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ANALYSIS OF SAFETY INDICES OF FLIGHTS AND AVIATION SECURITY IN RELATION TO THE TASK ON CONSTRUCTION OF TWO-LEVEL SYSTEM OF CONTINUOUS INFORMATION MONITORING OF AVIATION ACTIVITY SAFETY

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ABSTRACT

The article shows analysis of flight safety indices and aviation security of the Russian Federation in comparison with global indices. Based on the analysis results, conclusions have been made about the necessity in systematization of data acquisition and processing in the task of increasing the level of flight safety and aviation security by means of joining of regulatory bodies and servicing providers within the considered activity areas into a single information space. The possibilities to use principle of continuous monitoring mechanism are considered within the framework of universal check programs of ICAO in the areas of control assurance for flight assurance and aviation security in relation to tasks on construction of information systems of state control and monitoring within the concerned activity areas. Due to complexity and evident interaction of state systems of control for flight safety and aviation security assurance an approach is proposed for creation of two-level system for monitoring of control efficiency for flight safety and aviation security.

Key words: flight safety, aviation security, continuous monitoring, information system, aviation activity.

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1. INTRODUCTION

The existing system of aviation activity security assurance in the Russian Federation is a multi-level structure of interacted trends of safety assurance [1]. Safety of aviation activity includes the following trends:

- aviation security;
- flight safety;
- industrial safety;
- information security;
- environmental safety.

Figure 1 Multi-Level Structure of Aviation Activity Safety Notion Structure

The article considers approaches to forming a two-level continuous aviation activity security and flight safety monitoring system. The specified trends are closely intertwined both based on the provided structure of aviation activity security and within the framework of international obligation fulfillment [2], particularly, participation of the Russian Federation in implementation of ICAO continuous monitoring mechanism within the framework of general check programs in the area of aviation security and flight safety area.

2. ANALYSIS OF FLIGHT SAFETY INDICES

The flight safety is an important factor for growth and stable development of world aviation industry. Taking into consideration that by 2030 the international passenger throughput will have increased almost twice in comparison with 2016 (over 6 bln. persons), and it is assumed that the volume of cargo services will have increased more than twice - up to 125 mln. ton [3], the development of the aviation industry will have significant consequences in respect of growth of the level of risks for flight safety.

Let’s consider the flight safety indices at the worldwide level and compare them with the indices of the Russian Federation. The data is used from the integrated Safety Trend Analysis and Reporting System iSTARS of ICAO.

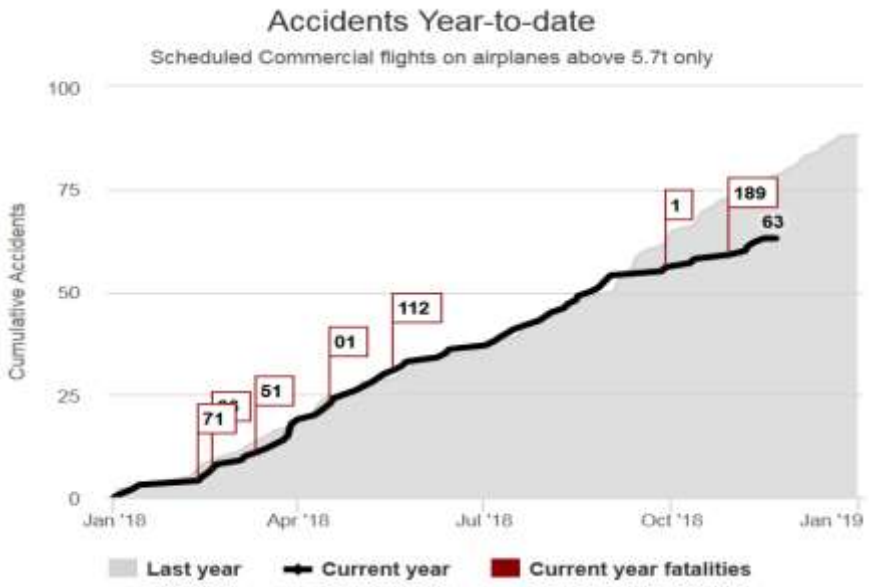

Figure 2 The world statistics on aircraft accidents for 2018 in comparison with 2017

Fig. 2 shows accidents of commercial aircraft in the world with weight over 5.7 ton for 2018 in comparison with the indices of 2017. In total, there were 63 aircraft accidents, 7 of them were with human losses.

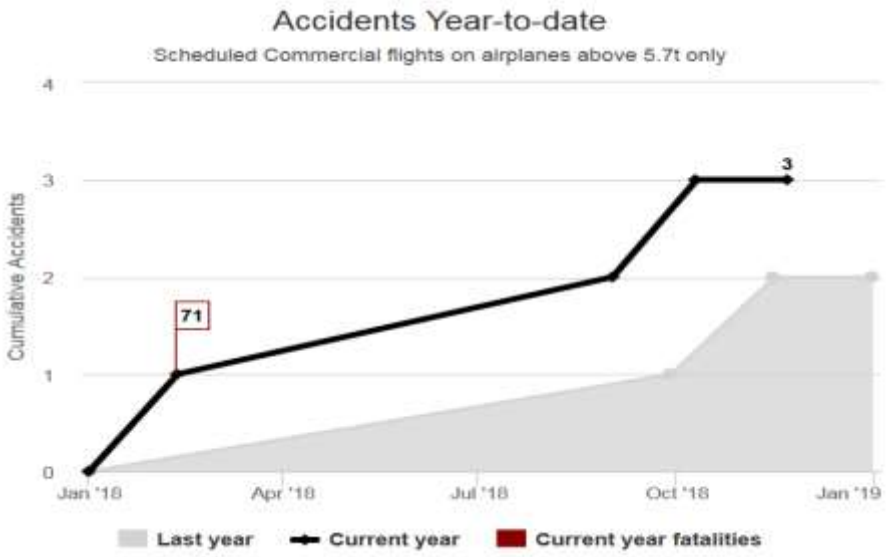

Figure 3 Statistics on aircraft accidents in the Russian Federation for 2018 in comparison with 2017

Fig. 3 shows aircraft accidents in Russia with commercial aircraft with weight over 5.7 tons for 2018 in comparison with indices of 2017. In total, there were 3 aircraft accidents, one of which was with human losses.

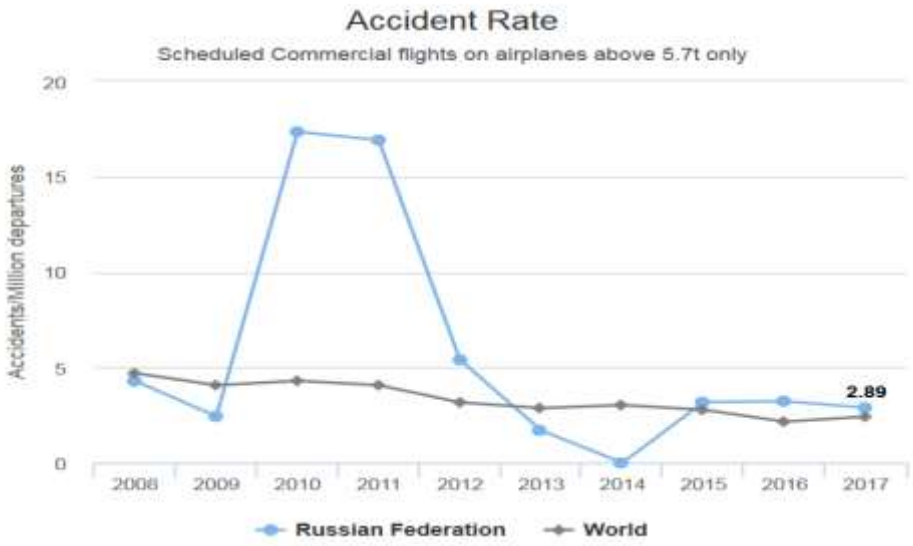

Figure 4 Number of aircraft accidents per one million of flights in the Russian Federation and in the world in the period since 2008 till 2107

Fig. 4 shows comparison of aircraft accidents number per one million of flights in Russia with similar worldwide indices for commercial aircrafts with weight over 5.7 tons within the period since 2008 till 2017.

Taking into consideration that the world passenger throughput is over 4 bln. persons per a year, the aviation is one of the safest modes of transport. However, in the opinion of experts, 100% flight safety is an unachievable level in the future.

In 2018 aircraft flights became safer by factor of 30 as compared with the 1970s. (https://www.aex.ru/news/2019/1/6/192269/). At the same time, the existing methods to increase flight safety in the civil aviation are far from being perfect. Thus, in spite of the stable world trend of reduction in number of aircraft accidents, if absolute index of human loss number is considered as a result of aircraft accidents in 2017 and 2018 (in 2017 42 persons died, and in 2018 over 500 persons died), the necessity to implement new methods and means for flight safety level increase and improve the existing ones becomes apparent.

Analyzing the relative indices of flight safety in the Russian Federation for 10 years and comparing them with the world indices (Fig. 2-4), it should be noted that in Russia in spite of comparatively low intensity of flights, random increase in indices of aircraft accidents and crashes per 1 million of flights is observed.

Such non-uniform distribution can be associated with insufficiently developed system approach to the task of control over the flight safety assurance in the Russian Federation. The tools and procedures available in ICAO to determine the flight safety level are used not to the fullest extent, that slows down the process of flight safety level increase and minimizes the possibility of applying the forecasting management to this process. At this date the mechanism implemented and used in the Russian Federation for continuous monitoring within the framework of ICAO universal check program within the area of aviation security assurance is applied only as a tool for implementation of the obligations undertaken by the Russian Federation within the framework of MOU. At the same time, the use of the principles and procedures of the mechanism for continuous monitoring of ICAO universal checks within the scope of task on the internal audit and control over flight safety assurance would allow forming a system of direct interaction between federal executive bodies in the country being responsible for regulatory and legislative assurance of the process for control over flight

safety and servicing providers acting within the framework of the specified regulatory and legislative assurance in a fairly short term.

Figure 5 Scheme for Interaction of Federal Executive Bodies of the Russian Federation and Servicing Providers in the Area of Regulatory and Legislative Assurance and Management of Flight Safety

Since its creation the system illustrated in Fig. 5 will be self-developing, because the supervisor represented by the federal executive body will be able to evaluate the efficiency of the stimulus commands executed by the service providers at any time within the scope of the task on flight safety level increase.

Full scale use of the principles and procedures of continuous monitoring mechanism for universal programs on check of flight safety control will ensure more thorough control over flight safety based on the continuous interaction between all participants of the flight safety assurance in the civil aviation of the Russian Federation. In its turn, this will allow implementing both local (within the Russian Federation) increase of flight safety level, and global positive effect on the worldwide indices of flight safety.

3. ANALYSIS OF AVIATION SECURITY INDICES

At the end of 1960s the aviation security was a serious problem in the world, thus, some amendments associated with the acts of unlawful interference were introduced into system of Appendices to Chicago Convention, and subsequently the basic international legal documents aimed for protection of civil aviation against acts of unlawful interference were accepted [4-11].

Recently the current world situation associated with increasing threat of acts of unlawful interference into the activity of civil aviation activity considering terrorist attacks in 2011, 2015, 2016 at the facilities of civil aviation and increasing terroristic threat in the whole word determines the necessity to strengthen control actions aimed at increasing measures to ensure aviation security both at world and regional levels.

A sign of efficient assurance of aviation security is small number of acts of unlawful interference into the activity of civil aviation, particularly, minimizing the number of injured and dead persons to zero index.

Notwithstanding that severity of the acts of unlawful interference is reduced and decreased, thus, within six years starting from 1987, 15 seizures and skyjacking of aircrafts

occurred, within six years starting from 1998 already 4 seizures and skyjacking occurred, and within six-year period this index decreased to one [12-18], the total number of acts of unlawful interference in the Russian Federation remains at high level for 30 years (Fig. 6).

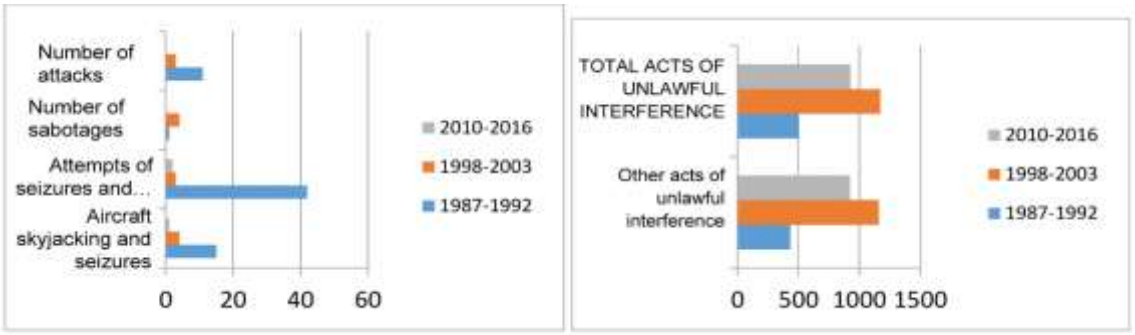

Figure 6 Quantitative characteristic of acts of unlawful interference (performed by periods of 6 years) in the Russian Federation

When considering the statistics for the period within 2010-2017 [12-18], it can be concluded that the number of acts of unlawful interference grows due to the increase in messages containing threats of acts of unlawful interference. The number of attempts of unauthorized penetration into air transport facilities remains at high level.

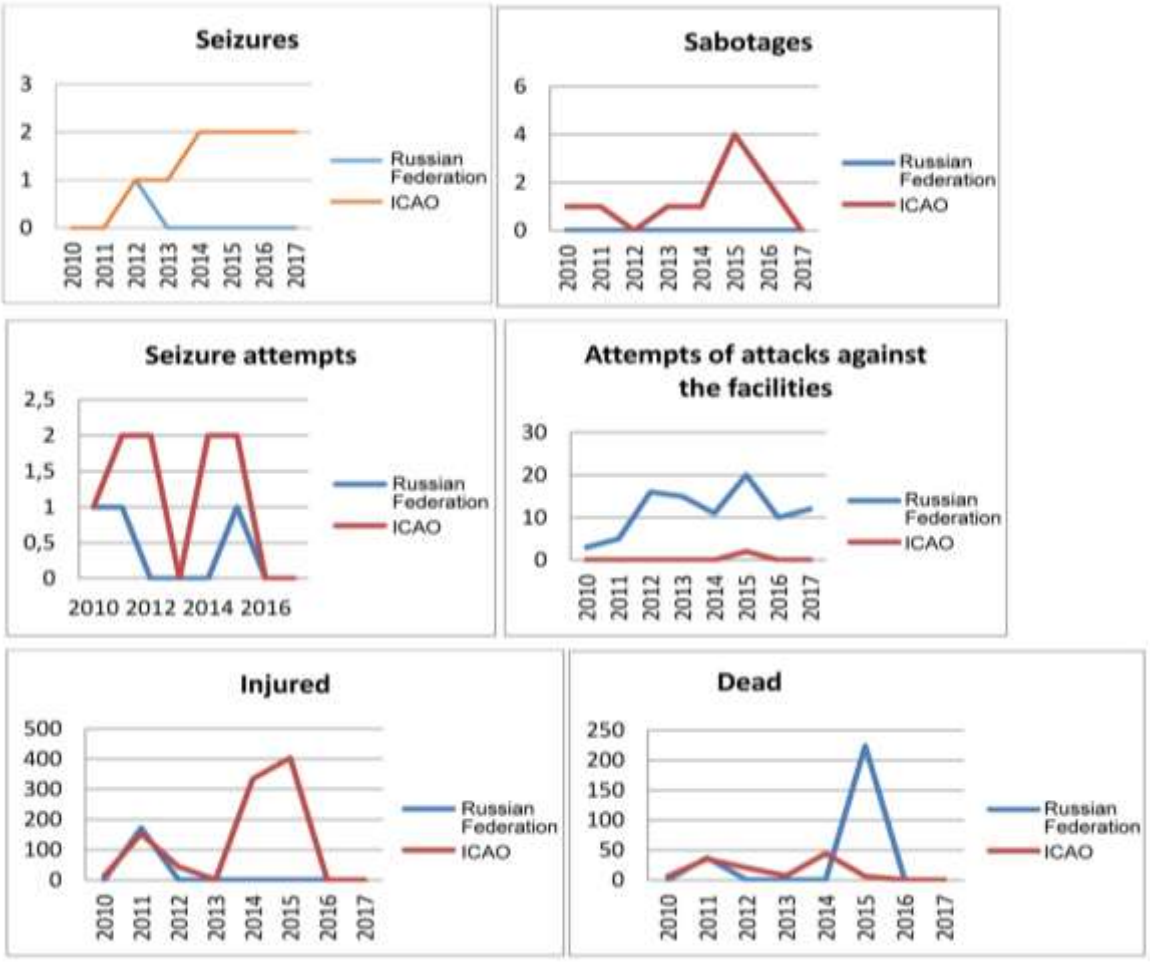

Figure 7 Diagram of Quantitative Characteristics of the Acts of Unlawful Interference in the Russian Federation and those registered in ICAO (executed within the period since 2010 till 2017)

Due to the difference in definition of the act of unlawful interference in the international right and national legislation [19, 20], indices of the Russian Federation can be compared with international indices only by several types (Fig. 7).

As Fig. 7 shows, in comparison with international statistics [21-25] in the Russian Federation number of attempts of attacks against facilities of the civil aviation remains at high level, and total number of registered acts of unlawful interference in the Russian Federation exceeds similar data as per ICAO by more than twice.

It should be noted that statistics of the acts of unlawful interference in the Russian Federation also includes airports performing only domestic air carriages, thus, it can be concluded that the following is required: a) analyze the experience of creating an efficient system developed by ICAO within the scope of universal checks on aviation security; b) consider the possibility to use such experience not only for airports executing international air carriages, but also for airports performing air carriages within the Russian Federation.

4. WAYS OF INCREASING EFFICIENCY IN FLIGHT SAFETY ASSURANCE AND AVIATION SECURITY

The existing problem makes it necessary to keep the issues of fight safety and aviation security assurance within the number of those with the highest priority for countries and international community, thus, the necessity to strengthen coordination of activity on increase of measures to ensure flight safety and aviation security has significantly increased between ICAO and countries which signed the Convention on International Civil Aviation [2, 26].

In order to strengthen measures on assurance of global aviation security and flight safety, ICAO Declaration on Aviation Security and ICAO Comprehensive Aviation Security Strategy (ICASS) have been developed and accepted, now the Global Plan on Aviation Security Assurance is being approved, continuous monitoring mechanism for universal programs on check of flight safety control is being implemented; to render assistance to the member states on issues of increasing the efficiency of control over aviation security assurance, regional bureaus of ICAO are widely used.

At the level of countries, continuous monitoring mechanism for universal programs on check of flight safety control is used as a means to detect system issues in the area of aviation security with subsequent development and implementation of plans of correcting actions and for improvement (change) of national systems of control for quality of aviation security assurance.

In order to ensure efficient participation in application of continuous monitoring mechanism for universal programs on check of flight safety control it is necessary to form a government-level system capable of detecting and eliminating any non-conformities of national regulatory base in the sphere of control over assurance of aviation security with standards and recommended practice of ICAO. Implementation of such a system will ensure availability of the constantly applicable expert community of specialists in the area of aviation security assurance in the country, that in its turn can warrant efficient participation of the Russian Federation in implementation of the ICAO Global Plan of Aviation Security Assurance, as well as ensure increase in efficiency of activity of working teams on aviation security attached to interdepartmental commission on ICAO acts in tasks on implementation of continuous monitoring mechanism for universal programs on check of flight safety control in the Russian Federation.

5. CONCLUSIONS

The results of analysis evidence that increase in level of efficiency of control over flight safety and aviation security assurance in the Russian Federation is possible provided a respective control system is created and implemented. This system shall ensure implementation of tasks of the country in the scope of functioning of continuous monitoring mechanism for universal programs on check of flight safety control and continuous monitoring mechanism of universal program of aviation security check, execute functions of internal control and audit of efficiency in taken measures on flight safety and aviation security assurance [27, 28]. The specified system shall be managed centrally and represented by Federal Executive Bodies authorized in the area of civil aviation of the Russian Federation, particularly the Ministry of Transport of the Russian Federation.

Due to the fact that the civil aviation system in the Russian Federation has multiple-factor structure, within the framework of which issues on flight safety assurance are closely related with issues to control and assure aviation security, it is deemed expedient to develop and implement a two-level system of continuous monitoring mechanism of flight safety (FS) and aviation security (AS). At such approach the time of response of the system to any negative trends related to issues of efficiency of FS and AS will be minimized by means of continuously incoming information on the effectiveness of taken measures and possibility of prompt amendment or substitution of any regulatory and legislative and/or organizational management industrial documents in the area of FS and AS.

This system can provide functions of control and management of the civil aviation of the Russian Federation in tasks of the specified flight safety and aviation security level assurance due to direct interaction of aircraft authorities and service providers in the appropriate areas.

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