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DEVELOPMENT AND EXPERIMENTAL RESEARCHES OF ESTIMATION OF THE FIRST SIGNS OF FACTOR RESONANCE AT THE PRODUCTION OF FLIGHTS

The problem of flight safety and human factor is one of the most important problems of the world aviation at all and it demands principally new methods for solving this task. These approaches are described in requirements of ISO 9001:2009. Now the share of accidents which account to human factor according to official data, is 80-90%.

Nowadays most pilots do not know how to deal with negative phenomena that are identified through the application of process analysis [1,4]. These negative phenomena in the flight should also include a little-known phenomenon of the process of factor resonating [1].

During the analysis of first signs of the factor of the resonance it`s necessary to apply the process approach.

The first signs of the phenomenon of resonance factor includes areas sections of the factor vibrations during the flight, which leads to increasing of basic parameters of the flight with increasing of number of simultaneously acting factors. In fact, the first signs of the factor of the resonance phenomena it is a "crashes and accidents in the bud" which include the resonance curve until a small amplitude and period. [1]

Structurally, the method of evaluation of the first signs of the resonating factor means:

- data capture on each working cycle or training;
- construction of a list of data for all cycles of work and training;
- ranking of the data according to time intervals or some selective (custom) ranking of data;
- separation of data into some groups for a large number of operators or comparison of several groups;
- tabulation of statistics for plotting;
- construction of the coordinate charts and performance capacity curves of operators;
- evaluation (assessment) of the initial level of efficiency and training of the personnel;
- comparative analysis of the success of the individual operator and the group as a whole.

Method for predicting and preventing of accidents by the first signs of factor overlays and factor of the resonance includes:

- methodology of applied method - a process of approach [4];
- the basic premise of the developed method consists in the fact that the last (or intermediate) phase of the accident are areas of resonating factor described by a model of the resonance curve and its model - Anesi function [1];

- data processing is carried out not on the list of attributes and a specially designed multi-purpose cards;

- basic statistics for the prediction of first signs of the flight - flying without comment of aviation specialists. Flights of status " without remarks" is formed in the airline and the flight unit on the basis of processing flight information from objective monitoring systems or a set of personal computers (PCs) on the complex plane simulator.

All flight directors are working in short time. So, was developed and proposed universal cards for flying exe flight directors from captains, squadron commanders, flying squads to command and management team flight controls. Processing on a single form (from the crew to aviation region) allows to quickly and efficiently producing of the factor forecasts and methods flight Operations, to eliminate a very dangerous phenomenon in the process of flying as the factor of the resonance and especially it`s form(fig.1, table 1):

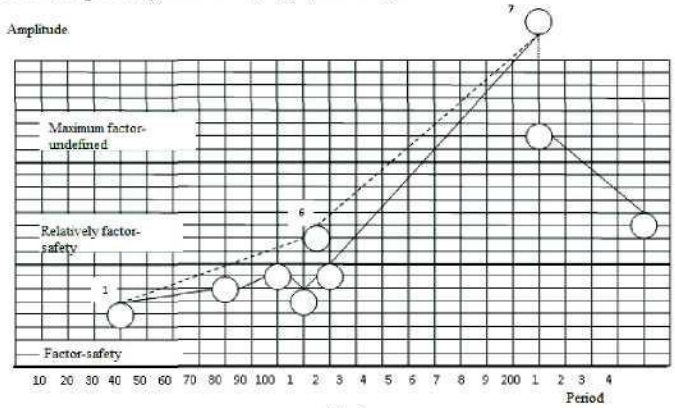

Fig.1.

Table 1

№ flight	A (amplitude)	T (period)
1	2	2
2	3,5	4
3	4	5
4	3	5,5
5	4	6
6	5,5	5,5
7	15	10
8	11	10
9	6,5	12

Such cards are needed: at the level of the crew, individual adjustments for each pilot; at the level of flight crew, squadron, to remove uncertainty factor safety

and prevent of catastrophic and emergency incidents, etc.; at enterprises, concerns, departures to optimize management flight operations.

In this case, the grouping and separation of normal operations into three categories using the chart Burygin [3]:

- Factor-safety flights (zone FSF);
- Relative-factor-safety flights (zone RFSF);
- Limit-factor-undefined flights (zone LFUF) – table 2.

Table 2

Distribution of normal flights of Ил-62М

Distribution of normal flights of ИЛ-62М according to factor zones				
		Indexes of safety		
Zones		FSF	RFSF	LFUF
Squadrons				
1	All flights	73	55	6
	Flights with certain events	13	17	5
	Percentage	54	41	5
2	All flights	56	33	2
	Flights with certain events	6	7	2
	Percentage	61	36	3
3	All flights	100	33	5
	Flights with certain events	17	14	3
	Percentage	72	24	4
4	All flights	71	35	3
	Flights with certain events	17	7	2
	Percentage	65	32	3
5	All flights	81	15	3
	Flights with certain events	27	6	2
	Percentage	82	76	2
Captain's staff	All flights	22	-	-
Instructor's staff	Flights with certain events	67	10	2
	Percentage	86	13	1
Squad at whole	All flights	448	181	21
	Percentage	68	28	4

The method means conducted analysis of each flight in each squadron and after that calculate mean values of the factor level fluctuations of all flight directors three values: the best flights each flight (factor-safety); the arithmetic mean of all flight data; the maximum factor-undefined flights.

After that is constructed a table for each aircraft squadron and fill the card. Analyzed after completing special cartograms each squadron.

Operational cards should be used at the level of crews for individual adjustments on handwriting of the pilot; at the level of flight detachment, squadrons, foro removing of undetermined factor flights and caution of accidents and crashes of aircrafts, incidents, etc.; at the level of aviation companies, concerns, management, departments with the aim of optimization of flight control and management of flight operation (work).

Conclusions

During last year's was developed effective methods for the analysis of flight experience such negative phenomena arising in complex flight conditions as a quotient resonate in certain phases of flight, leading to the possibility of emergency or catastrophic situations. The first signs of the factor of the resonance in preventing of accidents can be identified by special cards for flight directors. These maps of flight control work fully consider flights without comments of aviation specialists, flying with a certain event and allow determining statistical share flights with the first signs the factor of the resonance. Removal of the first signs of the resonance factor - the growth of the factor of oscillations in all parameters of flight at the appearance and effect of factor overlays on the crew - can be achieved by means of special training pilots - anti-stress training, aimed at the development of pilots counter the unexpected and sudden process of flight. This anti-stress training for flight crews should take place within the borders of all the forms and organization of flight operations and all kinds of Eastern European flight management system (debriefing, methodical work, etc.). The transition to the flight management on the cards of flight director take into account the fact that any flight director itself. At Mission Control as complex production processes it has a significant shortage of time to make decisions on safety, provides fail-safety of their crew and their personal in flight. Such a control card, which is used by us at all levels - from the individual pilot to the flight crew orders, airline flight controls are operational documents allowing to solve the main problem in aviation - access to the absolute ("zero") of crashes on all air accidents, including a plane crash. The proposed map implements one of the aspects of the concept of process safety concepts.

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