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THE WAY OF DEFINING A POWERFUL METHOD FOR SUPERSONIC AND HYPERSONIC WINGED SPACECRAFT AERODYNAMICS PREDICTION

Abstract

Super-and hypersonic flight speed aerodynamics prediction provokes considerable interest when composite spacecraft being designed. This type of aircraft is characterized by wings, rudders etc. For that reason it is essential to take account of spacecraft flight regime features: entropy layer effects on blunted nose and real properties of gas; aerodynamics should be obtained for wide range of influential parameters such as Mach numbers, angle of attack and angular deflection of vehicle control surface. The purpose of this study is to define a powerful method for super- and hypersonic winged spacecraft aerodynamics prediction. This method should comply with three basic requirements: feasibility, effectiveness and accuracy. The feasibility of the method was characterized by its using for composite spacecraft and its flight condition in influential parameters required range. The effectiveness of the method lay in defining aerodynamics for a complete set of influential parameters in acceptable term. Finally, the last requirement – accuracy which was determined by obtaining high accuracy prediction results of spacecraft objective parameters. This paper shows how numerical simulation results depend on selected lattice density while the aircraft is moving with super-and hypersonic velocities. The effectiveness of the method has been appraised. The validity of the method is shown by comparing numerical simulation and experimental modeling.