Vladimír NĚMEC, Professor, Ph.D. Eng.
Slobodan STOJIĆ, Eng.
Stanislav SZABO, Professor, Ph.D. Eng., M.B.A.

Czech Technical University
Department of Air Transport

MANAGEABILITY OF AIRPORT ORGANIZATIONAL FACTORS AND THEIR INFLUENCE ON SAFETY EVENTS’ REALIZATION

Abstract

It is widely known that airports due to their character of everyday operations constitute a suitable environment for performing various safety related events. A large number of objects conducting series of operations within limited space and time increases potential for a particular accident or incident realization. According to their structure, accidents or incidents typical for airports in most cases combine mutually related negative influences that create preconditions and precursors (factors) for particular safety events.

The aim of this paper is to provide a clear view on the organizational factors which represent integral elements of airport safety management and also to offer the solution for their better utilization for more effective identification and prevention of risk at the airport. The study takes into account different aspects of airport operations, management, decision-making processes, process monitoring, etc.

Keywords: airport safety management, organizational factors, risk mitigation, safety events.

Introduction

Various operations and procedures performed at airports are managed through several systems, according to their nature and purposes. Different operations and procedures are coordinated in order to ensure their effective flow and on-time performance. The quality of processes’ performance is dependent on the current level of safety within the organization. Such a dependence could be observed through financial aspects or increased complexity of respective processes caused by implemented safety measures. For instance, while designing a new airport, certain safety standards are always followed. The layout of the airport terminal building is one of the crucial elements for safe operations (Begera and Endrizalová, 2014).

The systematic approach to processes and procedures management also involves the management of safety. Some initiatives (ICAO SMM, 2013) require from aviation organizations to be more active in terms of the safety management and establishment of a system that would ensure effective treatment of safety with a focus on risk identification (Stolzer et al., 2011). Although, the results of aviation safety management are satisfactory (ICAO Safety Report, 2015), continuous improvement is required.
The question now arises what a proper setting of the safety management system is that will ensure effective dealing with safety issues and improve the level of organization safety performance.

The explanation presented in this paper is based on the statement that from a safety management point of view is of high importance to ensure comprehension of the system as a structure of continuous processes. The manageability of such processes (from the safety aspect) is a core for more preventive treatment of the future safety events. It also involves the need for a deeper analysis of the current safety issues which will enable to create a better system of errors and deficiencies detection. Such an approach to the issue of safety includes a proper understanding of various safety related factors and their influence, and importance in safety event’s structure.

Contributing factors are perceived as preconditions and precursors for particular safety events. It is worth asking how these factors should be treated and (in the best case) utilised actively for more proactive and preventive safety management. The contributing factors could be divided into several groups, according to the issues, objects, subjects or processes which they are related to. Various initiatives define the contributing factors (Boeing, 2013; IATA, 2015). For instance, IATA within its Airport Handling Manual (IATA, 2015) defines several contributing factors groups as follows:

- working area/environment;
- equipment/tools;
- communication;
- ergonomics;
- procedures/task/training;
- individual factors;
- leadership/supervision/organization;
- organizational factors.

The focus here will be put on the organizational factors. Dealing with such a kind of contributing factors is a step into a modern safety management evolution phase. The approach has changed from targeting technical issues exclusively to blaming the involved person and finally to become a modern view which takes into account organizational flaws and deficiencies. Therefore, the aim will be to explain the importance of organizational factors and demonstrate how such factors could be proactively used within the safety management.

**Understanding the purpose and importance of organizational factors**

It is of great concern how organizational factors are understood and what purposes they are used for. The current status in a large amount of aviation organizations within the Czech environment indicates that particular organizational (as well as other contributing factors) factors are in some cases identified, however, finding and labelling them is more or less everything what they are used for.

The reason for such a situation refers to complexity and lack of knowledge on the possible influence and impact of such factors on the system. In comparison to other contributing factors types, organizational factors do not concern a particular issue but rather indicate which part in the organization structure does not function properly or for some reason it is not capable of stopping a particular error to occur. Organizational factors and their structure are dependent on a type of aviation organization. It is not necessary for an airport to monitor flight scheduling processes of a particular airline because most probably it will not provide valuable information relevant to operational airport safety management. On the other side, for a particular airline, it could be an
important source of information, preventing from inadequate crew planning, aircraft utilization, aircraft maintenance planning, etc. This is a logical example, however there are some common, more general factors, typical for all organizations, for instance, the issues related to personnel training, company policies, union actions, etc.

Organizational factors, due to a fact that they are focused on system setting and properties, are directly related to other types of contributing factors. These relations could be understood through management of individual contributing factors which is partially based on organizational improvements. In order to explain it in a more practical way, a fictitious safety event could be used. On the following figure (Fig. 1), a fictitious incident is presented as a chain of events which resulted in a ground collision between the airport ground vehicle and the manoeuvring aircraft. The chain consists of four subevents where links between them are presented by arrows. Each subevent represents safety event by itself, however without a special impact on the safety when considered individually.

![Fig. 1. Chain of events and organizational factors](image)

The provided figure shows how first two subevents – “2 instead of 5 workers on position” and “personnel procedure violation” could be covered by a common organizational issue (factor) labelled as the “staff management”. In practice, it means that the issue here refers to insufficient staff planning management which enabled the situation where for a particular procedure is allocated a less number of employees than required. Another subevent indicates that the personnel which performed a particular action violated provided procedure rules. The relation between this subevent and staff management factor is based on the fact that the analysis of the event showed that the allocated personnel did not have a required level of training for such a kind of procedures.

Second group on the presented figure are organizational factors “work process / supervision”. These follow the analogy of the previous example where a subevent “More procedures performed by 1 person” indicates a clear lack of supervision and existence of issues with a work process organization. The last event in the chain shows that last barrier which could prevent from an incident does not even exist, so it has led to safe event realization.

These organizational factors represent a manoeuvring area for management activities. The assumption here is that focusing on individual contributing factors only
solves symptoms however it does not exact causes. The following sections introduce approaches on how these factors should be defined, managed and used for improvement of the organization safety performance.

**Defining and managing organizational factors**

As previously mentioned, stating individual organizational factors do not create a “whole” picture of the organization’s level of safety. However, it indicates the existence of systematic issues which management is assumed to prevent from contributing factors emerging at other points, most commonly during particular operational processes. Therefore, the organizational factors should be monitored and managed through relevant operational processes. It means that such issues should be comprehended as deficiencies in an operational performance, whose on-time detection leads to further safety event prevention.

The core of the issue refers to the ability of a given organization to set a mechanism adequately that will be able to indicate the existence of potential issues. The aim is to identify what are the possibilities for corrective measures implementation and demonstrate what significant influence such a treatment of organizational factors will have on other contributing factors prevention. It is almost impossible to define a stable set of organizational factors that would be applicable for all types of airports. Therefore, an approach in dealing with such a type of issues must involve a continuous process of system monitoring and safety events’ analysis. Identification of events is also an important step in airport emergency planning (Kraus *et al.*, 2015).

First of all, organizational factors must be recognised and well distinguished from other contributing factors. The main characteristic of these factors is their indisputable connection with organization managing processes and potential to create a convenient environment for different kinds of errors and violations. Individual organizational factors are the results of a proper analysis of relevant safety events. In other words, organizations take responsibility when it comes to their definition and monitoring.

Some examples of these factors include:

- inadequate supervision;
- an inadequate quality of process and task planning management;
- organization policies;
- personnel management;
- training processes, standard practice and procedures, etc.

Airports including their units and operations are considered as a single system of mutually dependent elements. The existence of contributing factors is typical for all system elements. It is common that one factor influences several elements simultaneously, regardless whether these elements are related to or not. Organizational factors, on the other hand, could be presented as high-level factors due to the fact that these are identifiable exclusively on the organization level within a given organization. The next level is operational where individual contributing factors are presented as the results of the current organizational factors existence. The following figure (Fig. 2) presents a distribution of the factors between two levels of management. A green box represents a level where organizational factors should be treated in order to mitigate potential safety risks.
Fig. 2. Contributing factors to levels of management

Due to the fact that a creation of stable sets of organizational factors is highly questionable, these factors should be determined according to the current needs of the given organization. Since organizational factors are preconditions for other contributing factors, a direction of the analysis leads from individual contributing factors to factors on the higher level.

During the research, available safety data were a primary source for a correct definition of individual contributing factors. Due to sensitivity of the available data it is not recommended for them to be presented in a way that could destroy the existing safety management system within a particular organization. However, these data open manoeuvring space for search of general patterns of the system behaviour. The process included initial safety event and audit findings analysis. Individual safety events were structured into a chain of smaller subevents or factors that played a role in their realization. These were then described with the focus on subjects and objects involved, their impact on the system, possible barrier existence, etc. Their classification (labelling) is performed in order to enable an unified view on a specific issue that appears to be important from the safety management point of view.

By implementing such contextual information, defined subevents and factors were observed as more structured terms suitable for their separation into several groups according to their nature. In this way organizational factors became a separated group of factors that are evaluated as those whose on-time solving could be a preventive barrier to the following creation of subevents chain leading to safety event realization. The following table (Table 1) represents an example on how one organizational factor could be defined and what set of other subevents (other contributing factors) could be linked (related to) to them.

<table>
<thead>
<tr>
<th>Organizational factors</th>
<th>Other contributing factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>quality of task organization management</td>
<td>number of staff less/more than required</td>
</tr>
<tr>
<td></td>
<td>time pressure</td>
</tr>
<tr>
<td></td>
<td>procedure violation</td>
</tr>
<tr>
<td></td>
<td>workload</td>
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<td></td>
<td>inadequate experience for a given position</td>
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</table>
After defining, the organizational factors must be monitored and managed in the case they are detected or if there are some symptoms of irregularities. The knowledge on the current processes and detected irregularities, including various contributing factors, enables the management to detect possible organizational issues and solve them or to restructure and improve system (organization) settings. In order to enable such a clear overview, the organization is supposed to establish a mechanism that will monitor system processes continuously, detect an impact of emerging contributing factors and will be capable of identifying the issues on the organizational level.

**Ensuring factors’ management processes**

From a practical point of view, the focus in dealing with organizational factors is put on the management of various processes. It includes activities such as operation monitoring, control of ground movement, coordination of general or military operations, etc. Important aspects are also given to operational conditions, system behaviour and other. All of the above are valuable sources for adequate contributing factors determination. Understanding these factors enables to comprehend the organizational factors.

It could be concluded that the manageability of organizational factors is highly related to the manageability of processes within an organization. It implies that issues should not be searched for according to what has happened, but more proactively, according to what could have caused them. Therefore, the organizational factors are of core importance. To enable such an approach, organizational and other contributing factors must be adequately managed. The mechanism determined for such purposes should focus on various contributing factors and according to them be able to define what organizational elements require: improvement or reconstruction.

Good instruments for such purposes are safety performance indicators, which if set properly, could provide some important information on the current trends in some event or factor realizations. There are various initiatives focused on safety performance indicators established for the airport safety management needs (Wyman, 2012; ACI Recommended Practice, 2014). The Airports Council International made efforts by creating the examples of safety performance indicators for airport needs (ACI Recommended Practice, 2014).

According to the theory, there are two types of safety performance indicators (Øien et al., Part 1, 2011; Øien et al., Part 2, 2011). Lagging indicators provide numbers of some final event realizations and leading indicators are focused on potential issues and preconditions for safety event realization. Indicators should be established upon events contributing factors (Lališ, 2015), or more precisely, they are supposed to provide valuable information on particular factors realization.

Due to the nature of organizational factors, it is possible to establish particular leading safety indicators according to them.

The data gathered from these indicators represents a foundation for more proactive safety management. The proactivity refers to monitoring of the preconditions that could be systematically prevented by the organization management activities. It creates the possibilities for potential contributing factors prediction. The analysis of the gathered data could also be an input for more proactive planning and performance of an auditing process. The audits are mainly based on compliance monitoring within an organization. However, having known what the current issues on the management’s level are, audits could focus on the problematic elements of the system management.
Conclusion

In order to approach solving safety issues systematically, the aviation organizations are supposed to focus their activities on internal, organizational issues (factors). These are characterized by their proper manageability, due to the connections with system management processes. By managing individual organizational factors, the management directly or indirectly influences other contributing factors. This confirms that a strong relation between organizational and other contributing factors could be used for more effective safety management.

Focusing only on the contributing factors could be misleading, if the whole context of the incident is not taken into account. It is important to be acquainted with the event background, where organizational factors play a significant role. Organizational factors almost always represent a background and a precondition for other subevents or contributing factors. If taken individually, organizational factors are primarily at the beginning of the event chain.

For managing organizational factors, various mechanisms could be used. Leading safety performance indicators are a suitable instrument for effective monitoring of organizational factors. The reason is that such factors do not represent a safety event by themselves but are precursors for other contributing factors.

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