



THE INFLUENCE OF AIR ACCIDENTS ON LEGISLATION IN CIVIL AVIATION IN SLOVAK AND CZECH REPUBLIC

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Abstract

This paper deals with the influence of air accidents on legislation in civil aviation in the Slovak Republic and Czech Republic. Firstly, it focuses on defining essential terms, organizations, laws, and regulations which are affecting air accidents investigation. All these elements are based on the aviation regulation L13 (ANNEX 13). Then it deals with detailed analysis of chosen air accidents that happened in Czech or Slovak Republic. As a result of previous research have been defined categories of the most common causes of air accidents between the year 2016 and 2020 which occurred in Czech and Slovak Republic and created their classification. The main goal of the paper was to identify new legislation measures and changes, which have been propounded or adopted to prevent another air accidents with the same or similar causes in the future. Among those regulations belongs for example area 100 KSA, AUPRT or background checks. Lastly it deals with the upcoming legislation changes affecting civil aviation in Slovak Republic.

Keywords

Air Accidents, Annex 13, Civil Aviation, EASA, ICAO, Air Accident Investigation, Safety

1. INTRODUCTION

The probability of air accidents and incidents increases in proportion to the higher number of aircraft operated and the persons involved in air transport. With the gradual development of aviation technology and systems, it is also necessary to introduce safety measures and regulations, the role of which will be to ensure greater safety in aviation. Firstly, this work focuses on the definition of basic terms, organizations and legislation affecting the investigation of air accidents in the Czech and Slovak Republics. Besides, the paper also analyzes selected air accidents from the year 2016 to the year 2020 in the already mentioned area and to characterize their most common causes based on the analysis of all available final reports published by the Slovak Letecký a námorný vyšetrovací útvar and the Czech Ústav pro odborné zjišťování příčin leteckých nehod. The main objective of this study is to determine the impact of air accidents on legislation in civil aviation. Lastly, the work also focuses on the planned legislative changes in civil aviation in the Slovak Republic.

2. INVESTIGATION OF AIR ACCIDENTS AND INCIDENTS IN THE CZECH REPUBLIC AND SLOVAK REPUBLIC

To conduct research, it is necessary to first define the terms related to the investigation of air accidents and incidents. The key is to determine which event can be defined as an air accident or an incident. An air accident is an occurrence related to the operation of an aircraft defined by a time period which begins with the first person boarding the aircraft for the purpose of the flight and ends when all persons leave the aircraft, in which there has been serious or fatal injury to persons caused

by the operation of the aircraft or any contact with it or parts of it, or serious damage to the aircraft, when damaged parts need to be repaired or replaced, or the aircraft is in a completely inaccessible location or is deemed missing [1].

An incident is an event other than an accident in which air safety is threatened or has already been affected. Unlike an air accident, the consequences of an incident do not require early termination of the flight or emergency procedures. Incidents are divided into several categories according to different types of causes. These categories include, for example, technical incidents in air traffic control, security technology, etc. [1].

In order to prevent the occurrence of air accidents and incidents or at least mitigate their consequences, it is necessary to carry out a detailed investigation of all reported events. This investigation is not intended to identify and pursue the culprit but to establish the cause and, if necessary, to issue appropriate safety recommendations. Therefore, the investigation is one of the most crucial elements for ensuring higher air traffic safety. In individual states, the investigation is entrusted to specialized departments, which, according to the applicable laws, regulations, and regulations, conduct investigations of incidents in air transport. In the Czech Republic, Ústav pro odborné zjišťování příčin leteckých nehod is authorized for this purpose, and Letecký a námorný vyšetrovací útvar is responsible for the investigation in the Slovak Republic. Investigation procedures are based on ICAO legislation, regulations, and decisions of the European Parliament and the European Council and from the individual states' laws. In the Czech Republic it is the act N. 49/1997 Sb., o civilním letectví as amended and in the Slovak Republic the act N.143/1998 Z.z. o civilnom letectve (letecký zákon) as amended [2] [3].

The act N. 49/1997 Sb., o civilním letectví as amended by subsequent regulations, establishes the Ústav pro odborné zjišťování příčin leteckých nehod. ÚZPLN investigates all air accidents and incidents that happened in the Czech Republic. Professional investigators, in cooperation with an employee of the Vojenský ústav soudního lékařství and specialized workplaces conducting expertise in aircraft systems, such as aircraft power units, will issue a final report, which in some cases also contains safety recommendations for certain entities.

In the Slovak Republic, the Letecký a námorný vyšetrovací útvar investigates air transport incidents. The unit has a standing committee and contracted experts involved in the investigation. However, they are not direct employees of the LNVÚ. Compared to the Czech ÚZPLN, its Slovak counterpart does not have a permanent budget. As a result, it needs to obtain approval from the Minister of Transport and Construction of the Slovak Republic for the necessary expertise, the amount of which exceeds 5,000 euros.

The International Civil Aviation Organization (ICAO) issues Annexes that deal with individual areas in civil aviation. Today, there are 19 of these Annexes and in the Czech and Slovak Republics they are named as "L" type aviation regulations and a serial number that is identical to the Annex number. For this work, the most important regulation is L 13, which deals with the area and issue of professional investigation of the causes of air accidents and incidents. The regulation defines all the necessary concepts in this area, the procedure of investigation and prevention to prevent air accidents [1] [4].

Both examined countries are members of the European Union and the European Aviation Safety Agency (EASA), and therefore the legislation issued by the EU and EASA is legally binding on them. The key and most important EU regulation for individual investigative units is Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (O.J. EU L 295, 12.11.2010) as amended. The Regulation also addresses how evidence and sensitive information are being handled, explains how occurrences are to be reported and what the final investigation report should contain [5].

Another regulation in determining the causes of air accidents is Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (O. J. EU L 122, 24.4.2014) as amended, defining which events are to be reported voluntarily and which are mandatory. It also deals with the procedure for reporting, collecting, storing, disseminating and exchanging information related to occurrences in air transport. This Regulation also deals with the European Central Repository, managed by the European Commission, and archives all occurrence reports in the territory of the EASA Member States [6].

3. ANALYSIS OF THE SELECTED AIR ACCIDENT IN THE CZECH REPUBLIC AND IN THE SLOVAK REPUBLIC

The basis for examining the direction of the change in legislation in this area and the reason for the necessary changes are precisely the events or accidents or incidents that have happened and finding a way to prevent them. Therefore, the first thing that was needed was to conduct a comprehensive and detailed analysis of all aircraft and ultralight aircraft accidents in the Czech and Slovak Republics from 2016 to 2020. Three specific accidents were selected to highlight the key moments of the investigation and to bring the entire process closer. One of the causes was human error. Determining the cause is also important for the possibility of proposing safety recommendations or resisting safety assurance. These recommendations are often the basis for a subsequent change in civil aviation legislation.

3.1. Accident of the OK-SAL05 Aircraft

In September 2018, an accident of an ultralight aircraft ASSO 4 WHISKY with the registration number OK-SAL05 took place in the northwestern part of the Czech Republic, near the town of Teplice. The plane was piloted by a man in his seventies with a relatively little experience. According to the conclusions of the forensic and medical expertise, there were no indications that his state of health caused the accident, even though the pilot was regularly treated for health complications, which he did not report to the relevant aviation doctor.

After the expertise of the aircraft power unit, it became clear that someone had carried out an unauthorized service intervention in the reducer. The meteorological situation was favourable at the time of the accident. However, according to the testimony of witnesses, there was relatively strong turbulence in the area of the third turn in the traffic pattern of the area of sport aviation facility Teplice, where the stone quarry is located.

There are several causes of the accident, but the main one is the incorrect technique of piloting the pilot caused due to low experience with the aircraft type. The pilot in flight at an exceptionally low speed in the area of SLZ Teplice got the aircraft into a great bank angle and thus caused reaching the stalling speed and then put the aircraft into a spin. Another factor was the engine failure, which could have been caused by not switching the pumping from the second tank. And thus, the fuel could have been depleted. Note that this is only a hypothesis since the engine expertise did not determine the exact reason for the engine failure [7].

3.2. Accident of the OK-TKF Aircraft

The September 2017 air accident of a six-seat Cessna 421B with the registration number OK-TKF is another event whose one of the causes was human error. This accident took place in the northern part of the Czech Republic and killed two people. The pilot was a 46-year-old man with a total flight time of more than 675 hours, 47 of which were on a Cessna 421B.

The flight was conducted according to the Instrument Flight Rules (IFR) as the meteorological situation did not allow visual flight (VFR). However, this fact was not allowed according to the Certificate of Airworthiness for several reasons. The first was the malfunction of the DME, then the expiration of the oxygen tank and the most important reason was the expired period, after

which it was necessary to overhaul the left power unit. That deadline was exceeded by four years.

The immediate cause was the failure of the left power unit in flight, which could have been avoided by meeting the deadlines for overhauls and services. The subsequent expert examination discovered that the right engine was not working at the time of the impact of the aircraft with the ground, even the right engine was not working. According to conjecture, the pilot deliberately turned off the engine to stabilize and gain control over the machine since the aircraft was difficult to pilot during single-pilot operation with a malfunctioning engine, according to the testimony of witnesses. However, this version cannot be verified.

In connection with the accident, ÚZPLN issued a safety recommendation to the Civil Aviation Authority, according to which it should approve the Airworthiness Review Certificate in compliance with compliance with the limits of aircraft components and their systems prescribed by the manufacturer [8].

3.3. Accident of the OM-JLP Aircraft

The last accident in which detailed analysis was carried out in this work is the accident in March 2017 of the L-29 Delfin aircraft with the registration number OM-JLP. The accident took place at Sliach Airport (LZSL) in the Slovak Republic.

The pilot was a 49-year-old man with a total flight time of more than 861 hours. However, there was another person on board whose purpose is unknown. Its presence has disrupted the company's operating directive, which does not allow a person other than the flight instructor or examiner during the practice of emergency procedures onboard.

The accident took place on runway 36 when the pilot retracted the landing gear during a touch and go using the landing gear control lever. After retracting the landing gear, the aircraft sank at a height and hit the runway surface with its fuselage. According to the flight manual, the pilot reacted correctly and turned off the engine.

The primary cause of the event was improper piloting technique when the pilot did not consider the possibility of the aircraft sinking.

In connection with the air accident, the LNVÚ issued a recommendation to ensure safety for the Transport Authority of the Slovak Republic. According to the recommendation, the Authority should reconsider the conditions for conducting aerial work and tighten the restrictions for the presence of a second person on board [9].

4. CATEGORIZATION OF CAUSES OF AIR ACCIDENTS AND THEIR CHARACTERISTICS

In the characterization of the most frequent causes of air accidents in the Czech and Slovak Republics from 1 January 2016 to 31 December 2020, all aircraft and ultralight aircraft accidents, published on the official websites of the LNVÚ and ÚZPLN, were examined. Subsequently, they were analyzed in detail month by month, focusing mainly on their causes and the number of injured persons. Based on the research, the causes were divided into five categories:

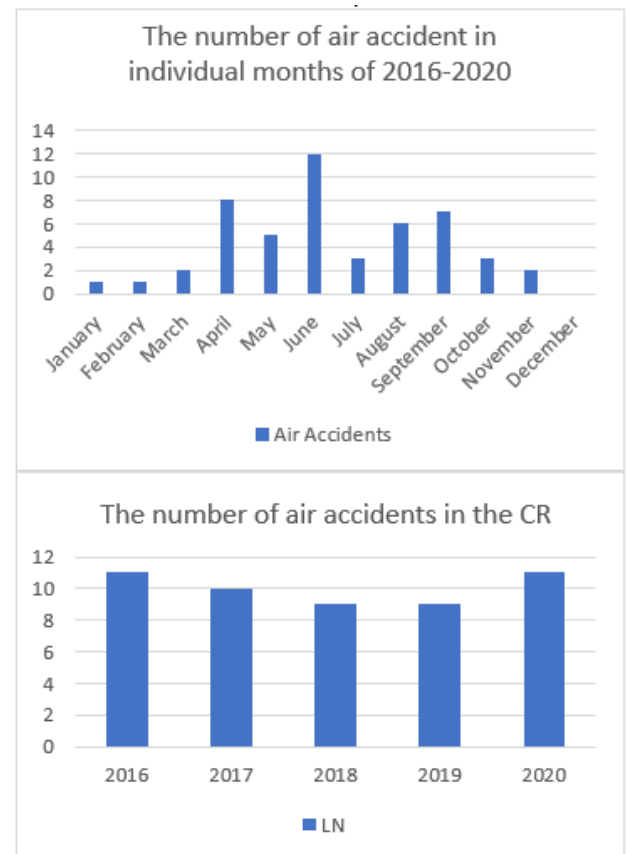
1. incorrect piloting technique,
2. non-compliance with procedures,
3. adverse meteorological phenomena,
4. technical fault,
5. imperfect pre-flight preparation and inspection of the aircraft.

4.1. Czech Republic

Approximately ten accidents were registered annually in the Czech Republic. A total of fifty of those accidents were examined during the period under review, which included twelve ultralight aircraft and forty-two other aircraft. Most accidents statistically took place in June and December. On the other hand, no event classified as a plane crash has been recorded.

The most common cause of air accidents was the incorrect piloting technique in the investigation reports. A total of twenty-eight accidents occurred due to this cause. The lowest number of accidents was caused by inconsistent aircraft inspection, precisely four.

A total of fifteen crew members and four passengers died due to air accidents during the entire period under review. The most deaths were in 2016, and the least in 2020.



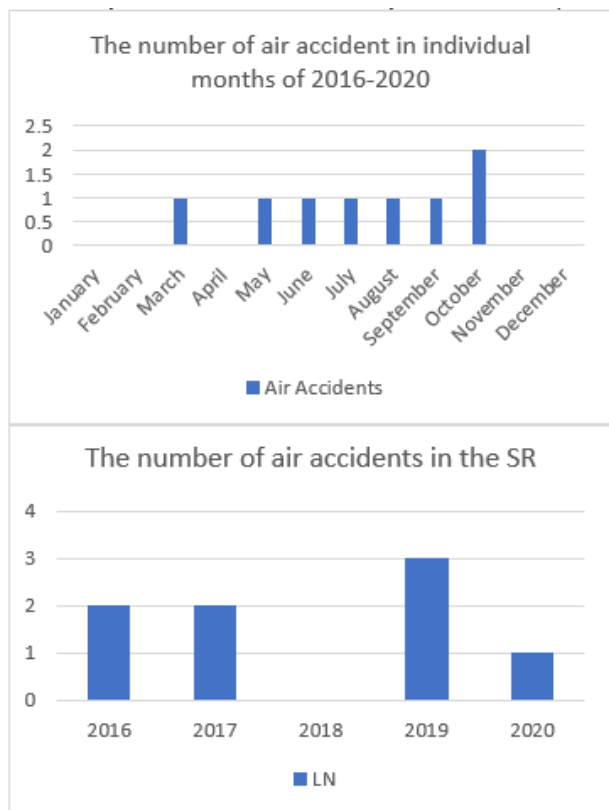
Graph 1: Number of air accidents in individual months and years in the Czech Republic.

4.2. Slovak Republic

In terms of the number of accidents in the analyzed period, the Slovak Republic is significantly better off. In sum, eight air accidents of eight aircraft took place in this area. In the context of the number of accidents, the worst month was November with two accidents. The most events classified as air accidents were in 2019, three to be precise. On the other hand, no aircraft accident was reported in 2018.

Incorrect piloting technology was, as in the Czech Republic, the most common cause of air accidents. It was one of the causes of five events. On the other hand, no accident was reported to have one of its causes incorrect pre-flight inspection or technical defect of any of the parts of the aircraft.

During the entire period, one person died from injuries after a plane crash. No other person was injured.



Graph 2: Number of air accidents in individual months and years in the Slovak Republic.

5. THE INFLUENCE OF AIR ACCIDENTS ON LEGISLATION IN CIVIL AVIATION IN SR AND CR

Due to the relatively low number of air accidents in the Czech and Slovak Republics in the period from 2016 to 2020, none of the air accidents had a direct impact on the legislative developments in the respective states, hence the research focused on the wider area of international civil aviation legislation concerning that these partial statistics from the Slovak Republic and the Czech Republic are also sent annually to the International Civil Aviation Organization (ICAO), which subsequently publishes a worldwide comprehensive report, the result of which, in the case of recurrent causes, is a subsequent change in legislation, e.g. in pilot training or even directly in

operation. An example is Germanwings flight 9525 from March 2015. At that time, an A320-211 registered under D-AIPX crashed into the French Alps. All 144 people on board died because of the accident. The cause was the poor mental state of the co-pilot caused due to personal problems. He took the opportunity to be alone in the cockpit, locked himself and deliberately guided the aircraft to the ground. [10].

This unfortunate event can be regarded as crucial to establishing a new mandatory curriculum in the training of commercial and airline pilots called 100 KSA ("Knowledge, Skills and Attitudes").

Due to the high number of accidents caused by improper piloting technology, the work also focuses on the implementation of the AUPRT component in the training of airline and commercial pilots.

The pilots' unreliability can be the instigator of air accidents caused due to human error. Thus, the study also deals with the issue of reliability verification, done by the Civil Aviation Authority in the Czech Republic and the Transport Authority in the Slovak Republic.

5.1. 100 KSA

All pilots who commenced training after 31.1.2022 in approved ATO training organisations to obtain an airline or commercial pilot license and those who will take the exams in one of the EASA Member States shall have completed Area 100 KSA. It focuses on the evaluation of a student's skills, knowledge, and attitudes, whether technical or non-technical. Non-technical ones include, for example, the ability to self-reflect and general awareness of the situation in the cockpit and beyond. The implementation of the new training component must be conducted following the published syllabus. It defines the areas and topics that training facilities need to concentrate on. The assessment of students is organised through written and practical exercises, oral exams, projects, communication exercises or presentations. In the final report, there are weaknesses but also strengths of the student [11] [12].

5.2. AUPRT

Advanced upset prevention and recovery training (AUPRT) is mandatory for all transport and business pilots who started training after December 20, 2019. This training consists of two parts. The first is theoretical preparation lasting at least five hours, in which the student is familiar with the instructions for the flight and subsequently with the analysis after the flight. The second part is practical and takes at least three flight hours. The content of this phase is a course of coping with deep pulling and pulling, preventing a fall during flight at stall speed, coping with spin, fall and spiral flight. In addition, the pilot should be familiar with the procedures for recognizing an upset and getting out of it adequately. This process is particularly relevant for flights in conditions requiring instrument flying (IMC where the pilot cannot rely on inspecting the state of the aircraft with the surrounding environment and is dependent only on aircraft instruments in the cockpit.

A graduate of this training does not go through any examination process but will receive a certificate of completion of the AUPRT course with unlimited validity [13] [14] [15] [16].

5.3. Background checks

In order to be authorized to enter airport security restricted areas, the person must have successfully completed the background check process. In this process, the national transport authorities are engaged in determining whether the person under consideration is convicted of crimes or certain offences. It also identifies its links to extremist or terrorist organizations that could endanger the safety of air traffic. Among the offenses for which a person might not obtain a certificate of verification of reliability are also offenses outside the field of air transport. For this reason, obtaining reliability for some individuals is quite complicated. In the Slovak Republic, the proof of reliability is valid for five years in the Czech Republic only three years. In addition to an extract from the criminal record, in some cases, the assessment of whether an individual is reliable or not is also served by checks carried out by the police at the place of residence of the examined person or extracts from other state authorities. [17] [18].

6. PROPOSAL FOR LEGISLATIVE CHANGES AND MEASURES

The necessity to update civil aviation regulations and laws is required worldwide. This requirement is mainly due to the increasing number of air passengers transported, as well as innovation in technology and training opportunities. The Slovak Republic is no exception. The current Civil Aviation Act has been in force here since 1998. A group of experts authorized by the Ministry of Transport and Construction of the Slovak Republic is currently working on a new version of the Law. The bill envisages modifications in the area of unmanned aircraft, aircraft register, protection of civil aviation against acts of unlawful conduct, and the performance of state supervision or investigation of aviation incidents [19].

From the point of view of this research, it was essential to focus primarily on the paragraph devoted to verifying the reliability of persons entering the restricted security areas of airports. Under the new proposal, the requirements for determining whether the person under assessment is of good repute and reliability should be changed. In the working group, there are different opinions on some points among representatives of individual areas of civil aviation, whether state administration or, for example, the pilots' association. However, the workgroup primarily aims to find a compromise that meets all European standards and requirements in the field and the context of the research carried out above, but at the same time does not cause something like "increased stress" in the normal personal lives of individuals working in civil aviation since they would lose their jobs due to offences that have no connection with the threat to air safety [19].

7. CONCLUSION

One of this research's objectives was to examine the issue of aviation accident investigation and its impact on the emergence of new legislative elements in the Czech and Slovak Republics. Aviation accidents that occurred in this territory from 2016 to 2020 did not directly affect the creation of the new legislation, so it was necessary to expand the subject of research to a global level, where the impact of accidents on the change in legislation was confirmed. As the number of passengers carried is constantly increasing, it is undoubtedly necessary to ensure the safety of all persons involved in air transport. For this reason,

the importance of a high-quality and professional investigation of air events is obvious. Specialized investigation institutions should be as independent as possible so that a high-quality investigation can be conducted as well as a safety recommendation. However, the topic of independence is debatable because the form of financing cannot be completely independent. Whether ÚZPLN or LNVÚ are in a way dependent on the government of the states under which they fall.

Legislative measures do not always satisfy the expectations of every civil aviation participant, including pilots, flight schools or airlines, as some changes cost them certain expenses and administrative complications, such as the expansion of training activities, which are necessary for maintaining civil aviation safety.

The investigation itself is a long-term process involving several complex and costly procedures. Therefore, cooperation between the individual EASA Member States, or ICAO or entities that can bring valuable experience to the investigation, is a crucial advantage. For example, the European Network for Civil Aviation Investigations (ENCASIA) is also used to exchange experience and cooperate in investigations.

Another purpose of the research was to highlight the dynamism of the aviation industry in the constant effort to ensure higher safety through the introduction of new procedures, regulations, or other measures.

ACKNOWLEDGMENT

This paper is an output of the project of the Ministry of Education, Science, Research and Sport of the Slovak Republic KEGA 040ŽU-4/2022 Transfer of progressive methods of education to the study program "Aircraft Maintenance Technology" and "Air Transport".

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