**Detailed Evaluation of CFD Predictions against LDA measurements for flow on an aerofoil**

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The prediction of boundary layers on rotor blades is important because it represents a necessary first step towards the simulation of phenomena such as dynamic stall and blade vortex interaction which place limitations on the operation and usage of rotorcraft. However, CFD validations for these problems have traditionally been carried out mainly using surface pressures. This is despite the fact that, due to turbulence modelling limitations, the prediction of smooth body separation is unreliable.

The current work is the validation of the Glasgow flow solver PMB for static and moving aerofoils against data measured at LABM. The treatment of turbulence and transition is considered.

Measurements made at LABM using an Embedded Laser Doppler Velocimetry (ELDV technique) provide detailed boundary layer measurements on a pitching NACA0012 aerofoil. Flow laser sheet visualisation was used to characterize the transition behaviour. Finally, balance measurements of the lift and drag were made.

After the measurements had been collected some RANS calculations were carried out. The detailed comparisons with the measured boundary layer profiles highlighted some difficulties, particularly with regard to the influence of the methods used for applying transition (Fig. 1). Once fixed the agreement was much improved.

The combination of calculations and experiments highlighted a few aspects of the experimental uncertainities, numerical problems and the sensitivity of behaviour to some flow features such as transition. These will all be discussed in the full paper.

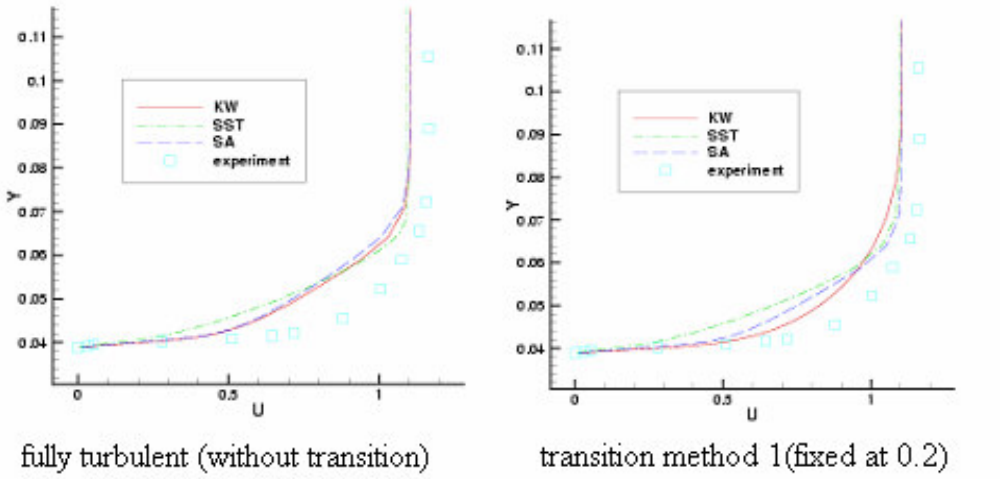


Figure 1: Comparison of boundary layer profiles on the aerofoil at fixed incidence using k-ω, SA and SST models with various transition treatments