



航空学报 » 1991, Vol. 12 » Issue (5) :272-278 DOI:

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### 曲壁气膜冷却数值计算的研究

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### A NUMERICAL COMPUTATION OF HEAT TRANSFER ON CURVED WALL WITH FILM COOLING

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摘要

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**摘要** 本文在一般二维边界层流动和换热计算方法的基础上,引入湍流混合长度的修正模型,用以考虑壁面曲率和注入冷气对换热的影响,研究计算了壁面的弯曲部分和曲率恢复部分换热的变化,并对曲面上的气膜冷却问题作了计算,取得较满意的结果。

**关键词:** 曲率 湍流 气膜冷却 边界层

**Abstract:** An predictional in vestigation of heat transfer on convex curvature surfaces with and without film-cooling is dealt with. The prediction is based on a general 2-dimensional boundary layer flow and heat-transfer program with inclusion of a modified mixing-length turbulence model to account for the effect of wall curvature and injection on heat-transfer. The predicted convective heat transfer coefficients, on both curvature region and curvature recovery region are compared with the measurements and predictions given in some references. The numerical results agree well with experimental data except in the region of film-cooling recovery region. From this paper, these conclusions were obtained: 1. The curvature has a considerable effect on turbulent flow, and the inclusion of this effect in engineering prediction is necessary and the model used in this paper proves valid. 2. The flat film-cooling model suggested by Crawford and Adams' turbulence model of wall curvature effect can be combined to predict the film-cooling on curvature surface, but the constants in the former model should be changed according to the strength of curvature ( $\delta/R$ ) This paper also gives the values of the constants at  $\delta/R=0.1.3$ . The models mentioned above cann't predict the full-coverage film-cooling recovery region satisfactorily, so that further improvement is expected.

**Keywords:** curvature turbulent flow film cooling boundary layer

Received 1989-12-30; published 1991-05-25

#### 引用本文:

江涛;刘松龄. 曲壁气膜冷却数值计算的研究[J]. 航空学报, 1991, 12(5): 272-278.

Jiang Tao;Liu Songling. A NUMERICAL COMPUTATION OF HEAT TRANSFER ON CURVED WALL WITH FILM COOLING[J]. Acta Aeronautica et Astronautica Sinica, 1991, 12(5): 272-278.

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