



Fig. 2 Average film-cooling effectiveness for row of discrete holes.

experiments results in

$$\bar{\eta} = 1/(0.90 + 0.080\xi) \quad (3)$$

which is shown in Fig. 1. The best fit to the data requiring that $\bar{\eta} \rightarrow 1$ as $x \rightarrow 0$ gives,

$$\bar{\eta} = 1/(1 + 0.065\xi) \quad (4)$$

It should be noted that use of θ_{ad}^* rather than $\bar{\eta}$ as ordinate in Fig. 1 would make the scatter appear significantly reduced.

Heat Transfer—Two-Dimensional Slot

The parameter Φ_0 presented by the authors is the ratio of the average heat-transfer coefficient over a distance x/s with film injection to the average heat-transfer coefficient over the same distance without film injection. The experimental determination in Ref. 1 demonstrates again, in agreement with Ref. 2-4, that the normal heat-transfer coefficient from non-film-cooling results can be used except at high angles of injection. At first glance, the increase of heat transfer because of the film cooling for high angles of injection appears significant at the large blowing rate. However, the injected mass flow was apparently as high as 25% of the total free-stream mass flow. This additional mass could change the freestream Reynolds number by 25% resulting in approximately a 20% change in the freestream heat-transfer rate. This is also indicated by the significant increase in heat transfer even for the relatively long plates.

Film-Cooling Effectiveness—Row of Discrete Holes

The multiple hole data can be compared with Ref. 7 in which adiabatic wall temperatures were measured with coolant injection through a single hole. The assumption that the momentum equation is not coupled with the energy equation makes the solution of the energy equation linear and the effectiveness of several single holes with the required spacing can be obtained by superposition of single hole data. This concept was used by Malhotra and Cermak⁸ for comparison of point source and line source mass diffusion data. Adding the effect of adjacent holes described by the effectiveness from Ref. 7, and averaging both longitudinally and transversely gives the average effectiveness for multiple hole data. The result of such a calculation is presented in Fig. 2 for $M = 0.5$,

$\beta = 35^\circ$, and for hole spacing of 1.71. Also presented are the curves from Ref. 1 for $M = 0.5$, $\beta = 20^\circ$, and $\beta = 60^\circ$, both for a hole spacing of 1.71. The agreement appears to be very good, indicating that the heat source model works well for injection through an arrangement of holes, at least at relatively small M .

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Erratum: "Prediction of Geometry of Sonic Boom Waves Incident on Arbitrarily Oriented Plane Walls"

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[J. Aircraft, 7, 256-260 (1970)]

IN Eq. (2), the first parenthesis was misplaced. Eq. 2 should be $\Delta T_p = 2(T_g - T_p) = (2/V)(D_{gv} - D_{pv})$.

Received September 9, 1970.