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Does Deterioration of Aerodromes' Economic Situation Influence the Level of Safety in Civil Aviation? What Can Be Done to Prevent It in Line with a Sustainable Transport Systems Approach?

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Abstract: Aviation has been one of the key engines of the globalization process and, at the same, time one of the industries most affected by the COVID-19 pandemic and the parallel economic crisis. As safety seems to be the key issue at aerodromes, the aim of this article is to analyze what kind of safety hazards have the coronavirus slowdown created and which of them pose the greatest risk for aerodrome safety in the long run. What is more, the goal of the paper is to direct managers' attention to proper crisis management in line with sustainability. The main findings are that all classified hazards cause, according to an expert's assessment, similar safety risk at aerodromes, though limited workforce training and development are perceived as posing the greatest risk. The recommended solution to minimize the occurrence of the hazard is proactive risk management, which means that managers try to anticipate possible hazards in advance and act accordingly, which requires continual controlling combined with internal and external environment analysis and a consistent learning process. That should be accompanied by constant staff development. All these seem to effectively minimize most risks and make ground for a sustainable and safe transport system.

Keywords: air transport safety; business management; sustainable transport systems; aerodromes; risk analysis

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1. Introduction

Transport development has been one of the engines of globalization; therefore, it draws the attention of business, politics and science. On the one hand, dynamic transport advancements facilitate our everyday life; on the other hand, however, they pose new challenges, sustainability among others. One of the transport types, aerodromes, basing its services on complex means—aircraft and complex infrastructure—as well as: navigation, ground handling and highly qualified personnel, is air transport, directly addressed in this paper. Its dynamic development could have been noticed in recent years. Since the beginning of 2020, however, due to the global pandemic of coronavirus, the entire economy has suffered from a regress. Air transport is a component part as well. It is especially the passengers' movement that is affected by consecutive lockdowns, national borders' and accommodation facilities' closure or resignation from vacation [1]. The transport of goods seems less affected [1] as countries still export their products, buy personal protective equipment and vaccines (for example), which must be quickly delivered to a selected location. In those cases, air transport is indispensable. Nevertheless, a decrease in civil aviation air traffic numbers, even if temporary, can indisputably be noticed. A significantly smaller number of air operations, lasting for over a dozen months already, provokes undesirable economic effects on all aviation businesses (aerodromes, airlines, ground handling companies, carriers, etc.) in the forms of: drop in income, suspension

of investment and development, the need to fire competent employees, decrease in their work motivation and so on. Uncertain situations and the prolonging SARS-CoV-2 epidemic definitely results in the deterioration of aviation enterprises' economic situation. What remains unchanged, regardless of the number of people flying, goods to move or taking off aircrafts', is the necessity to maintain the high level of air transport and traffic safety. However, all the suggested actions to be taken at aerodromes to prevent decreases in the safety level and to assure the high quality of transport services should be confronted with Sustainable Development Goals (SDGs) (e.g., sustainable energy, environment), which have become a top global issue recently. Taking all this into account, the authors pose a question: Does the deterioration of aviation companies' economic situation negatively influence the level of safety in civil aviation? How? To what extent? What can be done to not let this decrease happen in line with a sustainable transport systems approach?

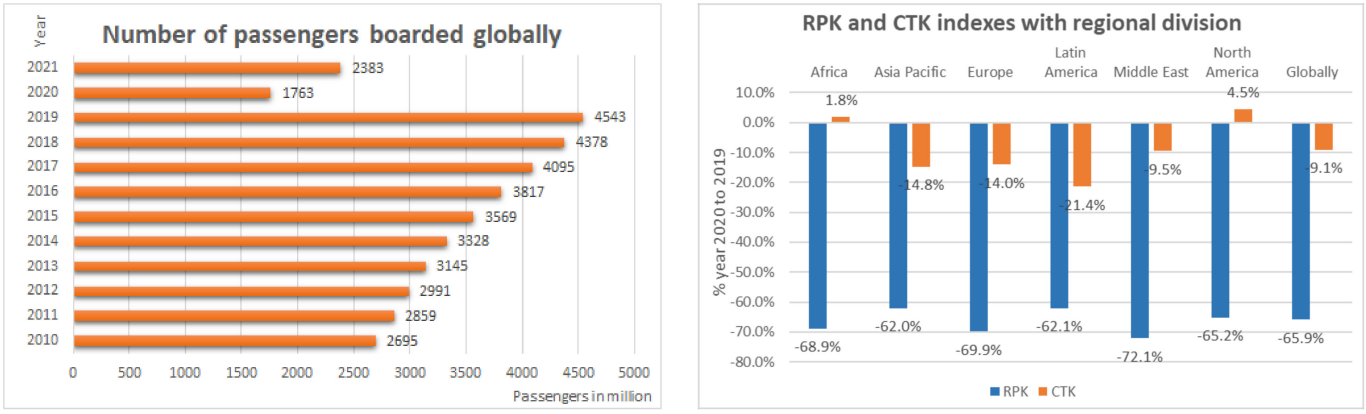
The approach of the research conducted is descriptively qualitative; however, a quantitative result of risk assessment is also proposed. In order to give a reliable answer, necessary analysis for one of the aviation enterprises types, aerodromes, was conducted. (1) To identify the hazards (for different risk consequences groups) resulting from the current global situation mentioned in the preceding part of the introduction. (2) To execute risk analysis with a quantitative result, showing the criticality of the potential inconsistencies of air traffic safety and the sustainable development of transport. (3) To develop a set of recommendations for airport stakeholders, especially for the airport managing body in order to avoid dangerous situations in the air and on the ground, thereby demonstrating proactive safety management, which is one of the fundamentals in air transport. Those three listed issues form the aim of this paper. The structure of the article allowing the main aim's achievement is the following: background of the research and literature overview (Section 1), crisis management and the influence of aerodrome's poor economic situation on the safety—identification of threats—(Section 2), FMEA risk analysis showing correlation economy versus safety in air transport (Section 3) and last but not least, discussion of the results, recommendations for aerodrome's stakeholders and conclusions (Sections 4 and 5).

1.1. Background of the Research

Air transport used to develop dynamically till the beginning of the year 2020 when a decrease by 55% in Instrument Flight Rules (IFR) movements in Europe (in particular its 44 Members States) was noticed (4979 flights in 2020 versus 11 085 flights in 2019) [2]. Moreover, the most optimistic Eurocontrol forecast predicts only 6 253 flights in Europe in 2021, which is 56% of the level observed in 2019, and the most pessimistic one—4731 (adequately 43%) [2]. The same trend, a constant increase over the previous years and then significant decrease over the last two years, can be noticed in the number of passengers boarded globally by the airline industry (see Figure 1a) [3].

From over 4000 million passengers attended by the global airline industry in years 2017, 2018 and 2019 (exact numbers on Figure 1a), only 1 763 million were left in 2020, and the forecast for the current year states 2383 million people who have booked/are going to book a flight with a commercial airline in 2021, which represents around a 50% loss compared to 2019. What a change!

Generally, SARS-CoV-2's impact on air transport was enormous. Strongly limited passenger traffic, as well as large financial losses, are related to the significant drop in revenues noted. Based on available statistics [1], it is impossible to point out a region in which Revenue Passengers–Kilometers (*RPK*) index would not fall by over 60% (see Figure 1b). Even in the least susceptible regions, benefitting from large domestic or regional markets—in Asia/Pacific and both Americas, the noticed falls varied around 62–65% below levels from 2019. As written in [1], "*The decline in air passenger transport in 2020 was the largest recorded since global RPKs started being tracked around 1950*".

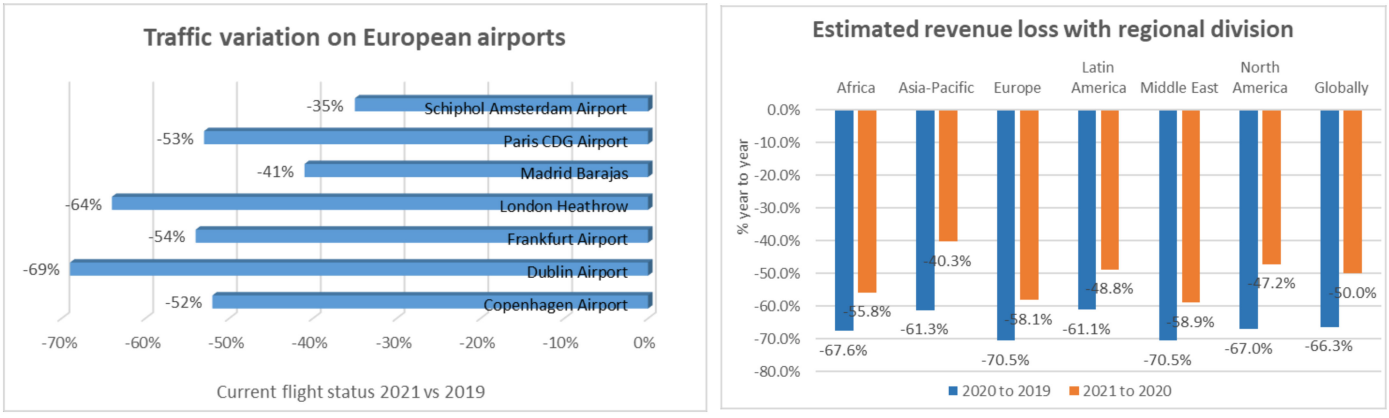


(**a**) (**b**)

Figure 1. Background of the research: (**a**) Number of passengers boarded globally, years 2010–2021, own work based on [3]; (**b**) Passengers and cargo indexes with regional division, % year 2020 versus year 2019, own work based on [1].

Passengers' traffic experienced difficulties in all regions. Cargo outcomes showed greater resilience to COVID-19 and its undesirable consequences. The observed falls were smaller (maximum decline noticed in Latin America had a value of −21,4%), while in two regions the Cargo Tonne–Kilometers (*CTK*) index has even reached a positive value (see Figure 1b), it may be explained by fewer restrictions implemented and smaller control measures taken for Africa and with a great number of goods imported from Asia for North America.

Fewer passengers attended, fewer flights performed and fewer goods transported have a direct impact on the economic condition of all aviation enterprises, in particular aerodromes, analyzed in this paper. Even the biggest airports suffered from the COVID-19 impact. Since 1 March 2020, for example: (1) London Heathrow lost a total of 451,915 flights, (2) Frankfurt lost 460,000 and (3) Amsterdam Schiphol lost 439,818 flights [2]. Figure 2a shows traffic variation on seven selected European airports located in capital cities. The numbers represent the 7-day average number of flights from June/July 2021 versus the same period in 2019 in percent. The biggest loss of 69% was detected at Dublin Airport. Moreover, Paris, London, Frankfurt and Copenhagen Airports recorded over 50% drops; these are the biggest airports in Europe. Losses on the smaller ones were probably even greater. The exact data from listed airports, as well as other European airports, are available in [2].



(**a**) (**b**)

Figure 2. Background of the research: (**a**) Passengers and cargo indices with regional division, % year 2021 versus year 2019, own work, based on [1]; (**b**) Estimated revenue loss with regional division, % year 2020 versus year 2019 and year 2021 versus year 2020, own work, based on [4].

The revenue loss of aerodromes has been tremendous and has made aviation managers much more concentrated on seeking opportunities for cost savings rather than caring for reasonable adjustments to new market demands. Although 2021 has brought a slight recovery, the negative trend in revenues has prevailed globally. Figure 2b depicts numbers regarding the estimated revenue loss with the regional division. Despite differences in revenue drops among regions, they have all been over 60% in 2020 (versus 2019) and over 40% in 2021 (versus 2020), with the sharpest decreases in Europe and the Middle East in both analyzed periods.

Coming back to a stable growth path of the aviation industry remains under question because of the uncertainties about the development of the COVID-19 pandemic and all the possible consequences for individuals, regions and the world as such. Therefore, the authors of the article would like to direct the attention of the readers to the importance of proper management practices, which may prevent aerodromes not only from further slowdown but also from deterioration of service quality, which can, in the long run, result in poorer safety standards and other problems. It is important to underline that the proposed practices are also in line with a sustainable development approach, including sustainable energy economics and policy, which are now top issues all over the world.

Aiming at green energy and sustainable policies in transport systems requires a lot of joint action from all transport system stakeholders. It is certain that in terms of clean energy (Sustainable Development Goal 7), it is crucial to implement totally new energy systems based on green (clean) energy on the macro level, but it still must be underlined that minor actions in that field are also important. Among them, truly responsible management of aerodromes, including proper planning of flight schedules in order to comply with all environmental rules, should be mentioned. Such an approach in aerodromes' management is aimed at, on the one hand, reducing risk, but on the other hand, improving environmental compliance of airports, and is very needed. The more effort put into the implementation of sustainable methodology and rules in every action, the greater the probability of reaching the SDGs and saving the world for future generations.

1.2. State of the Art—Literature Overview

Although the issue concerning COVID-19's impact on transport is quite new in the literature, some publications can already be found. The easiest to find are publications concerning air quality response to restrictions in people's movement and related air pollutants reduction in different world regions, such as China [5,6], where everything started, but also in Paris, France [7] or Southern California, USA [8]. Direct connections of air transport to COVID-19 concern first of all the link between aviation and the instant virus propagation [9,10]. References to air traffic may be found in [11], in which the authors focus on the medium and long-term impacts of COVID-19 on the entire aviation industry, wondering if "*it is just another crisis or end of aviation as we know it*"? Air mobility and the airline industry are analyzed in [12], based on a European (especially Croatian) example. In [13], airlines canceling services and aircraft grounded in UK airports as a consequence of coronavirus pandemic are taken into account.

Both issues addressed in this paper—aviation and economy—appear in works [14,15]. In [14], airport charges on different types of aerodromes, as well as financial assistance for them, are discussed. Reference [15] focuses more on service quality mentioning new priorities in financial resource allocation to ensure operational effectiveness.

Safety issues in air transport were subject to the authors' previous publications, e.g., [16,17]. This problem from different points of view is also being addressed by other authors, e.g., [18–21], although, as publications from the pre-COVID-19 era, they are not related to the SARS-CoV-2 pandemic and its consequences.

The issue of safety management with regard to aerodromes is tackled in [22]. The importance of proper communication to provide high-quality service and safety is described in [23] and the same issue but confronted with the COVID-19 pandemic and all its implications, in [24]. There are more publications referring to some specific aspects of

aerodrome management, such as the problem of dealing with wildlife at aerodromes [25]. The more detailed and up-to-date research referring to safety management at aerodromes in line with the proactive approach proposed by the authors of this paper can be found in [26]. Other publications directly connecting safety, air transport and COVID-19 can, of course, be found, such as [27], concerning the safety of the air medical transport of patients with COVID-19; however, the approach and scope of the research are entirely different.

Crisis management issues have been discussed in several papers, such as [28–30], among which [31] constitutes the main theoretical background for the new component of the modified risk probability number (described in Section 4 of the present article). As far as crisis management in the times of the COVID-19 pandemic is concerned, there are certain publications questioning the effectiveness of the existing risk management models [32]. Most of the papers referring to both COVID-19 and crisis management focus on psychological aspects of reactions to the unprecedented pandemic crisis [33,34].

Sustainability in transport and energy is an important issue in the current research. According to the Air Transport Association Group (ATAG) aviation supports 14 out of 17 Sustainable Development Goals [35]. The fact that significant changes in achieving sustainability in transport are connected with switching to renewable energy is tackled in [36]. A few publications stress the necessity of a more complex approach to sustainability, which translates to many concrete, responsible actions in business but also in everyday life [37]. Although a sustainable mindset should be popularized in transportation, it is hard to find publications covering that topic.

The literature review showed that although various publications concerning COVID-19's impact on air transport and business management may be found, few present a pro-active and more comprehensive than just regulation-based view approach to safety issues, analyzing the influence of the poor economic situation and low level of management in the aviation network on its safety and proposing actions, not only preventing decreases of safety level but also in line with sustainability. This is the aim of this paper.

2. Effective Crisis Management and Identification of Potential Hazards

It is certain that the COVID-19 pandemic was an unexpected occurrence with a lot of negative effects on the economy, as well as individuals and companies, and has developed circumstances that can be qualified as a crisis. Therefore, it seems reasonable to implement proper crisis management with specific strategies concerning the most important aspects of the everyday business in order to undertake appropriate action and ensure the long-term sustainability of aviation businesses, as well as further development of aerodromes.

There are various risks and hazards of the deteriorated economic situation of the aerodrome business. In this paper, they will be discussed in terms of their impact on safety, which is the priority in aviation; however, as it has already been mentioned, this will also be confronted with the sustainable development approach. After analyzing the possible negative consequences of aerodromes' difficult situation on safety, the authors have identified two main groups of hazards. The first group has been called "human factors" because they are strictly related to human actions and behaviors. Admittedly, the other group of factors has been categorized as non-human factors; however, they are in summary also stemming from human decisions, thoughts and moods, but in a more indirect way. Both hazards' main categories are presented in Figure 3.

Relation of all potential incompatibilities with people and their actions seems natural, as human errors are the reason for 70–80% of unwanted transport accidents due to people's incompetence, negligence, lack of verification or unintentional mistakes.

2.1. Human Factors

In the group of human factors, two other important subcategories of hazards have been identified. The first one is poor crisis leadership, whereas the second is deterioration in human capital, which can be a result of poor leadership but sometimes takes place when

the leadership is outstanding. Both are discussed in detail so that the connection between them and the safety level at aerodromes becomes clear.

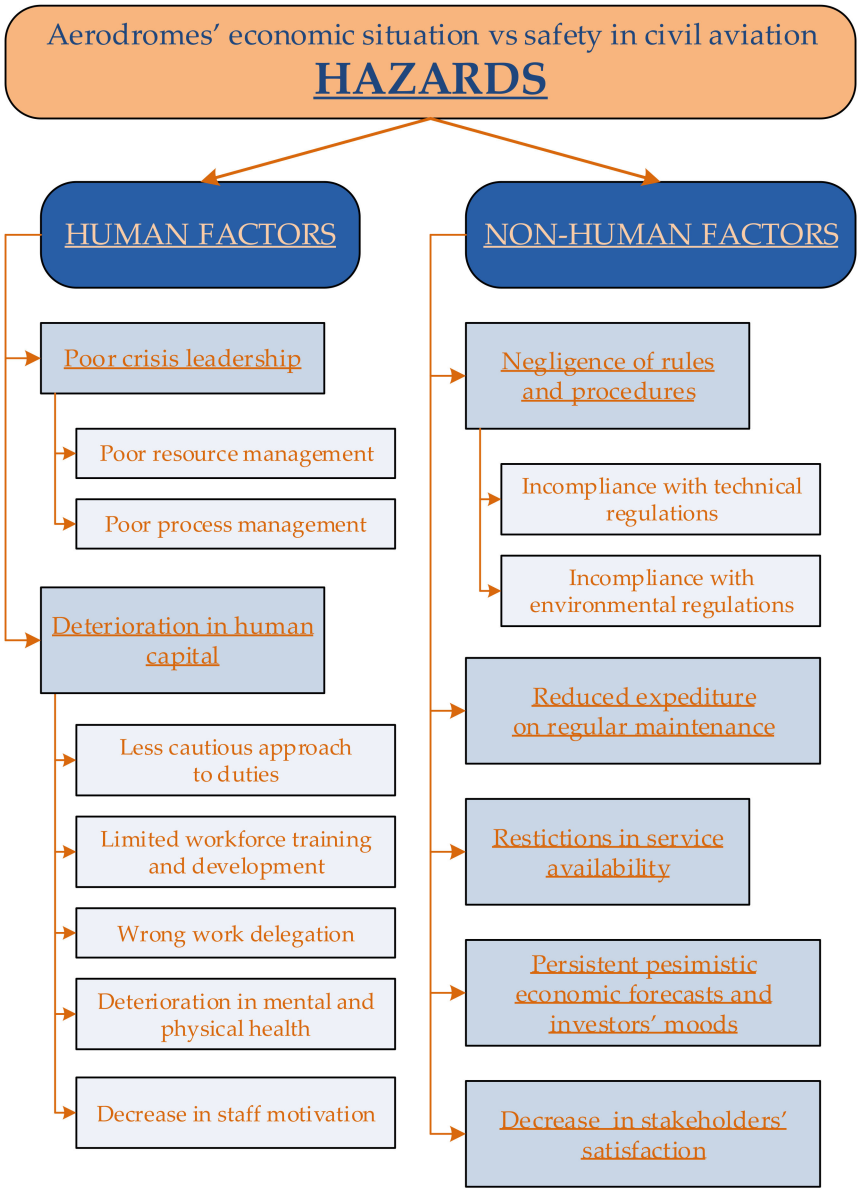


Figure 3. Identified hazards concerning the influence of aerodromes' difficult economic situation on safety in civil aviation, own work.

2.1.1. Poor Crisis Leadership

It is claimed that leadership, to a great extent, depends on the context—so all the factors around it—such as the external and internal environment, with the economic situation on top of that. During a crisis, good leaders seem to be even more important than in times of economic development [38].

To be an effective leader in the economic slowdown, one should be able to lead under pressure. However, it should be underlined that, in fact, it is not just the leader to manage the crisis but also their subordinates [39]. Crisis management, however, strongly correlates with what the leader undertakes and how he or she as a person deals with a concretely difficult situation. If the leader is responding to the crisis appropriately, despite all the unexpected perturbations, most, if not all, of his or her subordinates will follow him or her with convenience and absolute reliability. If he or she fails to tackle the crisis accordingly,

every team member is more probable to worsen their performance, which can, in the long run, have a negative effect on safety alongside other spheres of aerodrome management.

Despite the fact that poor crisis leadership is generally a hazardous occurrence, depending on the leader's strengths and weaknesses, his or her management can affect more severely either resource or process management. Therefore, poor crisis leadership hazards have been further divided into two specific types. When crisis arises, some leaders tend to fail more in resource management. It means that they make poor decisions regarding different kinds of resources, mainly sorted as: natural, capital and human. Poor resource management causes deterioration of the available equipment's condition, such as: devices or systems inside the passengers' terminal, as well as those located and moving on the movement area/apron, immovables and the entire infrastructure (including movement area, apron and maneuvring area: taxiways, runways). In effect, the decrease in operational safety may be noted, and, at the same time, higher risk of traffic congestion or incidents may appear. It can also happen that despite great resource management, the managerial strategies and actions concerning processes are poor, which can exert profound devastating impacts on the value chain and all the interactions between different internal and external activities. Summarizing poor leadership as a hazard to safety, it is worth mentioning that both its identified forms can be of different severity and scope, but above all, they can occur concurrently. It is also worth mentioning that poor leadership usually correlates with poor implementation of sustainability.

Crisis leadership has such tremendous importance in overcoming the economic slowdown and getting back on the growth path that the authors of the present article have decided to include the leader's approach (further on called "managerial approach") to the occurrence of different hazards, as one of the components necessary to evaluate the risk of a decrease in the safety level at aerodromes.

2.1.2. Deterioration in Human Capital

Deterioration in human capital, as it has already been mentioned, can either result from poor leadership management or can be independent of the leader's behavior. Human capital is basically the learning and development capacity of people employed in the organization [39]. It is claimed that the mental and physical health of individuals plays a significant role in their ability to learn and develop. If the state of health worsens, people cannot spend their energy on learning and working, as they have to concentrate on coming back to full health, which remains the primary human need exceeding every other.

The deterioration in human capital may result in different occurrences that have a potentially devastating influence on safety. Among the most important manifestations that can affect the long-term safety level provided by aerodromes are: a less cautious approach to duties, limited workforce training and development, wrong work delegation, deterioration in mental and physical health and a decrease in staff motivation. At this point, it should be underlined that all these hazards can be encountered together or alone. What is more, some of them can be interdependent. As a result, poor health can reduce motivation, whereas reduced motivation and job satisfaction can worsen further one's mental and physical condition.

Although staff motivation is a result of human resource management, it seems worth discussing that problem separately, as it can significantly deteriorate the quality of safety measures undertaken at aerodromes. People who lose the internal motivation to work start to execute their duties with lower care. They become more indifferent, often withdrawn, which makes them less engaged and so delivers service of poorer quality.

2.2. Non—Human Factors

In the group of non-human factors, five more specific hazards are extracted. The main one in this category, because of its most obvious impact on safety, is the negligence of rules and procedures. Air transport is just the domain strongly encased with numerous safety standards and recommended practices (SARPs), as well as Acceptable Means of Compliance

(AMC). It is said that learning those regulations is an even harder issue for aircraft captains than the art of steering an airplane. The everyday business of aerodromes is strictly defined by numerous rules and regulations. The relationship between compliance with the rules and safety is clear and can have two basic reasons. The first is incompliance with technical regulations. The second refers to the incompliance with environmental regulations. However, in the current situation of the COVID-19 pandemic, it seems worthwhile to also depict other important variables that should be considered by the aerodrome's managers so that safety management remains at the highest level despite the deterioration of the economic situation of the aerodromes and the generally unstable situation globally. Their description is placed later in this chapter, starting from Section 2.2.2.

2.2.1. Negligence of Rules and Procedures

Incompliance with technical regulations might be caused by cost-cutting pressure. However, it can also be derived from the discontinuity of operations. To comply with all the necessary safety provisions, one should not only know them well but also provide outstanding performance of certain actions. Proficiency comes with training; therefore, the longer breaks in the normal functioning of aerodromes, the lower skills and fluency in performing day-to-day operations, including the ones connected with safety. Longer breaks in executing some operations can make employees slower in action but also cause more probable mistakes. Continuity of operations is also related to the provision of appropriate personnel and infrastructure, availability of necessary information of good quality and last but not least, high-quality Air Traffic Control (ATC) services.

The poorer economic situation of aerodromes can also have a negative impact on the implementation of Agenda 2030 and the abovementioned 17 Sustainable Development Goals. Even though the executing strategy with a clear focus on environmental issues and innovation should be a priority now and in the long run it shall bring a lot of cost savings, the initial investment in both material and mental in sustainable management is substantial. The crisis caused by COVID-19 had at the very beginning some improvement in environmental issues because of lockdowns, but now survival becomes the priority goal of many economic entities, aerodromes equally; therefore, the necessary environmental investment and related safety issues are on hold.

2.2.2. Reduced Expenditure on Regular Maintenance

Another serious hazard to safety at aerodromes might be the reduced expenditure on regular maintenance. That is just the next of the multi-faceted, damaging effects of the poor economic situation of aerodromes. Deteriorating economic situation fuels the search for cost-cutting. Even though savings in the field of safety should never be done, real-life verifies that assumption. They cause a higher risk of equipment failures inside the passengers' terminal, as well as of devices and vehicles on the movement area. Because of significantly lower revenues, the companies have less money for investment, so the decline of the service quality often becomes a fact. Some of the necessary investments may be postponed or processed, but gradually, in stages so that the spending is stretched in time.

2.2.3. Restrictions in Service Availability

Apart from reduced spending on regular maintenance, other cost savings have been made because of the COVID-19 crisis. One of them can be achieved by restrictions in service availability. Among such restrictions, fewer plugs in aerodrome halls or limited access to the internet can be named. It seems of minor importance, but most passengers have already gotten used to having a constant opportunity to load their phones and computers or chat with friends while waiting, so they can easily get annoyed when unable to do so. Dissatisfaction among passengers can, as a result, increase anxiety among aerodrome employees, which can further decrease their work satisfaction.

2.2.4. Persistent Pessimistic Economic Forecasts and Investors' Moods

Parallel to what is happening inside the company, the managers of aerodromes should also closely watch what is happening in the economy and on the stock market. Likewise, inflation rises mostly because of people's expectations of rising prices in the economy; the forecasts for the aviation business influence the real situation of the industry and become a kind of self-fulfilling prediction. The forecasts impact the real situation, which, as it was stated above, result in lowering staff motivation, problems in human resource management and, in general, delivering high-level performance in the field of safety.

2.2.5. Decrease in Stakeholders' Satisfaction

Last but not least, the important danger of the worsened economic situation of aerodrome that ought to be taken into consideration by aerodrome managers is the satisfaction of all kinds of stakeholders. Every aerodrome has lots of different stakeholders, both inside and outside it: ground handling agents, shipping companies, adjacent residents, etc. The crucial ones are passengers and employees, but apart from them, various public and private institutions are affected by aerodrome activity in many ways and the other way round—they can influence aerodromes' strategy and economic situation. What is more, most of the aerodromes around the world are in the hands of the state, so governments can significantly impact the everyday business of aerodromes. That can have a multi-faceted effect not only on processes in the aerodromes' value chain but also on several safety issues.

3. Risk Assessment (Economy versus Safety)

Risk management processes are based on ISO international standards series 31,000. Three documents [40–42] should be considered as the basis on this issue. In reference to them, risk management is understood as a set of coordinated actions, including making decisions, setting and achieving objectives, improving performance and managing the organization in relation to risk. The managing risk may be shortly characterized as: being iterative, being an important part in setting strategy, achieving goals and making informed decisions. It includes internal and external contexts of an organization, facing human behavior, interaction with stakeholders or cultural aspects. It appears in organizations of all types and sizes, as they all face internal and external factors impacting the reach of objectives.

Risk management may be described as a complex process consisting of six fundamental components (see Figure 4).

Each of them is important, as well as for the proper functioning of other parts. Moreover, they all make up a complete systemic approach. In this paper, the focus is placed on risk assessment and its three components: (1) risk identification, (2) risk analysis and (3) risk evaluation in order to understand hazard's reasons and possible effects, as well as to identify their probability of occurrence.

In the previous paragraph, component number (1) was addressed. Potential hazards concerning poor aerodromes' condition and their impact on aviation operations safety were identified, divided into groups and described. In the following part of this paragraph, components (2) and (3) are addressed. First, a value indicating hazard's criticality must be defined together with rating scales of its components (Section 3.1., Tables 1–3). Then, risk analysis and its evaluation may be conducted in reference to the criteria defined before (Section 3.2. and Table 4).

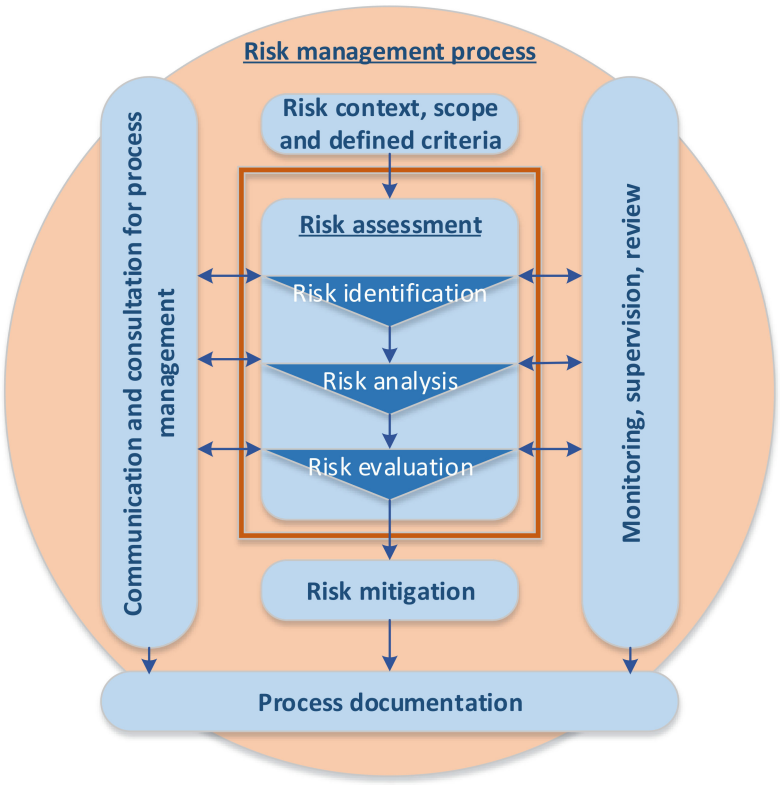


Figure 4. Risk management process, own work, based on [41].

3.1. Criteria Determination

Safety management standards, in particular those described for safety management systems (SMS) [43,44], require that this management is systematic, transparent and proactive. Focusing on the last attribute, proactive management means that special attention should be paid to preventing hazardous events by identifying threats and overseeing and implementing risk mitigation measures before a risky event even occurs. Early identification of possible hazards and prevention of their potential consequences before they occur is, therefore, the basis of the required approach. Out of many available risk analysis methods [41], for the issue under consideration in this paper, the authors propose to implement a modified version of Failure Mode and Effects Analysis (FMEA) with quantitative results. FMEA is a technique used to identify ways in which components, systems or processes can fail and not fulfill their tasks. FMEA defines [41]:

- all potential causes of damage to individual system components (the non-compliance mode determines what should be supervised or functions incorrectly),
- the effects that these incompatibilities may have on the system,
- the mechanism of failure,
- how to avoid the incompatibilities and/or mitigate their impact on the system.

This is exactly what is expected and necessary in order to answer the title question and to achieve the main part of the article's goal.

Modification of the FMEA analysis proposed in this publication concerns quantitative measure calculation. Usually, the Risk Priority Number (*RPN*) is being calculated as a multiplication of three main components:

- risk probability—*P*,
- risk severity—*S*,
- ability to detect the problem.

This time, however, the authors suggest calling the quantitative index *MRPN* (Modified Risk Priority Number) and to preserve the unchanged way it is calculated. Simultane-

ously, to keep the probability of hazards' occurrence and potential consequences of hazards' appearance (indexes *P* and *S*) as basic components arising from safety management standards [43], and to replace the third index with a more management-related one, which has been named the managerial approach to risks and hazards (index *A*) with reference to the analysis scope. As P. Drucker outlined in [45], it is the task of the executive to know how to make the whole organization productive despite the difficult circumstances. It is for sure hard to implement effective crisis management if aerodromes had not been properly managed before the COVID-19 outbreak. However, to make it possible, the executive (manager) should constantly be searching for sustainable development, observing the environment, setting the right priorities and making all employees motivated to achieve the set goals. Therefore, effectiveness both in the economic prosperity and in crisis times largely depends on the management team.

All three *MRPN* components should accept the rating scales from 1 to 5, based on the ICAO Safety Management Manual [43].

The safety risk probability component, standing for the likelihood of identified hazards' materialization, based on [43,46,47], is proposed to be assigned the probability classification and is presented in Table 1.

Table 1. Proposed classification table for safety risk probability index—*P*, own work based on [43,46,47].

Index Value	Hazards' Occurrence Probability	Criterion Description
1	Improbable	Hazards' occurrence is extremely improbable. Crisis, safety and sustainable management of very high quality.
2	Rare	Hazards' occurrence is rare and does not pose a significant threat to the ongoing process.
3	Moderate	Hazard occurs from time to time, is unlikely but possible and you have to reckon with it.
4	Often	Hazard happens to occur and poses a significant threat. Restrictive action required.
5	Frequent	Hazard occurs repetitively, cannot be avoided. Crisis, safety and sustainable management of very low quality.

On the other hand, the risk severity component, referring to possible consequences of identified hazards' materialization (when considering the worst foreseeable situation) based on [17,46,47], is proposed to be assigned to the severity classification and is presented in Table 2.

The third component of the *MRPN* considers the managerial approach to hazard occurrence. It seems to be neglected that both the hazard's occurrence and its severity depend to a high extent on managerial actions. Leading on from that, some hazards may be totally eliminated or at least minimized. The component has been proposed on the basis of [31,48,49], however, verified appropriately. The classification of different possible managerial approaches to risks and hazards is presented in Table 3.

3.2. Risk Analysis and Evaluation

In order to identify those hazards that potentially incur major risk, the authors have juxtaposed the list of hazards with their potential consequences and potential cause. Corrective actions to minimize the negative influence of each hazard's occurrence have also been proposed. A group of experts representing various professions associated with economy, aerodromes and aviation (aircraft's crew member, aerodromes' technical systems attendance and planning personnel, enterprise manager) has been asked to evaluate all three components in every case, and so the *MRPN* for every hazard type has been calculated. To give a qualitative description of each expert, it can be written: (1) Expert no 1—a woman, long-time aircraft crew member with great experience, flying on various aircraft types to different aerodromes in Europe, Asia and both Americas. Nearly eight thousand hours in the air, for the last 5 years, aircraft's cabin crew purser, responsible for safety on-board,

during boarding and flight. (2) Expert no 2—a man, engineer responsible for aerodrome's technical systems planning and attendance, 17 years of experience in the field. (3) Expert no 3—a woman, automation engineer, expert in the field of safety in civil aviation, data quality and Air Traffic Management (ATM), 15 years of experience. (4) Expert no 4—a woman, economist, expert in the field of management and sustainable development, 17 years of experience, active member of PRME (United Nations entity engaged in sustainable development promotion and education); (5) Expert no 5—a man, economist, expert in controlling and risk analysis, 17 years of experience.

Table 2. Proposed classification table for risk severity index—*S*, own work based on [17,46,47].

Index Value	Hazards' Materialization Severity	Criterion Description
1	Meaningless	Air incident (if any), no fatalities or injuries; aircraft's airworthiness maintained, air operation disturbed.
2	Minor	Annoyance, air incident, no fatalities, minor injuries; aircraft's airworthiness disturbed or lost, air operation interrupted or aborted.
3	Moderate	Serious air incident because of a collision with a bird or vehicle in the ground traffic area or a collision with an obstacle or an element of aerodrome's infrastructure—aircraft's damage possible and repair required, people injured, air operations capability affected.
4	Significant	Serious incident or even air accident involving more than one aircraft because of a collision with a bird or vehicle in the ground traffic area or a collision with an obstacle or an element of aerodrome's infrastructure—aircraft's damage and repair, severe injuries; air operation seriously affected, air traffic services disturbed.
5	Catastrophic	Air accident sometimes involving more than one aircraft resulting from a collision with a bird or vehicle in the ground traffic area or a collision with an obstacle or an element of aerodrome's infrastructure—aircraft's damage and repair, multiple fatalities; air operation and air traffic services impossible.

Table 3. Proposed classification table for a managerial approach to risks and hazards index—*A*, own work based on [31,48,50].

Index Value	Managerial Approach to Risks and Hazards	Criterion Description
1	Interactive	This most integrated approach is proactive and advanced as it evaluates the hazards before, during and after the crisis. With the help of the information obtained in this process, it includes continuous organizational learning and self-control mechanism, all these based on sustainability approach.
2	Proactive	This type of approach precedes the interactive one as managers are aware of the long-lasting negative consequences of the economic crisis. Leading on from that, they acquire adequate information, determine risk and develop early warning systems. Special groups involved in risks and hazards management are established.
3	Solving	Management team is simply reacting to the hazard occurrence and does not try to predict it or prevent it in advance. However, the actions undertaken are adequate and basically solving the encountered hazard problem, and so minimizing its potential negative influence on safety.

Table 3. *Cont.*

Index Value	Managerial Approach to Risks and Hazards	Criterion Description
4	Reactive	The reaction of managers is more usually caused by the hazard's occurrence and connected with that substantial increase in its negative impact on safety. The actions are usually aggressive and, therefore, lacking proper analysis beforehand. Therefore, the probable destructive influence of the hazard's occurrence is pretty high.
5	Avoidant	Managers try to avoid direct confrontation with the crisis and so the hazard's occurrence, acting only if the exposure to the hazard eventually takes place and requires urgent measures to be implemented because of its strong adverse impact on safety. Otherwise, no action is undertaken.

The group for this initial analysis consisted of five experts in the field. Not a big group for sure; however, it was decided that for this first introductory consideration it is sufficient, especially since it involved representatives with different professional experience. Independently, it is worth stating that if the results of this analysis were to be used operationally in an aerodrome, the authors suggest expanding the number of experts interviewed. The results of the calculation are presented in Table 4.

Table 4. Risk assessment concerning the influence of aerodromes' difficult economic situation on the safety in civil aviation, own work.

No	Component's Name	Identified Hazard	Potential Consequences	Potential Cause	Corrective Actions	*P*	*S*	*A*	*MRPN*
1.	Human factors								
1.1	Poor crisis leadership	Poor resource management	Deterioration of available equipment's condition (devices/systems inside the passengers' terminal, as well as those located and moving on the movement area/apron), immovables and infrastructure (including movement area, apron and maneuvring area: taxiways, runways); excessive energy consumption, no or inadequate energy consumption policy; no or inadequate investments. In effect decrease in operational safety—higher risk of traffic congestion or incidents.	Lack of people's competence; human error; cost savings; incorrect resource allocation.	Implementation of valid rules and procedures; intelligent management; introduction of green project management in line with sustainability rules; long-term perspective; in-depth strategic analysis of resources enabling appropriate actions ensuring high-quality performance despite economic breakdown.	4	3	4	48

Table 4. *Cont.*

No	Component's Name	Identified Hazard	Potential Consequences	Potential Cause	Corrective Actions	*P*	*S*	*A*	*MRPN*
		Poor process management	Wrong decisions in every field of management, resulting in the deterioration of working conditions and general decrease in human capital, which may result in an increase in the risk of probable accidents and incidents; Safety/Quality Management System breakdown in long time period; greater (than necessary) deterioration of enterprise's economic situation.	Lack of people's competence; human error; cost savings; incorrect long-term financial decisions.	In-depth strategic analysis of the value chain and processes in the value chain with regards to resources necessary for ensuring high quality of the processes.	3	3	4	36
1.2	Deterioration in human capital	Less cautious approach to duties	Higher risk of accidents and incidents; extended waiting time for check-in, boarding, safety check, etc., causing clients' dissatisfaction; deterioration of company's image, violence of sustainability rules; aircraft separation minima infringement.	Deterioration in working conditions and remuneration, resulting in motivation depression and generally more indifferent approach to duties.	Regular meetings with managers in order to track and control staff moods; constant training on the importance of a cautious approach to duties with stress on benefits for the staff, as well as other stakeholders.	4	3	4	48
		Limited workforce training and development	Lower staff competences; human errors; decline in previous proficiency; no staff development; skills freeze; operational errors leading to incidents or even accidents.	Poor management; attempt to reduce costs; short-sighted management approach.	Management training on the importance of constant personal development even in times of crisis; search for possible low-cost development options to be proposed to staff members.	5	4	4	80

Table 4. *Cont.*

No	Component's Name	Identified Hazard	Potential Consequences	Potential Cause	Corrective Actions	*P*	*S*	*A*	*MRPN*
		Wrong work delegation	Higher risk of staff incompetence and so higher risk of accidents and incidents; staff incompetence in various (often operational) situations, shortages in staff skills and proficiency; incorrect or slower performance of assigned tasks; delays, urgent need to call for support staff; traffic congestion; aircraft safety minima infringement; safety risk.	Poor management, willingness to cope with shortages in staff by providing those employees who stay on board, with additional duties mismatching their competencies.	Competent staff appointment; HR managers training and scrutiny of resource allocation; diagnosis of on-hand capabilities and lacking ones.	4	4	4	64
		Deterioration in mental and physical health	Higher risk of less cautious approaches to duties and so higher risk of accidents and incidents	Assignment of tasks inappropriate to competences and experience; stress; excessive expectations; negative moods in the whole society resulting from the state of the pandemic and all its implications.	Medical coaching for the whole staff; collaboration with institutions dealing with health issues; incentives to make employees aware of everyone's responsibility for their physical and mental health (team participation in some health programs gathering, in which everyone has to gather kilometers by riding a bike, etc., to win a prize for the company).	3	3	5	45

Table 4. *Cont.*

No	Component's Name	Identified Hazard	Potential Consequences	Potential Cause	Corrective Actions	*P*	*S*	*A*	*MRPN*
		Decrease in staff motivation	Higher risk of less cautious approaches to duties and so higher risk of accidents and incidents; incorrect or slower performance of assigned tasks; delays.	Deterioration in working conditions and remuneration; assignment of tasks inappropriate to competences and experience; stress; excessive expectations; poor management; no personal development possibilities.	Individual and team coaching; constant monitoring of staff needs and moods to meet the needs and provide necessary back-up if necessary to maintain high motivation.	4	3	4	48
2.				Non-human factors					
2.1	Negligence of rules and regulations	Incompliance with technical regulations	Failure to conduct required inspections of available infrastructure (e.g., runway/taxiway surface condition, light checks), limited overviews of aircraft's condition, less cautious approach to safety procedures, checklists, etc., irregular check of obstacles (high, condition) in the aerodrome's area, excessive energy consumption. In effect, decrease in operational safety—higher risk of ground incidents and accidents during take-off and landing.	Pressure on cost-cutting and search for savings in every possible field; ignorance; failure to adhere to inspection intervals and their scope.	Implementation of valid rules and procedures; intelligent management; long-term perspective; correct traffic management.	3	5	3	45

Table 4. *Cont.*

No	Component's Name	Identified Hazard	Potential Consequences	Potential Cause	Corrective Actions	*P*	*S*	*A*	*MRPN*
		Incompliance with environmental regulations	Persistent noise (sometimes during the curfew hours), deterioration of company's image; collision with a bird or group of birds. Violence of sustainability rules.	Pressure on search for increasing revenues; indolence; ignorance of procedures.	Regular staff training on sustainable development (and 17 Sustainable Development Goals), aimed at making everyone familiar with sustainable development and the necessity of mutual engagement in environmental protection and the need for responsible actions of every single person.	3	3	3	27
2.2	Reduced expenditure on regular maintenance		Higher risk of equipment failures inside the passengers' terminal, as well as of devices and vehicles on the movement area; decline of the service quality; delays; client dissatisfaction.	Pressure on cost-cutting and search for savings in every possible field; ignorance; failure to adhere to inspection intervals and their scope.	Set-up of a team responsible for scrutinizing cost management and verifying cost structure with consideration.	3	4	3	36
2.3	Restrictions in service availability		Less available services (internet, electronic sockets, shops, restaurants, rest areas, etc.) and their poorer quality (cleanliness, diversity, convenience); more dissatisfied stakeholders who may badly influence the ambiance of work and employee's mental health, and so increase the risk of incidents or undermine the aerodrome's image.	Decrease in investment on service improvement and maintenance; cost-cutting concerning services standards, diversity and availability.	Appropriate information management so that all possible stakeholders receive required, high-quality information providing reliable reasons for decrease in service availability, which would also refer to environmental issues.	4	2	4	32

Table 4. *Cont.*

No	Component's Name	Identified Hazard	Potential Consequences	Potential Cause	Corrective Actions	*P*	*S*	*A*	*MRPN*
2.4	Persistent pessimistic economic forecasts and investors' moods		Further decrease concerning investments in goods (maintenance of owned equipment/systems, development—purchase of new ones) and people (training, management, non-financial benefits).	Uncertain pandemic situation resulting in many speculations concerning the future, a lot of them pessimistic ones as pessimistic information is more commonly taken up by media.	Regular team meetings and workshops with managers to have current insight into what employers feel and think to manage closely possible changes in the internal ambiance.	4	3	4	48
2.5	Decrease in stakeholders' satisfaction		Decrease in the number of air connections proposed and their frequency; poor aerodrome's image; resignation from further cooperation by some stakeholders, in effect further deterioration of economic situation.	Poor crisis leadership and all its consequences; lack of stakeholder management.	Set-up of a team responsible for stakeholder management to outline concrete information strategies with regards to specific stakeholder's groups.	4	2	4	32

Table 4, together with the classification of the three components, which constitute the *MRPN,* has been distributed to five experts, of whom three are women and two are men. Everyone evaluated each index (*P, S, A*) separately, not knowing the evaluation of the others. The authors of the present article have calculated the approximates for all the numbers. In the case of discordant opinions or hesitation between two adjacent values, a stricter one was selected due to the fact that this analysis concerns safety in air transport, where in the case of danger, no second chances occur. Leading on from that, the average *MRPN* has been drawn for every hazard. To provide illustrative knowledge concerning the detailed assessments of all five experts, selection of their opinions, limited to three examples—two most critical cases and the least critical one—is shown in a brief form in Table 5.

A comment on the examples provided in order to show the methodology for processing individual experts' results all three lines are analyzed. In the first case, concerning limited workforce training and development, three experts assessed index *P* to 4 and two experts to 5. That is why a stricter value was chosen. The *S* index was easier to assess, while four experts agreed on value 4, which was finally chosen. In the case of index *W*, the obtained results were 54,441, so the fifth experts' opinion significantly varies from the other four. In this situation, it was not taken into account, and index *W* was assigned value 4. A similar analysis may be presented for all the identified threats. In each case, the authors tried to reveal the most popular or the average value, to make the assessment as reliable as possible. Parameter *S* for incompliance with environmental regulation (presented in Table 5), for example, was

assessed at 42,234, so it was finally assessed to 3. When the decision depended on a choice between two values (for example, value *P* for the first line in Table 5), usually the stricter one was chosen to assure maximum safety in the analyzed case.

Table 5. Selected assessments of the five experts in a brief form, own work.

No	Component's Name	Potential Incompatibility	Expert No 1			Expert No 2			Expert No 3			Expert No 4			Expert No 5		
			P	*S*	*W*	*P*	*S*	*W*	*P*	*S*	*W*	*P*	*S*	*W*	*P*	*S*	*W*
1.2	Determination in human capital	Limited workforce training and development	4	4	5	4	4	3	5	4	4	5	3	5	4	4	1
		Wrong work delegation	3	3	5	3	4	4	5	4	4	3	3	4	4	4	1
2.1	Negligence of rules and regulations	Incompliance with environmental regulations	2	4	2	2	2	3	3	2	3	3	3	4	4	4	2

4. Discussion

In general, the conducted research shows that most of the identified hazards pose significant risks to safety at aerodromes. Even though the highest marks are far below the maximum level of 125, it does not mean that any of those risks can be neglected. As it is shown in Table 4, each of those hazards may exert a considerable impact on safety, supposing that management teams do not approach the problem properly. What can also be noted is that the managerial approach (index *A*) never reaches values 1 or 2 (interactive, proactive), which is strongly expected in aviation safety management. Most hazards were assigned value 4 (9 out of 13), which means reactive response to a threat AFTER it has already occurred. This result indicates that there is a lot to be done in the field of aerodromes' management.

A similar distribution of assigned values can be noted for the probability of appearance (index *P*). This index also never reaches value 1 or 2 (improbable and rare adequately), and most hazards are assessed to 4 (7 out of 13). This may be understood as the correct identification of threats concerning the poorer economic situation's influence on aerodrome safety.

The situation of not reaching the highest values of the *MRPN* index is mitigated by hazards' materialization severity (index *S*), which was assessed in a more moderate way than the other two components. Value 1 (meaningless) still does not appear even once, but value 2 (minor) does appear this time twice. What seems worth mentioning for this index is that the only hazard for which the severity of occurrence was assigned the highest value 5 (Catastrophic) is incompliance with technical regulation, what authors suggested previously in paragraph 2 and what seems natural for safe air traffic operations.

The full results of the risk assessment according to their criticality are shown in Table 6.

To sum the results up, experts perceive limited workforce training and development as the greatest identified hazard for aerodrome safety (*MRPN* = 80). Undoubtedly, training, knowledge and experience in aviation are one of the most important issues. However, wrong work delegation (*MRPN* = 64), poor resource management alongside a less cautious approach to duties, decrease in staff motivation and persistent pessimistic forecasts pose similarly high risk (*MRPN* = 48).

Among all the identified hazards, the lowest safety risk creates incompliance with environmental regulations (*MRPN* = 27). That low score seems justified as it can be expected that negligence, in that case, may be onerous and cause nuisance (due to bothersome noise, for example), but it does not directly translate into the safety of take-off and landing operations unless we take into account collisions with birds, which in the analysis results in the index *S* value was assessed as 3. Furthermore, a decrease in service availability, as well as a decrease in stakeholders' satisfaction, seem to incur relatively low risk as well.

Table 6. Risk assessment results according to their criticality, own work.

No	Identified Hazard	*MRPN*
1	Limited workforce training and development (1.2)	80
2	Wrong work delegation (1.2) Poor resource management (1.1)	64
3	Less cautious approach to duties (1.2) Decrease in staff motivation (1.2) Persistent pessimistic economic forecasts and investors' moods (2.4)	48
4	Deterioration in mental and physical health (1.2) Incompliance with technical regulations (2.1)	45
5	Poor process management (1.1) Reduced expenditures on regular maintenance (2.2)	36
6	Restrictions in service availability (2.3) Decrease in stakeholders' satisfaction (2.5)	32
7	Incompliance with environmental regulations (2.1)	27

5. Conclusions

Aviation has been one of the industries most affected by the COVID-19 pandemic and the parallel economic crisis. As safety seems to be the key issue at aerodromes, the aim of this article was to analyze what kind of safety hazards have the coronavirus slowdown created and which of them pose the greatest risk for aerodrome safety in the long run. What is more, the goal of the paper was to direct managers' attention to proper crisis management, which would be in line with sustainability rules for modern transport systems. To fulfill those purposes, the authors: (1) identified a list of possible hazards for safety (Section 2), (2) proposed the Modified Risk Probability Number (Section 3.1.), (3) calculated the risk of every hazard by asking five experts to evaluate the numbers for each component of the *MRPN* (Section 3.2.), (4) described the results and recommended corrective actions minimizing the risks (Section 3.2., Sections 4 and 5) and corresponding with a sustainability approach. By employing descriptive qualitative (identification and description of hazards) and quantitative research methods (the construction and calculation of *MRPN* value), the authors achieved their aims. The main findings are that all classified hazards cause similar safety risks at aerodromes; however, limited workforce training and development poses the most significant among all. Generally, to avoid or minimize the negative impact of most of the identified hazards, managers ought to proactively manage risk and remember the need for constant development, which relates to every individual aerodrome employee, but also to the whole staff as an integrated body, whose condition can, to a great extent, affect the level of safety in aviation and improve energy spending, which is a natural result of a truly responsible approach in management.

The analysis of the research results clearly shows that human factors are considered to create greater safety hazards at aerodromes. Therefore, it seems worthwhile, underlining once again, that the deterioration in human capital can be prevented or at least restricted by proper human resource management [51,52]. Concrete actions have been proposed for every kind of hazard, but some general recommendations can still be made:

1. every decision, especially the ones referring to cost-cutting and the reorganization of any kind, ought to be carefully analyzed;
2. regular monitoring of staff moods but also of other stakeholders should be undertaken;
3. executives shall work on their communication skills to become capable of informing, in a polite and non-aggressive manner, about thorny issues, such as the necessity of taking on additional responsibilities without extra remuneration;
4. sustainability should remain the primary goal despite the crisis, and adequate training about Sustainable Development Goals (*SDG*s) shall be delivered;
5. taking a closer look at reasons for every specific hazard individually shall be an obligatory action of the crisis management team to reduce their possible negative impact on safety;

6. inspectors from the Civil Aviation Authority could not only evaluate the aerodrome's compliance with international recommendations (such as [53,54]) concerning technical issues but also provide recommendations for airports' management, bearing in mind that they are enterprises to be managed;
7. greater care to proper human resource management should be taken.

All these points will be shortly discussed with more detailed suggestions for each of them.

Careful analysis of every decision made in the crisis seems obvious, but it is worth repeating that it shall constitute a basic rule of crisis management. All processes, as well as resources, of the organization, should be well identified and described so that possible solutions for every problem are provided. Every crisis is always a great occasion for reengineering and reorganization, if only decisions about different work delegation, decreased spending, and other difficult issues are not taken under pressure, without proper analysis of all circumstances beforehand.

Adequate stakeholder management is another bullet point for all aerodrome executives. As it has already been discussed, aerodromes have various stakeholders who can influence the everyday business of aerodromes in many ways. Therefore, accurate identification and description of the main stakeholders should be made so that an adequate communication policy with regards to every group is delivered. Conscious stakeholder management can prevent serious dissatisfaction among aerodrome stakeholders and facilitate the implementation of difficult but necessary solutions.

The recommendation concerning constant training of managers to provide non-aggressive but effective communication is very important; however, it requires a lot of individual effort from every crisis leader. Bearing in mind that all information can be delivered in a form that does not harm anybody, while inducing the necessary joint actions is something every manager should strive for every day. Finding how to make people listen and realize what we ask them to do is not easy, and it takes time, but it pays off in the long run.

Environmental incompliances can be substantially reduced if only proper and consistent training on Sustainable Development Goals is delivered. SDGs are our mutual obligation, and the achievement of SDGs is for the sake of every single human being; therefore, all institutions, including aerodromes, shall intensify efforts to pursue those goals. Reorganization in many fields should also be an occasion to take up new sustainable projects and green project management.

Notwithstanding all the abovementioned recommendations, to effectively minimize the occurrence of the identified hazards, aerodrome managers ought to analyze the possible causes of every hazard individually. The ones described in Table 4 do not compile a complete list of reasons but seem to touch on the crucial ones. The fact that many of the hazards, derived from the increased pressure on cost-cutting, should be food for thought for managers. It is obvious that economic slowdown pushes for the searching for savings; however, that should be done in a very thoughtful manner, with round-the-clock care about appropriate communication, which would be focused on making people understand and accept the changes and savings and, at the same time, motivating them towards continuous development and high-quality performance despite financial problems of the organization.

Aerodromes are inspected regularly by representatives of the Civil Aviation Authority. The authors' recommendation assumes extending the group of visiting inspectors and the scope of the inspection to incorporate issues related to the management of the airport as an enterprise. Moreover, to make the managerial inspection thorough and meaningful, the person supervising that issue should be a specialist in business management with significant experience. The idea is not to interfere where unnecessary but to give a fresh look on issues that are simply underestimated. As it was shown in the article, the level of management has a significant impact on operational safety.

Aerodromes have been strongly affected by the COVID-19 slowdown. Thus, aerodrome employees have been widely dismissed from work. A lot of those who maintained their positions have had to approve of worse working conditions, especially in terms

of salary and other financial components of remuneration. On the one hand, massive reductions in employment enable immediate cost reduction, but on the other hand, they negatively influence the atmosphere at work, making employees feel more stressed and insecure. Constant stress affects health in a variety of ways. More common circulatory problems, as well as plenty of other health dysfunctions, may pose a greater danger of accidents at work, which can directly or indirectly impact safety levels at aerodromes. Moreover, the pressure on cost-cutting has limited workforce training and development, which has been depicted as the most crucial risk to aerodromes' safety. To conclude, it seems that proper human resource management is a pivotal success factor in time of crisis, such as the one caused by the COVID-19 pandemic.

Future research on the topic of the present article shall widen the group of experts, making the risk evaluation results even more reliable. A valuable insight would certainly be surveying representatives of all aircraft employee groups, such as pilots and maintenance crews. What is more, it would be worth checking how different expert's features (among others country of origin or form of engagement in everyday aerodrome business) differentiate the results of the MRPN calculation. Although the group of experts for the presented calculations was small, it could be seen that women have more often than men awaited a rather reactive approach of management to most of the hazards, whereas men have claimed that aerodromes' managers seem to be well prepared to manage accordingly, solving or even proactively approaching negative occurrences. Other future research directions may concern detailed surveys at aerodromes—interviews with personnel at different career stages. It would be reasonable to repeat the evaluation of risks with the same group of experts in specific time intervals in order to track whether the assessment changes with time and various environmental advances. Possible limitations resulting from pandemic dynamics and the necessity of aerodrome's day-to-day management.

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