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Trajectory Control of Small Rotating Projectiles by Laser Sparks
ANDREY STARIKOVSKIY, CHRISTOPHER LIMBACH, RICHARD MILES, Princeton University — The possibility of controlling the trajectory of the supersonic motion of a rotating axisymmetric projectile using a remotely generated laser spark was investigated. The dynamic images of the interaction of thermal inhomogeneity created by the laser spark with the bow shock in front of the projectile were obtained. The criterion for a strong shock wave interaction with the thermal inhomogeneity at different angles of a shock wave was derived. Significant changes in the configuration of the bow shock wave and changes in the pressure distribution over the surface of the rotating projectile can appear for laser spark temperature of $T' = 2500$-3000 K. The experiment showed that strong interaction takes place for both plane and oblique shock waves. The measurement of the velocity of the precession of the rotating projectile axis from the initial position in time showed that the angle of attack of the projectile deviates with a typical time of perturbation propagation along the projectile's surface. Thus the laser spark can change the trajectory of the rotating projectile, moving at supersonic speed, through the creation of thermal heterogeneity in front of it.

Andrey Starikovskiy
Princeton University

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