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The suppression of wing rock of wing/body configurations[1]
XUEYING DENG, Retired from BUAA, YANKUI WANG, Professor of BUAA, MINISTRY-OF-EDUCATION KEY LABORATORY OF FLUID MECHANICS, BEIJING UNIVERSITY OF AERONAUTICS AND ASTRO TEAM — The suppression and flow mechanism of wing rock for wing/body configurations with high and low swept wing at high angles of attack have been studied. The results of low swept wing model reveal that wing rock patterns are dominated by body asymmetric vortices which are strongly dependent on circumferential location θ of micro-perturbation on the body tip. There are three types of free roll patterns: limit cycle at θ=0° or 180°; irregular oscillation at θ=0° or 270°; tiny roll pattern, if θ is at the other positions. For low swept model a technique of suppressing wing rock by rotating tip perturbation was developed with higher frequency than one of free roll motion. For the model with high swept wing another technique of suppressing wing rock was developed, where two pairs of asymmetric vortices (one pair from body and the other from high swept wing) will dominate the wing rock. If two pairs of asymmetric vortices are in phase coincidence, it makes wing rock stronger while two pairs of vortices are in phase reversal the wing rock becomes weaker. Based on this fact the perturbation at body tip can be adjusted to suppress the wing rock.

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