

# Turbulent-Spot Growth Characteristics : Wind-Tunnel and Flight Measurements of Natural Transition at High Reynolds and Mach Numbers

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## Abstract

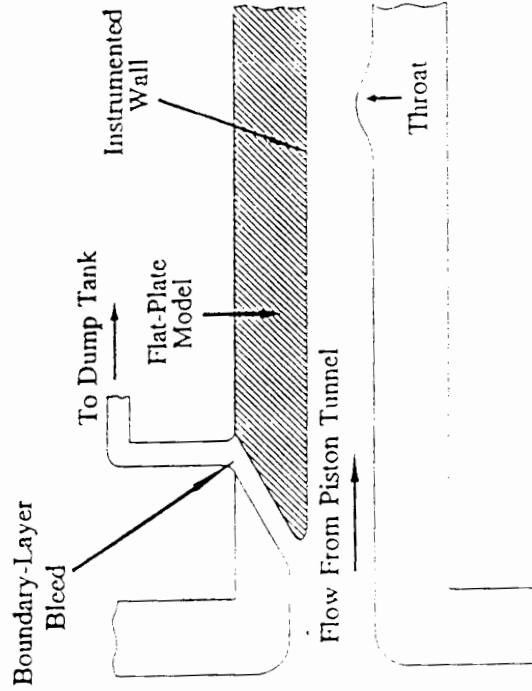
A series of experiments are described which examine the growth of turbulent spots on a flat plate at Reynolds and Mach numbers typical of gas-turbine blading. A short-duration piston tunnel is employed and rapid-response miniature surface-heat-transfer gauges are used to assess the state of the boundary layer. The leading- and trailing-edge velocities of spots are reported for different external pressure gradients and Mach numbers. Also, the lateral spreading angle is determined from the heat-transfer signals which demonstrate dramatically the reduction in spot growth associated with favourable pressure gradients. An associated experiment on the development of turbulent wedges is also reported where liquid-crystal heat-transfer techniques are employed in low-speed wind tunnel to visualise and measure the wedge characteristics. Finally, both liquid crystal techniques and hot-film measurements from flight tests at Mach number of 0.6 are presented.



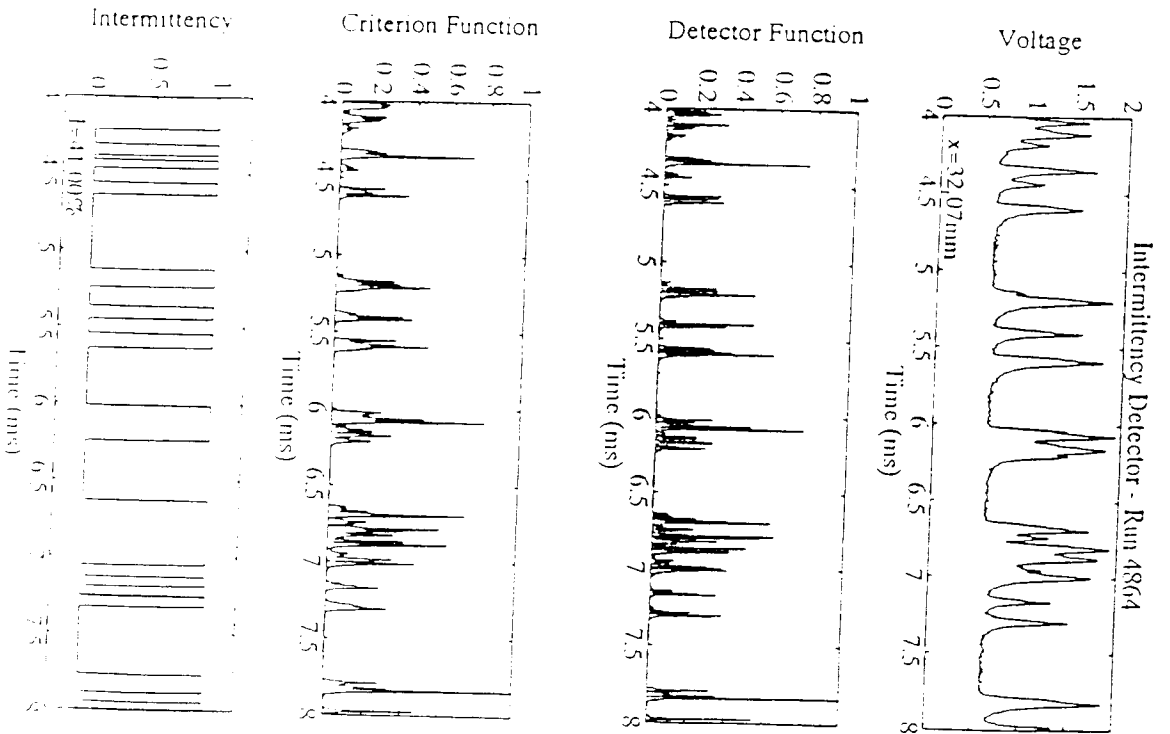
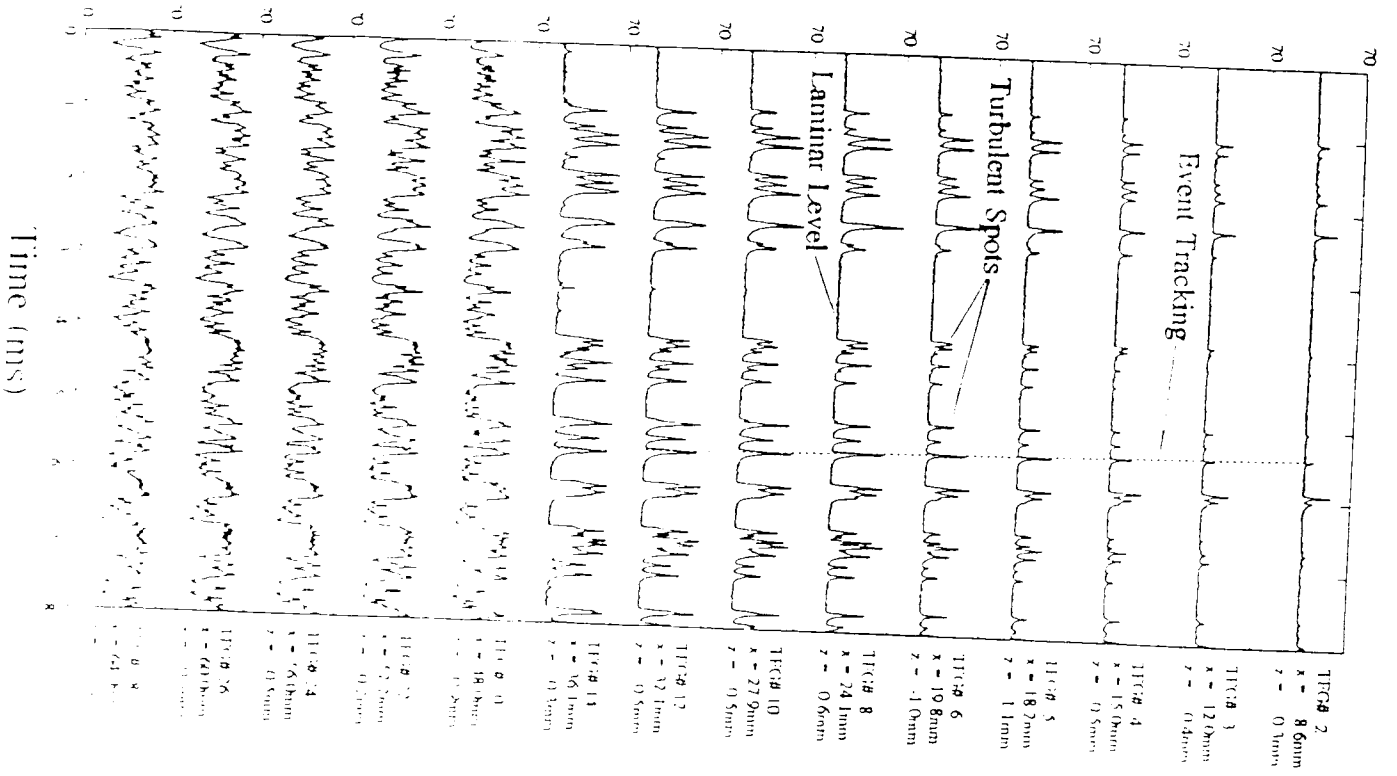
## Turbulent-Spot Growth Characteristics : Wind-Tunnel and Flight Measurements of Natural Transition at High Reynolds and Mach Numbers

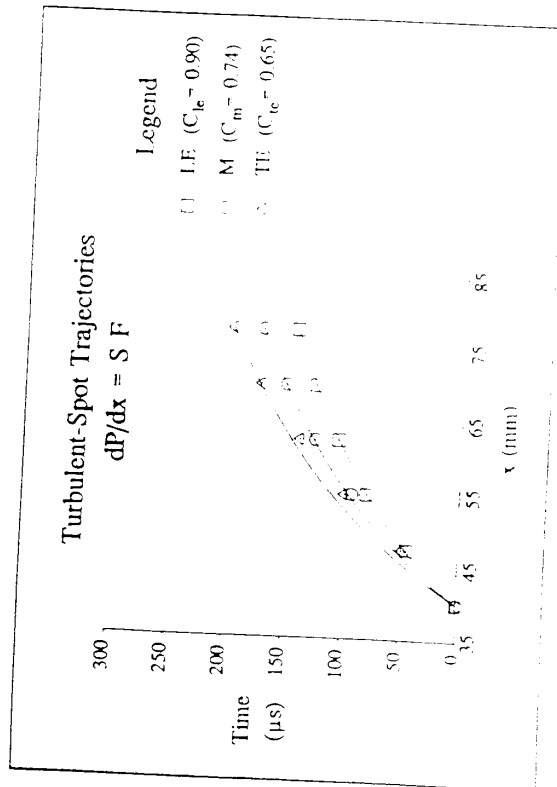
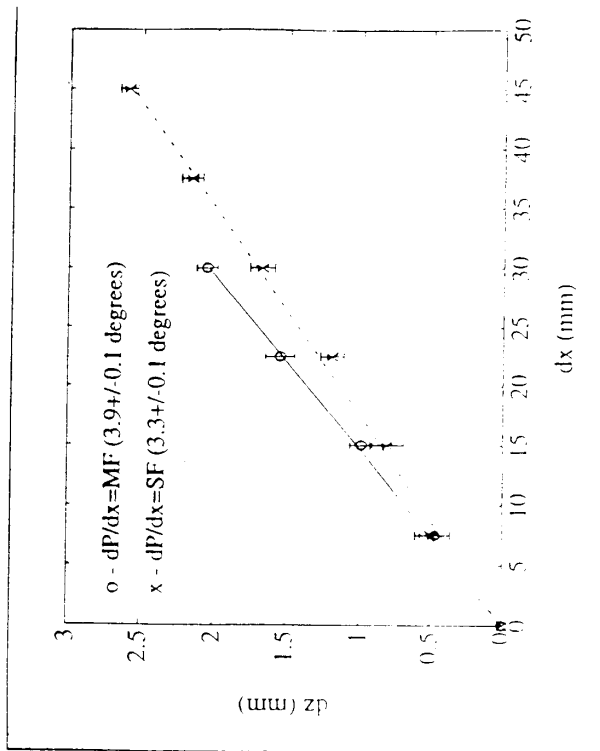
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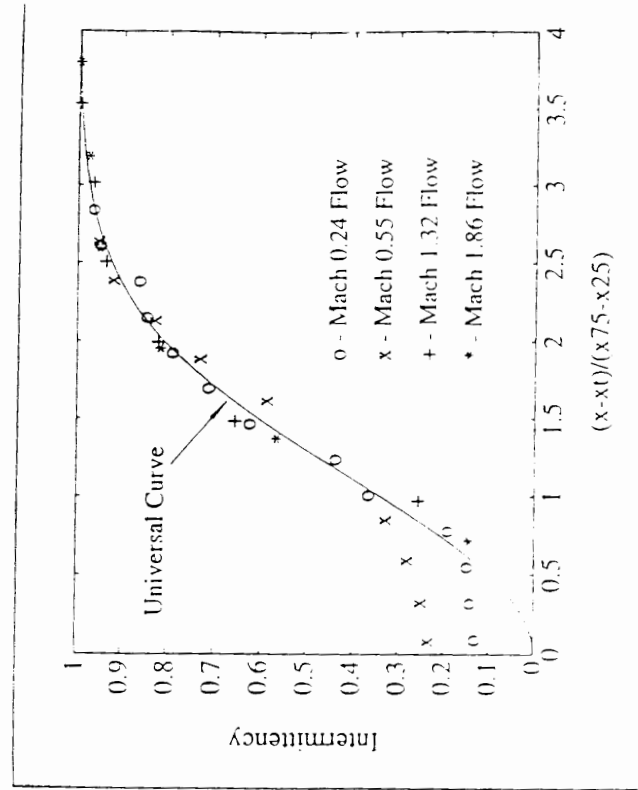
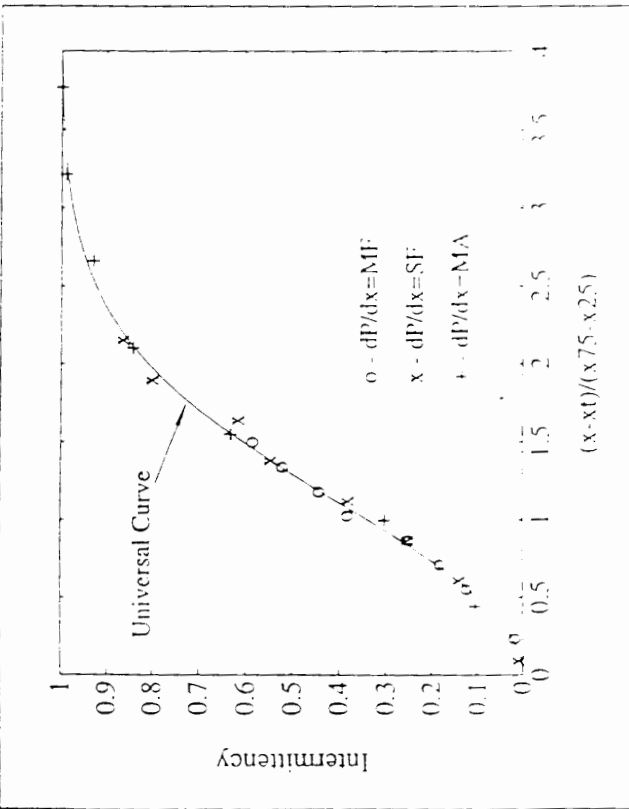
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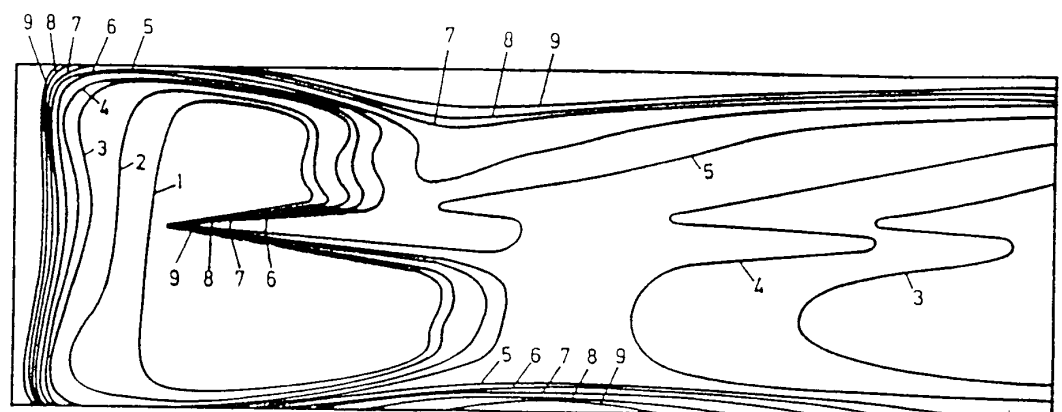
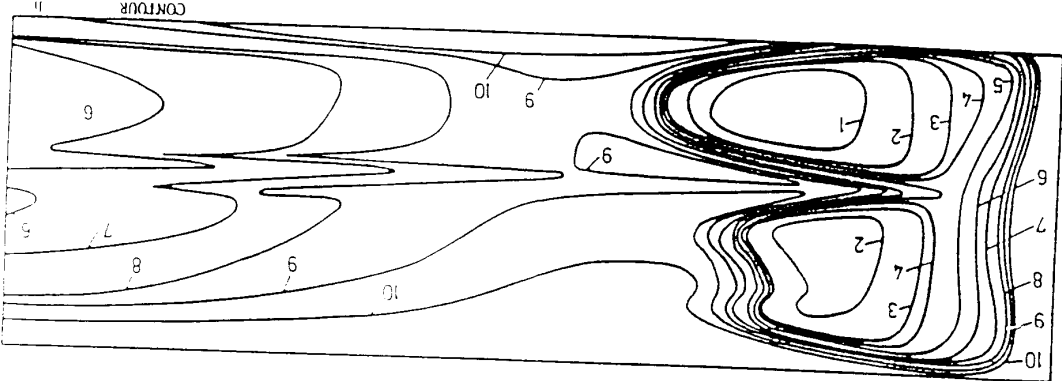
$\dot{q}$  (kW/m<sup>2</sup>)







147.3	10
131.2	9
122.1	8
117.9	7
105.8	6
95.5	5
84.9	4
81.1	3
66.9	2
59.9	1



CONTOUR	h W/m²K
1	74.4
2	92.9
3	114.3
4	125.2
5	176.9

