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### 超声速客机低音爆布局反设计技术研究

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### A Research on Inverse Design Method of a Lower Sonic Boom Supersonic Aircraft Configuration

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摘要

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**摘要** 音爆已经成为限制民用飞机在陆地上空进行超声速飞行最关键的因素。降低超声速客机的音爆水平,使其能够在陆地上空超声速飞行,将会给超声速客机带来巨大的潜在市场。基于SGD(Seebass-George-Darden)方法,构建了相关的设计分析环境,对超声速客机低音爆布局的反设计技术作了研究分析,在此基础上首次提出了一种“梭式”布局静音超声速客机方案。计算分析表明,“梭式”布局较好地兼顾了低音爆的设计要求和气动的设计要求,升力面沿机身纵向均衡配置以及双S形前机身都有利于降低音爆,为新一代低音爆超声速客机的设计提供了有益的参考。

**关键词:** 超声速客机 音爆 声波传播 气动布局 激波 反设计

**Abstract:** Sonic boom has become the most critical technology limiting civil aircraft's supersonic flight over land. To realize sonic boom reduction for supersonic aircraft, thus making supersonic flight over land available, will bring a huge potential market. Based on the SGD (Seebass-George-Darden) method, a procedure involving inverse design has been set up, which allows for complete analysis of lower sonic boom and aerodynamic performance. A "shuttle" configuration is developed for the first time. The results reveal that the proposed "shuttle" configuration achieves a better balance between the design demands of lower sonic boom and aerodynamic performance. Both balanced deployment of lifting surface along the longitudinal direction of the fuselage and double S-shaped design of the front body can contribute to the sonic boom reduction, providing a useful reference for designing next-generation high-speed civil transport with low sonic boom.

**Keywords:** supersonic aircraft sonic boom acoustic wave propagation aerodynamic configurations shockwaves inverse kinematic

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