

Division A: Energy, Fluid Mechanics and Turbomachinery
Extension Activity (ExA)

Flow Visualisation

October 5, 2021

This Extension Activity (ExA) is associated with three Engineering Areas:

- Energy and the Environment
- Aerospace and Aerothermal Engineering
- Mechanical Engineering

Description:

The objective of this activity is the visual study of the flow around delta wings, the measurement of lift and drag force on these wings and the production of a group report (including a short video) illustrating the flow. Delta wings have been chosen for the study since the flow over these wings at incidence is dominated by strong vortices with interesting flow patterns which are relatively easy to visualise. The development of the vortex flow has a strong influence on the variation of lift and drag with incidence. The students will be divided into sub-groups of 4 students with each sub-group assigned a particular task.

The tasks use the following tunnels/techniques:

1. Smoke tunnel for streamline visualisation
2. Supersonic wind tunnel for Schlieren density imaging and oil-flow based surface flow visualisation
3. Markham wind tunnel for quantitative lift and drag measurements
4. Low speed wind tunnel for detailed surface flow visualisation

5. Computational Fluid Dynamics (CFD) predictions

When the measurements are complete each sub-group will demonstrate their techniques and will present their measurements to the rest of the group.

Assessment:

Assessment is by a final presentation. Each sub-group will have 20 minutes to demonstrate their work to the rest of the group. As a verbal report the presentation should include an introduction, a description of the technique, the results and findings, a rationalisation of these results, and a set of conclusions.

Numbers:

There are two sessions, one at the end of Michaelmas, one at the beginning of Lent term. Each session is open to not more than 20 students.

Responsibility:

Dr N. Atkins (nra27)