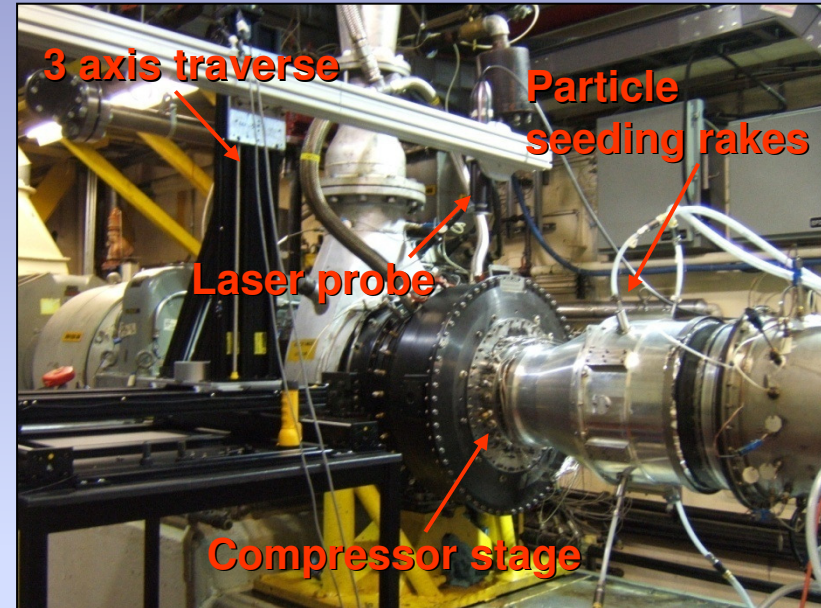


EXPERIMENTAL STUDY OF AN AERO-ENGINE CENTRIFUGAL COMPRESSOR STAGE

Background

Rarely are detailed flow data available from turbo-machinery stages due to the difficulty of taking such measurements. Hence, to validate CFD predictions, design engineers for the stage studied here have had to rely only on pitot rake pressure profiles from earlier studies, measurements of pressures, temperatures, mass flow rate, and in-house empirical models.



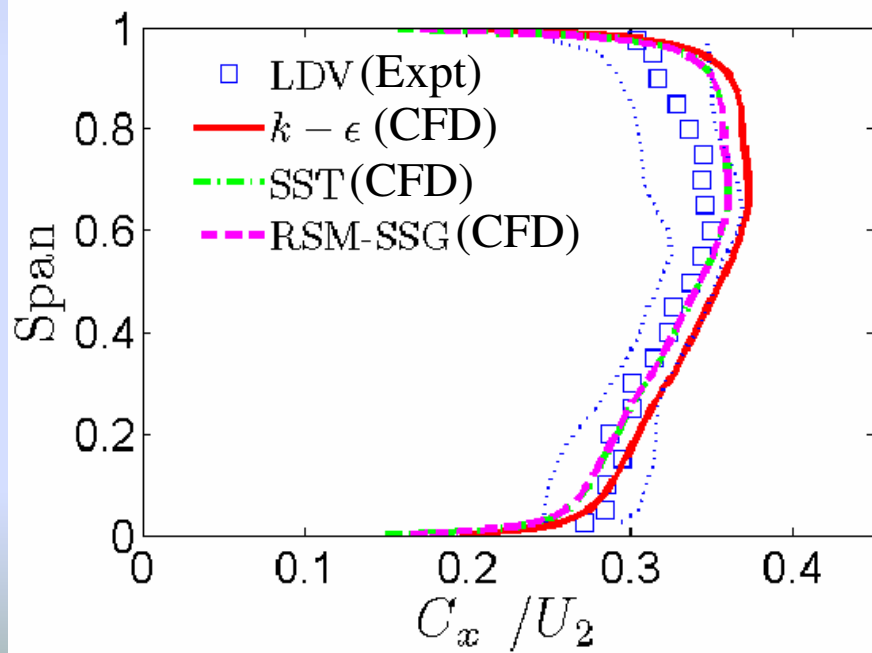
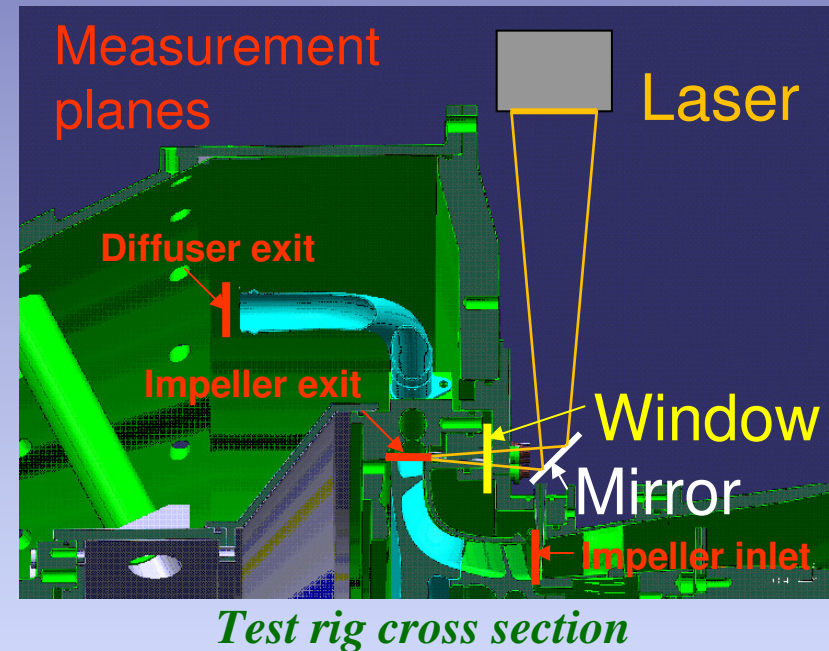
Centrifugal compressor test rig

Objective

Laser Doppler Velocimetry (LDV) velocity measurements to better understand the flow and validate CFD models of the compressor stage.

Research Carried Out

- Detailed LDV measurements at the design speed and flow rate (corresponding to peak efficiency) for the three planes:
 1. Impeller inlet
 2. Impeller exit
 3. Diffuser exit



Impeller inlet pitch-averaged axial velocity

Outcomes

- The comparative study shows that the mixing plane approach to bridging the rotating and stationary domains in CFD yields good flow field results all along the gas path. A reliable method for taking compressor LDV data has been established.