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1 **Numerical experiment on the flow field properties of a blunted body with a counterflowing**
2 **jet in supersonic flows**

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9 **Abstract:** The prediction of the drag and heat flux reduction characteristics is a very important issue in the
10 conceptual design phase of the hypersonic vehicle. In this paper, the flow field properties around a blunted body
11 with a counterflowing jet in the supersonic flow with the freestream Mach number being 3.98 were investigated
12 numerically, and they are obtained by means of the two-dimensional axisymmetric Reynolds-averaged
13 Navier-Stokes (RANS) equations coupled with the two equation standard k- ϵ turbulence model. The surface
14 Stanton number distributions, as well as the surface static pressures, were extracted from the flow field
15 structures in order to evaluate the drag and heat flux reduction characteristics. Further, the influences of the jet
16 pressure ratio and the jet Mach number on the drag and heat flux reduction were analyzed based on the detailed
17 code validation and grid independency analysis process. The obtained results show that the flow cell Reynolds
18 number has a great impact on the heat flux prediction, and its best value is 5.0 for the case studied in the current
19 study. However, the flow cell Reynolds number and the grid scale both have only a slight impact on the
20 prediction of the surface static pressure distribution, as well as the turbulence model. The larger jet pressure
21 ratio is beneficial for the drag and heat flux reduction, and the smaller jet Mach number is beneficial for the heat

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