贺旭照,秦思,周正,倪鸿礼.一种乘波前体进气道的一体化设计及性能分析[J].航空动力学报,2013,28(6):1270~1276

# 一种乘波前体进气道的一体化设计及性能分析

# Integrated design and performance analysis of waveriderforebody and inlet

投稿时间： 2012-03-11

DOI：

中文关键词： 乘波前体 超声速进气道 一体化设计 密切内锥 流线追踪

英文关键词:waverider forebody supersonic inlet integrated design osculating inward turning cone streamline tracing

基金项目:国家自然科学基金(90916012,91216303)

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中文摘要:

采用特征线方法设计了具有直线初始激波、内收缩段消除激波反射、出口参数均匀可控的基准内锥流场.基于密切内锥(osculating inward turning cone,OIC)乘波体设计方法,发展了一体化密切内锥乘波前体进气道(osculating inward turning cone waverider inlet,OICWI)设计技术.基于一体化基准内锥流场和前体进气道设计技术,设计了密切内锥乘波前体进气道.采用数值软件对设计的乘波前体进气道进行了仿真分析,结论如下:①OICWI的设计是遵循气动原理的.②一体化密切内锥乘波前体进气道的前缘形状、内收缩比及出口参数可以根据需求定量准确设计.③理论设计结果和模拟结果吻合一致,证明设计方法是正确可靠的.④数值模拟研究结果表明一体化密切内锥乘波前体进气道具有较好的出口流场均匀度及较高的流量捕获率和较高的总压恢复特性.

英文摘要:

The basic inward turning cone was designed by methods of characteristics which were represented by straight initial shock wave and inner compression section shock wave cancelation, controllable flow parameters and uniformity exit inner compression section. The integrated osculating inward turning cone waverider inlet(OICWI) design methods were developed based on the osculating inward turning cone (OIC) waverider design methods. Based on the designed basic inward turning cone flow field and OICWI design methods, an OICWI was designed. The OICW's performances were analyzed by numerical ways. The results show that:(1)The integrated waverider inlet design methods agree well with aerodynamic principles. (2)The waverider-inlet's shape can be easily controlled by adjusting inlet capture curve, front capture curve and basic flow field structure. (3)Numerical simulation results agree well with the design results and the flow field structures are consistent with each other, showing that the integrated design methods are correct. (4)The viscous results on design and off-design conditions show that OICWI has high pressure recovery and flow capture characteristics, and the flow field parameters are uniform in the inlet exit plane.