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METHODOLOGY AND TOOLING OF THE PROCESS OF SOLVING INTERDISCIPLINARY PROBLEMS WITH AIM AT ENHANCING THE EFFICIENCY OF SKILLS IN MULTIPLE CRITERIA ANALYSIS FOR FUTURE ENGINEERS

Abstract

Design tasks in aerospace engineering, as well as design tasks for any other involved engineering system, are based on integrated multiple criteria analysis of a large number of various data and on searching a compromise between various parameters of a system being developed. Hence, a future engineer, especially in aerospace, should have not only the narrow background, but also possess considerable interdisciplinary knowledge and skills to be capable of carrying such an analysis.

Of course, the traditional education involves, as a rule, a good account of well-proven analogies (examples of design and engineering solutions) and explicit algorithms based on which a student can obtain a sought-for result in some general case. Under this approach the time is saved, because in this case there is no need in running through a multitude (in general, inefficient) solutions, but a future engineer has no way to analyze various alternative solutions and to get a greater insight into them, that is, to understand which variants are possible, what are the advantages and disadvantages of a given variant for a specific design, and why it may happen that a variant, which is better at first sight in terms of several parameters, may prove unfit in the large. In the first place, understanding of such peculiarities is important in choosing the article conception (especially, the for new ones), its general design and composition analysis.

In the report, we propose a number of methodological approaches and software tools with which an aerospace engineers will be able, on a short time-scale, to efficiently receive and drill his or her skills in multiple criteria analysis on an example of a solution of a design problem of a landing module of an interplanetary space vehicle. This example was chosen because this problem has a number of alternative solutions starting from the choice of the concept, form, and size of a space vehicle and ending with the analysis of the landing trajectory and estimating parameters of single systems. To cope with this problem, a future engineer needs to be familiar with (or recall) the knowledge and skills for design of various systems, engineering process, aerodynamics, ballistics, control, and many other disciplines.