

極超音速流れにおける凹面・凸面および平面形状前方での衝撃波不安定性とその制御

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Shock Instabilities in front of Different Curvature Concave Geometries at Mach 7 Hypersonic Flow

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Dates: 2015/12/14 ~ 18

To understand the unstable nature of bow-shock in front of hemispherical concave shaped blunt nose, six different degrees of curvature geometries have been tested at Kashiwa Hypersonic and High Enthalpy wind tunnel at Mach 7 Hypersonic flow-field. The force measurements along with shock visualization have been performed for these six geometries. The isometric views of these geometries and corresponding bow-shock visualization images have been shown in Fig.1. The force measurement was performed with six-component force balance. The unsteady nature of shock oscillation have been captured using Phantom Miro M310 high-speed camera at 100,000 fps with 1 μ sec exposure time and 192 x 120 resolution for 1.3 seconds. Further by image processing method, the bow-shock oscillations at the center location have been measured with time for 1 sec. Fig. 2 shows the variation in shock location at center of cavity with time for 75° and 90° curvature geometry, measured from high-speed Schlieren video.

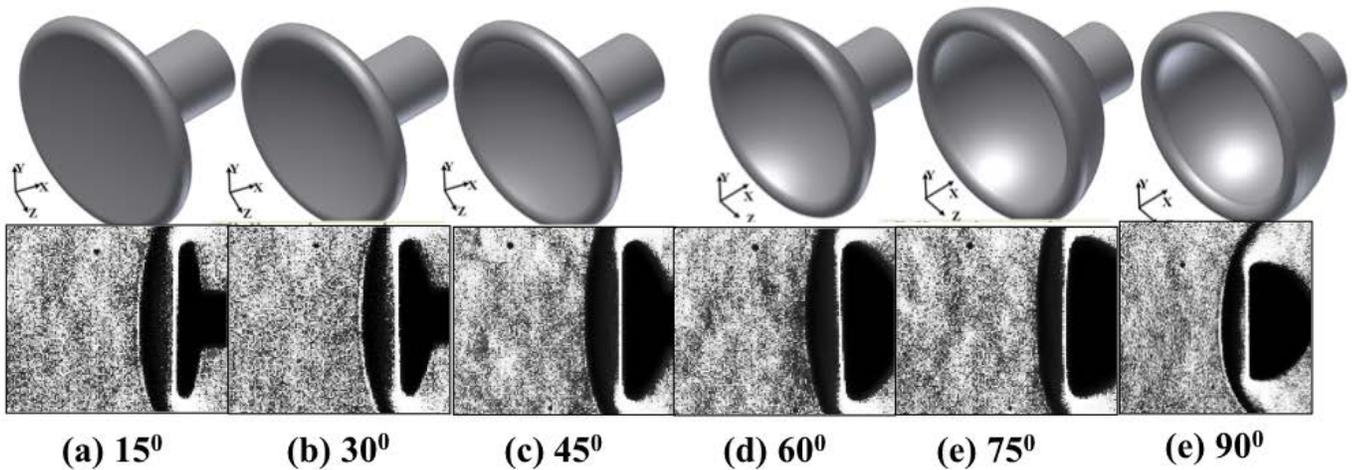


Figure 1: Schlieren Images of Shock in front of different degrees of curvature geometries by High-Speed Camera at 100,000 fps

Shock fluctuation at the center of cavity

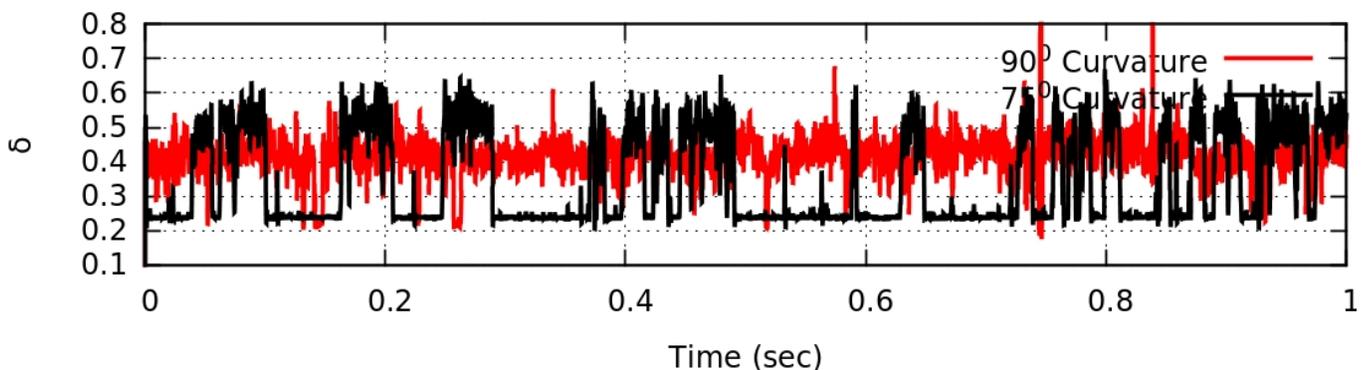


Figure 2: Shock fluctuation at the center location for 75° (black) and 90° (red) curvature geometries with time