Chapter 6

Intelligence-Based Operation of Aviation Radioelectronic Equipment

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ABSTRACT

This chapter presents the questions of aviation radioelectronic equipment operation. Operation is the main stage in the life cycle of equipment. This stage is the longest in time and very significant in terms of the costs for equipment reliability providing. Control influences are realized in operation system to provide the efficient functioning of the equipment. The operation system is complex in structure intelligence system and is the object of design and modernization. The chapter deals with the structure of the operation system and its elements interconnection and discusses the models of diagnostic variables, reliability parameters for the case of changepoint presence. An important issue during design and improvement of operation systems is the selection, evaluation, and support of the efficiency indicator. This chapter concentrates on the efficiency indicator substantiation taking into account the effectiveness and operational resources costs. Three data processing strategies analysis allowed choosing the most rational option from maximum efficiency point of view.

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INTRODUCTION

Scientific and technical progress is developing towards the creation of intelligent automated systems that are aimed at increasing productivity, reducing production costs, etc. Such systems are based on the principles of adaptation and flexibility, system and process approaches, which are elements of artificial intelligence (Solomentsev, Zaliskyi & Zuiev, 2016).

It is known that civil aviation is a system of systems. One of them is air navigation service (ANS) system. The main component of the ANS is radioelectronic equipment (REE). This equipment contains communication, navigation and surveillance systems.

Air navigation service system is used for air traffic management, radio engineering support of flights, providing aeronautical and meteorological information in accordance with the standards and recommended practices of ICAO and Eurocontrol requirements. So REE is intended for the formation and transmission of flight information to aircraft board and air traffic controllers of flight control centers.

According to Doc 9859, one of the ways to reduce the risks of ANS is the technical condition monitoring for early recognition of its deterioration. To do this, it is necessary to perform procedures for collecting and processing statistics on reliability parameters and diagnostic variables of the REE.

To provide efficient use of REE for its designated purpose, the operation system (OS) is utilized. The purpose of the operation system (OS) is to ensure the stable functioning of ground-based radioelectronic equipment to provide the data and information to the consumers.

The OS includes:

1. Radioelectronic Equipment.
2. Processes.
3. Personnel.
4. Documentation.
5. Operational Resources.

BACKGROUND

The main element of the operation system is radioelectronic equipment (Kuzmenko, Ostroumov & Marais, 2018). Therefore, all operational processes are directly related to REE (Nakagawa, 2005). The main process is the REE intended use. Other processes are a maintenance, repair, life extension, ground and flight tests, etc. (Dhillon, 2006).

According to ICAO and Eurocontrol documents requirements, all personnel must be certified. To do this, the initial training courses and the advanced training are implemented, the traineeship is organized and so on.

Regulatory documents play an important role during the safety and regularity of flights providing. The entire set of documents can be conditionally divided into international documents (ICAO, Eurocontrol), national domestic documents and documents developed by airlines taking into account the specifics of production activities.