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考虑变截面影响的航空发动机短舱声学模型及数值结果

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A New Approach for the Acoustic Design of Aeroengine Nacelle with the Effect of Varying Cross-section Area

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摘要

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摘要 针对航空发动机短舱声学设计的需要,发展一种快速计算方法——传递单元法(TEM),并与直接边界元方法相结合,计算发动机远场声辐射。TEM以等价分布源方法为基础,该方法的优势在于易于计算变截面管道内的声传播,同时,对管道内部声衬位置及长度没有任何限制。给出更接近于真实发动机形状的声辐射算例。

关键词: 直接边界元方法 传递单元法 发动机消声短舱 变截面管 声衬

Abstract: This paper presents a transfer element method (TEM), which can be used to predict the sound propagation in a varying cross-section duct with acoustic liners. Compared with the existing work, such as Mode-Matching method and Boundary Integral method, this method does not need the eigenvalue calculation arising from a lined duct and at the sometime it has a capability of treating varying flow Mach number. Various numerical simulations show that the present results agree with the existing data very well at the same geometrical condition. Finally, this method is extended to calculate the sound propagation in a finite length duct, which also shows very interesting results.

Keywords: direct boundary element method transfer element method aircraft engine nacelle varying area duct liner

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