

Portfolio

## Whole Flow Field Visualization around a Bullet by Differential Interferometry in Polarized White Light

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Received 23 March 2007 and Revised 4 April 2007

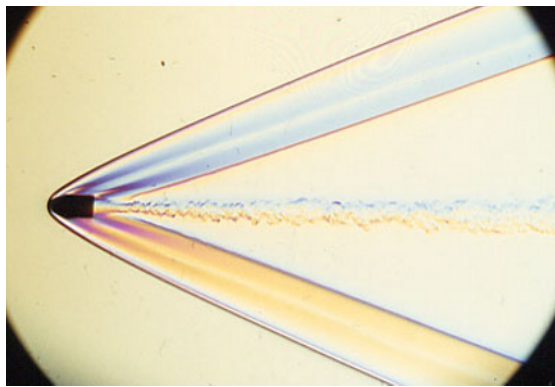


Fig. 1. Wollaston prism angle : 1°.

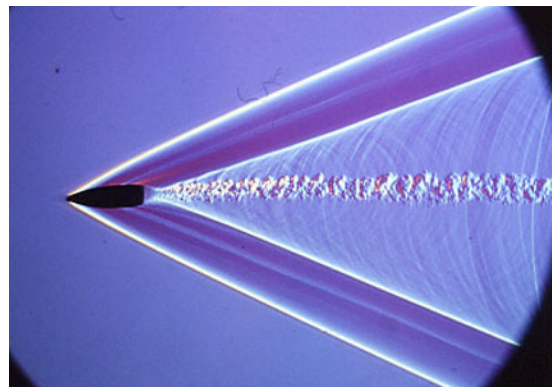


Fig. 2. Visualization of acoustic waves.

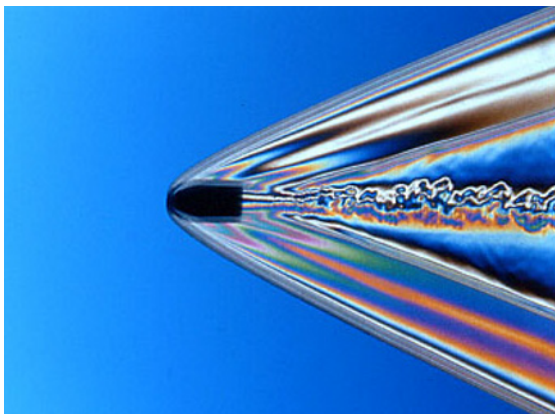


Fig. 3. Wollaston prism angle : 4°.

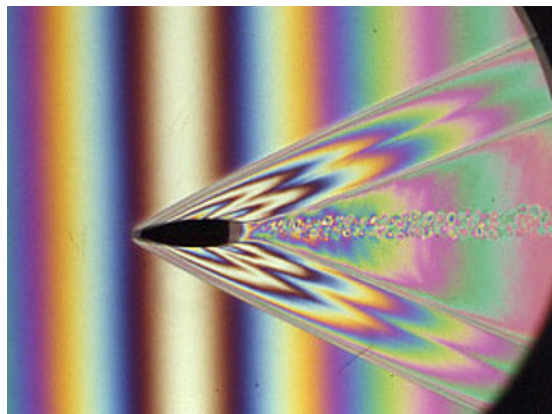


Fig. 4. Finite-fringe mode.

Differential interferometry using a Wollaston prism has been used to visualize the whole flow field around a small bullet (diameters 5.56 mm or 7.62 mm). A double-pass system with the Wollaston prism placed at the curvature center of a spherical mirror is used. The light source is a spark which is triggered when the bullet has reached the centre of the optical test section. The bullet Mach number is 3 and the exposure time of the spark is 300 nanoseconds. Figures 1-3 were taken in so-called infinite-fringe mode just before the firing. Figure 1 shows the gradients perpendicular to the flight path and Fig. 2 the gradients in direction of the bullet trajectory. Moreover, it is possible to see very weak acoustic waves on each side of the wake flow behind the bullet (Fig. 2). In Fig. 3, the Wollaston prism angle is chosen to 4° to strongly increase the sensitivity and the visualized gradients are vertical. This picture shows very well contrasted and saturated colors. Figure 4 shows an interferogram recorded in finite-fringe mode. Here, the difficulty to take this picture lies in the fact that the bullet is just located in the middle of the white fringe. In this configuration, the upper and lower colors of the image situated between the upstream and downstream shock waves are very symmetrical and identical. This particularity gives a wonderful interferogram.