IMPLEMENTATION OF IT SYSTEMS FOR EMERGENCY MANAGEMENT AT THE ZADAR AIRPORT

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ABSTRACT

Emergency situations at airports, primarily related to the aircraft, challenge each airport operational service or division. Situations such as the emergency landing of aircraft because of equipment failure, fire, kidnapping or emergency medical interventions, require quick response and coordination between all involved services. In all documents and regulations or their individual parts related to emergency situations, clearly and unambiguously is stated that the main objective of emergency response is saving human lives, and that’s why is necessary to take all measures to allow quick and correct decision making. Today, when the information technology (IT) is at very high level of development in all aspects of customer needs, its use in emergency response planning for all kinds of emergency situations at the airport, would enable faster and better coordination between services. In this paper, it will be presented the implementation of IT systems for emergency planning, with the example of the Zadar Airport and plans for its further development.

KEY WORDS

emergency situation, planning, IT implementation, Zadar Airport

1. INTRODUCTION

Situation such as the landing of aircraft because of equipment failure, fire, kidnapping or every other situation which endangers human lives is called crisis situation or simply – emergency. This also includes situations outside the scope of aircraft operations, which are deviation from planned or expected behaviour. Emergency usually happens unexpectedly and demands immediate response to stabilize the situation, in order to save lives or reduce the possibility of damage to property.

To respond immediately, it is critical to have the right data at the right time, in order to make a right decision and take appropriate action. In other words, for every person or service that is involved in crisis situation, it is critical to follow the plan, so it is necessary to establish emergency management at the airport. Emergency management encompasses a wide range of activities, which could be grouped as components or described as aspects of emergency planning. But most of authors and emergency professionals generally
agree that these activities are part of the one cycle that can be divided into five phases:
1) Planning,
2) Mitigation,
3) Preparedness,
4) Response and
5) Recovery.

The first three phases, planning, mitigation and preparedness occur before crisis situation, response during crisis situation, while recovery encompasses actions after the accident or some other catastrophic event (Figure 1.).

Today, when the information technology (IT) is at very high level of development in all aspects of customer needs, its use in emergency management would enable the most appropriate information for all actions in previous mentioned three phases that occur before crisis situation, faster and better coordination between services and rescue teams during response and it should also make response time shorter and recovery actions more efficient.

In this paper, the phases of IT system implementation are going to be briefly described and also some results of preliminary analysis for emergency planning at the Zadar Airport will be shown. Zadar Airport is mixed aerodrome which is consist of military airbase and civil airport and from the aspect of physical characteristics of manoeuvring area it is unique aerodrome in Croatia and from the aspect of the number of daily operations it is the busiest Croatian aerodrome, considering that most of the operations are military training flights.

In case of Zadar Airport there are many challenges associated with the implementation of IT tools for emergency management and aerodrome operator has already began with the process of implementation which is currently focused on analysis and planning phase.

2. SOME ELEMENTS OF CURRENT RESEARCH

There are lots of definitions of airport emergency but mostly in documentation which are published it is used following: “An airport emergency is any occasion or instance, natural or man-made that warrants action to save lives and protects property and public health”. Airport operations are highly regulated and for providing emergency management it is necessary to established Emergency Response Plan (ERP). Purpose of ERP is to facilitate the timely and appropriate response to emergencies occurring on or in the immediate vicinity of the city.

Analysing materials which are covering ERP it can be categorizes on three categories by sources: research institutes and international organizations, airports and airlines.

As ERP is a complex topic, new technology was implemented with the aim to increase respond time and to disperse important information to all stakeholders. There are several scientific papers who research those topics.

First is Abdalla, R. [16] who work on 3D Web-based GIS Visualization and Significance of 3D modelling for Emergency Preparedness at Airports. The next research paper [17] covering standards for airport emergency planning and geoinformation for airport emergency planning. Geodata d.o.o. company from Croatia develop for Split Airport application “WebGIS Airport Emergency Planning”. The objectives of that application are to enable wide access of AEP in its current version (the AEP is continuously updating) and to provide additional information concerning the shortest path for selected emergency vehicle. Same author made additional research also on WEB GIS for Airport
Emergency Response - EML Model [18]. Beside those scientific papers [19], ACRP Report 88 was published titled “Guidebook on Integrating GIS in Emergency Management at Airports”. In that document, it is clearly stated how to Start and Manage a GIS-EM Integration Initiative at an Airport (describe Vision, Recourses and Launch, Develop and Implement, Progress and Enhance).

There are another two companies who develop innovated IT Systems related to Emergency Management. One of those companies is called Veoci [20] and another is called Innovative Systems [21]. Both companies develop IT solutions (platforms) how to manage Emergency Response using IT System.

2.1. Research institutes and international organizations

From research institutes and international organizations good example of research was made from following. Faculty of Transportation Sciences in Prague [1] develop document titled “Airport Emergency Plan Guidelines and Template”. In this document, it is defined in detail who are stakeholders, organizations included in ERP and what are they assignment and responsibilities. Addition to that in document each step how develops and maintenance ERP was defined. Furthermore, they recognize importance of specific hazard in ERP and dividing it into 6 categories as following:

1) Aircraft incidents and Accidents,
2) Natural Disasters
3) Bomb incidents
4) Hazardous Materials Incidents
5) Structural Fires
6) Failure of Power for Movement Area Lighting.

All those 6 categories are role of each responsible person during ERP are in detail explained. Smith F. [6] made research in topic “Airport disaster preparedness in a community context”. In that study author made analysis over 30 airports from US and describe their reaction on emergency operations via several benchmarks.

Florida Department of Transportation published document “Aviation Emergency Response Guidebook” [8] in which they describe emergency types, agencies who are involved and Special Equipment needed for Aviation Specific Emergencies. Benefit from that document is that there are emphasize good management practices how to develop ERP.

Addition to previous document, Raylene, A. [11] showed in his presentation good example how to establishing an Emergency Response Plan. He defined what are the questions what need to be answered related to ERP, what ERP need to cover and who should be involved. From aviation organizations, there are mostly documents from ICAO and IATA. ERP is describing mostly in ICAO Doc 9859 Safety Management Manual (SMM) [15]. There are several presentations [3] where it is shown ICAO SMS compliance required related to International Standards Require a Safety Management System, including an ERP with following statements “An operator shall have a plan detailing the procedures to be followed in the event of an accident, incident or other emergency. In those presentations, it was stated what are Common Emergency Response Problems in term of:

1) Lack of planning,
2) Lack of training,
3) Lack of resources,
4) Lack of communication,
5) Lack of coordination and Defined Key Components of an Emergency Response Plan.

Company Gates Aviation published CD with Emergency Response Planning (ERP) Guidance Manual with the air to help users to define emergency response process fit for purpose. In those materials three main sections are defined as following: Emergency Response Planning Basic Principles Guidelines and regulations; Emergency Response Planning General Guidance Direction; Emergency Response Planning Framework. Furthermore, in that document segment of emergency response plan was describe, emergency contacts, flow of information and positions, organizations and roles of each participant in EP. Addition to that different types or emergencies are describe.

There are lots of available templates for use as example who to develop ERP. Those examples are published by New Hampshire Aviation System [1,7, 12].
2.2. Airports

From airport side, there are several airport and airport related organizations who published their examples of ERP. In ACI Asia-Pacific region Mr. Kanaya develop document “Emergency Planning and Crisis management for Airport Business” [2]. In his document, Crisis management and Emergency Plan were defined. Focus of that document was made on Conceivable Crises and Risks at Airports and influence of earthquake to airport operational disturbance.

Also research project on solving problem how to react on Earthquake related to airport operations was explained in Tribhuvan International Airport ERP [4]. In their research they describe Methodology how to develop ERP, Concepts of TIA Disaster Response Plan, Contents of the Plan. Another example is from Kirkland Lake Municipal Airport [5].

Good example how to handled emergency on smaller airports are shown from research University of Minnesota in appendix A “General Aviation Airport Emergency Plan Template”[10].

Another good example of ERP in term of major airport came from Rome airport “Leonardo Da Vinci Fiumicino” [13]. In that document standards and procedures for emergency statuses or aircraft accident was describe in detail.

2.3. Airlines

Although there are mostly airports defining emergency plan, airline called ABCX airways published their Crisis Response Planning Manual and Emergency Response Plan which is related to their Station Managers [9]. In that document all information and procedures how to handle their aircraft in emergency on airport are describe. IATA published document titled “Emergency Response Plan - A template for Air Carriers” [12]. In that document, it is shown how to prepare ERP, how to communicate and it gives good examples of forms for fulfilling during ERP. KLM was another airline who explained their Emergency Response Plan [14]. In their presentation, they divided chronology of developing ERP and how they upgrade ERP to best useful one.

3. REGULATIONS

Following regulations are crucial element when ERP was developed, used and updated. Regulations clearly define outer boundaries and describe how process must be define. By its definition regulations is a rule of order having the force of law, prescribed by a superior or competent authority, relating to the actions of those under the authority's control.

When we define regulations related ERP it is crucial to split those regulations into three categories as following:

1) International
2) European Union Directives and Regulations
3) Croatian Regulations

3.1. First level - International

The first level is mostly defined by ICAO and it comes in form as International Standards and Recommended Practices (SARP’s). Those documents which describe process of ERP are:

- ICAO Annex no. 14 Aerodromes – Chapter 9
- ICAO DOC. 9137 – Airport Service Manual Part 1, Rescue and Fire fighting
- ICAO DOC. 9137 – Airport Service Manual Part 7, Airport Emergency Planning
- ICAO Doc 9774, Manual on certification of Aerodromes, Appendix 1, Part 4.3

3.2. Second level – European Union Directives and Regulations

- ENAC – Regulations for the Construction and Operation of Airports, am. 8 of 21/12/2011, Chap. 9
- ENAC – Circular APT-18A of 30/01/2008
- EASA regulation ADR.OPS.B.005 Aerodrome emergency planning EASA regulation
3.3. Third level – Croatian Regulation

- Air Traffic Act, Official Gazette No 69-09, 84-11, 54-13, 127-13, 92-14
- Airports Act, Official Gazette No 78-15, 19-98, 14-11
- Ordinance of rescue and fire protection at the airport, Official Gazette No 39/09
- Ordinance on emergency medical services at the airport Official Gazette No 57/12
- Firefighting Act, Official Gazette No 106/99, 117/01, 36/02, 96/03, 139/04, 174/04, 38/09, 80/10
- Fire Protection Act, Official Gazette No 92/10

4. PROCESS OF IT SYSTEM IMPLEMENTATION

Although IT system as a product is recognized as integration of automated hardware and intelligent software solutions, implementation is a comprehensive process with a wide range of activities, very detailed analysis and planning. The specific implementation process can vary from organization to organization and it is mostly dependent on the size of the airport, number of aircraft movements and also on details of the actual strategic plan. But majority of activities (analysing requirements, infrastructure planning, configuration, customization, testing, training etc.) are common to all types of airports, what led us to the conclusion that every implementation process should consist of these four basic phases:

1) Analysis,
2) Planning,
3) Construction/installation and
4) Implementation

The implementation (as the fourth phase) is actually the result of the first three phases, as shown in Figure 2., but it should be observed as a phase because it involves a change, precisely, transforming from something familiar to something new. More complex and detailed first three phases will ensure that changes are fully integrated and accepted what makes implementation successful and cost effective.

Figure 2. Phases of IT system implementation

4.1. Analysis

The first phase of the implementation process is gathering and collecting various types of data. The goals of this analysis phase are to identify the need for change, determine what innovation or set of practices are likely to meet that need, and to decide what is going to be the most appropriate way to move ahead with implementation process. Some of the analyses that should be included in this phase are: geographic analysis (location of the aerodrome, surrounding and populated area, closest public safety and health institutions etc.), environmental analysis (land use adjacent to the aerodrome etc.), infrastructure analysis (access roads, physical characteristics of the manoeuvring area, possibility of upgrading current buildings and plans for development etc.), documentation analysis and their compliance with the regulations, air traffic analysis etc.
4.2. Planning

The second phase of implementation process is closely related to the results of the previous analysis phase. The phase of planning includes the determination of priorities and objectives and outlining the future actions that are needed to achieve these objectives. Some of the plans that should be included in this phase are maintenance plan, plan for documentation update and compliance with the regulations, infrastructure works plan, IT system implementation plan etc. Probably the most important plan is financial plan, which needs to be implemented in the financial plan of the whole organization.

4.3. Construction and installation

The activities of the third phase are based on the previous determined plans and basically it includes all activities that are part of the project management. Successfully completed project, which means that all infrastructure is built and IT system is installed and ready to use, is going to provide all the necessary capacity which will support the implementation of the new practices.

4.4. Implementation

Every implementation is unique and depends on the scope and complexity of the project that was undertaken in the previous phase. Implementation should be focused on the acceptance and integration of the change to operational practices. Some of the activities are identification of key stakeholders who share the interest and need for change and identification of a leadership team responsible for the oversight of necessary aspects of the change integration process over time. Education and training are the key activities to ensure that IT system will be successfully used in case of emergency. Such IT system have to allow creating an accurate training model of the emergency scenarios, which will provide significant opportunity to improve the effectiveness of the response. Moreover, improvisation is strictly forbidden during emergencies and that represents one of the worst forms of inefficiency and most likely sources of error and confusion.

Also, constant updating of the system, based on the education and training analysis, is the key activity to ensure that capabilities of such complex and intelligent system will be used to support decision making and accuracy of the response, rather than causing interfere or obstruction in the operational practices. That led us to the conclusion that every implementation phase is basically a cycle shown on Figure 3.

5. EXAMPLE OF THE ZADAR AIRPORT

Safety is a top priority at the Zadar Airport. In the current safety policy, it is clearly visible that Zadar Airport chooses continuous improvement of the safety management system, based on which was developed an initiative for the implementation of new technologies in order to improve the operational procedures, coordination between emergency services and general exchange of information in cases of crisis situation. One of the specific objectives of the initiative is the implementation of IT system, which could provide harmonization of the operating procedures of all involved emergency services in case of crisis situation.

In accordance with the previously described process of IT system implementation, Zadar Airport is currently undertaking analytical activities ie. the
first phase of implementation - analysis. For that purposes, during 2015. and 2016. several field researches were performed and large amount of data was collected. Until now, infrastructure, documentation and air traffic (aeronautical) analyses were completed [21] while geographic and environmental analyses are going to be completed by the end of 2017. The results have shown various needs for improvement and the need for implementing new practices and technologies. For example, during field research, more than 20 kilometres of roads and paths around the airport were inspected, of which 13,2 kilometres was processed in the infrastructure analysis. Roads and paths were observed as access roads to the airport and were divided in the three zones, related to location of the runways. Results have shown which roads and paths are suitable for access to the aerodrome in all conditions in case of the emergency, and where the improvements can be made. Also, results have shown that airport operator should implement new operational practices and technologies for inspection of the aerodrome fence, more rendezvous locations, etc. There are also other benefits of the field researches, especially for the education of the rescue and firefighting (RFF) staff. Because the most of the collected data can be shown on the map, an application was developed, to be used with Google Earth software. User friendly interface and the fact that the Google Earth is used on a daily basis for a variety of purposes, were arguments for selection of this software for education of the RFF staff. With this application, it is possible to visualize all the theoretical data that is usually part of the education (Figure 4.), as well as the location of the access roads and paths, rendezvous points, gates on the aerodrome fence etc. With the completion of geographical and environmental analysis, Zadar Airport will be ready for the planning phase of the implementation. Considering that in 2016. Airside development study and Terminal building development study were completed and some other projects are realized that will support the initiative, the planning phase should be focused on financial plan and the IT system implementation plan. EU funds or some other financial programs are one of the opportunities in this case.
6. CONCLUSION

The use of the IT systems for the emergency responses and other activities, such as education and training, are a significant benefit to operational procedures and practices. With constant improvements and upgrades, it should significantly reduce the response time, which is most important and the main reason for its implementation. Using IT systems significantly increase dispersion of necessary information for fast emergency response. Furthermore, with using those IT systems for ERP, visualization of terrain and for example aircraft crash site could be presented on dynamic geological layer what will additional help all rescue team (internal Zadar Airport response team and external medical and firefighting rescue team from City of Zadar and surroundings) to be more orientated during approaching area of accident.

Example of the Zadar Airport shows that although implementation process it is not yet finished, and that many challenges will be with the future work, there are already benefits that can improve reaction and decision making in case of the emergency.

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