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NASA TECH BRIEF

Lewis Research Center

Slot Configuration for Axial-Flow Turbomachinery Blades

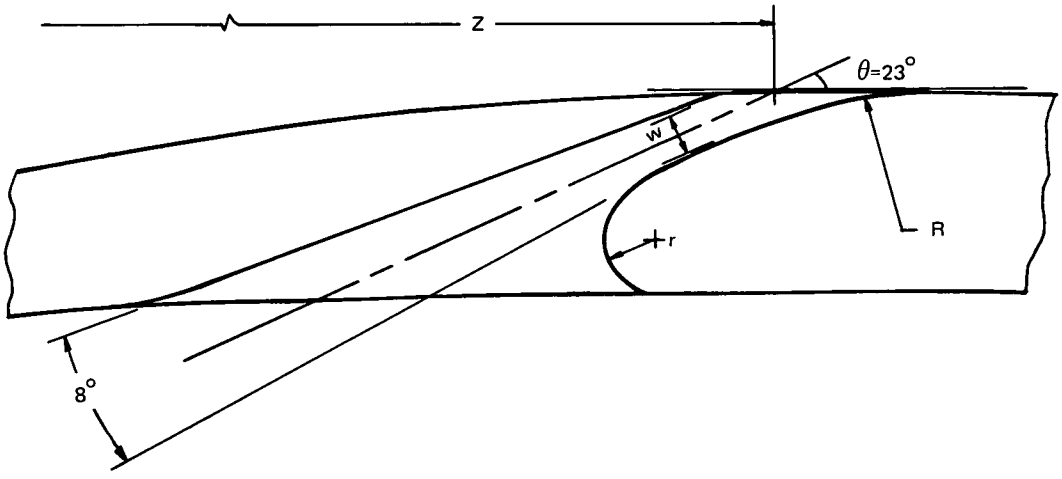

Figure 1.

A slot, machined to provide a flow path between the pressure and suction surfaces, has been found to improve the range of operation and flow turning characteristics of hydrofoils arranged in various cascade configurations, simulating axial-flow blading geometries. Although slots have often been proposed to extend compressor blade operating ranges, in practice the slots have seldom achieved the objectives of increasing either the operating range or the flow turning angles. A slot geometry achieving these objectives, in a two-dimensional cascade, has recently been developed.

The 8-degree converging-wall slot geometry, shown in Figure 1, uses a 16.7-percent chord radius (R) at the slot exit on the suction surface, a 1.67-percent chord slot lip radius (r) at the slot inlet on the pressure surface, a 1.57-percent chord slot width (W) at the suction surface, and the slot centerline was located at the 45 percent chordal station (Z) with an angle of 23° between the slot centerline and the tangent to the blade surface. Blading which uses this slot geometry was tested in a two-dimensional cascade. The improvements in turning angle (θ) and loss coefficient ($\bar{\omega}$) performance of this slot with the indicated cascade configuration are shown in Figure 2. The results show that the slotted blade turning angles increase linearly with increasing incidence angle. Slotted blade loss coefficients, although higher than those for the unslotted blade within the minimum loss region, are significantly lower at higher incidence angles. Thus, these slotted blades have a greater range of incidence angle operation. The improvements in performance obtained from the slots appear to be most significant when the slotted blades are arranged in low solidity cascades.

Notes:

1. The following documentation may be obtained from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $11.50
   (or microfiche $0.95)

(continued overleaf)

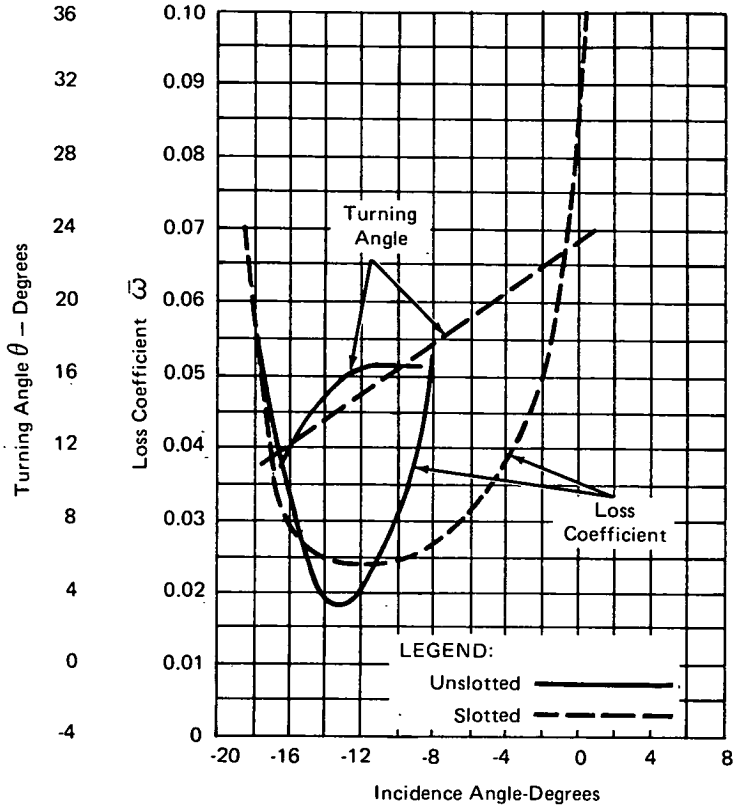

Figure 2.

Reference: NASA CR-72870 (N72-24366), Systematic Two-Dimensional Cascade Tests, Vol. 3 – Slotted Double Circular-Arc Hydrofoils

2. Technical questions may be directed to:
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Reference: B72-10484

Patent status:

No patent action is contemplated by NASA.

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