

Experimental Investigation of the Flow Field in a Turbine Center Frame through Particle Image Velocimetry

Thanks to the non-intrusive character and the capability to get velocity vectors simultaneously on a large number of measurement points, Particle Image Velocimetry (PIV) is a consolidated technique in turbomachinery research. At the Institute of Thermal Turbomachinery, stereoscopic PIV has been successfully applied in the past to study the stator-rotor unsteady interaction in a transonic turbine stage (Fig. 1a). Now it is going to be applied to a 1.5 turbine stage, including a so-called Turbine Center Frame (TCF, Fig. 1b).

This inter-turbine duct is a critical component in modern turbofan engines: it has to guide the flow from the last high pressure turbine stage to the first low-pressure turbine stage smoothly and to carry structural loads. The plan is to use PIV for the unsteady flow characterization through the TCF, which is equipped with optical access.

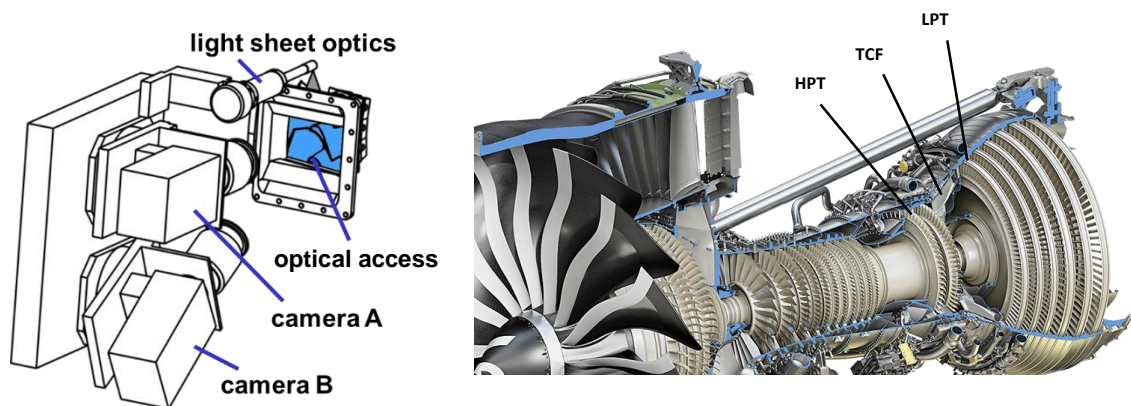


Figure 1: a) Stereo-PIV measurements (diss. Göttlich). b) TCF in a modern turbofan engine (GE aviation)

The aim of the master thesis is to arrange the stereo-PIV measurement setup: seeding supply, including injection device design and positioning, cameras calibration and lightsheet definition are the main issues the student is going to deal with. Finally, measurements will be performed and the acquired data post-processed to get useful information about TCF (e.g. turbulence intensity, separation pattern or other flow structures).

The work plan consists of the following steps:

- Literature study to get familiarity with the involved flow features and measurement technique.
- PIV measurement setup definition
- Data acquisition and evaluation

Duration: 6 months

Start date: available now

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