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NUMERICAL STUDY ON EFFECT OF NOSE ECCENTRICITY ON PENETRATOR PERFORMANCE

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ABSTRACT

The objective of this work is to study the effect of nose eccentricity on penetrator performance by 3-D Computational Fluid Dynamics (CFD) using commercially available software. The conical nose shaped penetrator was simulated for different eccentricity ranging from 0.3 to 0.9 mm in steps of 0.1mm. The penetrator was meshed with tetrahedral shaped elements with six prism layers of size 0.05 to 1mm spacing. An unstructured hybrid mesh is generated for this analysis. Analysis is carried out with boundary conditions of pressure at one atmosphere; static temperature of 288K, with turbulence model k-omega, and for different velocity ranges (1.2-1.8 Mach number) of air was applied to the penetrator.

The results show that location 3 subjected to minimum velocity and maximum pressure due to sudden variation of area irrespective of eccentricity. The increase in eccentricity of the penetrator nose causes more variation in pressure and velocity on penetrator body hence there is instability in the penetrator. The 0.9mm eccentricity shows maximum difference of pressure of 26kPa and difference of velocity of 7m/s throughout the structure which leads to the instability of penetrator during flight condition.

KEYWORDS: Computational Fluid Dynamics, Mach Number, Penetrator, Nose Eccentricity