EXPERIMENTAL INVESTIGATION OF A SUPERSONIC THREE DIMENSIONAL INLET ARRANGED WITH THE THROAT CONTROLLED BY SLOTTED FLAPS

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Results of an experimental investigation of an innovative three-dimensional inlet developed at Khristianovich Institute of Theoretical and Applied Mechanics (ITAM) are presented. The inlet is designed for a flight Mach number $M_d = 2$. It has an external compression ramp built as a V-shaped waverider. In the design flow regime, the external and internal compression flows with oblique shock and isentropic waves forming in the inlet is two-dimensional. The inlet is arranged with a device which provides the inlet starting and controlling of the throat cross section by deflected paired fore and rear flaps being panels of V-shaped compression body. These flaps, when they are deflected, form both cross and longitudinal slots between themselves flaps and between the flaps and side walls. Air bypass takes place through these slots at inlet starting and the boundary layer developing on panels of V-shaped body and in corners between the body and side walls is bled.

Results of tests in the blow-down wind tunnel T-313 of inlet with a flowmeter at free-stream Mach numbers M = 1.75 and 2 are presented in this paper. Characteristics of the inlet, particularly the flow-rate φ and pressure recovery σ factors, were determined depending on extent of opening the throat flaps. By data of the tests, values $\varphi = 0.96$, $\sigma = 0.925$ at M = 2 and $\varphi = 0.87$, $\sigma = 0.985$ at M = 1.75 were obtained for the case of the completely closed throat flaps. The level of pressure recovery factor of the investigated 3D inlet generally correlates with TsAGI data for supersonic 2D shocked inlets of mixed compression and a typical low for supersonic transport aircraft by data of E.L.Goldsmith and J.Seddon.

Key words: innovative three-dimensional inlet, experimental investigation, supersonic speeds.