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# Nose Micro-Blowing for Asymmetric Vortices Control on Blunt-Nose Slender Body at High Angle of Attack

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**Keywords:** Nose micro-blowing, Asymmetric vortices, Blunt-nose slender body, High angle of attack, Flight control

**Abstract:** The asymmetric vortices over blunt-nose slender body at high angles of attack result in random side force. In this paper, a nose micro-blowing technology is used to control the asymmetric flow. Pressure measurement and particle image velocimetry(PIV) experiments are conducted in a low-speed wind tunnel to research effects of jet flow rate on asymmetric vortices over blunt-nose slender body. The angle of attack of the model is fixed at 50° and the Reynolds number for the experiments is $1.6\times10^5$ based on diameter of aft-body. A blow hole(5mm in diameter) on the nose is processed at circumferential angle $\theta_b$=90° and meridian angle $\gamma_b$=20° with jet momentum ratio $C_\mu$ ranging from $5.30\times10^{-7}$~$1.19\times10^{-4}$. Tests are made under two kinds of perturbations. One is called single perturbation with only blow hole and the other is called combined perturbation consist of blow hole and additional granules set on nose. The results show that whether the model has the single perturbation or the combined one, the sectional side force of $x/D$=3 varies in the same direction with the increasement of $C_\mu$ and remains stable when $C_\mu$ is greater than $3.29\times10^{-6}$. But the stable force values are different according to various perturbations. The fact proves that the size and direction of the side force of blunt-nose slender body can be controlled by the nose micro-blowing.

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