Chapter 1

Analysis of Decision-Making of Operators in Socio-Technical Systems

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ABSTRACT

In this chapter, the authors present Air Navigation System (ANS) as a Socio-technical System (STS). The evolution of Human factor’s models is presented (from 1972 to present time) and the role of society in human factor (HF) models is defined. The authors made an analysis of the International Civil Aviation Organization (ICAO) documents on risk assessment and the impact of the social environment on the aviation system. The authors obtained the results of the evaluation of non-professional factors: determination the social-psychological impact on DM of human-operator (H-O) by identifying the preferences; diagnosing individual-psychological qualities of H-O ANS in the development of flight situation; monitoring of the psycho-physiological factors as emotional state H-O ANS. Authors demonstrate some interesting advantages offered by the new methodology of forecasting the behavior of the operator in emergency situation (ES).

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THE EVOLUTION OF HUMAN FACTOR’S MODELS

The aviation system is a complex system that requires investigation of the human contribution to safety and an understanding of how human performance may be affected by its multiple and interrelated components such as technical, political, physical, social, economic culture etc. (Cross-Cultural Factors in Aviation Safety, 2004). The HF remains a major cause of aviation accidents. That is why current management system needs to improve. The HF as a term requires a precise definition because when it is used in everyday life, it is often encompasses all aspects of human activity (Human factors training manual, 1998; Human Factors Guidelines for Safety Audits Manual, 2002). People are the most flexible, adaptable and important element in aviation system and the most vulnerable in terms of opportunities effect on its activity. At the initial stage of development of aviation, many problems have been associated with exposure to human noise, vibration, heat, cold and acceleration forces. But optimization of the human role in complex systems is related to all aspects of human activity, such as: DM processes and knowledge; design configuration displays, controls and equipment cockpit and cabin; maintaining communications and software; preparation of plans and maps.

Human factor and its effects on safety performance continue to evolve. The theory of the HF is gradually developed, tested and institutionalize. From the end of the previous century and now ICAO presents the cultural interfaces and systematic approach in aviation safety with reference to main establishment of conceptual of safety models. There are many circulars, documents and reports of ICAO presented conceptual models of HF and evolution of HF’s models (Human factors training manual, 1998; Human Factors Guidelines for Safety Audits Manual, 2002; Cross-Cultural Factors in Aviation Safety, 2004; Safety Management Manual, 2013; State of Global Aviation Safety, 2013, ICAO Safety Report, 2014): the SHEL, SHELL, SHELL-T, SHCHELL’s models; Reason’s model of latent conditions; the Threat and Error Management (TEM) model and other models of HF. In the centre of the SHEL model is a person (Liveware - L), the most critical and most flexible component in the system to which other components of the system must be carefully matched if stress and eventual breakdown in the system are to be avoided (Human factors training manual, 1998). In order to achieve this matching, an understanding of the characteristics of this central component is essential. People are subject to considerable variations in performance and suffer many limitations, most of which are now predictable in general terms (Human Factors Guidelines for
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