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**Reducing shock related unsteadiness of supersonic flow over spiked bodies** JACOB COHEN, DEVABRATA SAHOO, S. K. KARTHICK, Aerospace Engineering, Technion-Israel Institute of Technology, Haifa - 3200003, SUDIP DAS, Space Engineering & Rocketry, Birla Institute of Technology, Mesra - 835215 — Spikes, mounted at the stagnation point of a blunt body moving at supersonic speed, are utilized to reduce the forebody drag at the expense of increase in flow unsteadiness. We examine three configurations: flat, hemispherical and elliptical blunt bodies. Our goal is to distinguish between the unsteadiness mechanisms associated with each configuration, using experiments and CFD conducted at  $M=2$ . Drag is measured by in-house built balance, whereas unsteady pressure transducers and high-rate Shadowgraph snapshots, subjected to POD and DMD analysis, are utilized to quantify the flow unsteadiness. The flat blunt case has been investigated in the past and two modes of unsteadiness have been reported: a mild flapping oscillation and a violent axial pulsation. The latter mode is used to validate our results. When a spike is attached to hemisphere/ellipse body, the upstream strong detached bow shock wave is replaced by a system of weaker oblique shocks. The flow then separates over the spike body forming of a separated flow region bounded by an axisymmetric shear layer. Within the shear layer KH vortices are formed and shocklets are attached to these vortices and all move together downstream. We find the separation angle, separation shock and the separated volume to govern the flow unsteadiness. These are further demonstrated by using the hemispherical forebody with hemispherical spike tip.

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