

## **Thermal conditions analysis of the front composite wing edge of a small-size aerospace vehicle**

© I.S. Bodnya, V.P. Timoshenko

Bauman Moscow State Technical University, Moscow, 105005, Russia

*Heat-resistant composite materials are widely used for reusable aerospace vehicles constructions to provide effective heat protection for load-carrying structure elements. We conducted thermal analysis for one of the types of thermal-protective coating (TPC), heat-resistant porous ceramics based on  $Al_2O_3$  fibre, to estimate the impact of external atmospheric pressure on the temperature field inside porous TPC. We used the front wing edge of a small-size space vehicle as a simulated construction. We developed a mathematical simulation which considers the fact that TPC heat conductivity depends on temperature and pressure during the whole faze of vehicle reentry in the atmosphere. According to the results of calculations based on this model we educed 15% difference between temperature peak levels of load-carrying structure and simulation model. Simulation model TCP heat conductivity depends on temperature under a pressure of 101.325 kPa (1 atm). Judging by the results we concluded that external atmospheric pressure is one of the main factors which must be taken into consideration while designing porous TPC for reusable aerospace vehicles.*

**Keywords:** *mathematical simulation, composite materials, heat protection, front wing edge, small-size aerospace vehicle, heat current, porous ceramics*

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**Bodnya I.S.**, Master's Degree student, Department of Aerospace Composite Structures, Bauman Moscow State Technical University. e-mail: ivanbodnya@gmail.com

**Timoshenko V.P.**, Professor, Department of Aerospace Composite Structures, Bauman Moscow State Technical University. e-mail: moltim@yandex.ru