VISCOUS HYPERSONIC GAS FLOW CHARACTERISTICS OVER THE DELTA WING WITH BLUNT LEADING EDGES

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This work covers the heat flow on the wing surface that is known to have a complex distribution. The laminar-turbulent transition on the winward surface is also known to have a complex structure[1]. From the experiments we can only obtain shock wave form, integral and surface characteristics, so the numerical sumulation is the only way to obtain flow structure in order to explain the experimental results.

In this paper the results of numerical simulation of a laminar hypersonic gas flow over delta wing with blunt leading edges and nose tip in ICEM CFX along with corrsponding experimental data are given. Geometry parameters of the model are: width – 16 mm, length – 530 mm, sweep angle – 75^0, bluntness radius – 8mm. The gas flow characteristics are: Mach number – 6-8, Reynolds numer about $1 \cdot 10^6$. The exact values coincide this those of experimental data. The angles of attack are 0, 5 and 10^0.

The analysis has shown that the regions of high heat flows correspond to the boudaries of the vortexes. The heat flow distribution obtained from numerical simulation is in a good agreement with the experimantal data(UT1,T-117 TsAGI).

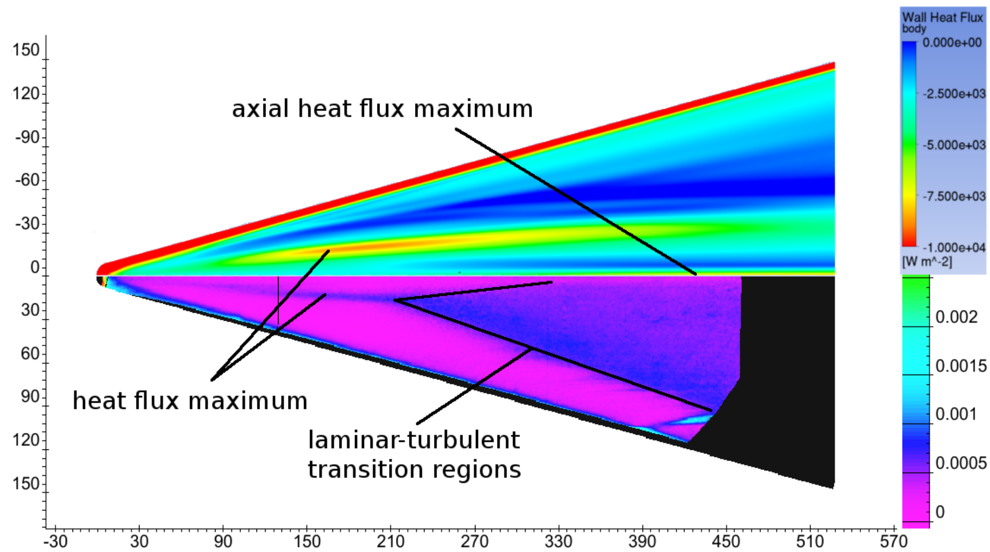

Fig 1. Heat distribution comparison alpha = 0^0,M = 6. Upper: numerical simulation heat flux distribution, lower: experimental Stanton distribution.

The analysis of vortex structure and boundary layer flow structure is also presented. The flow structure dependency on the angle of attack and Mach number is investigated.

REFERENCES

1. **Experimantal study of transition on the models of triangular plate with blunted leading edge at high supersonic flow** / A.V. Vaganov, S.A. Gaponov, Yu.A. Ermolaev et al.. // XV International conference on the methods of Aerophysical Research. Novosibirsk: Parallel. Abstracts Part I. – 2010. – P.248-249