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RESEARCH OF THE QUANTITATIVE INDICATORS OF THE FLIGHT SAFETY

To analyze the state of the level of flight safety in the airline, country, region and to identify its dependence on the properties of the air transport system (ATC) and its operating conditions mainly two types of indicators (criteria) statistical and analytical are used. Statistic characteristics are obtained as a result of data processing during aircraft operation. As physical quantities can be used such data as the number of aviation events (AE), incidents (IN), the number of dead crew members and passengers, the amount of work performed for both the total and specific AE, and so on. Operating time can be represented by air raids or number of flights (landings). Statistical indicators can be divided into general and partial, absolute and relative. General characterize the level of flight safety, taking into account the combined influence of all factors, and partial - only individual factors or groups of factors.[1]

Analytical indicators have a probabilistic expression. They are calculated by methods of probability theory. Statistical and probabilistic indicators are functionally related to each other, so one or another type of indicators can be calculated both from statistics and analytically based on the use of probabilistic methods. Probabilistic indicators of the flight safety level objectively reflect the following pattern: AE, IN as a potentially possible result of a particular flight due to the accidental occurrence in time and space of flight of adverse factors that cause it [2].

Absolute statistical indicators of the flight safety level

Absolute statistical indicators of flight safety level for the considered period of operation include:

- number of aviation events–n_{ae};
- number of disasters–n_{dis};
- number of accidents–n_{ac};
- number of incidents–n_{in};
- the number of dead crew members and passengers per aviation event–n_d.

Relative statistical indicators of the flight safety level

To obtain estimation of the relative statistical indicators of the flight safety level, it is necessary to calculate additional data:

- total duration of flights of aircraft of appropriate type for the analyzed period of operation (flying hours):

$$T_1 = K \cdot N_i \cdot t_i, \quad (1)$$

where K–is the number of aircraft of this type; N_i– average number of flights per one aircraft during the considered period of operation(pieces), t_i–duration of one flight (hours)%;

- total flight range of aircraft of appropriate type for the analyzed period of operation (flight in kilometers):

$$L_1 = K \cdot N_i \cdot l_i, \quad (2)$$

where, l_i–average range of one flight, km

- number of flights of aircraft of appropriate type for the analyzed period of operation:

$$N_1 = K \cdot N_i \quad (3)$$

- total number of passengers for the same period:

$$N_2 = K \cdot N_i \cdot n_{pas}, \quad (4)$$

where,n_{pas}– the average number of passengers carried per one flight;

- the total amount of work performed with the help of aircraft of appropriatetype, for the analyzed period of operation (raid in ton-kilometers):

$$N_3 = K \cdot N_i \cdot n_{pas} \cdot l_i \quad (5)$$

The obtained data allow to calculate the following relative statistical indicators of flight safety level:

- average raid per aviation event:

$$T_{ae} = \frac{T_1}{n_{ae}} \quad (6)$$

- average raid per incident:

$$T_{in} = \frac{T_1}{n_{in}} \quad (7)$$

- average number of flights per aviation event:

$$N_{ae} = \frac{N_1}{n_{ae}} \quad (8)$$

- average number of flights per incident:

$$N_{ae} = \frac{N_1}{n_{in}} \quad (9)$$

Relative statistics allow us to estimate the level of flight safety, taking into account all the factors and causes of AP. These criteria are very important, because they reflect the level of perfection of aviation equipment, the organization and provision of flights, their planning and management, the degree of training of flight crew and the qualification of engineering and technical personnel.

The International Civil Aviation Organization (ICAO) uses the following relative statistics as indicators of the level of flight safety in scheduled air services:

- number of disasters per 100 million km of flight:

$$q_{d1} = \frac{n_{dis}}{L_1} \cdot 10^8, \quad (10)$$

where n_{dis}– the number of disasters during the analyzed period;

- number of disastersper 100 thousand hours raid:

$$q_{d2} = \frac{n_{dis}}{T_1} \cdot 10^5 \quad (11)$$

- number of disastersper 100,000 flights:

$$q_{d3} = \frac{n_{dis}}{N_1} \cdot 10^5 \quad (12)$$

- number of crew and passenger deaths per 1 million passengers carried:

$$q_{d4} = \frac{m}{N_2} \cdot 10^6 \quad (13)$$

- number of passenger deaths per 100 million passenger-km:

$$q_{d5} = \frac{m}{N_3} \cdot 10^8 \quad (14)$$

Flight safety level indicators are objective criteria, and this is their main value. However, they have a number of significant disadvantages:

- evaluate the level of flight safety after the emergence of aviation event;
- cannot be used to optimize the level of flight safety taking into account the available resources and the specified efficiency;
- cannot be used for long-term planning of the level of flight safety, because they do not take into account the features of new equipment, changes in its operating conditions;
- do not allow to determine the degree of danger of adverse factors and their impact on the level of flight safety and, therefore, can not be used in the development of effective ways to prevent aviation events.

Reference list:

1. Solomonov P.A. Technical issues of flight safety. M .: Voenizdat, 1975.- 120 p.; Prokofiev A.I. Reliability and safety of flights. Textbook. M.: Mashinostroenie, 1985. -184 p.
2. Zhulev V.I., Ivanov V.S. Aircraft safety. M.: Transport, 1986. 224 p.
3. Annex 13 to the Convention on International Civil Aviation. Investigation of aviation accidents and incidents. ICAO, 2010.-76 p.
4. Safety Management Manual, Doc 9859 AN/460, ICAO, 2006.
5. Zubkov B.V., Sakach R.V. etc., ed. Sakach R.V. Flight safety: textbook. M.:Transport 2005.