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NUMERICAL AND EXPERIMENTAL ANALYSIS OF AERODYNAMICS OF BIGOS 4 ROCKET, A 1:2 SCALE MODEL OF PERUN SUBORBITAL ROCKET.

Abstract

BIGOS 4 is a fully recoverable and reusable sounding rocket capable of achieving the altitude of 16 km and maximum speed of 650 m/s (2.0 Ma). Its total length is 5.5 m and main body diameter is 0.2 m. It has been designed as a 1:2 scale model of a planned suborbital rocket named PERUN, which is currently being designed by the Polish company SpaceForest. One of the main goals of BIGOS 4 project has been the development of a reliable way of predicting aerodynamic characteristics required to size the engine and control systems of the full-scale rocket. This paper presents certain results of CFD simulations, which has been used to calculate aerodynamic coefficients as a function of the Mach number and the angle of attack. The presented calculations are focused on the prediction of the drag coefficient and the location of the pressure centre of the rocket. The results obtained are compared with the data gathered during the first supersonic flight, which took place in November 2018. The calculations of aerodynamic forces acting on the rocket during the ascent are based on the analysis of the measurements from the on-board accelerometers and gyroscopes. Additionally, the atmospheric pressure was measured during the descent to provide realistic boundary conditions for the simulations. These data, together with the verified CFD models, are planned to be used to predict the aerodynamics of PERUN rocket, a full scale model of which is scheduled to be launched in 2019.