REAL SURFACE EFFECTS ON TURBINE HEAT TRANSFER AND AERODYNAMIC PERFOMANCE

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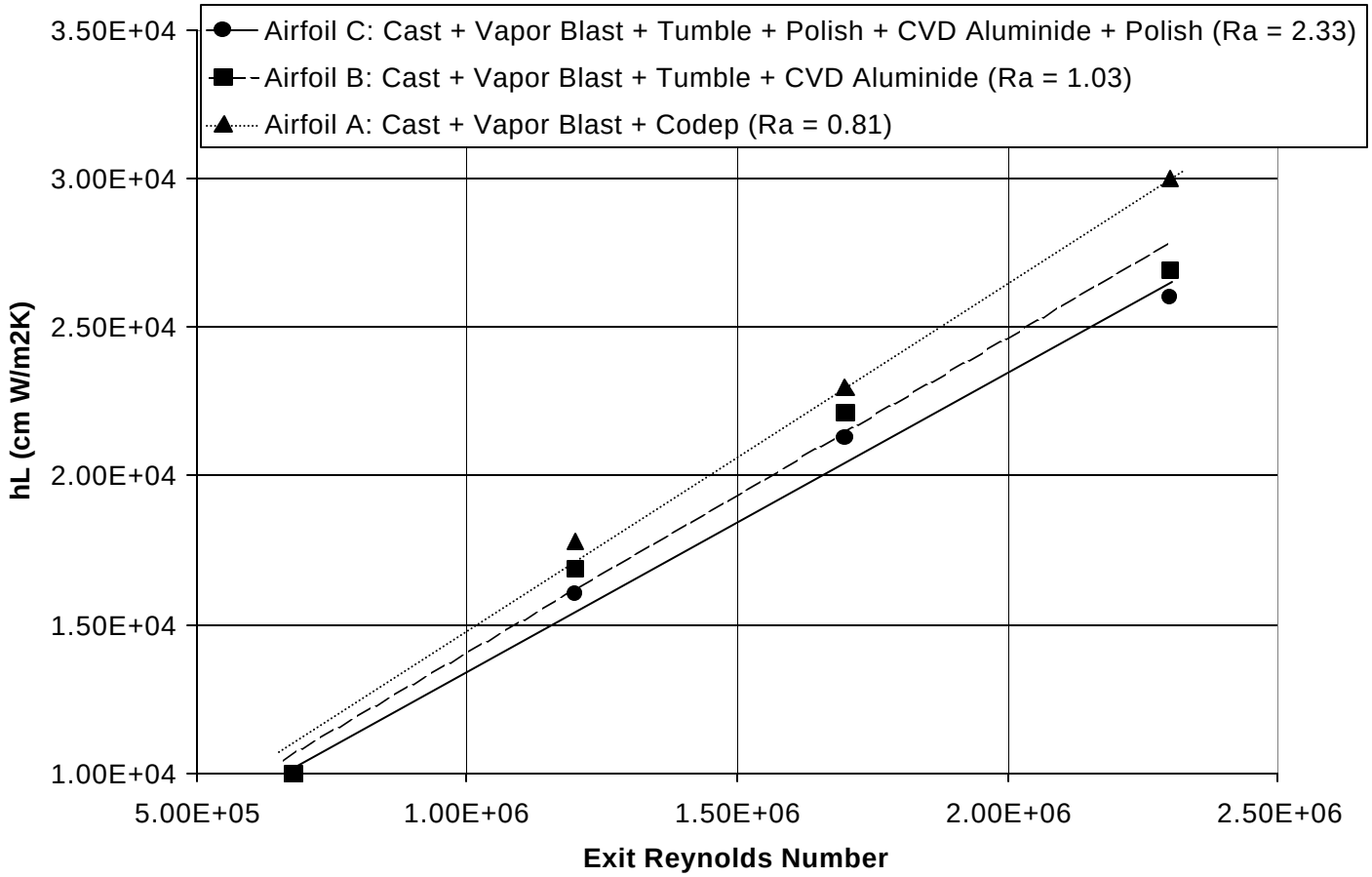
REAL TURBINES ARE ROUGH



(Taken from Abuaf et al, 1997)

and ROUGHNESS MATTERS!!!

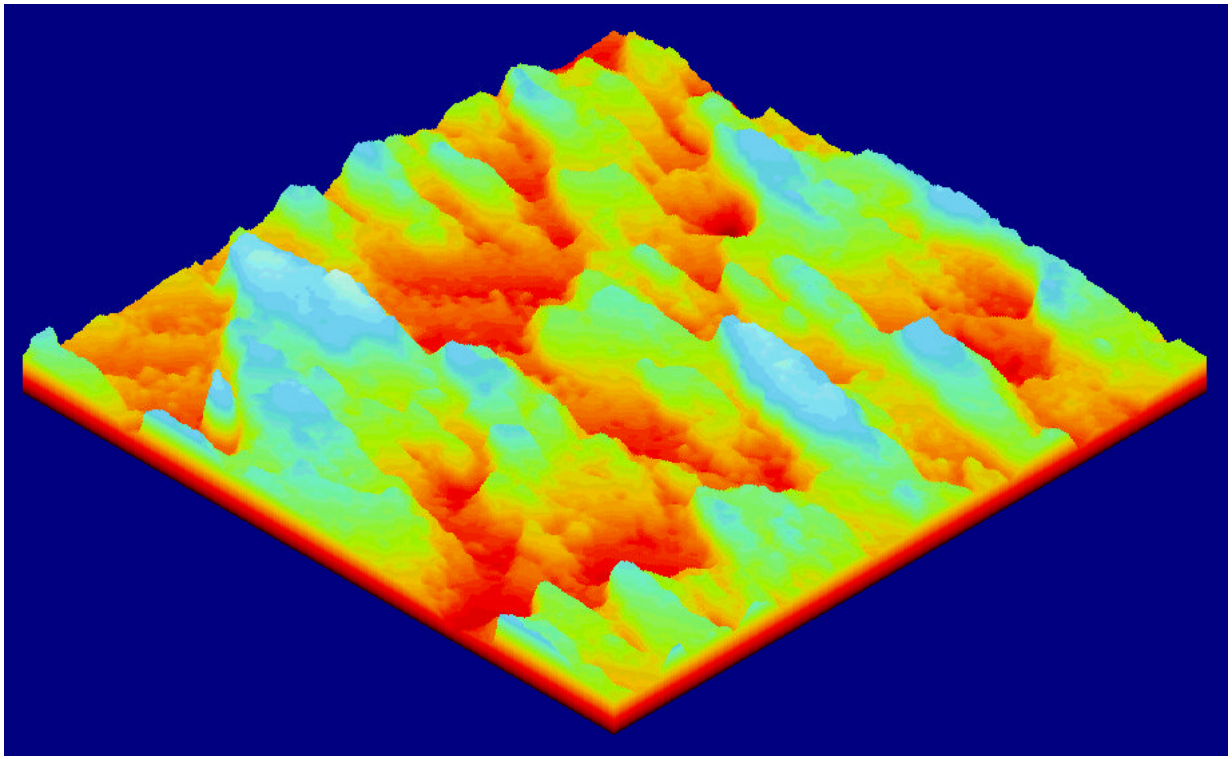
OBJECTIVES

- UNDERSTAND WHY
- And BE ABLE TO PREDICT OBSERVED BEHAVIOR OR FLOW OVER ROUGH SURFACES

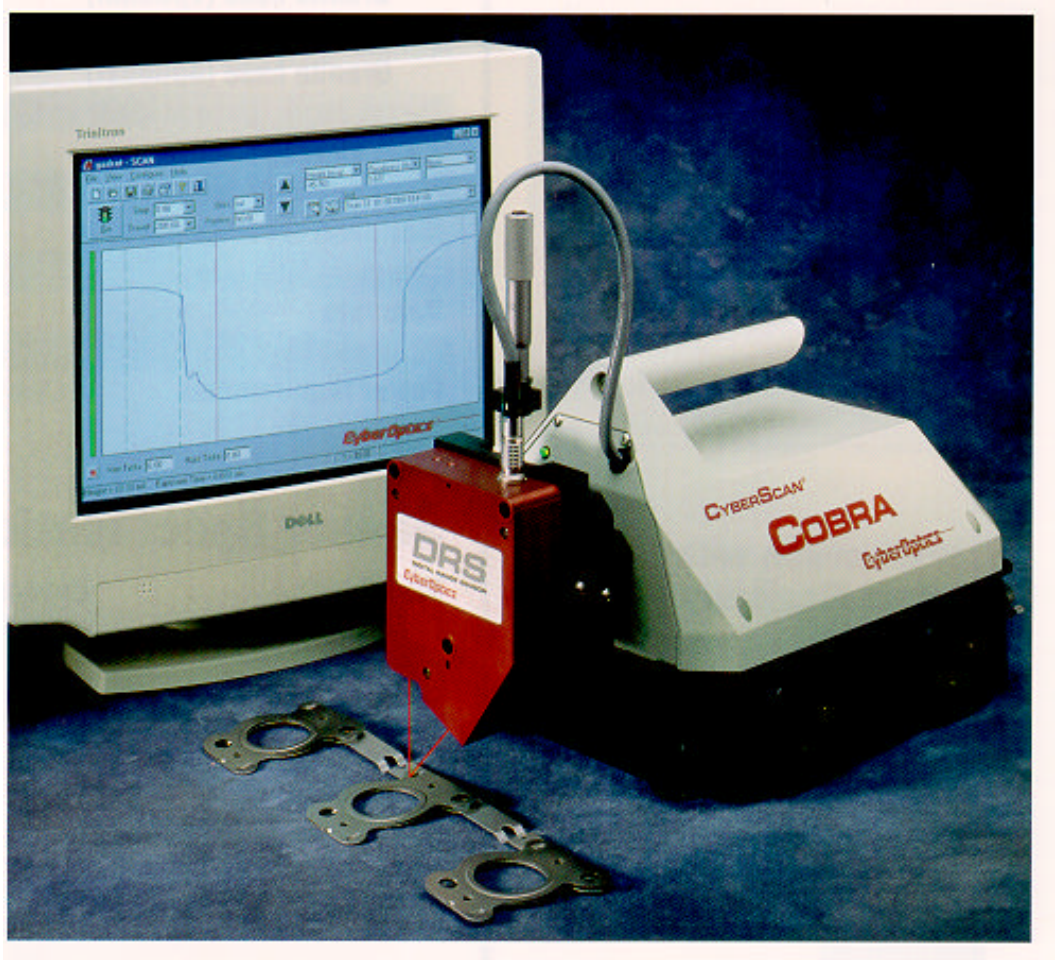
3-YEAR PHASED EFFORT

- EXPERIMENTAL COMPONENT
- COMPUTATIONAL COMPONENT

PHASE I: SURFACE CHARACTERIZATION



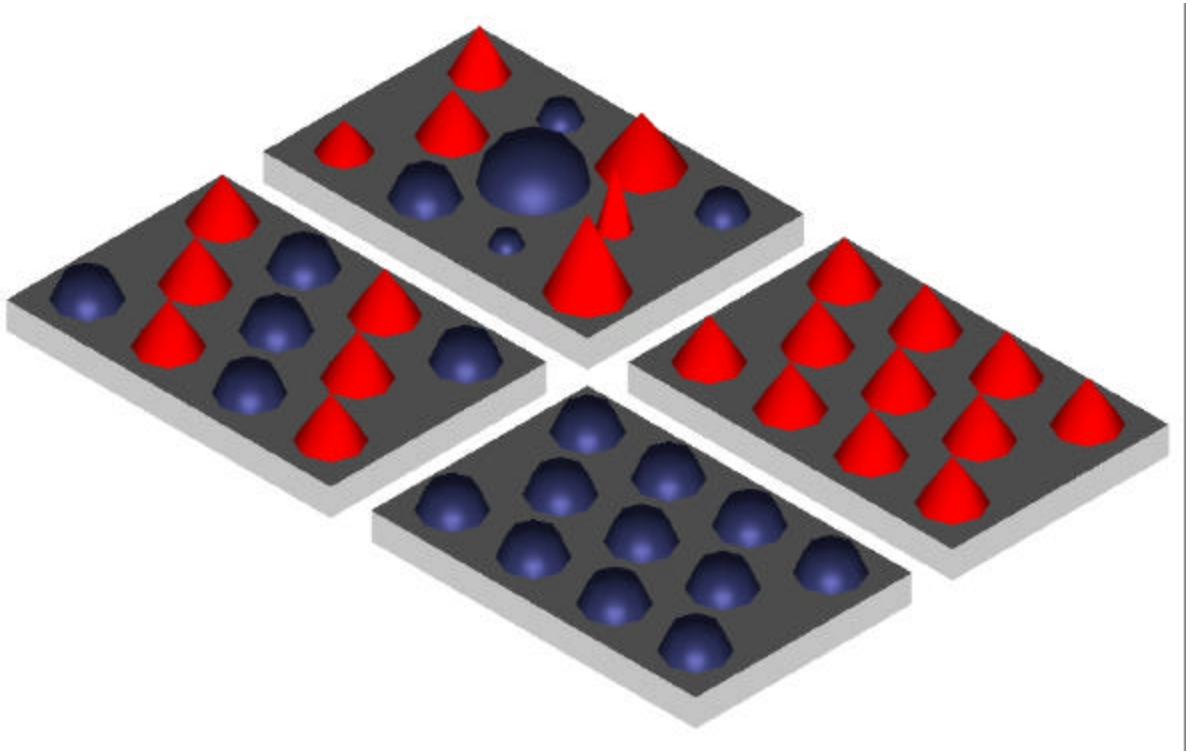
- MEASUREMENT OF ACTUAL HARDWARE



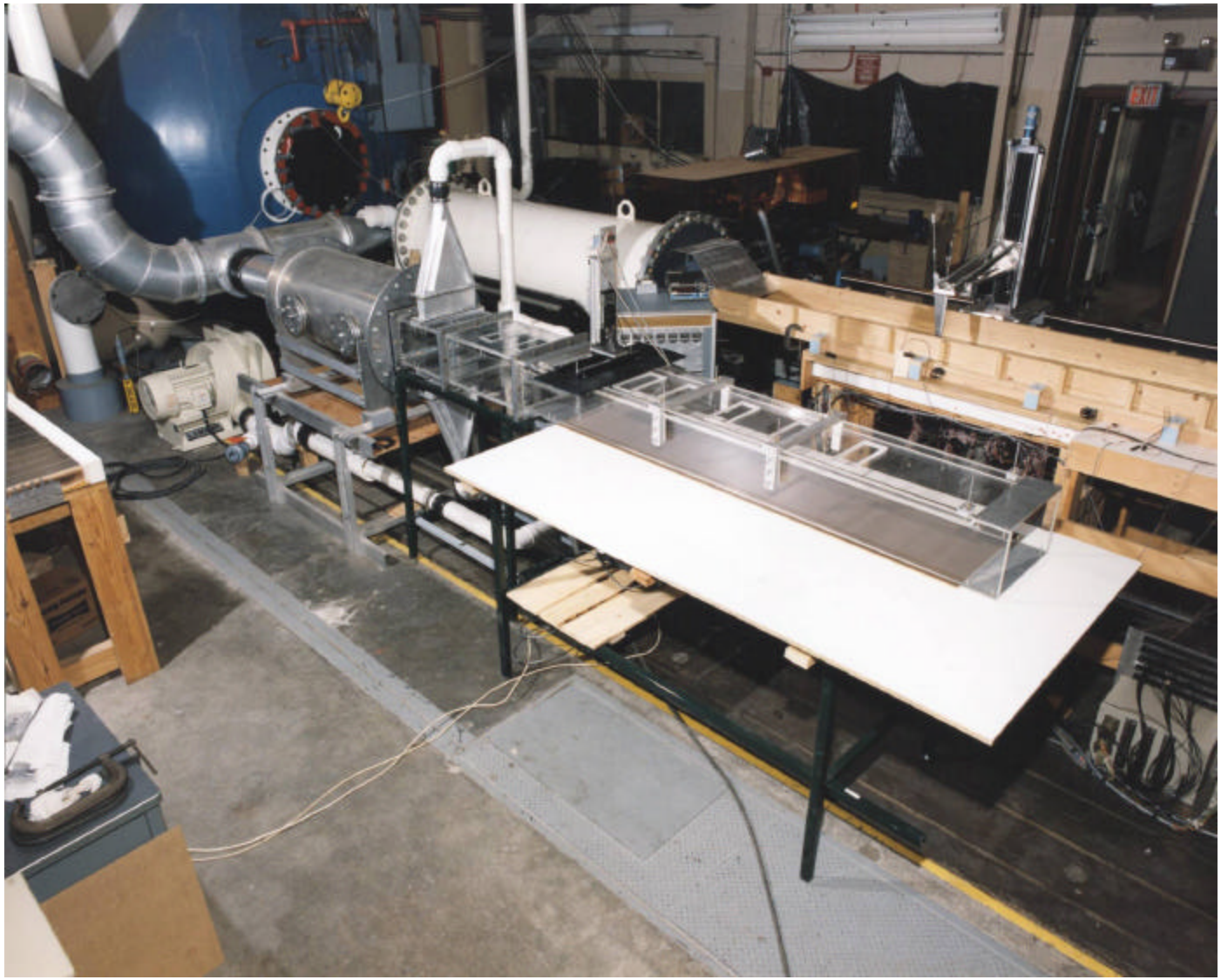
- CATALOGUE OF CHARACTERISTICS
- PARTICIPATING COMPANIES:

  Solar, Allied-Signal, Westinghouse, General Electric

PHASE II: TUNNEL TESTING



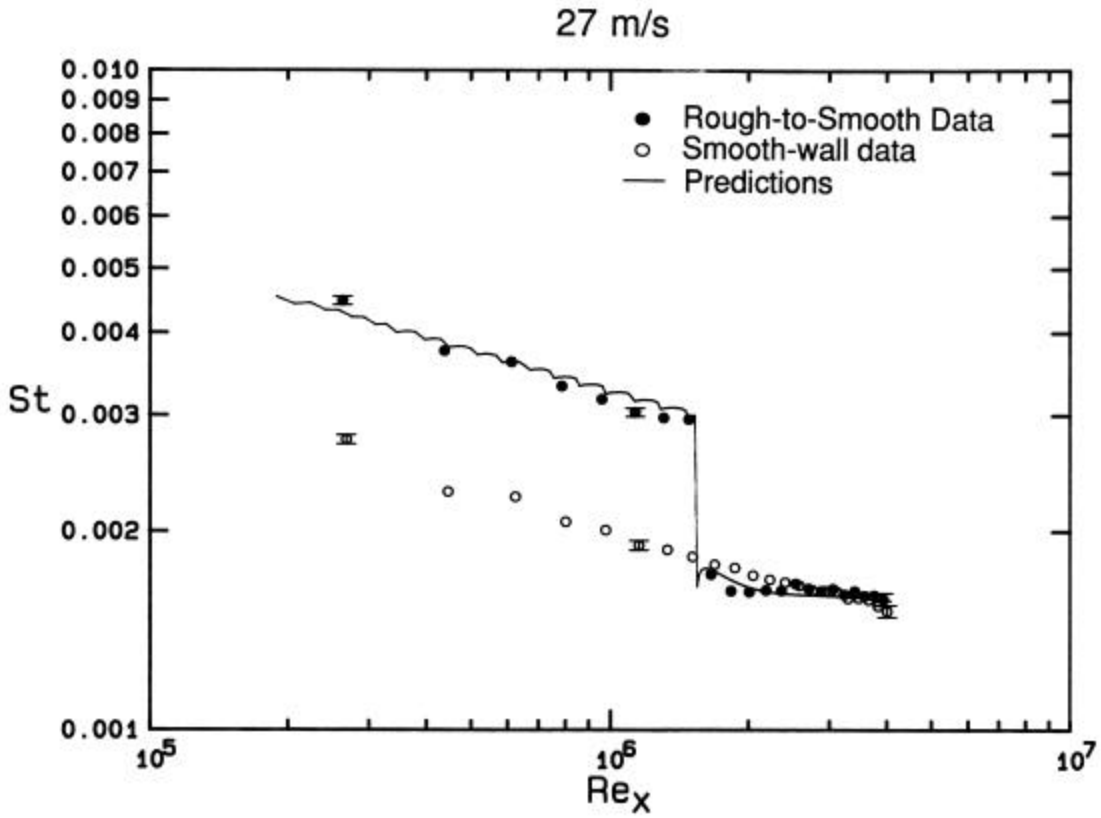
- Flat-Plate Testing of Scale Models and Statistical Equivalents



- Tunnel Configuration to Measure h and C_f

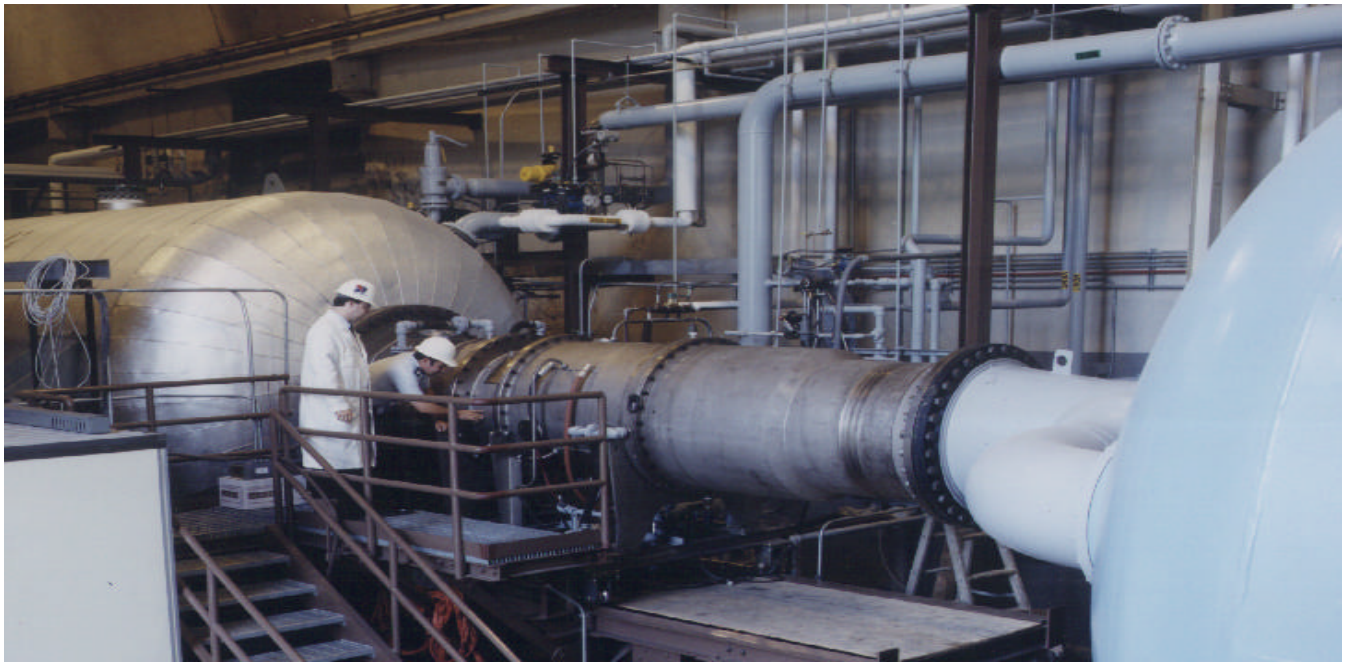
PHASE III: MORE PARAMETERS and COMPUTATIONS

- Additional Experimental Parameters of:
  - Pressure Gradient
  - Freestream Turbulence
  - Curvature
  - Film Cooling Holes



- Computational Modeling Using Discrete Element Model or Derivative in Boundary Layer Codes.

PHASE IV: FULL TEST and MODEL VALIDATION



- Full-Scale Roughened Blades in AFRL Turbine Research Facility
- Compare Experimental Result to Predictions Based on Models.