

System for minimizing the negative impact of personnel on the airport's aviation security procedures

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Abstract. *The problem of civil aviation safety is largely determined by the "human factor". Transport security is a multidimensional concept that includes various security factors that are provided by aviation personnel in the relevant areas of professional activity. A particularly important factor should be considered the activities of personnel in the field of airport security. An acceptable level of airport aviation security can be achieved if the level of professional activity of the security personnel meets the established requirements. The system of requirements is implemented in a set of algorithms and procedures for personnel activities, the implementation of which is mandatory in strict accordance with the requirements. However, the physical nature of the human component, under the strictest control, does not guarantee absolute compliance with the requirements, i.e. the professional activity of aviation personnel is not guaranteed against accidental or unintentional errors. These errors are a source of negative impact of personnel on the airport's aviation security. In this case, it is necessary to have the means to minimize the negative impact. The paper considers some software and technical means of minimization.*

KEYWORDS: TRANSPORT SECURITY, HUMAN FACTOR, AVIATION SECURITY PERSONNEL, NEGATIVE IMPACT OF PERSONNEL, MINIMIZATION SYSTEM.

1. Introduction

Security is a multi-valued concept that characterizes the security and low level of risk for a person, society, or any other subjects, objects, or their systems. This is a state of a complex system when the action of external and internal factors does not lead to deterioration of the system or the impossibility of its functioning and development [6].

Of particular importance is the task of ensuring the aviation security of airports, which solves the problem of protecting objects from illegal interference in their activities.

Aviation personnel, performing their target function, carry out professional activities to ensure security, i.e., solve the problem of achieving an acceptable level of aviation security. On the other hand, personnel, being a human component in the ergatic aviation security management system, due to their physiology may allow some deviations from the established algorithm of activity, and not necessarily intentionally. In the end, the ratio of positive and negative aspects in the production activities of personnel ensures an acceptable level of airport aviation security [11].

The aviation security system is focused on performing its functions according to the formula: detection-reflection-elimination. In normal mode, if there are no threats to the security of the object, the system works to prevent hazards by performing predefined algorithms. In the event of an abnormal signal, the activity of aviation security personnel changes significantly, while some component is highlighted, which is unauthorized (illegal) interference by AB personnel. The reasons for the occurrence of unauthorized interference are determined by the specifics of the personnel's activities, which distinguish this activity from all others in the field of security.

2. Materials and methods

Production activities of aviation security personnel are performed in full compliance with standard operating procedures (BOT), which reflect the entire set of requirements, the implementation of which guarantees the achievement of an acceptable level of safety. On this basis, the procedure (algorithm) of personnel activity is built (Fig. 1).

In all cases of deviations from the BOT, an abnormal signal appears, indicating the appearance of a special situation in the object's security system, which may turn into a situation of working out a real security threat. By analyzing this signal, the AB specialist forms an information model in the mind aimed at eliminating the deviations that have appeared. The information model is compared with the reference model developed on the basis of BOT for various types of object protection procedures.

Some system reference signal is generated with the characteristics of the situation. An AB specialist evaluates the situation in order to identify the event, analyzes possible alternatives to the activity and makes the appropriate decision, and then proceeds to its implementation. At each of these stages, errors

in the specialist's activities that determine the content of unauthorized intervention are not excluded.

The system for minimizing the negative impact of personnel (SMNVP) is functionally largely dependent on the operations performed by the ESM to solve aviation security problems, since the initial information for the SMNVP is personnel errors, which, in turn, occur when AB personnel perform these procedures. The structure and main functions of the ESM and SMNVP are presented in the model in Figure 2.

Elektronika Security Manager (ESM) is an automated system of aviation security of the airport. Functionally, the system consists of the following clusters: ACS-access control and management system, SVN-video surveillance system, NEA-video analysis system, STCP-TV monitoring system of territories and perimeter, RAOC-radar optical system, SITB-information technology security system, STS-security alarm system, SUM-monitoring management system, PMSMO-positioning and monitoring system for mobile objects, QMS-engineering systems and communications management system.

Subsystems solve the following tasks: A-hardware configuration; B-database management; C-collection, processing and analysis of information; C-providing user interfaces; E-information protection and sharing of access to it; F-management of security subsystems; G-integration with information management systems.

Personnel play a particularly important role when implementing incident management in the system, and the following tasks are solved: 1. event registration and video recording, 2. incident discovery, 3. alarm generation, 4. event and situation analysis, 5. incident identification and verification, 6. activation of protective equipment, 7. event recording, 8. enabling reflection procedures, 9. notification, 10. enabling incident management procedures, 11. enabling incident elimination and completion procedures.

At any stage of interaction between aviation personnel and the ESM, errors occur in the dialog, which are recorded and transmitted to the system for minimizing the negative impact of personnel (SMNVP).

Structure SMIT includes the following subsystems: monitoring system processes, the system monitoring personnel. deviation monitoring system, error identification system, error analysis system, error statistics system, decision-making system, duplication system, correction system, personnel training system, certification system (Fig. 2).

It should be noted that the division of the structure into two systems is rather conditional, since many processes of minimizing the negative impact occur within the combined algorithms and cannot be separated.

Aviation security management in ESM is carried out through an incident, i.e. through some manifestation of a threat. Since aviation security personnel are one of the most important

elements of security, their negative impact is shown when the system works out the sequence of incidents. In this case, the SMNVP system solves the problem of personnel management in such a way as to exclude this negative impact for this purpose, the

staff's algorithms and technical means are reconstructed, or the level of professional readiness of personnel to perform their functions is corrected.

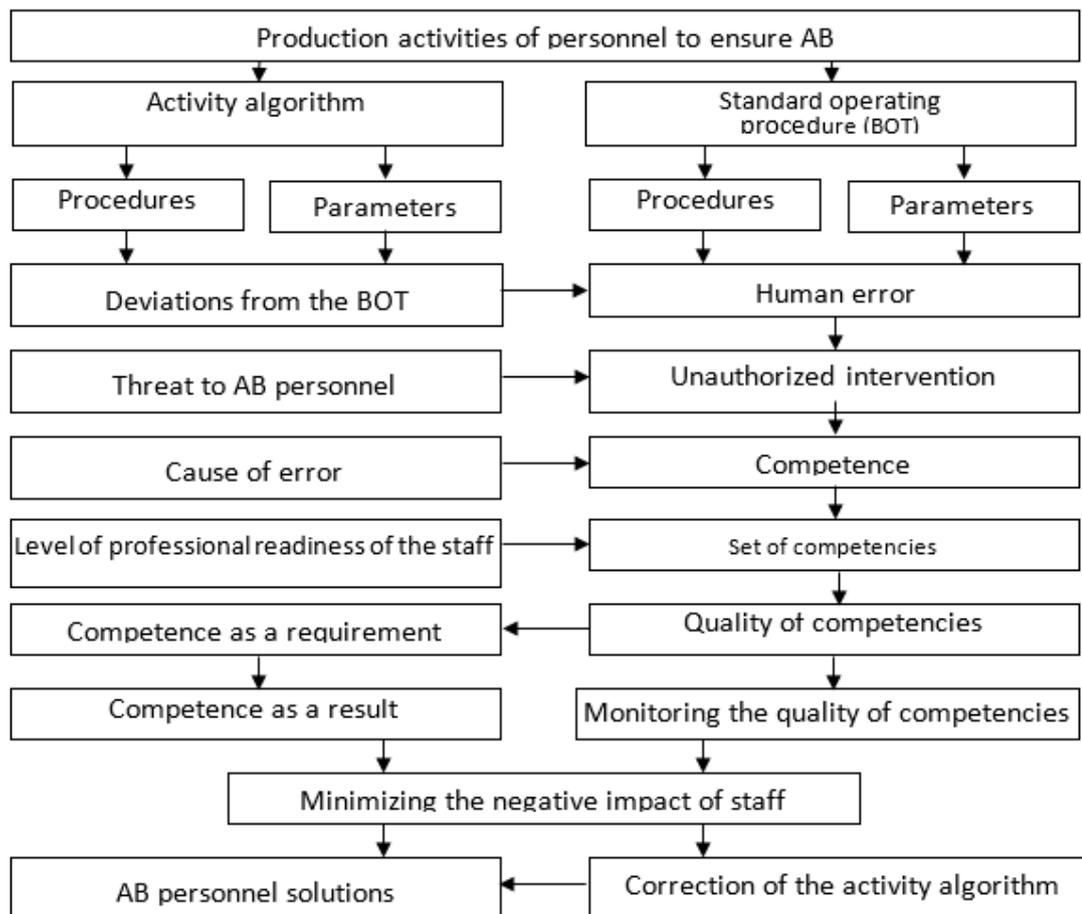


Fig. 1. Model the negative impact of staff

SMNVP works in two modes – in normal mode and in the mode of the incident. In normal mode, the staff works out their algorithms according to a pre-developed scenario that does not involve external interference, i.e. external threats do not provoke the staff to make mistakes related to the complication of the situation. In the incident mode, the staff works in conditions of increased responsibility, when the situation is not always unambiguously predicted, and the actions of the specialist are clearly algorithmized, which forces the staff to make responsible decisions in conditions of limited information and, as a result, the number of staff errors increases, and the degree of negative influence increases.

Monitoring of human error in SMNVP is carried out continuously and in real time. First of all, monitoring of aviation security processes in the ESM is implemented. Both in normal mode and in incident mode, the system monitors whether the parameters of the ESM algorithms correspond to the design values, thereby confirming the legitimacy of the system's actions. In parallel, the same modes are used to monitor the professional actions of personnel, confirming the adequacy of the implemented procedures to the parameters of the project algorithm of the specialist's activity (SEP). The most important in the monitoring system is to monitor deviations, comparing between the two settings mentioned above, algorithms, and fixing any detected discrepancies, evidence of the emergence of human error or, much more rarely, a failure in the system hardware. The end of monitoring is the identification of the error, which consists in determining its parameters according to a certain standard [3,7].

The error analysis system consists of evaluating the detected error in terms of its impact on the level of airport aviation

security. An identified error is no longer a threat, but a negative event that has certain negative consequences that change the situation in the system from minor to catastrophic deterioration. Error analysis answers a series of questions: who is to blame, at what stage of the algorithm, the reason for its occurrence, its place in the classification, the degree of novelty or routine, the degree of interference in the process, the alleged damage, and many others. The parsing system works in contact with the statistics system that stores data about previous mistakes and re-entering (Fig.3).

The algorithm reflects some procedures to minimize the negative impact of staff based on analysis of human error in the performance of their professional activities to ensure airport security through the interaction of software and hardware platform ESM (security AB) and NVP (minimize negative impact).

3. Results

The personnel of an aviation organization in the implementation of their professional function is in a certain situation, the parameters of which are determined by the parameters of the BOT and the parameters of the real algorithm of the professional activity of a particular specialist. A security risk occurs if there are inconsistencies between these parameters (figure 1). In this case, you can avoid presenting the black sea fleet as a certain factor and consider it as a threat to the security of the object from illegal interference in the activities of this object related to a person. In other words, it is proposed to investigate the negative impact of the personnel of an aviation organization on the procedures for ensuring and managing aviation security.

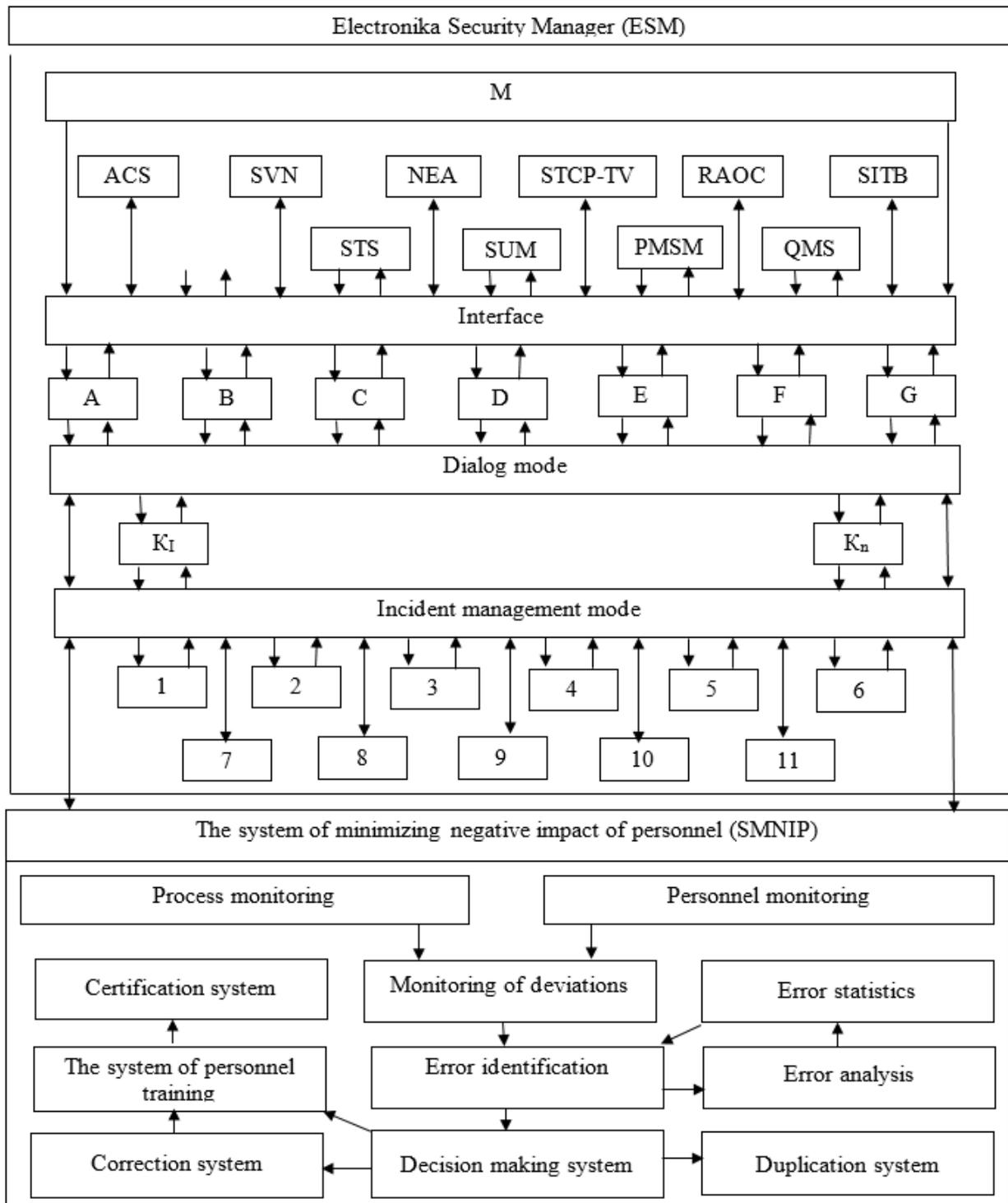


Fig. 2 Structural and logical model of the system for minimizing the negative influence of personnel.

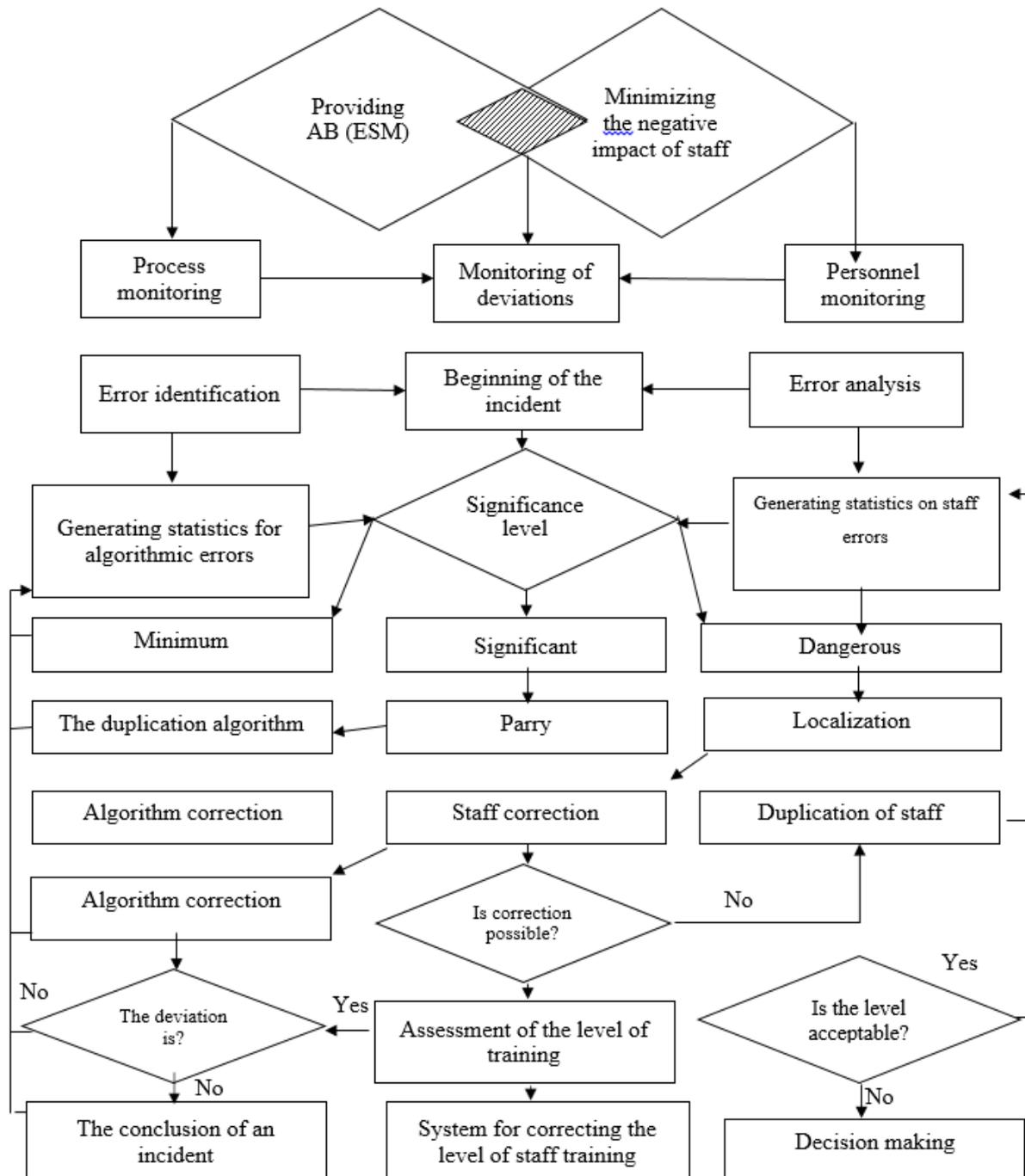


Fig. 3. The enlarged algorithm of the system to minimize the negative impact of personnel.

It is necessary to minimize the part of the black sea fleet that represents a threat (danger) to production activities and is an unauthorized intervention. In this case, there are appropriate structural and logical models and methods of their research that identify the negative impact of the personnel of the aviation organization. The result of the study, presented in some quantitative equivalent, can be considered as a parameter for controlling the level of negative influence, i.e. the threat of the black sea fleet becomes manageable [2].

4. Discussion

Threats from personnel engaged in professional activities to ensure aviation security are considered as part of the overall set of threats to airport security, as one of the types of threats. In fact, this is not quite true. External threats and their types are determined by the intruder model. Based on this model, appropriate counteraction measures have been developed for each type of threat, including the activities of personnel and a set of appropriate

technical means of protecting the object. Threats to personnel are considered as a side effect of the professional activity of an aviation security specialist. This means that it is impossible to single out a separate threat or classify threats in any way. For the same reason, it is not possible to investigate personnel threats as potential, i.e. it is impossible to develop a counteraction apparatus for each threat in advance. This is the main difficulty in studying personnel threats, which prevents the use of mathematical models and other classical research methods [1,5].

5. Conclusion

The threat of personnel is not always a potential event. quite often these threats are implemented, manifesting themselves as some negative results of the activities of an aviation specialist, which can be a terrorist act in the limit. This means that in the course of their professional activities, aviation security personnel perform certain actions that are not provided for by their functional responsibilities and are not included in their target functionality.

These actions may occur as a result of staff errors or some other reasons, but in any case they lead to deviations from certain SEP activities. The result of such activity can be manifested in the form of algorithmic intervention, which is understood as a change in the standard algorithm of the operation or its parameters, or in the form of incompetent intervention, which is due to an insufficient level of professional competence [3,8].

The human factor is not a factor in a strict definition, but a much more complex and multi-faceted category that belongs to complex systems and has a target functional that cannot be described in a strict mathematical way. A new concept of "personnel threat" is introduced, which is understood as the state of inadequacy of the operator's professional readiness and the parameters of the security situation, determined by the maximum level of professional parameters of the individual that allows the appearance of a negative event. There is absolutely new situation when you need to not minimize the human factor as such, but seeks to regulate the negative impact of staff aviation organizations on the procedures for production activities, considering this impact as a threat to the safety of the facility. In this case, approaches to solving the problem and research methods change [8]

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