



## VISUALIZATION OF UNSTEADY REGIMES DURING VORTEX WAKE / SHOCK WAVE INTERACTION

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### KEYWORDS:

**Main subjects:** shock / vortex interaction, flow visualization

**Fluid:** high speed flows, flows with shocks, vortexes

**Visualization method(s):** schlieren visualization, adaptive visualizing transparencies technique

**Other keywords:** image processing

**ABSTRACT:** The results of experimental study on vortex wake behind of a wing interaction with bow and oblique shock waves are presented. Experiments were performed in supersonic wind tunnels T-313 and T-326 in ITAM SB RAS at Mach numbers of 2-6. Vortex wake is generated by an unswept wing with sharp leading and trailing edges. The bow shock wave is generated by a cylinder with a flat end face. Oblique shock wave is generated by a wedge with sharp leading edge. Complex of visualization techniques included: high-speed shadow technique with adaptive visualization transparencies [1, 2] and high-speed schlieren visualization. Analysis of visualization results allows to detect different interaction regimes. During the vortex / bow shock interaction vortex was found to be an initiator of self-oscillatory process (Fig. 1) at wing angles of attack of 6-14 degrees. This regime is characterized by global reorganization of flowfield structure and high level of pressure fluctuations. During the vortex / oblique shock interaction at Mach number of 6 weak interaction was observed. At Mach number of 3 experiments reveals to the strong interaction with forming a reverse flow region (Fig. 2). The work was supported by the Russian Foundation for Basic Research (grant No. 09-01-00780) and performed under the contract with the International Science and Technology Center (ISTC), Moscow, (Project No. 3872).

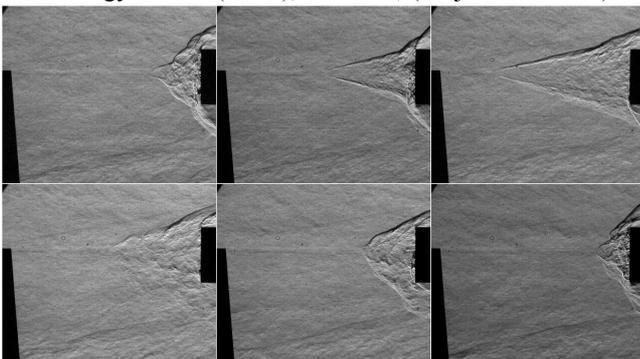


Fig. 1. Different phases of self-oscillations during vortex / bow shock interaction at Mach number of 6 and wing angle of attack 10 degrees.

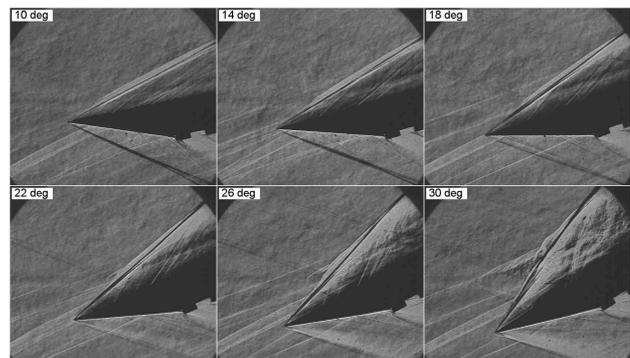


Fig. 2. Vortex / oblique shock interaction at Mach number of 3 and wing angle of attack 10 degrees depending on shock intensity.

### References

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