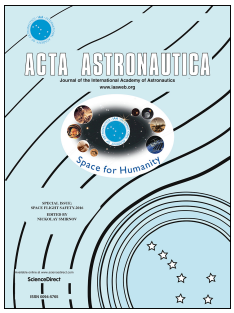
Accepted Manuscript



Numerical investigation of drag and heat flux reduction mechanism of the pulsed counterflowing jet on a blunt body in supersonic flows

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PII: S0094-5765(18)30172-3

DOI: 10.1016/j.actaastro.2018.02.040

Reference: AA 6735

To appear in: *Acta Astronautica*

Received Date: 23 January 2018

Revised Date: 21 February 2018

Accepted Date: 24 February 2018

Please cite this article as: R.-r. Zhang, W. Huang, L. Yan, L.-q. Li, S.-b. Li, R. Moradi, Numerical investigation of drag and heat flux reduction mechanism of the pulsed counterflowing jet on a blunt body in supersonic flows, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2018.02.040.

Numerical investigation of drag and heat flux reduction mechanism of the pulsed counterflowing jet on a blunt body in supersonic flows

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Abstract: To design a kind of aerospace vehicle, the drag and heat flux reduction are the most important factors. In the current study, the counterflowing jet, one of the effective drag and heat flux reduction concepts, is investigated numerically by the two-dimensional axisymmetric Reynolds-averaged Navier-Stokes equations coupled with the SST k-ω turbulence model. An axisymmetric numerical simulation mode of the counterflowing jet on the supersonic vehicle nose-tip is established, and the numerical method employed is validated by the experimental schlieren images and experimental data in the open literature. A pulsed counterflowing jet scheme is proposed, and it uses a sinusoidal function to control the total and static pressures of the counterflowing jet. The obtained results show that the long penetration mode does not exist in the whole turnaround, even in a relatively small range of the jet total and static pressures, and this is different from the phenomenon obtained under the steady condition in the open literature. At the same time, it is observed that the variation of the physical parameters, such as the Stanton number induced by the pulsed jet, has an obvious periodicity and hysteresis phenomenon.

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