

Determination of Financial and Economic Implications of Air Accident at the Airport

ALICA TOBISOVÁ¹ - STANISLAV SZABO² - ANDREA SEŇOVÁ³ - RÓBERT ROZENBERG⁴ - LUBOŠ SOCHA⁵

^{1,2,4,5} *Technical University of Košice, Faculty of Aeronautics*

Slovak Republic

³ *Technical University of Košice, Faculty of Mining, Ecology, Process Control and Geotechnologies*

Slovak Republic

Abstract

Crisis situations become a part of our common life. These situations pose a threat not only to individual processes in our lives, but also to business processes, even the existence of businesses. For this reason, it is very important for businesses to anticipate these situations and have been prepared beforehand. Effective handling of this crisis situation is based on a well prepared plan for managing emerging crisis phenomena. Airline companies, especially airports must pay close attention to the preparation and development emergency plans, under which they are prepared various scenarios for crisis management of all possible types of emergency crisis situation. However, this plan does not address the issue of the impact of the crisis situation. The range of material, but especially financial, impacts of individual emergency crisis may vary. However, it is possible to estimate the minimum financial cost limit in the event of a given crisis situation.

Keywords: Cost, Crisis, Crisis situation, Air accident, Financial analysis.

JEL Classification: G01, G30, Z3

1 Introduction

Airport surface safety and in particular runway and taxiway safety is acknowledged globally as one of aviation's greatest challenges. Aurtors usually write studies about airport safety, but they don't calculate the financial cost of accident at airport. Wilke et al. (2015) introduces a novel methodology for risk and hazard assessment of airport surface operations, and models the relationships between airport characteristics, and the rate of occurrences, the severity of occurrences, and the causal factors underlying occurrences. All airports are required to have an emergency plan drawn up. Part of this plan is the development of the procedures for defining the

¹ Ing. Alica Tobisová, PhD.; Technical University of Kosice, Faculty of Aeronautics, Department of Air Traffic Management, Rampová 7, 041 21, Kosice, Slovak Republic, alica.tobisova@tuke.sk

² Ing. Iveta Vajdová, PhD.; Technical University of Kosice, Faculty of Aeronautics, Department of Air Traffic Management, Rampová 7, 041 21, Kosice, Slovak Republic, iveta.vajdova88@gmail.com

³ doc. Ing. Andrea Seňová, PhD., Ing.- Paed. IGIP; Technical University of Kosice, Institute of Earth Resources, Faculty of Mining, Ecology, Process Control and Geotechnologies, Park Komenského 19, 040 01, Kosice, Slovak Republic, andrea.senova@tuke.sk

⁴ Ing. Róbert Rozenberg, PhD.; Technical University of Kosice, Faculty of Aeronautics, Department of Flight Training, Rampová 7, 041 21, Kosice, Slovak Republic, robert.rozenberg@tuke.sk

⁵ Ing. Euboš Socha, PhD.; Technical University of Kosice, Faculty of Aeronautics, Department of Air Traffic Management, Rampová 7, 041 21, Kosice, Slovak Republic, lubos.socha@tuke.sk

activities of all aeronautical services, including their responsibilities, for which an extraordinary event has occurred. Emergency plan for airports processed to minimize the consequences of emergencies, not only materially but also personnel and financial terms. The emergency plan is developed on the basis of an airport need, whose role is to manage the crisis situations arising within its scope.

Previous studies (Shangyao & Chung-Gee, 1997; Government of Canada, 2002; Rupp, Holmes, & DeSimone, 2003; Balvanyos & Lave, 2005; Gordon, Moore II, Park & Richardson, 2007) have produced estimates of the economic implications of terrorism on commercial aviation and the cost of a shutdown for a specific stakeholder. Pejovic, Noland, Williams and Toumi (2009) simulated and assessed the effects of a short-term shutdown at London-Heathrow for some stakeholders (airlines and passengers). Maertens (2012) used this research to assess more in depth the interruption losses of a shutdown for the airport and airlines. Therefore, the objectives of this research are to determine all economic effects and costs of a temporary shutdown of an airport for different stakeholders, and this both in the short and long run.

Another study (De Langhe, Struyf, Sys, Van de Voorde, & Vanelslander, 2013) determine all economic effects and costs of a temporary shutdown of an airport for different stakeholders, and this both in the short and long run.

The cost of providing security in airports, especially in facilitating passenger throughput, has risen despite efforts to upgrade training and technology. The classic measure of passenger throughput assumes passengers are passive cogs in a carefully designed security matrix to optimize output. This perspective does not take into account passenger behavior. (Kirschenbaum, 2013)

The term "extraordinary event" refers to all events whose accompanying feature is threatening human life and material damage. Aviation terminology distinguishes eight types of extraordinary events. The individual extraordinary events are shown in Figure 1.

Among the entities that provide security and are involved in recognizing and dealing with any emergency situation occurring in civil aviation mainly include:

- Ministry of Transport and Construction of the Slovak Republic,
- Ministry of the Interior of the Slovak Republic,
- Ministry of Defence of the Slovak Republic,
- Ministry of Finance of the Slovak Republic,
- State administration bodies within their competence,
- Police force,
- Airport operator,
- Air ground equipment operator,
- Airline operator,
- Air traffic service provider.



Figure 1 Extraordinary events
Source: Authors

For analysis needs in terms of content intensity the article discusses selected crisis situations, including ground aircraft accidents and air accidents outside the airport's periphery, which are also categorically similar. The above-mentioned emergencies was also created simulated accident at the airport in order to highlight the impact of such an incident to the financial costs of the airport. As a prerequisite for the realization of the simulated extraordinary event, the conditions of the international airport were chosen - Airport Košice, a.s., while the simulation of the accident was based on the organization of this airport. Simulation is also applicable to airports of a similar type and character.

2 Ground Aircraft Accident

Air accident at the airport is defined as an occurrence associated with the operation of an aircraft which takes place at the time of boarding the first person with the intention of flight until time as all persons have left the aircraft and that has resulted in death or injury to any of the persons or damage aircraft. (Rozenberg & Szabo, 2009)

Announcement of the occurrence of an emergency incident in the form of air accident at the airport receive the leading shifts at the airport control tower. The head of shift at the airport control tower is then obliged to inform:

- Regional Control Centre,
- Airport Protection Department,
- Department of Air Dispatching.

The Regional Control Centre launches an Integrated Emergency Coordination System that includes calling:

- Rescue fire service,
- Emergency Medical Service if located at the airport.

Department of airport dispatching is subsequently obliged to report an air accident to notify the following components:

- Chairman of Emergency Management,
- An aircraft operator affected by an emergency at the airport,
- The Transport Authority of the Slovak Republic,
- Airport spokesperson,
- Border Police Department.

All of these steps are illustrated and described in each Airport Emergency Plan. When occurrence of an emergency of any kind is necessary that all components, which are listed event relates to adhere assembled emergency plan and to follow up effectively.

Ground accident - an incident, is an event other than an accident, associated with the preparation of an aircraft to flight, its operation, treatment, maintenance, repairs or the state, resulting in damage to health or death of the person or damage or destruction of the aircraft. (LAA SR, 2001)

3 Modeling of Financial Costs of Air Accident at the Airport

The individual process steps are differently valued financially and also are valued on the basis of different parameters. For this reason, it is necessary to analyze financial expenses gradually take into account and process all the parameters that enter directly into the process of solving the given extraordinary event.

For more effective and clearer view of the individual cost items it was created scheme, which takes the form of Figure 2.



Figure 218 Components affecting the amount of financial costs of an extraordinary event

Source: Authors

In case of ground aircraft accident costs are quantified on the basis of the total consumption of extinguishing agents. The current price list for the most basic extinguishing agent, Stahmex class-A, is approximately € 5 per litre (actual price list of Pyrotex s.r.o., January 2017). The percentage of admixing using a pen that is available to the Fire Rescue Service is 3%. For 100 litres of water, it is 3 litres of foam. It is estimated that about 34 m³ of water and 1,000 litres of foam are consumed to eliminate the consequences of an accident at the airport. The total cost of fire fighting agents may range from € 5,100 or more depending on the severity of the emergency situation.

The prices of fire extinguishers used for the elimination of extraordinary events range from € 11 to € 40 for a powder fire extinguisher depending on size. Snowflakes from € 30 to € 40 depending on size. (This price is from actual price list from Pyrotex s.r.o., January 2017.)

The fire extinguishers also use fire extinguishers ranging from € 130 to a burglar hook, €120 for a fire brigade, € 70 per shovel, € 120 per fire brig, € 230 per crank, € 100 per hammer and € 80 for a fire axe. All these prices are only approximate, depending on the type and size of firefighting equipment. (This prices are from actual price list from Pyrotex s.r.o., January 2017.) The approximate fuel consumption of the fire and rescue vehicle is 50 litres per 100 kilometres. The total cost of fuel consumption, using one fire truck, can range from € 70 (This price is calculated from actual price list fuel consumption, January 2017).

If the airport does not have its own ambulance on its premises, the injured person injures the injured nest. In the nest of the wounded, the Emergency Health Service take over these people. The price for one fast medical assistance with the Mobile Intensive Unit equipment is about € 50. The price for one kilometre of the aforementioned ambulance is € 0.79 (Price list from Košická záchranka).

When a ground air accident occurs, it is also necessary to provide an alternative transport for passengers for the purpose of moving to a hospital and a place of substitute accommodation.

Refuelling with one bus for approximately 50 passengers is estimated to be between € 200 and € 300 (Price list from Interbus).

Table 1 shows the approximate sum of individual components in the event of a ground air accident. This amount is only indicative and shows the amount needed to hit a single component of the rescue component.

Table 1 Financial analysis of ground aircraft accident.

Rescue unit	Performance	Amount per performance (EUR)
Rescue and fire brigade:	Extinguishing agents (foam)	from 5 100
	Fire extinguishers	from 40
	Fire fighting tools	from 100
	Fuel consumption (100km)	from 70
Emergency Medical Service	Quick medical service	from 50
	Price per km	0,79
	Replacement transport	from 200

Source: Own elaboration

The resulting amount, after counting all the items in Table 1, is equal to € 5 560. This amount is not final. It is an amount that should be considered, at a minimal cost, for the elimination and destruction of a ground aircraft accident. In fact, these amounts can grow up to several 10 times. It all depends on the scale, size, severity of the emergency, and the rescue component.

4 Discussion

The issue of security and crisis management in air transport and, in particular, in the airport's territory is dealt with by many authors and practitioners. The problem of these studies is that they are elaborated from a procedural point of view and there is a minimal scope of the financial field. It is very difficult and problematic to obtain specific financial data in the form of cost items that are needed to eliminate a given crisis event or, eventually, which items is airport forced to incur in such an event. Airports use reserve funds to fund such events as well as using funds gained from insurance contracts. It is because of these facts the airport uses these data for internal purposes only and the public has no access to them. At the same time, the airports do not even quantify either the estimated or minimal funds that are associated with the individual crisis events occurring in the airport's territory. This is where we see the problem, because by such a prediction, which would point to the minimum costs of the crisis situation, the airports would be able to prepare for the event not only on the procedural side but also on the financial side. For this reason, this contribution, which is part of this financial study, points to the minimum financial cost needed to overcome the crisis situation.

5 Conclusion

The financial cost of individual aviation crisis situations and its quantification is relatively complex. Each airport maintains its own pricelists and financial headings, setting out the exact amount of the financial costs of this aviation crisis. This quantification depends on a number of factors, including, the quantity of rescue and other equipment used and not least the scope of

cooperation with other parts of the airport. Many airports currently do not even create a financial reserve that they could use in the event of an extraordinary crisis situation. For this reason, airports have no idea what the costs arising from the intervention of rescue forces. This role is mostly left to external companies, such as insurance companies, which are responsible for the liability for damage caused by airport operations.

The financial analysis described in the article represents only a simulated situation, provided the minimum and basic means of solving the accident at the airport are used. With this amount, international airports of similar magnitude could be considered as the minimum financial costs required for the performance of individual rescue units. It should be noted that every exceptional emergency situation can give rise to other emergency situation. On the basis of such a financial assessment of the minimum cost of an accident, the airports could produce forecasts of individual extraordinary events to ensure the stability and smooth development of the airport.

References

- Act No. 143/1998 Coll. on Civil Aviation (Civil Aviation Act) and on Amendments to Some Acts as amended by later regulations.
- Balvanyos, T., & Lave, L. B. (2005). *The Economic Implications of Terrorist Attack on Commercial Aviation in the USA*. Center for Risk and Economic Analysis of Terrorism Events, University of Southern California, Los Angeles, CA. Retrieved from <http://create.usc.edu/assets/pdf/51831.pdf>
- De Langhe, K., Struyf, E., Sys, Ch., Van De Voorde, E., Vanelslander, T. (2013) Economic effects and costs of a temporary shutdown of an airport – Review and case study. *13th World Conference on Transport Research, Brazil, Rio de Janeiro*. Retrieved from <http://www.wctrs-society.com/wp/wp-content/uploads/abstracts/rio/selected/1621.pdf>
- Emergency plan of Kosice Airport – Airport Košice, a. s.
- Gordon, P., Moore II, J. E., Park, J. Y., & Richardson, H. W. (2007). The economic impacts of a terrorist attack on the US commercial aviation system. *Risk Analysis*, 27(3), 505– 512. <http://doi.org/10.1111/j.1539-6924.2007.00903.x>.
- Government of Canada, P. W., & G. S. C. (2002, July 1). Airport Closures in Natural and Human-Induced Disasters: PS4-8/2004E-PDF - Government of Canada Publications. Retrieved from <http://publications.gc.ca/site/eng/262572/publication.html>
- Kirschenbaum, A. (2013). The cost of airport security: The passenger dilemma 2013. *Journal of Air Transport Management*, 30(2013), 39-45.
- Košická záchranka. Retrieved from <https://www.kezachranka.sk/18/Cenniky/>.
- LAA SR. (2001). Directive on professional investigation of the causes of air accidents. Bratislava. Retrieved from http://www.laa.sk/ht/smernice/setrenie_in.pdf
- Maertens, S. (2012). Interruption of airport operations – Classification, loss potential for the operator and its airline customers, and the question of liability. *Air Transport Research Society World Conference, Tainan, Taiwan*. Retrieved from <http://www.atrsworld.org>
- Pejovic, T., Noland, R. B., Williams, V., & Toumi, R. (2009). A tentative analysis of the impacts of an airport closure. *Journal of Air Transport Management*, 15(5), 241–248. <http://doi.org/10.1016/j.jairtraman.2009.02.004>.
- Price list from Pyrotex s.r.o. Retrieved from <http://www.pyrotex.sk/pyrotex/eshop/10-1-Penidla-zmacadla/30-2-Synteticke-penidla>
- Price list from Interbus. Retrieved from <http://www.interbus.sk/index/prenajom-autobusov.html>

- Rozenberg, R., & Szabo, S. (2009) *Základná letecká terminológia*. Kosice: Faculty of Aeronautics, Technical University of Kosice.
- Rupp, N. G., Holmes, G. M., & DeSimone, J. (2003). Airline Schedule Recovery after Airport Closures: Empirical Evidence Since September 11th (Working Paper No. 9744). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w9744>
- Shangyao, Y., & Chung-Gee, L. (1997). Airline Scheduling for the Temporary Closure of Airports. *Transportation Science*, 31(1), 72–82.
- Vágner, J., & Pappová, E. (2013). Comparison of Radar Simulator for Air Traffic Control. *Nase More*, 61(1-2), 31-35.
- Wilke, S., Majumdar, A., Ochieng, W. (2015). The impact of airport characteristics on airport surface accidents and incidents. *Journal of safety research*, 53, 63-75.
- Zalai, K. (2010). *Finančno-ekonomická analýza podniku*. Bratislava: Sprint dva.