivation was to obtain a ransom in exchange for hostages [7].

Thomas notes that, according to available data from 1967-2004, 15% of kidnappings were terrorist acts [8]. Hijacking motives can be divided into four categories: personal motives, hostage-taking, political motives, and asylum. According to the FAA's (Federal Aviation Administration) conclusions, the most common motive for hijacking was to flee the economic, political, or social situation in the hijacker's home state and seek asylum. Other frequent causes were the desire to avoid prosecution or deportation to the hijacker's home state, as well as various forms of mental disorders. As there are usually no warning signs for potential threats of this kind, it is difficult to prevent them.

2. AIR TRANSPORT AS A TARGET OF INTERNATIONAL TERRORISM

The ICAO has responded to a growing number of hijacking cases, namely through the Tokyo Convention of 1963 and the Hague Convention of 1970. In 1974, the "Anti-Hijacking Act" [9] was revised to define „aircraft piracy" as any command (or attempt to command) of an aircraft by the threat of force or violence or by any other form of intimidation. Significant changes in the process of air safety organisation resulted from the 9/11 attacks, as evidenced by the unprecedented increase in security staff, the implementation of 100% screening of checked baggage for explosives, and lists of wanted person's expansion on board.

Security processes have undergone the two most significant changes – namely, the passenger screening operations unification and the screening of all checked baggage for the presence of explosives. A proactive approach to civil aviation safety uses new approaches based on passenger profiling and recognising behaviour patterns. The profiling process detects abnormalities in passenger behaviour and detects the absence of normal behaviour based on the analysis of a person. During the detection control, when the process of behaviour pattern recognition (BPR) is used, the principle of equality of access is observed, as factors such as race, gender, and age are eliminated [10].

The BPR technique is a very advanced tool for eliminating risky passengers. The BPR technique has two phases. The first phase is suspicious behaviour identification. Selected persons are then subjected to a targeted interview with a member of the security forces. Behavioural analysis is a modern detection technique that requires trained security staff on the part of the airport operator, but it eliminates unwanted human rights approaches. The BPR method uses a synergistic approach based on patterns of behaviour while taking into account the ethnicity, religion, nationality, and travel information of passengers. Aviation security will continue to be based on detection methods that are regularly evaluated by the ICAO's Interim Safety Inspection Guidelines. The methods include X-ray screening and visual examinations [5].

According to the ICAO, improvised explosive devices are the most significant threat to civil aviation, and a single recommended security control regime unifies the processes of the international standard of civil aviation safety, especially in the field of liquid detection. In response to the

increasingly frequent security controls on persons, cabins, and hold baggage in the 1970s, terrorists have partially shifted from hijacking to bombings [11]. According to a 1996 study, more than 10% of all acts of international terrorism that have taken place have been related to air transport [12]. Statistics available from the Global Terrorism Database (GTD) show that there were 1,415 terrorist attacks worldwide against aircraft, airports, and airline buildings between 1970 and 2020 [6].

Illegal acts are divided into groups of unauthorised detention and attacks on equipment, which are further divided into successful and unsuccessful attempts. Another group of illegal acts is called sabotage. There is also a group dedicated to other illegal acts, which include in-flight attacks.

During data processing, we used the data of total incidents from 1947-2021 [6, 7]. We calculated development trends in the field of aviation security from 2000-2019. In 2017, there was a change in how illegal acts were reported; this was reflected in the evaluated parameters.

2.1. Structure of the security control lane simulation model

Passenger screening in European airports is carried out in accordance with EU legislation EC (2008), EU (2015). Means for checking passengers and luggage are divided according to the type of security activity, physical interaction, and type of item (interest) sought. The entry factor (EA), inspection area (IA), and exit area (ExA) are key factors influencing the flow of clearance. The security control lane also affects the fluidity of passenger screening.

Queue-Queue security control lane is a basic type of passenger movement arrangement. The Dedicated Stand - queue-based security control lane and Dedicated Stand – Dedicated Stand-based security control lane are analogously structured security control lines [12]. Based on the performed analyses, it was calculated that increasing the distance between passengers has a direct impact on reducing the flow of passengers by 18-20% for selected types of detection stations [12, 13]. The total number of incidents in air transport shows a declining trend – see Fig. 1.

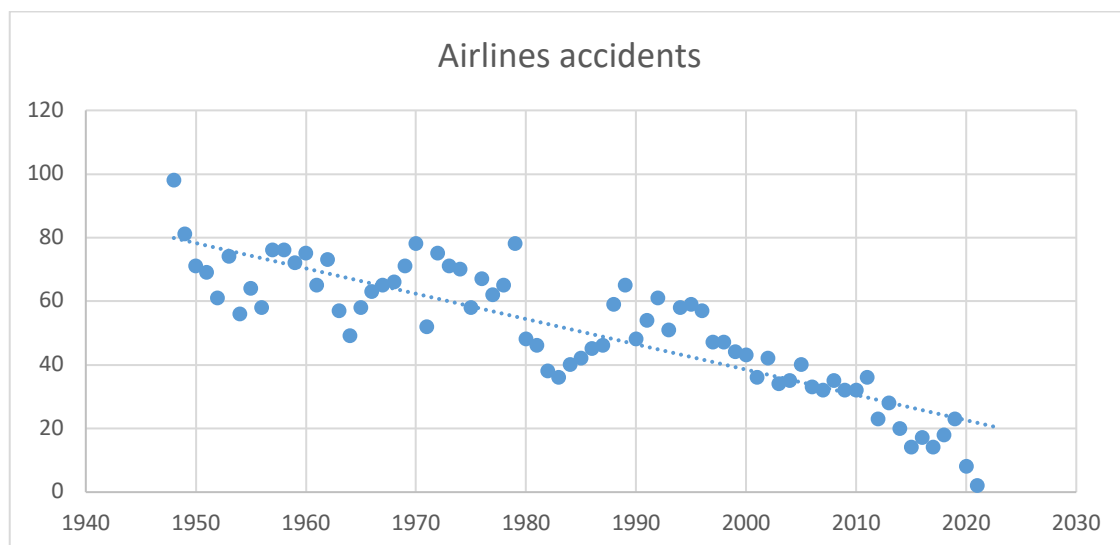


Fig. 1. Overview of air accidents [7]

Similarly, the trend in the number of victims shows a declining trend.

Offences that may compromise the safety of civil aviation include the seizure of an aircraft in flight or on the ground, the holding of hostages, intrusion, weapon possession, and messages or misleading information that endangers the plane's safety. Hijackers' motives for committing an illegal act against civil aviation can be divided into the categories shown in Fig. 5, which also shows the number of incidents for the analysed period.

The numbers of victims associated with hijackings reflect political instability and the willingness of kidnappers to achieve their goals.

The numbers of attacks in different parts of the world are shown in Fig. 4.

Of the 59 hijacked flights, 37 were domestic and 22 were international. Fig.6 shows the number of hijackings of domestic flights in specified world regions.

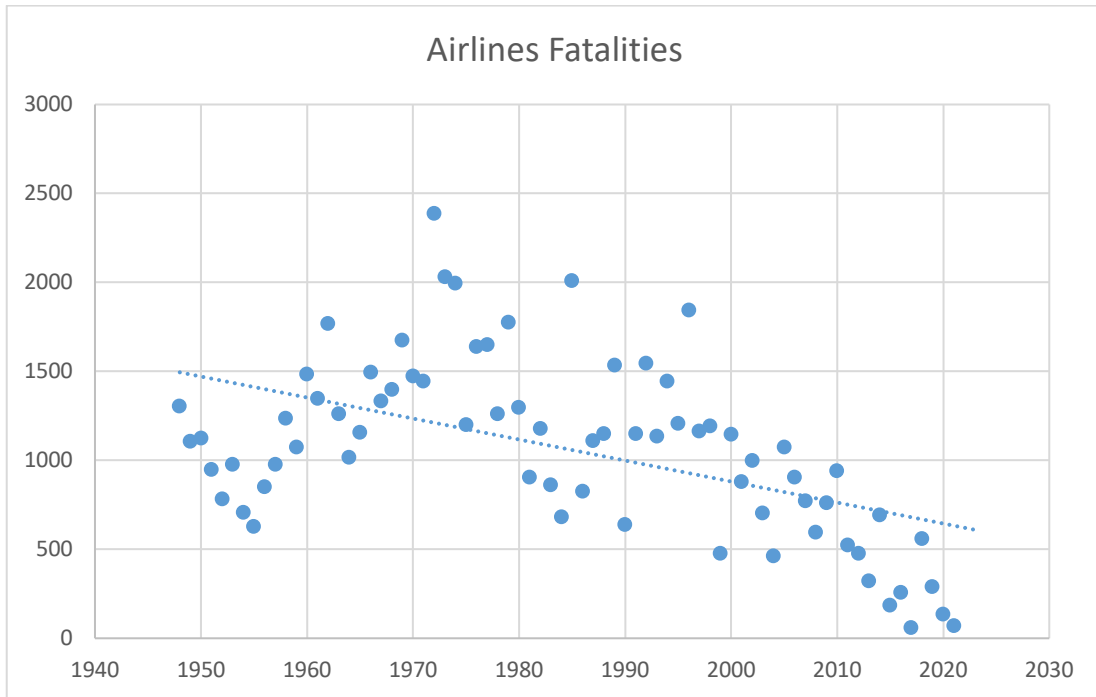


Fig. 2. An overview of the number of victims associated with air transport [7]

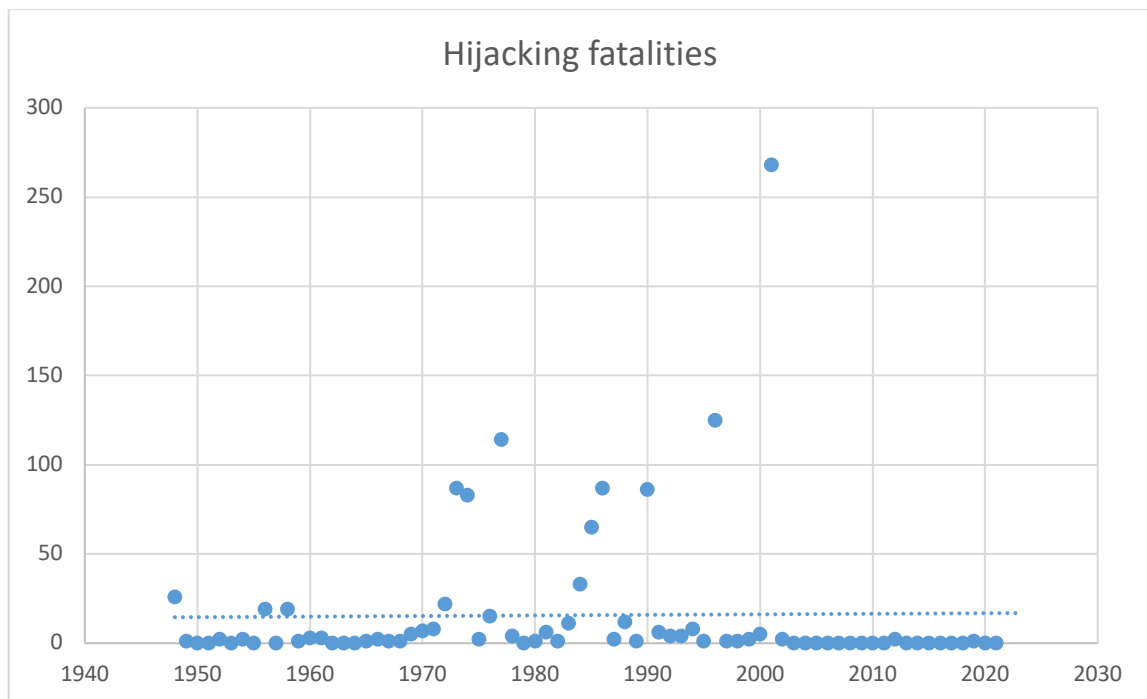


Fig. 3. An overview of the number of victims associated with hijackings [7]

The largest number of hijackings of domestic flights (10) occurred in Africa. Three of these cases were committed in Sudan, two hijackings took place in Algeria, and one hijacking each took place in

Libya, Egypt, Mauritania, Ethiopia, and South Africa. The People's Republic of China has recorded nine cases of domestic flight hijackings. Norway reported one hijacking of a domestic flight.

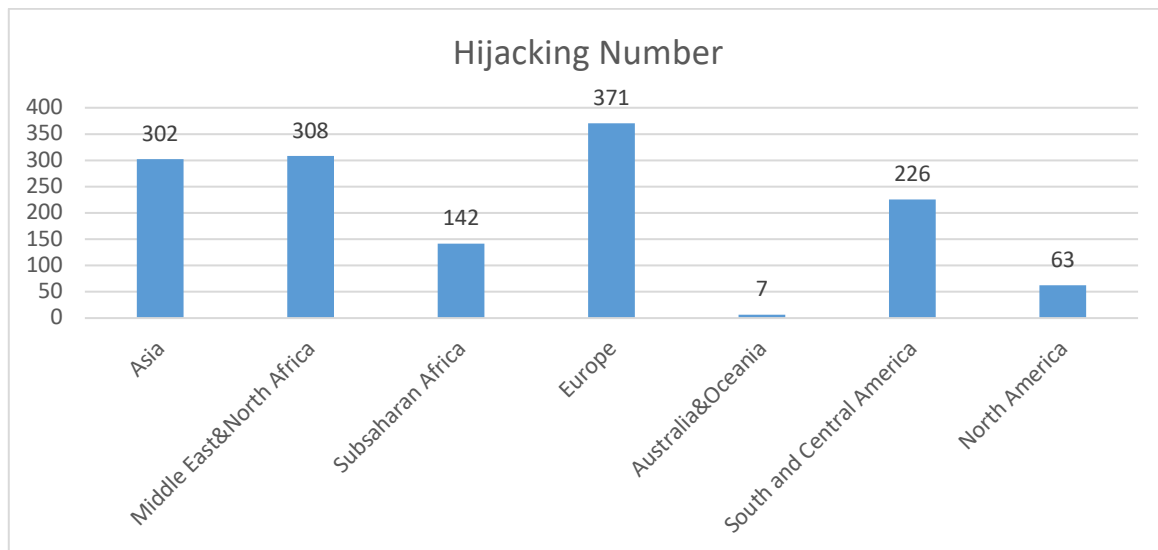


Fig. 4. Areas of air traffic attacks from 1970-2019 [7]

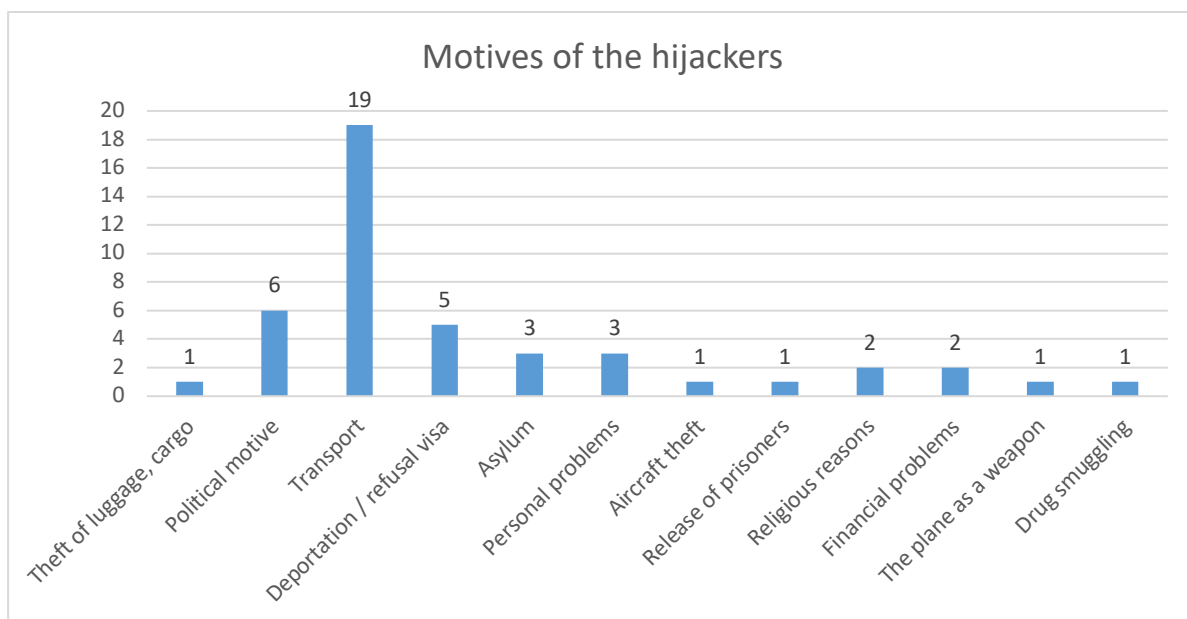


Fig. 5. Motives for hijackings [7]

3. NUMBER OF AIRCRAFT HIJACKERS INVOLVED IN ONE HIJACKING

The number of attackers is an important indicator when taking measures to increase security. Fig. 8 shows the number of hijackers involved in each hijacking case.

There were 44 cases of attacks committed by one person (76.5%). Two attackers were involved in six cases (10.01%). The largest number of hijackers was eight (in one case).

3.1. Weapons used

An important factor is the weapons used by hijackers, as it indicates possible errors in security and control systems at the airport. The weapons used can be divided into seven groups; the frequency of the use of each type is illustrated in Fig. 9. In six cases, it was not possible to find information about the weapon used. In 14 cases, it was found that the hijackers were not armed [14, 15]. The number and type of weapons used does not match the total number of abductions, as some perpetrators used more than one item [16].

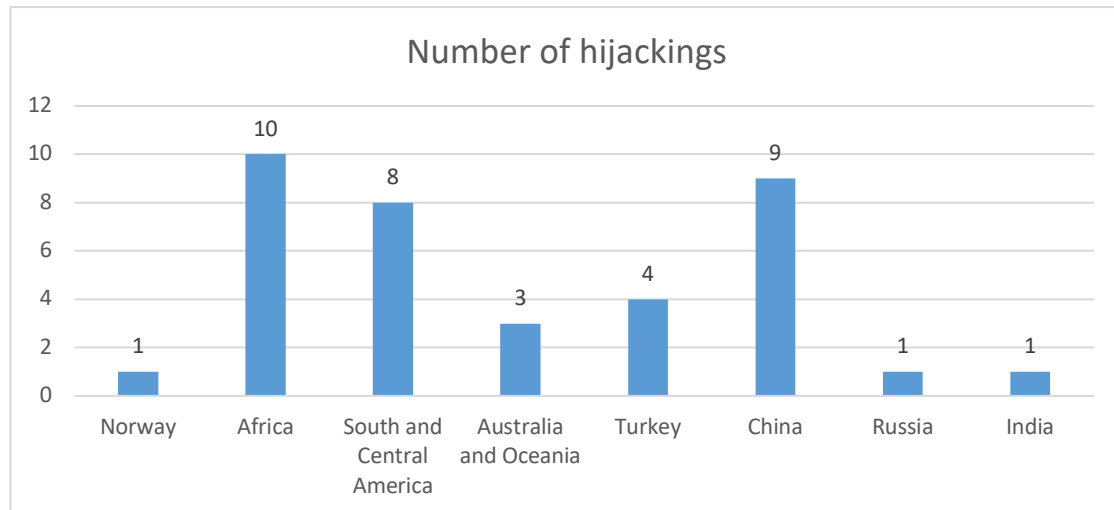


Fig. 6. Areas of domestic flight hijackings [7]

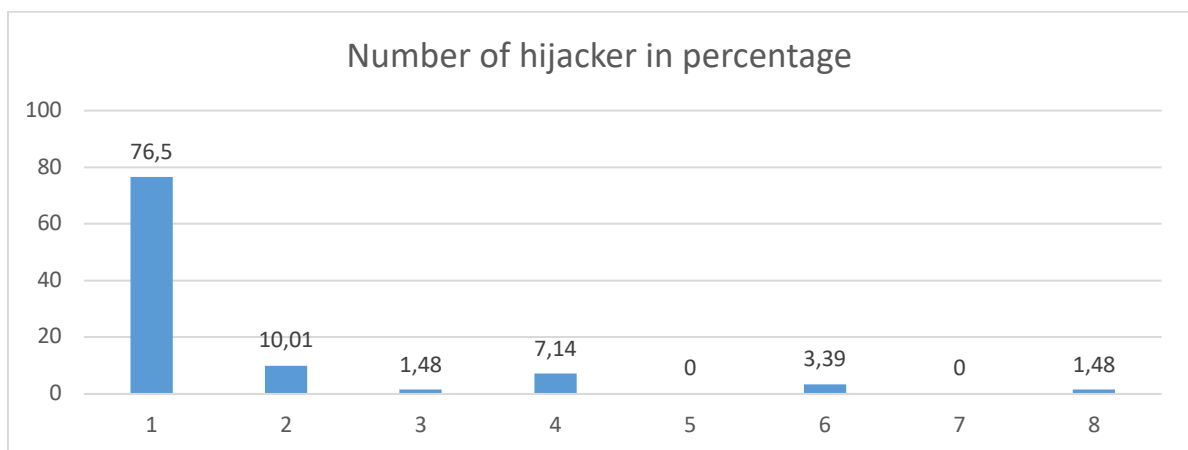


Fig. 8. Number of hijackers involved in one hijacking [7]

Knives and pistols are the most accessible and most widely used coercive means used by hijackers. Improvised explosive devices are also a very significant type of risk for civil aviation. It is necessary to use available equipment to detect substances that may serve to decrease the safety of air traffic.

4. RECOMMENDATIONS

The model of the airport security process is based on valid legislation and uses three types of detection stations: QQ, DSQ, and DDS. Processes associated with the control of passengers, cabins

that hold baggage and cargo, and the control of access to airport facilities make it possible to detect weapons and metals, chemicals and explosives, and radioactive material using different types of detectors [17, 18]. Work to increase security must continue following an approach where politically unstable regions are the cradle of potentially motivated terrorists who feel that their actions are justified.

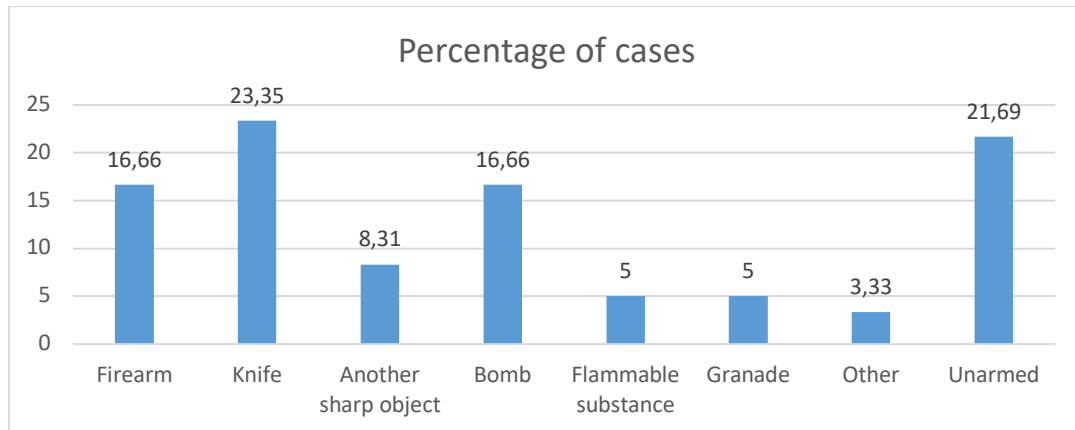


Fig. 9. Category of weapons used [7]

The aviation industry is based on the adoption of measures that are applicable worldwide and where regulations balance passenger comfort, universal human rights, the General Data Protection Regulation, and security measures [19]. Measures in passenger and baggage reconciliation, the screening of passengers and baggage, and the creation of a buffer zone in front of the terminal buildings are based on the willingness of passengers to accept partial restrictions that increase their personal safety. The assumption that the risks will be completely eliminated is unreasonable, as the ingenuity of potential offenders and the availability of possible means of illegal activity are by no means limited.

The present article introduced the methods of detecting prohibited articles, the number of illegal acts, hijackers' motives for committing illegal acts against civil aviation, and other related matters. Since 1950, the number of illegal acts against civil aviation in Europe has decreased significantly, indicating the success of the implementation of the ICAO's regulations and recommendations. The level of regulation in the field of aviation security requires the close cooperation of all participating entities and the search for consensus on legislative and safety requirements [20]. Owing to growing political tensions in some countries, illegal acts against civil aviation can be expected to increase, and preparation for this situation is needed. The current pandemic situation, the level of security, and the Security Information Service Annual Report provide a clear impetus to reconsider the approach to protecting people's personal freedoms in the context of defined security risks [20].

The greatest danger of an illegal act against civil aviation can be expected in the future, such as abduction in some parts of Africa and, in general, in countries with an insufficient security control structure that have not sufficiently applied the ICAO's recommendations. In the future, the conditions for travelling to such countries should either be tightened and, thus, the personal freedom of passengers should be further restricted. Alternatively, these countries should be put under sufficient pressure to implement a sufficiently functioning security system with passenger profiling. Passenger profiling is a preventive tool combining the processing of personal and biometric data [20].

If we accept that the increase in air safety must also be seen in human rights and freedoms, then a compromise can be found when taking action. Assuming that most passengers comply with the legal requirements of the community and the technical level of security of personal data theft reduces the level of risk close to zero, then it should be incorporated into the air carrier's obligation to provide personal data to public authorities without requesting it [20].

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