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前掠翼融合体无尾布局流动控制技术

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Flow Control Technique for Forward-swept Wing Blended- Body Tailless Configuration

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摘要 通过风洞试验研究了前掠翼融合体无尾气动布局（FBB布局）的流动控制技术。研究结果表明，FBB布局设计使前掠翼的前缘涡与融合于机体的大后掠侧缘的侧缘涡的发展过程达到了较为理想的匹配，有效控制布局的流动是FBB布局获得突出纵向气动性能的主要物理根源。针对大迎角状态提出的两段可动式侧板流动控制技术，通过可动段与固定段前缘之间形成收缩型缝道，将机身下表面的高能气流引入上表面增强了机体侧缘涡，加强了对机翼根部和后体流动的控制、减缓机翼根部分离、控制机头分离区，既可提供俯仰控制力矩，又不损失升力，改善了失速特性，有利于FBB布局的纵向配平和俯仰控制。FBB布局的流动控制设计思想和两段可动式侧板控制技术为无尾布局飞机设计提供了一条崭新的思路。

关键词： 前掠翼 融合体无尾布局 两段可动式侧板 风洞试验 流动控制

Abstract： This article investigates the flow control technique of forward-swept wing blended body (FBB) tailless configuration by means of wind tunnel tests. The results show that the FBB tailless configuration can make the leading edge vortex and high swept side-strake body vortex work well together, so that wing-root separation can be controlled. Thus, the FBB configuration acquires excellent longitudinal aerodynamic characteristics. The two part moving strake (TMS) technique is introduced to solve the separating problem of a forward-swept wing at a high angle of attack. TMS works using a slot formed by its moving part and fixed part. The slot leads the high speed flow from a lower surface to an upper surface to enhance the side-strake body vortex, and in this way separation at the wing-root can be controlled. At the same time, TMS can limit the separating area at the head of a plane. In conclusion, TMS improves the pitching characteristics without causing lift decrease. This leads to great amelioration of the aerodynamic performance of a plane after stalling and improves the longitudinal equilibrium and pitching control of FBB tailless configuration. The conclusion of this article may serve as reference for studying the control of other tailless configurations.

Keywords： forward-swept wing blended body tailless configuration two part movingstrake wind tunnel test flow control

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