

*O.H. Ilkova  
(National Aviation University, Ukraine)*

### **Data collection for researching of the role of human factors after investigation of aviation events**

*The article is devoted to study of the role of the human factor in the models of information collection and analysis during the investigation of aviation events by experts from the National Bureau for Investigation of Aviation Events and Incidents with Civil Aircraft.*

The National Bureau of Air Accidents Investigation of Ukraine (NBAAI) was established in 2012 and is a state specialized expert institution for investigating aviation events and incidents involving civil aircraft in Ukraine [4]. The aviation events analysis and warning sector operates in the organizational structure of this public body [3]. It prepares flight safety newsletters monthly as well as semi-annual and annual relevant analyzes. According to the analysis of 2017, the main factor that led to aviation events and incidents was the human factor of 21% [1], so the study of this factor is extremely important, and it is necessary to make maximum efforts to minimize this striking figure.

The purpose of study of the role of the human factor during the investigation of aviation events is to improve the safety of flights by analyzing how human mistakes in performing its tasks could contribute to the emergence or development of a critical situation, the identification of threats to flight safety, the development of recommendations to eliminate or reduce the effects of false actions or decisions. To achieve the goal of studying the role of the human factor, the collection and analysis of information about the human factor should be as methodical and complete as in any other phase of the investigation. In almost every element to be investigated, from the decision of the leader to commit the actions of pilots or technical staff, it is possible to identify aspects of the human factor that will help to make a sequence of stages of the events that have caused it. [2].

The information to be collected in the aspect of the human factor is in two main categories: information that can help state inspectors build a detailed chronology of each significant episode preceding the aviation event, and in some cases, after the occurrence of the event; circumstances and situations that allow the state inspector to explain the reason for such behavior of a person. A person can relate to the event in three cases: a person directly contributes to the occurrence of an aviation event by committing dangerous actions; a person works in hazardous working conditions or uses faulty (dangerous) equipment and means; indirectly, that is, "not directly" contributes to the emergence or development of dangerous conditions as a result of committing dangerous actions long before the occurrence of an event or the creation of a latent (latent) factor.

The methodological recommendations for investigating the role of the human factor during the investigation of aviation events and incidents developed by the NBAAI are analyzing four models that can assist the State Inspectorate in

gathering and analyzing information related to the aviation event in order to identify various possible causes and concomitant factors: model SHEL, model of causation of Rieson, model of latent dangerous conditions (LUC), model of behavior and errors. The SHEL model allows you to systematize data collection. Each component of the SHEL model is one of the blocks defining the essence of the study of the human factor. The central element of the model is a person (personnel). A human element interacts directly with each element of the SHEL model. Investigation of the human factor should identify conflicts between the elements that led to the emergence of a critical situation [2].

Human-machine interaction (technology personnel) includes any physical or mental (mental) human-machine interaction, design constraints, peculiarities of the configuration of the workplace. "Human-system" interaction (personnel-mathematical support) means the order of information exchange between a person and auxiliary systems, in particular check-lists, user manuals, training, procedures and rules. "Man-the environment" interaction is expressed as internal and external interaction: internal - personal comfort, physical conditions of activity; external - weather conditions, environment, aerodrome infrastructure, etc. Human interaction (staffing) includes interaction between people and interpersonal interactions.

The Rhizon model explains how a person can influence the failure in a complex, interactive and well-protected aviation system. Airborne events rarely occur solely as a result of active failures or dangerous operations by operating personnel. According to this model, aviation events arise due to interaction of several deviations or latent factors that existed for a long time in the system [3]. The difference between the active and the latent failure is the speed of the onset of the consequences. Active failures are called errors or violations that cause an immediate negative effect. Latent denials are the result of decisions or actions that had taken place long before the event occurred. Latent factors that are the result of wrong decisions or erroneous actions, being separately harmless, together with others can give the pilot, air traffic controller or engineer the opportunity to create an active refusal, which, having overcome all protective barriers, will lead to an aviation event. Operational personnel are hostage to latent system factors.

The LUC model contains elements of the SHEL model, along with the Rhizan concept of latency. In the aviation event, there is an event element. That is, exploitation under the same dangerous conditions can last for years without any consequences, however, at any moment, another element of "failure" can be added here, resulting in an event. Individual latent hazards (P-LUC factors) include factors such as the psycho-emotional mood of an individual, his physical condition, etc., that is, factors that may adversely affect the safety of the flight or the person who carries out the maintenance of the equipment [3].

Similarly, organizational latent hazards (OLUC factors) [3], that is, such factors that are beyond the competence of a person, may also occur. The model of behavior and errors analyzes human behavior when making decisions. There are two distinct categories of errors: actions that differ from those that are necessary or planned in advance and are unintentional (that is, actions that are not in line with the plan), and intentional actions (that is, conscious actions that can be carried out according to the plan but do not achieve the desired effect). The model of the

universal error modeling system - GEMS (Rison 1990) has the following classification: miscalculations and oversights associated with self-confidence; errors based on the use of rules; errors related to knowledge constraints [3].

The models described above, related to the organization of work and human errors, focus on potentially dangerous conditions, the disclosure of which requires an investigation. An integrated process of studying the aspects of the human factor is also needed. This process involves 7 steps: collecting event data; establishing a sequence of events; detection of dangerous actions (decisions) and dangerous conditions; definition of a class of error or violation; setback mode; determining the causes of behavior; identification of potential problems for flight safety.

The success of the human factor investigation depends to a large extent on the quantity and quality of the information collected. As a rule, at the initial stage, the state inspector collects as much information as possible, and unnecessary data is removed already during the investigation. The main sources of information that directly affects the human factor are video records, paper documentation, recordings of language and parametric flight information recorders, communication, direct observation of aviation personnel and modeling activities. Secondary sources of information could be a database of aviation events, technical literature, and human resources specialists.

Thus, the authorized body for investigation of aviation events and incidents occurring on the territory of Ukraine with civil aircraft is NBAAI, which in accordance with the established procedure informs about its activity in order to prevent aviation events in the future. The data collection for human factor research during the investigation is clearly regulated.

## References

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