NUMERICAL STUDY OF HIGH SUPERSONIC FLOW OVER DOUBLE SKEW WEDGES ARRANGED ON A PRE-COMPRESSION RAMP

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Results of the numerical study of supersonic flow over a double skew wedges with swept leading edges arranged on an unswept pre-compression ramp are presented. The wedges generate sloped shock waves deflecting the compressed flows one towards another. The said shock waves, firstly, three-dimensionally interact one with another near the plane of symmetry. Secondly, they induce 3D turbulent boundary layer separations along the leading edges of the wedges. 3D shock wave – turbulent boundary layer interactions generating by swept wedges are of high complexity, and study of them has the theoretical significance in the understanding of interaction phenomena. There is also practical interest in the knowledge of properties of such interactions as they take place in flows at junctions between different aerodynamic elements of flying vehicles. Numerical computations of the studied flow at free-stream Mach number M = 6 were performed with FLUENT Navier – Stocks code and k-ω *SST* turbulence model.

The study showed that the shock interaction is irregular with formation of reflected shock waves of von Neumann type in a plane normal to the line of their intersection. The separated flows arising along the leading edges of the wedges collide one with another near the symmetry plane with forming on the ramp a node *N* and a saddle point *S*. A local return near-surface flow is observed here which is directed from the saddle point *S* to the node point *N* but it does not attached up to the point *N*, and a local closed secondary separation zone does not form here. As a result, a swollen viscous flow layer developing along the intersection rib of wedges forms.

The performed numerical study displayed a distinctive flow pattern over the configuration under consideration, which extends the known by publication spectrum of supersonic flow patterns with three-dimensional turbulent boundary layer separations induced by shock waves generated by swept wedges.

Key words: three-dimensional supersonic flow, double skew wedges with swept leading edges, shock wave – turbulent boundary layer interactions, numerical computations.