УДК 53(07)

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USE OF FUNDAMENTAL IDEAS OF PHYSICS TAKING INTO ACCOUNT STEM-TECHNOLOGIES

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Abstract: *The article outlines the use of fundamental ideas of physics taking into account STEM-technologies. It is established that to improve the quality of teaching physics in future technical specialists it is necessary to systematically improve the methodology of educational and cognitive activities, to apply modern learning technologies, which leads to productive mental and practical activities of students in the process of mastering educational material.*

Keywords: symmetry, physics, STEM-technologies.

In modern physics, a certain relationship between physics laws and principles of symmetry is considered. Particularly relevant issues related to the theory of symmetry [3] in modern physics theories based on the combination of fundamental interactions, as well as the application of the concept of symmetry in disciplines of professional profile in the development of STEM-education in higher education institutions of technical profile.

It is important to demonstrate the engineering and technical component of STEM education and to develop methods for studying the disciplines taught to students of the academy, taking into account the integrated approach and interdisciplinary links.

The transition to STEM-training requires the improvement of methods of teaching physics in an integrated approach, which includes: the use of new methods, techniques, teaching aids that would help solve several methodological problems; application and introduction of interesting and important scientific achievements in the educational process in physics, as well as the strengthening of those aspects that stimulate and activate the independent cognitive activity of students of the Flight Academy of the National Aviation University [1, 2].

Consider, as an example, the study of basic physics concepts and the fundamental concept of symmetry in the process of studying the dynamics of aircraft motion by students, based on an integrated approach to teaching physics and disciplines of the professional profile of the academy.

The motion of an aircraft as solid consists of two motions: the motion of the center of mass and motion around the center of mass. Since in each of these movements the aircraft has three degrees of freedom, in general, its movement is characterized by six degrees of freedom. At high speeds within the atmosphere, when the aircraft is exposed to large forces and moments, deformations begin to appear, which affect the aerodynamics and lead to changes in the dynamic characteristics of the aircraft. In some cases, the bodies placed inside the aircraft perform a given motion, so the aircraft must be considered as a system of solids.

As the coordinates that determine the position of the aircraft in space, usually take the Euler-Krylov angles, which determine the orientation associated with the axes of the aircraft coordinate system (CS) XYZ relative to the base CS. Horizontal and velocity CS are usually used as the latter. To carry out the controlled movement of the aircraft, it is necessary to control the parameters of the flight by influencing the forces and moments acting on the aircraft. Influence on aerodynamic forces and moments is carried out using control surfaces (rudders, ailerons, ailerons, guards, stabilizers) and air brakes. Traction is changed by changing the engine mode. The change in the force of gravity occurs due to changes in the fuel supply on the aircraft, dumping of cargo, and others.

As regulating factors that allow you to influence the aircraft to control its movement, you can choose the angles of deviation of the rudders height and direction, ailerons, stabilizer, etc.

Flight mode is determined by many interdependent parameters. Since there are unambiguous connections between these parameters due to the equations of motion of the aircraft, you can choose a small number of parameters that characterize the flight mode. These parameters can be selected as adjustable. The motion of an aircraft is the only process described by a complex system of differential equations. However, often the complex motion of the aircraft is divided into the simplest types of it (angular motion and motion of the centre of mass, longitudinal and lateral motion, etc.), which greatly simplifies and facilitates the study of

the problem. The errors allowed in such a close examination, in some cases are small. The admissibility of such assumptions and the degree of preservation of the main features of the movement of the aircraft is significant and complex problems of flight dynamics. If the manoeuvres take place in a vertical plane that coincides with the plane of symmetry of the aircraft, and the gyroscopic moments of the rotating parts can be neglected, then we can consider movements in the plane of symmetry (longitudinal motion) and relative to the plane of symmetry (lateral motion) [4].

One of the frequently used methods of simplification is that the equations of motion of the aircraft are composed of a certain undisturbed flight mode. Assuming undisturbed motion given and assuming small deviations of the actual disturbed motion, it is possible with additional simplifications to obtain simpler approximate equations characterizing the motion of the aircraft.

Thus, we consider the influence of the concept of symmetry in the process of lifting force and drag of the aircraft, studied by students of technical educational institutions and a transdisciplinary approach in the study of the concept of symmetry.

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