

# SEARCHING FOR AIRCRAFT AFTER EMERGENCY LANDING

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The theme of the thesis is to hunt for the aircraft after an emergency landing and its main aim is to focus on the hunt for aircraft, aviation accident investigation and their overall progress during the execution of search and rescue action. The work elaborates on the whole search and rescue operations carried out in the Slovak Republic and describes the entire rescue operation from receipt of distress alerts aircraft in distress over the total course of that action until its completion. The work also focused on the equipment is search aircraft and helicopters, which are an integral part of search and rescue and also analyzed the air rescue service, its history and main activities that are carried by that service.

**K e y w o r d s:** Search and rescue service, Rescue co-ordination centre, Area of search, Aeronautical information publication.

## 1 INTRODUCTION

Air transport inherently represents one of the most important and dynamic sector of the economy. Based on selected statistical indicators, air transport is the safest method of transport and according to these criteria it maintains leading position. The occurrence of aircraft accidents is in comparison with other methods much lower, but the consequences of accidents in air transport are often, for the crew of the aircraft and passengers, fatal. Air accidents cause injuries, fatalities, property damage and damage to third parties.

Significant and most widely discussed issue is the question of security. Statistics point to the fact that with the increasing number of flights is increasing the number of accidents and fatalities. The occurrence of aircraft accidents when compared to other methods of transport is much lower, but the consequences of accidents in air transport to the flight crew and passengers are often fatal. Air accidents cause injuries, fatalities, property damage and damage to third parties. Air transport unrivalled the safest method of transport.

The thesis is divided into six chapters, which describe the overall issue of search and rescue. The first part deals with the legislative framework, search and rescue, in which I discussed the laws, regulations and manuals relating to civil aviation and related search and rescue aircraft. The second part deals with the organization of search and rescue services, the responsibility for providing and setting up the service as well as the establishment of search and rescue regions and individual sites in the Slovak Republic. The third chapter describes the steps to prepare for search and rescue, which implements the Rescue Coordination Centre in Bratislava and its activities during the period of emergency declaration. Airlines search, equipment investigative aircraft and helicopters, air rescue service and the various methods of searching I described in chapter four. In the fifth chapter, I compared the effectiveness of the various schemes that are used in visual search. The last, sixth chapter is devoted to a search for the optimal procedure Slovak region.

## 2 LEGISLATIVE FRAMEWORK SEARCH AND RESCUE

### 2.1 Chicago Convention

Convention on International Civil Aviation (also known as Chicago Convention), was signed on 7 December 1944 by 52 States. Pending ratification of the Convention by 26 States, the Provisional International Civil Aviation Organization (PICAO) was established. It functioned from 6 June 1945 until 4 April 1947. By 5 March 1947 the 26th ratification was received. ICAO came into being on 4 April 1947. In October of the same year, ICAO became a specialized agency of the United Nations linked to Economic and Social Council (ECOSOC)[1].

**The Convention on International Civil Aviation set forth the purpose of ICAO[1]:**

- whereas the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuse can become a threat to the general security; and
- whereas it is desirable to avoid friction and to promote that co-operation between nations and peoples upon which the peace of the world depends;
- therefore, the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically;

### 2.2 Air Traffic Services of the Slovak Republic

Of Air Traffic Services of the Slovak Republic is a provider of air traffic services.

**The role of air traffic services are[2]:**

- prevent collisions between aircraft;
- prevent collisions with aircraft on the maneuvering area;
- maintain a smooth and orderly flow of air traffic;
- provide advice and information useful for the safe and economical conduct of flights;

- inform the organization oľietadľach, after which to hunt or to be granted emergency service and to cooperate with those organizations.

**Air traffic services include:**

- air traffic control service,
- flight information service,
- emergency department.

**Air Traffic Services provide the following stations[2]:**

- Area control center (ACC)
- Approach control (APP)
- Aerodrome control tower (TWR)
- Flight information centre (FIC)
- Central air traffic services reporting Office (CARO) and i tis departments (ARO).

**2.3 Regulation no. 143/1998 Coll. Law on Civil Aviation (Aviation Act) and on amendments to certain laws**

This Act governs the operations of aircraft in the airspace of the Slovak Republic according to flight rules applicable to civil aviation, civil aviation, competence and certification of aviation personnel of aircraft and other aeronautical products, keeping a register of aircraft, establishment and operation of airports and aeronautical ground facilities, the implementation of aviation, aerial work and other business in civil aviation, civil aviation, competence of state administration and imposing sanctions.

The Act also applies to the operation of civil aircraft registered in a Slovak Republic (hereinafter referred to as "aircraft register"), which are temporarily outside the territory of the Slovak Republic.

The law limited scope also covers the operations of aircraft in military service or police services (hereinafter referred to as "state aircraft")[3].

**2.4 Treaty on Mutual Assistance in search for aircraft, assistance in rescue operations in the event of an accident**

On 26 January 2010 the Minister of Transport, Posts and Telecommunications of the Slovak Republic, the Minister of Interior of the Slovak Republic and the Minister of Defence of the Slovak Republic approved the **"Treaty on Mutual Assistance in search for aircraft, assistance in rescue operations in the event of an accident."** Subject of the agreement is cooperation on the provision of search and rescue aircraft to the Slovak airspace in distress, or in the Slovak Republic crashed. Text approved document is made available electronically on the website in the section Documents and Materials/National legislation[5].

**2.5 AIP Slovak Republic**

The authority responsible for the organization of search and rescue services in the Slovak Republic is the Ministry of Transport, Construction and Regional Development of the Slovak Republic. They are authorized to co-ordinate search and rescue actions. The search and rescue actions are organized on the basis of multilateral agreement in co-operation with the Ministry of Defense of the Slovak Republic and the Ministry of the Interior of the Slovak Republic, contingently with other state and/or public institutions on the basis of bilateral agreements. The Rescue Co-ordination Centre (RCC) is established for organization, co-ordination and control of search and rescue missions[4].

**2.6 Law no. 129/2002 on integrated rescue system**

Law no. 129/2002 on integrated rescue system regulates the organization of the integrated rescue system, scope and role of government bodies and rescue services within the integrated rescue system, the rights and obligations of municipalities and other legal entities, natural persons authorized to do business and other individuals in coordinating related to the provision of assistance if the immediate danger to life, health, property or the environment[6].

**In the integrated rescue system operate[6]:**

- Basic emergency services,
- Other emergency services,
- Police departments.

**3 ORGANISATION SEARCH AND RESCUE**

**3.1 The main tasks of search and rescue services**

- Performs monitoring emergency broadcasts, provides the link, coordinate search and rescue tasks, first aid or medical transports using public or private resources, including cooperating aircraft, ships and other vessels and equipment.
- It must be established without delay and provide the territory of each Contracting State of ICAO, alone or in cooperation with other countries so as to ensure assistance to persons in distress.
- The basic elements must include the legal framework, the responsible authority, organized available resources, fasteners and personnel competent to carry out the coordination and management activities.
- To provide its procedures should be established to improve the provision of services with regard to planning, national and international synergies preparation and training.
- The competent authorities of the States take the responsibility for providing this service must be used for search and rescue units and other available resources to help any aircraft or persons on board which are or appear to be in a state of emergency[5].

### 3.2 Establishment and provision of search and rescue services

Search and rescue service should be provided in the territory of each Contracting State of ICAO continuously. Spaces that are not subject to the sovereignty of a particular State responsible for providing search and rescue services are determined on the basis of regional air navigation agreements which are approved by the ICAO Council on the recommendations called. Regional Air Navigation Meetings. State which took over responsibility for providing search and rescue services in such areas shall proceed in accordance with the provisions of this Regulation. When providing assistance to aircraft in distress and survivors of an accident, must proceed regardless of the nationality of the aircraft or its occupants. Search and rescue services in Slovakia organized and managed by the Ministry responsible organization[7].

### 3.3 Connection

Search and rescue devices operate on frequencies 121.5 MHz, 243.0 MHz and 406 MHz. Emergency frequency used by all aeronautical stations is 121.5 MHz. Aircraft and vehicles carrying out search and rescue operations use the frequency 123.1 MHz. Are used in conjunction codes and abbreviations published in ICAO Doc 8400 Abbreviations and Codes. Aircraft and vehicles carrying out search and rescue operations use the call sign "Rescue" by identification letter Alpha, Bravo, Charlie, etc.

#### Basic types of connections used in search and rescue:

- 1) Telecommunication connection
- 2) Connection using visual signals.

### 3.4 Evaluation and restore alert

For the evaluation stage of the search and rescue action is necessary to perform a rigorous analysis of the presence of individuals and crews that participated in this event. Coordinator of search and rescue based on evaluation of the course plotted in the map tracing all relevant information and also the space that was searched. Information obtained during the evaluation are recorded in the form "Report on the evaluation during the quest" and plot on transparency film, which covers the area of search. Coordinator to rescue those plotting it possible to determine whether the space adequately searched. When new information that may substantially affect the outcome of search is useful to consider the renewal of alert. Initiation quest without thoughtless reasons may increase the risk of injuries of those persons attending search action, which may prevent their use in other emergencies. Poorly thought out quest leads to the deployment devoid of purpose means that are used in search and rescue[8].

### 4 Preparatory actions for the search and rescue

The main prerequisite for the success of search and rescue action is the speed and accuracy of execution of the event because of that, for any accident may be people who survive an event, they need help and they hope to survive an accident is reduced by the minute. Results of search and rescue depend largely on how quickly receive all the necessary information Integrated Air Force Rescue Coordination Centre in order to accurately assess the situation and immediately decide on the most appropriate method of implementing search and rescue action[8].

#### 4.1 Period of emergency

**To determine the procedures for search and rescue action are announced each period of emergency[7]:**

- 1) **The period of uncertainty ( INCERFA )** - is a condition where there is uncertainty about the safety of the aircraft or its occupants, and during this period the Rescue Coordination Centre extent possible, work with air traffic services and other competent authorities and services in order to received messages as soon as possible to evaluate.
- 2) **The period of emergency ( ALERFA )** - is a condition where justified concern about the safety of the aircraft or its occupants in the event of the declaration period of emergency rescue coordination centre shall immediately be put into standby competent authorities of the search and rescue service and take the necessary measures under the Operational Plan the area.
- 3) **The period of distress ( DETRESFA )** - is a condition where the aircraft or its occupants need immediate assistance or there is some uncertainty that the aircraft or its occupants at risk of serious and imminent danger.

#### 4.2 Activity RCC Bratislava to declare an emergency period

Rescue Coordination Centre based in Bratislava organizes, coordinates and manages search and rescue operations throughout Slovakia 24 hours a da. RCC is responsible for the effective organization and coordination of the search and rescue continuously monitors broadcasting the emergency frequency 121.5 MHz and cooperate with the evaluation of Cospas-Sarsat center in Toulouse, which identifies the location by satellite emergency signal. RCC receives a request for the provision of search and rescue services and from the appropriate LPS[8].

RCC Bratislava cooperate in preparing and carrying out search and rescue and rescue coordination centers with neighboring countries and in its activity utilizes the most advanced equipment and technology. These modern means includes a digital terrain model to the appropriate software allow you to maximize the effectiveness of the provision of search and rescue services. Centre in this area include the best equipped workplaces in the world. Its annual activity is used in more than two hundred cases

of which the accident accounts for about 40 % and the rest of accidents attributable to incidents such as false posting board Emergency Locator Transmitter.

## 5 SCHEME SEARCH

It is important to pay close attention to the selection of the most appropriate scheme alert. Choice is made after assessing all the factors that may influence the quest itself[8].

**When choosing a search scheme must take into account certain criteria and they are[8]:**

**a) Adequacy** - quest must be completed within the prescribed time limits;

**b) Feasibility** - search must be carried out within the scope of operational capabilities and possibilities of search units;

**c) Acceptability** - the expected result of search must correspond to the time and efforts made to search.

**Scheme between visual alerts include[8]:**

- 1) The search along the route
- 2) Parallel search
- 3) The search flight at the wavelength line
- 4) The search to square one aircraft
- 5) The sector search
- 6) Contour search
- 7) Search using illumination flares

## 5 CONCLUSION

Air transport is one of the youngest type of transport, yet this right is still considered the safest. Owing to the aviation community, which pays great attention to the analysis of adverse events and their priority to safety.

Air transport despite all represent a large group of people dangerous mode of transport, which is caused by the accident are published extensively. Accident may affect not only the flight and flight conditions, but especially endanger the health and safety of all persons on board the aircraft. The main causes of air accidents is equipment failure, anomaly crew when equipment failure or a combination of these causes, which may be related to the effects of extreme flight factors. To ensure the fastest possible assistance to aircraft in distress and survivors of an accident is used search and rescue service. Aviation safety is a complex phenomenon and involves not only fully developed technique, but everything surrounding it. The main objective of Investigation is finding the causes of accidents and prevention of these events. It is not a remittance of any blame or liability of persons but the main aim is that such accidents occurred in the least. Despite the evident improvements in safety with the increase in air traffic also increases the risk of air accidents .

Although it comes from a statistical point of view the safest mode of transport, recently there is air crashes and accidents which have in most cases fatal. Search and rescue actions performed at the site of such events are

extremely difficult to logistic support and coordination of reactants.

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