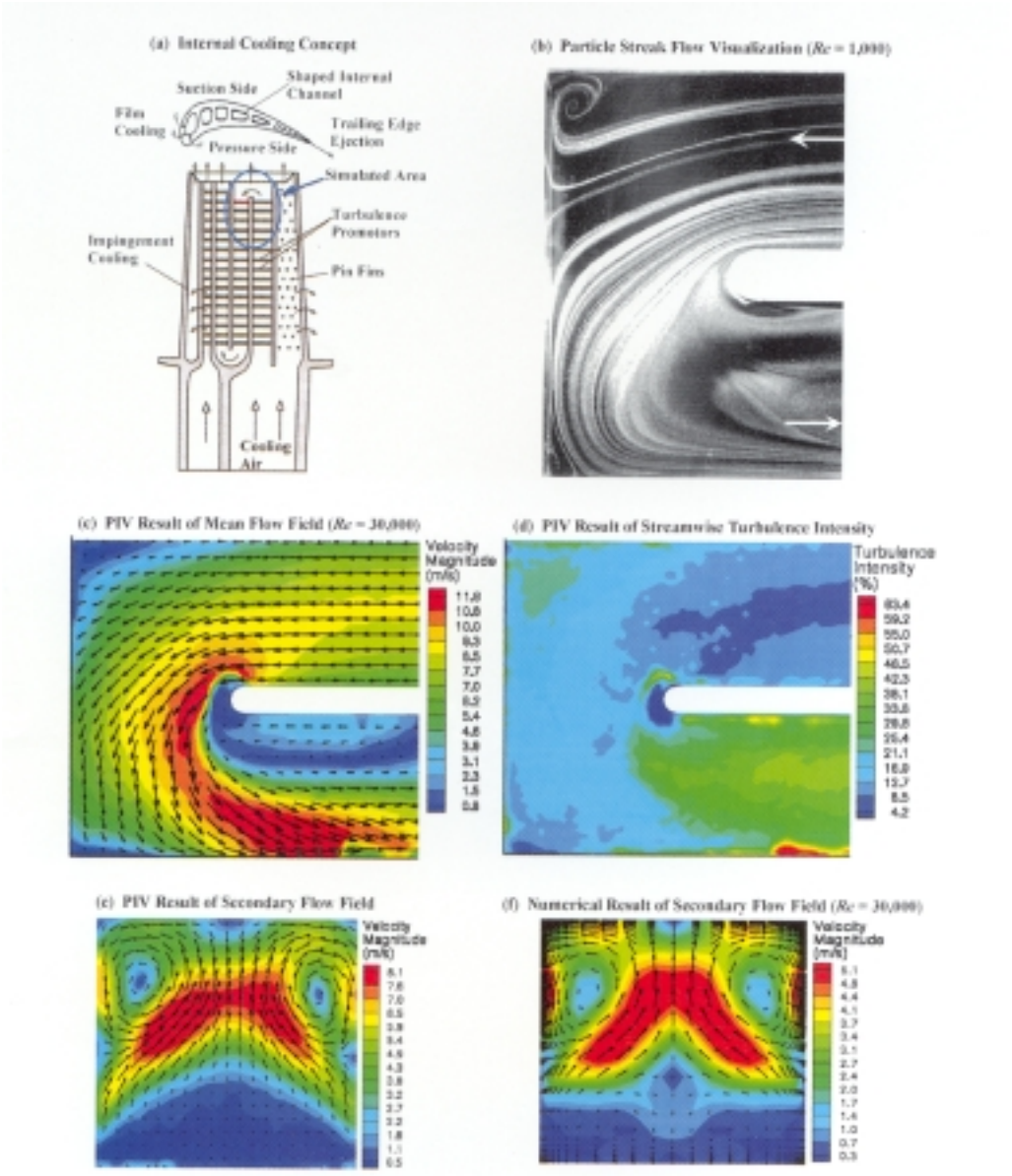

COOLANT FLOW FIELD MEASUREMENTS IN A TWO-PASS CHANNEL USING PARTICLE IMAGE VELOCIMETRY (PIV)

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A two-pass channel simulates the 180-degree taming tip region of the serpentine coolant passage of a turbine blade (a & b). Full-field flow velocity vectors, at high Reynolds numbers up to Re = 30,000, have been measured in a two-pass square channel (50.8 mm x 50.8 nim) with smooth walls using particle image velocimetry (PIV) implemented at Texas A&M University (Lee et al., 1996).

Ensemble average of 500 PIV image pairs produces two-dimensional average velocity vector fields of the main flow (c) and the streamwise r.m.s. turbulence intensity distribution (d). Ensemble-averaged secondary flow (e), perpendicular to the main flow axis at the end of the 180-degree turning, shows a strong swirling pair occurring nearby the outer wall surface, i.e., the bottom wall in (b). The numerical prediction (f), obtained by the Reynolds stress model analysis, demonstrates strong similarity in the swirling flow pattern and locations.

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