AN EXPERIMENTAL STUDY OF PROJECTILE -BLAST FLOW FIELD INTERACTION IN TRANSITIONAL BALLISTIC REGIMES

Athira C. M., Rajesh G.

Department of Aerospace Engineering, Indian Institute of Technology Madras, Chennai, 600036

ABSTRACT

The flow field around a moving projectile in the vicinity of the launch tube (transitional ballistic regime) is highly complicated as well as strongly time-dependent. There are various types of flow interactions among the shear layers, shock waves, and wake flow behind the projectile and with the moving projectile itself [1-3]. The diffraction of shockwave from the exit of the launch tube results in the formation of Primary blast wave[1] which is followed by the unsteady jet, the projectile and depending on the Mach number of the jet exiting from the launch tube ahead of the projectile, a secondary shock[5] wave may form behind the primary blast wave. This is followed by a Secondary blast wave(SBW) and an under-expanded supersonic jet due to the ejection of high pressure compressed gas behind the projectile. There are projectile flow-field interactions which affect the aerodynamic characteristics of the moving projectile in the flow field. One is the interaction of the projectile with the unsteady flow structures within the primary and secondary blast wave and the second is the interaction of the projectile with the primary blast wave, commonly known as the projectile overtaking problem.

In the present study, experiments are conducted to understand the flow field characteristics of different shaped projectiles (cylindrical, conical and ogive). Time resolved schileren technique is employed to obtain the projectile trajectory.