INVESTIGATION OF CIVIL AVIATION ACCIDENTS

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The article discusses factors primarily influencing the occurrence of aviation accidents, including human and technical factors and the environment. The article implies a description of a process of aircraft accident investigation in accordance with the legislative requirements of the International Civil Aviation Organization ICAO. An important aspect of the article is the analysis of level of accident rate in the operation of civil aviation worldwide. The article accentuates the incident reporting system, which provides collection, selection, analysis, interpretation and distribution of necessary information.

Key words: aircraft accidents, factor, investigation, reporting system and civil aviation.

1 INTRODUCTION

Aircraft accidents investigation entails a compilation of questions and searching for answers leading to comprehensive solution and conclusion.

2 FACTORS AFFECTING OCCURENCE OF AIRCRAFT ACCIDENT

The occurrence of aircraft accidents is influenced by three main factors, i.e. human factor, technical factor and external environment.

The most common cause of aviation accidents is a critical activity of aviation personnel dispatchers, maintenance technicians and air traffic controllers. Disorders may be caused by workload, health factors, stress or fatigue. Level of safety personnel skills and abilities is subject to monitoring. At present, various indicators such as the length of working hours, net working load, training, level of experience and age are employed.

Technical level of the aircraft is affected by occupancy, manufacturing defects, design flaws, but also the surrounding environment.

Weather impacts act as the external environment and they are often referred to as co- impacts of aviation accidents, for example turbulence, strong winds, storms, etc.

As an example of a human error an aircraft accident of Greek airlines Helios Airways from 2005 when all 121 people on board died can be used.

The accident was caused by the operation of the maintenance technician who, after performing work, did not set the aircraft pressurisation system to its original state. Because pilots have overlooked this error, after the depletion of oxygen supplies they succumbed to hypoxia and flight 522 from Larnaca to Athens was operated by autopilot. The plane crashed upon exhaustion of fuel.

Technical error can be demonstrated in an accident from 1991. Flight 585 of United Airlines flying from Denver to Colorado Springs. Smooth flight was disrupted by severe turbulence, the machine turned on its back and what followed was an uncontrolled crash.

Steering booster test detected piston error, which under certain conditions could get jammed. Functional test of the steering booster unit thermal shock proved that when a hydraulic fluid heated to a high temperature is released into a cold drive mechanism, it leads to its failure. Based on further testing, it was revealed that the rudder can not only get blocked but in this case it can also react in the opposite direction.

Civil Aviation Safety is a combination of personal and material resources with an aim of a continuous improvement of security and efficiency.

3 METHODOLOGY OF AIR ACCIDENT INVESTIGATION

The investigation consists of evaluation of air accidents facts and data, crew and aeronautical technology. The verification process of course and causes, additional expertise and laboratory analyses assist in achieving the objective of the investigation.

The primary objective of the investigation of aviation accidents is to provide for efficient flow of information on the draft measures for the future operations of aerial transportation. The complexity of accident analysis is subject to a large number of seemingly non-essential factors, the impact of which can have fatal character.

The occurrence of air accidents is in many cases subject to erroneous decisions, which appear to be destructive factors endangering the safety of the flight and a failure to adhere to the limit of damage leads to an accident.

The course of investigation is searching for signs and events, which are in casual connection to air accidents. The focus is on determination of conditions of emergence and development of dangerous flight situations.

Following notification of air accident, it is required, as soon as possible, to appoint a Commission of Inquiry, the task of which is to determine the cause of the incident. Data recorders, aircraft wreckage, statements of witnesses, results of medical examinations to determine the competence of the crew and the like are implemental.

The Commission of Inquiry submits an investigation report of an air accident in order to ensure the prevention of recurrence of similar accidents and thereby increase overall level of flight safety to a maximum.

Aircraft accident investigation is a complex process made up of a mosaic of specific events with far-reaching consequences. Only thorough and consistent investigation of accidents allows to take effective measures to prevent similar incidents.

4 CIVIL AVIATION INCIDENT REPORTING SYSTEM

First of all, it is important to understand the distinction between various incident reporting requirements in civil aviation determined by various government regulators and various international organizations.

4.1 Incident Reporting System in accordance with ICAO

The International Civil Aviation Organization ICAO identifies requirements in Annex 13 worldwide. In this case it is necessary to distinguish between mandatory and voluntary reporting of air incidents because regulations may significantly vary in different Member States.

Mandatory reporting

ADREP is a compatible incident reporting system in civil aviation instrumental for collection, processing and dissemination of information of flight safety. It was created in 1976 as a part of Annex 13, Aircraft Accident and Incident Investigation.

Aircraft incidents reports have to be sent immediately after the conclusion of the investigation to the ICAO, the task of which is to inspect the reports and then save them to the database. Data obtained by the incident reporting system in civil aviation form a summary of information used to effective analysis of the level of accidents in the world. It is therefore inevitable that all Member States make use of a single standardized format of data exchange „ADREP taxonomy", i.e. uniformed definitions and classification.

Voluntary reporting

Voluntary incident reporting system enables to detect errors and mistakes that are not possible to be verified by the mandatory incident reporting system. ICAO appeals to Member States to establish a voluntary incident reporting system and supports changes of applicable laws and regulations which may positively affect the level of aviation safety. Within the voluntary incident reporting system not only aircraft accidents and serious incidents and incidents are reported but also reporting of risks and dangerous factors, which act as incidents co-factors.

4.2 Incident Reporting System - ADREP/ECCAIRS

International Organization ICAO and the European Commission created the first global system for reporting aircraft incidents and accidents in the field of civil aviation.

The objective of the system is standardization of individual categories and definitions of aircraft accidents and incidents, collection, analysis and dissemination of safety information.

The aim of ICAO is to support the European co-ordination centre for aircraft incidents and accidents reporting system - ECCAIRS, and the European Commission, vice versa, introduced taxonomy under the Regulations of ICAO.

Unification of ICAO standards with EU standardization has brought compatibility in the electronic exchange of information from various sources between different countries, identification of safety problems and detection of potential danger.

4.3 Incident Reporting System in the world - ICASS

International system of anonymous aircraft incidents reporting - ICASS provides an effective way of a continuous improvement of aircraft safety in civil aviation. Only invited states operating an anonymous system of aircraft incidents reporting at national or international level and those independent of commercial and legal interests may become members of ICASS group.

The main objectives of ICASS system include:
- counselling and assistance in the establishment and operation of anonymous systems;
- incidents and accidents reporting;
- simplification of security related information exchange between independent aircraft incidents and accidents reporting systems;
- identification and resolving problems related to the use of anonymous systems.

5 ANALYSIS OF THE CURRENT STATE OF ACCIDENT RATE

5.1 Analysis of the current state of accident rate in the Slovak Republic

Following the results of a specified period, that is last ten years, predominant growth of aircraft serious incidents can be concluded. It is more than necessary to understand what is the main cause of such a state.

Total number of aircraft emergency incidents depends on the amount of individual incidents and accidents. In this respect, there is an evident disproportion of a number of aircraft incidents and serious incidents to incidents.

The reason is the increase of commercial air traffic and the number of private aeroplanes. The majority of the occurrence of aircraft accidents is created by private operators, flying schools and aero clubs. On the contrary, the expansion of regular and charter flights has increased the level of incidents of a more technical nature.

On the territory of the Slovak Republic, there is still a need to develop a full-area methodology of causes of serious incidents investigation in civil aviation. It is necessary to apply the knowledge gained from the training of personnel and in the air traffic.

More effective accident prevention is subject to examination of combination of accident growth effects and development of methodology for a consecutive and annual monitoring and analysis of aircraft accidents and incidents.

5.2 Analysis of the current state of accident rate in the world

At present, the civil aviation transport is on the increase and this trend is constantly on the move. In the past, a continual proportion between the volume of passenger traffic and the number of aircraft accidents was often visible. Disruption of interdependence was brought by 2012, when there were disproportionately less aircraft accidents than in the previous years.

The aim of all air organizations involved in aviation safety is to maintain this trend. Constant exploration, description and dissemination of information on aircraft safety have a positive impact on reducing accident rates in the world.

Meeting the target is subject to increased attention to critical factors of flight and a creation of possibilities of their prevention. The priority is to focus on those accident categories, which are of the most risky nature, i.e. controlled flights into terrain, loss of flight control and accidents associated with operation of runways.

Analysis of the current accident rate showed a high proportion of accidents in Africa, what greatly affects the overall accident rate worldwide. Efforts to reduce this represent the implementation of stricter standards and regulations, implementation of more consistent controls and demonstration of personal and technical capability to fly.

6 DRAFT MEASURES ON THE ADJUSTMENT OF INCIDENTS REPORTING SYSTEM IN CIVIL AVIATION OPERATION

1. „Just culture"
The proposal is the implementation of the Culture Responsibility throughout the European Union. The Culture Responsibility is conditional to exclusion of any penalties for the source of information.

2. Unification of the incidents reporting systems
The recommendation is to unify the system of national incidents reporting in member states of ICAO in order to increase the efficiency of the incidents reporting system in civil aviation operation worldwide.

3. Revision of ICAO ADREP 2000
The proposal is to update the taxonomy of ICAO ADREP 2000 and the subsequent addition of maintenance taxonomy and bird's collision taxonomy.

4. Simplicity and timelines of ADREP/ECCAIRS
Collection and classification of received information into a database should be done in a reliable and simple way. The recommendation is also regular updating, obsolescence prevention, constant development of the system, new ECCAIRS software versions corresponding with the actual requirements in the civil aviation.

5. Support of incident reporting system pyramid
The proposal is the inclusion of the incident reporting system in civil aviation support through three basic elements - safety culture, ADREP 2000/ECCAIRS, trainings.

6. Raising the level of expertise of incident reporting system personnel
The recommendation is constant raising of the level of expertise of persons performing analysis of reported events, whether through training, annual reports, daily updating of changes, or representation CDs or DVDs.

7. Raising the level of expertise of aviation personnel
The proposal is a systematic increase of the level of knowledge of pilots, maintenance technicians, dispatchers and other aviation personnel in order to identify not only the procedures but also current changes in mandatory and voluntary incident reporting system.

8. Prevention of duplication of reported incidents
The recommendation is to avoid duplication of reported incidents primarily for national incidents reporting. Classification of similar or even identical causes of incidents and their elimination could achieve incensement of efficiency.

9. Application, alteration and revocation of multiple regulations
The proposal is a prompt dissemination of regulations in the field of incident reporting system to the competent authorities of the Member States in order to avoid duplication of recommendations and regulations from the European Union and ICAO

10. Better identification of hazards and risks

The proposal is to create a new Annex to the regulation Annex 13 - List of examples of the risks and hazards in civil aviation. The authorities of the Member States could more easily assess adverse situations and adapt appropriately.

11. Raise of awareness and incident reporting system support in Africa

The recommendation is that the ICAO ensures through the collaboration with African Civil Aviation Commission the implementation of incident reporting system ICAO/ECCAIRS in all Member States of ICAO, primarily in Africa.

Overall improvement could be achieved by implementation system training, regular actualization reports or information DVDs.

12. Voluntary incident reporting system and non-member states

The quality of the overall security of the civil aviation in the world also depends on effective and efficient incident reporting system. The proposal is for the non-member states, within the scope of voluntary incident reporting system, to make use of ICAO/ECCAIRS system, the consequence of what would not only be a greater number of received information but also increase in overall efficiency of the system.

13. Voluntary incident reporting system support

The recommendation is that organizations in the field of civil aviation continually urged their employees to voluntary incidents reporting. The organisations should demonstrate an obvious disinterest in disciplinary actions, or allegations of staff negligence.

14. Standard format for voluntary incident reporting system

In order to make the voluntary system of incident reporting more effective, improve it and speed it up, it is suggested to establish standardized reporting format that would provide a uniform format and scope of reported information.

15. International network of ICAO authorities for incident reporting system in civil aviation

The proposal is the establishment of International Network of ICAO authorities for the incident reporting system in civil aviation, the aim of which would be modernization and streamlining of the incident reporting system in the world.

The purpose of the International Network of Authorities could be coordination of co-operation of national authorities in reporting incidents, counselling to institutions in the field of incident reporting, provision of information sharing , training of staff performing analysis of events and incidents and development of comprehensive annual reports using information from mandatory and voluntary systems of the Member States.

16. Increase of overall incident reporting system effectivity

The proposal is that all operators of civil aviation implement and use in practice the mandatory and voluntary incident reporting system, provide data gathering, information exchange, examination of risk and evaluation of the facts.

7 CONCLUSION

Aircraft accidents have always brought not only incalculable losses, but also invaluable knowledge and experience that helped to push the level of flying safety to a higher level. However, it was only possible when the incident was thoroughly investigated and adequate precautions and recommendations were taken.

The main objective of the incident reporting system is the acceptance, collection and analysis of obtained data in order to establish a complete picture of the development of civil aviation safety in the world.

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