

ACTUAL PROBLEMS OF EDUCATION IN AVIONICS

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The contribution is focused on the presentation of the actual issue of education and training in the field of avionics of modern aircraft with due regard to their improvement for flight safety. Described are the possible directions of development in the contents of education aimed at the improvement in the preparation of aviation professionals.

K e y w o r d s: avionic systems, flight safety, education

1 INTRODUCTION

The notion of AVIONICS (combination of two English words: AVIation and electrONICS) is generally referred to the electronic equipment of flying vehicles. Its origin can be traced back as the result in the development of aircraft and air transportation. The roots of avionics reach far back into the history of early aircraft structures and designs with their use in mind. Avionics of these days was born when electronic devices (radars, DMEs, direction finders, gun sights) were first installed aboard the aircraft and their further development stepped into the phase based on semi-conductors, computer technology - bringing about their digitalization and the oncoming integration into modular systems providing for several functions. Currently, onboard electronics takes the major share of aircraft development.

2 AVIONICS AND FLIGHT SAFETY

Efficient operation of aviation equipment under complex meteorological, technological and political conditions all that closely related to flight safety. Successful solution of the problems of sustainable development of aviation is dominant in determining the prospects of both civil and military aviation. The complicated issues of flight safety are made even more complex by the intensity of air transportation, and by the growth of density in overpopulated regions, as well as the solution of tasks related to humanitarian aids to countries suffering from catastrophes caused by the elements or military conflicts.

In the light of the problems and need for further development of avionics, its growth in the complexity does not only adds to their failure rate, but also increases the physical and psychical workload of the aircrew, a frequent cause to errors in piloting. A medium-sized aircraft is made up of say 40 000 elements, requiring diagnostic and transfer of information to the aircraft control center, to the pilot-operator fulfilling the function of the decision making member.

Important position in controlled flight safety is held by special-purpose on-board devices, realizing the information-based assurance of outputs in the decision-making capacity of the operators. These mostly include:

- systems of warning for critical regimes of operation,
- systems of controlling and signaling errors,
- systems of electronic indication etc.

The scope of the diagnosed and controlled system, aggregates and further objects located in the vast geometry of the airframe keeps widening. The influence of the flight engineer and air operator on maintaining flight safety is irreversible also for the reason that the great variability of principles governing the operation of these systems is increasing by their and more to it is always affected by the climatic conditions. The ever increasing speed and performance of aviation transport results in the growth on demand to the dynamics, and stability of the systems and the aircraft as a whole. Credibility and efficiency of the shaped information functions is algorithmized to the estimates and prognosing the outputs of the onboard ergatic complex elements. False signals, however, might be transformed to generated false situations. As a result, there is the need for developing such a safety system, which is based on the function of cross-tested factors of influence.

The mentioned field is the domain of the informatics, which plays an important role in the learning process of a flight engineer. Part of his education from the position of air regulations, which combined with flight safety will unambiguously determine its importance, paying due attention automated checks, diagnostics, remedy actions related to the ergatic complex and the functions of the information control systems. Proportionate increase is desirable on the part of the aircrew in terms of their quality particularly when handling emergency situations during flight. The pilot-operator is in direct contact with the informative presentation of the control signals and must be capable of shaping the control algorithms of the onboard integrated system bound to warrant flight safety. The logical outputs of the ideas are formulating the requirements a new level of education needed of aviation professionals.

3 POSSIBLE DIRECTIONS OF DEVELOPMENT IN EDUCATION AT THE DEPARTMENT OF AVIONICS FA TUKE

The educational and scientific research activities of the staff at the Department of Avionics are oriented primarily towards the field of aviation electronic and electrical systems of modern aviation technologies. Further development of education in its conditions with focus on covering the issue of improving flight safety presupposes the following activities:

- developing a methodology to the theory of signal transfer and processing, programming processes, modeling experimental monitoring and estimation of the efficiency in converting the outputs and information carriers to ensure flight safety; see methodology developed in [1],
- developing theory and introducing new aspects into the teaching the operation of autonomous and integrated systems that ensure flight safety from the point of the needs for automatic control and manual handling of the ergatic complex; its contents is dealt with in [2],
- developing methods of identifying the factors that directly affect flight safety and methods of prognosing development of information support and algorithms of identification, as well as ways of maintaining safety constants; see sources available in books [3, 7],
- developing methodology of modeling and ensuring the efficiency of information and control systems making use of the functional elements of the onboard ergatic complex; by principles laid down in book [1],
- within the framework of solving problems at the II. and III. levels of education, applying new methods of research making use of the theory of safety reliability, mathematical stability, theory of probability, systems analysis a parametrical and structural synthesis, demonstrations of the theory of terminal control with accepted solution, which assumes the knowledge of methods of optimal filtration and imitational modeling of complex control systems,
- in practical application, developing methods of laboratory- and reality-based experiments, for theory and practice see books [1, 3, 4, 5].

4 SUPPORTING BOOKS PUBLISHED

In support of the aims of education in the issue of flight safety, the staff of the Department of Avionics has developed a basic portfolio of publications to be extended in the near future. The most important titles involve, published as monographs or university textbooks are:



Fig. 1 Process analysis of estimating the efficiency of identifying MPM with intelligent control (monograph)



Fig.2 Instruments of ensuring flight safety (university textbook)



Fig.3 Innovative outputs from the transformed experimental workplace with small size turbo-jet engine (monograph)

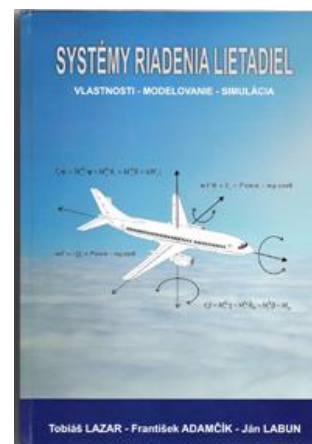


Fig. 4 Systems of aircraft control: characteristics- modeling – simulations (university textbook)

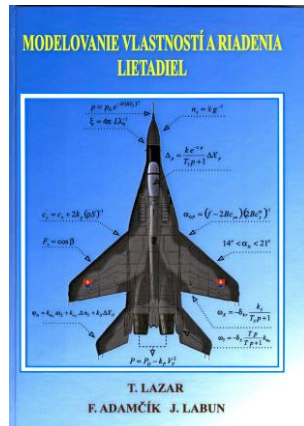


Fig.5 Modeling of characteristics and control of aircraft (university textbook)

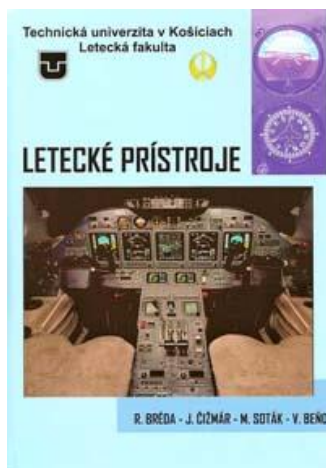


Fig. 6 Flight instruments (university textbook)

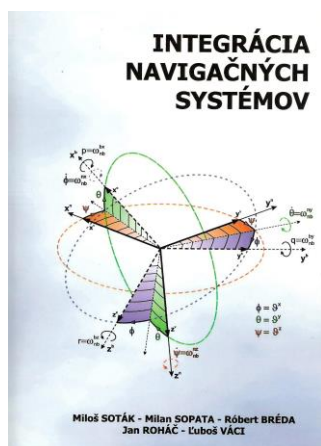


Fig. 7 Integration of navigation systems (monograph)

5 CONCLUSION

The results of the activities as above and the assumed contribution of introducing the new contents of education at the Department of Avionics to be expected as outputs:

- development of the theory and methodology of diagnosing and identifying onboard „man-machine,, information systems with projections into the systems of active flight safety
- formation and development of a new theoretical and practical basis for methods of design and research focused on information-control systems of assuring flight safety in the AIRCREW – AVIONICS – AIRCRAFT loop:
- obtaining certificate and accreditation of new scientific branches, which would meet the corresponding air legislation,
- introduction of new areas and development of laboratory methods of research as basis for final (thesis and dissertation) works in the field of information and control systems, built-in checks, diagnostics of on-board systems.

Laboratory researches in the field of work dynamics are extending the application of computer technology directly affecting the development of informatics in aviation equipment thus positively influencing the factors affecting the competitiveness of the graduates of the Department of Avionics.

RESUMÉ

The paper is aimed at presenting the current issue of the direction of education in the field of advanced aircraft avionics systems in response to the increasing demands of flight safety. Reported are the possible directions of development of the curriculum in order to improve aviation training professionals.

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