# CASTS Talk

*The Active Perturbation Control to Wing Rock Motion Induced by Asymmetric Vortices*

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10:30 - 12:00
400, Institute of Applied Mechanics

The high maneuverability and high agility are among the most important performance characteristics of modern advance multifunctional fighters. Usually the high maneuverability of fighters can be appeared if they are flying at high angles of attack. However some of uncommand flying motions are generated, such as wing rock motion. And present studies of free roll oscillation patterns with circumferential locations of micro-tip perturbation and suppression technique of free-roll-oscillation for wing/body configurations with low swept wing and high swept wing have been investigated in the range of angles of attack from low to high. The results of low swept wing model reveal that wing rock motion patterns are strongly dependent on the circumferential position of micro-perturbation at the tip of model and there are three types of free roll oscillation patterns: limit cycle of wing rock at θ=0o or 180o, where θ is circumferential angle of micro-perturbation from windward symmetric surface; irregular oscillation at θ=90o or 270o; tiny roll oscillation pattern, if θ is on the other circumferential positions. For the model with low swept wing a technique of suppressing wing rock motion by rotating nose tip perturbation was developed with higher frequency than one of free roll oscillation, and the higher the frequency of rotation of micro-perturbation on nose tip, the better effect suppression of free wing rock has. For the model with high swept wing, another perturbation control technique for suppression of wing rock was developed, in which two pairs of asymmetric vortices (one pair from forebody and another from high swept wing) will control the wing rock motion mainly. In the suppression technique, if two pair of asymmetric vortices are in phase coincidence, it makes wing rock more stronger while two pair asymmetric vortices are in phase reversal the wing rock becomes weaker, which can be adjusted by circumferential location of micro-tip perturbation on the nose.