

INFLUENCE OF PARAMETERS OF ACTIVE ELEMENTS ON INDICATORS OF ELECTROMECHANICAL CONVERTER OF ELECTRODYNAMIC TYPE

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On the basis of the developed chain mathematical model, recurrent relations for calculating the interconnected electromagnetic, mechanical and thermal processes of an electromechanical converter of an electrodynamic type are obtained.

It is established that with an increase in the thickness of the square copper bus of the inductor coils and the anchor from 1.0 to 2.5 mm, the amplitude and pulse of electrodynamic forces increase (EDF). However, the maximum speed of the armature is greatest for the transducer, the coils of which are wound with a 1.5 mm thick winding. The highest efficiency value is demonstrated by the converter, in which the coils are wound by a 2.0 mm thick winding. With an increase in the number of layers of the inductor coil bus, the amplitude of the EDF decreases significantly, and the magnitude of the EDF pulse decreases slightly. This reduces the maximum speed of the armature, efficiency and temperature rise of the inductor coils and the armature.

The largest amplitude of the EDF is achieved in an electromechanical converter with a minimum number of bus layers of the inductor and anchor coils. The largest value of the pulse EDF achieves with the maximum number of winding layers. In this case, the largest values of the amplitude and momentum of the EDF occur under the condition that the number of bus layers of both coils are the same. The highest efficiency (21.82%) is achieved in the converter, in which the inductor and anchor coils have four layers of a 2.0 mm thick square bus.

A catapult model for launching an unmanned aerial vehicle (UAV) was made and tested on the basis of an electromechanical transducer of the electrodynamic type (Fig. 1).

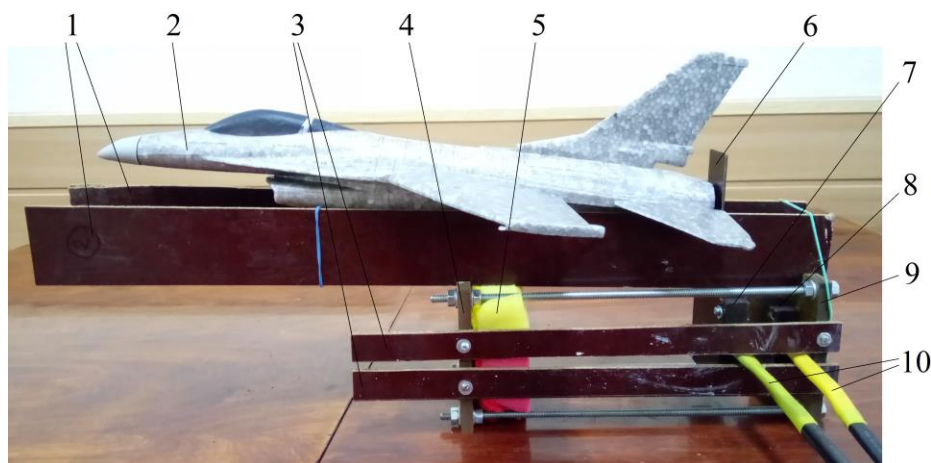


Fig. 1. Model of a catapult for launching a UAV: 1 - guide plates for moving a UAV; 2 - UAV; 3 - guide plates for moving the current leads of the armature coil; 4 - brake stop wall; 5 - brake elastic damper; 6 - upper ledge; 7 - anchor coil; 8 - inductor coil; 9 - starting thrust wall; 10 - current lead coils