FM11S_11918

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Control of Internal Supersonic Flow Separation

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Supersonic internal flow separation at a cylindrical convex contour was controlled by means of obstacles and swirling jets used to excite the turbulent boundary layer. In the former case a row of oblique half-cylinders paired in a form of V-letters were stuck to the wall. In the latter case the jets from orifices in the wall were injected into the boundary layer. They were strongly swirled to induce the vortex brake down phenomenon. In this effect the air of the jets spreads around orifices and disturbs only the flow region close to the wall. In the supersonic flow the boundary layer separation is accompanied by a shock wave. It was noted in the present experiments that the shock wave displaces remarkable downstream when the boundary layer is excited. The separation is delayed due to streamwise vortices downstream of obstacles and swirling jets which enhance mixing of retarded and fresh air particles.

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