High supersonic speed aircraft intake design based on the three-dimensional flow along the corner of intersecting wedges

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Interest in studying approaches to improving supersonic flow deceleration efficiency in air intakes is associated with the development and creation of various hypersonic aircrafts. The main opportunities for improving the air intake performance are related to implementing intakes with spatial flow deceleration. Implementation of a three-dimensional system of weak shock waves in intakes allows achieving a non-separated flow in the air intake duct as well as reducing the length, flow surface area, heat flows and intake weight. The paper proposes an approach to spatial supersonic flow compression from the intake leading edge in shock waves arising from the flow over two plane surfaces intersecting at an arbitrary angle. Suggested scheme of supersonic flow deceleration enables to produce a flow with decreased pressure gradient at its sides compared to the core, which allows achieving a non-separated flow at smaller compression lengths. Calculations of the three-dimensional flow parameters at the intersection of shock waves and at the intersection of a shock wave with a solid surface are based on exact analytical relationship for oblique shock waves. The results of calculation of the spatial flow parameters with flat shock waves are presented. They allow revealing the structure of shock waves in the elements of spatial intakes. Calculation results for intake external and internal compression areas are analyzed with an estimated Mach number of 2.5.

***Keywords**: intake, shock waves interaction, corner body*

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