A car mounted active wing. Experimental and numerical investigation.

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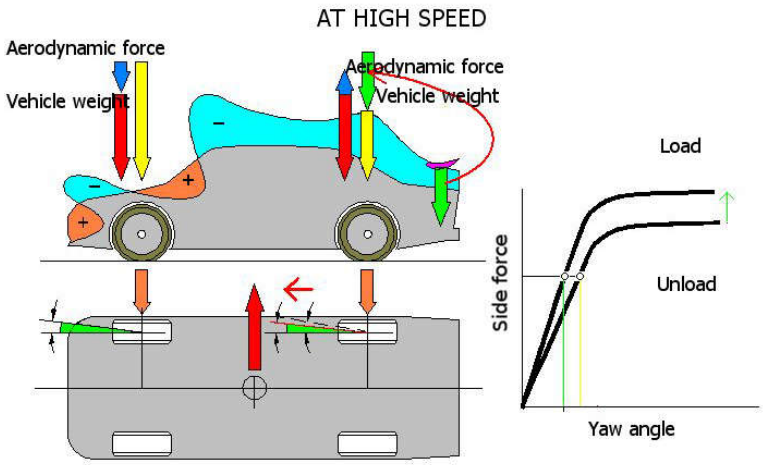
Experiments in Fluid Mechanics 24.10.2017

Agenda

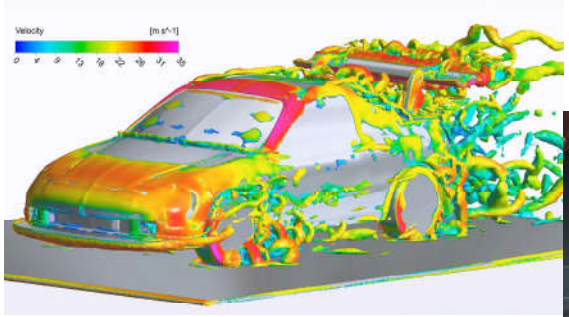
- Problem description
- CFD simulation
- Wind tunnel test
- Results comparison
- Road tests
- Summary

Why do we use active aerodynamics?

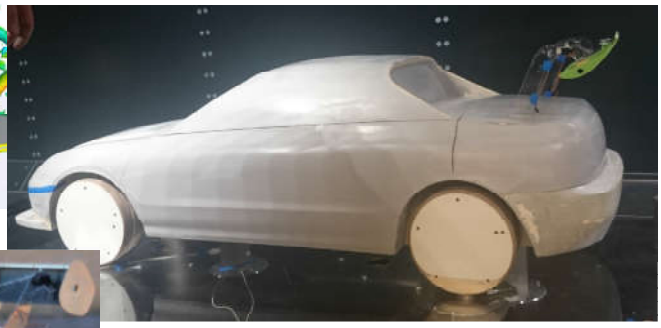


- To optimize drag
- To compensate lift force (rear)
- To increase driving capabilities
- To react on instant changes in surrounding
  - Moose test
  - Acoustic barrier

Research methods



CFD

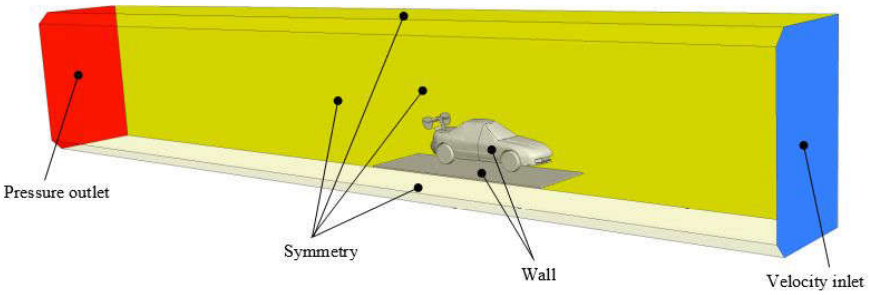


1:2,5 scale wind tunnel tests

Road test

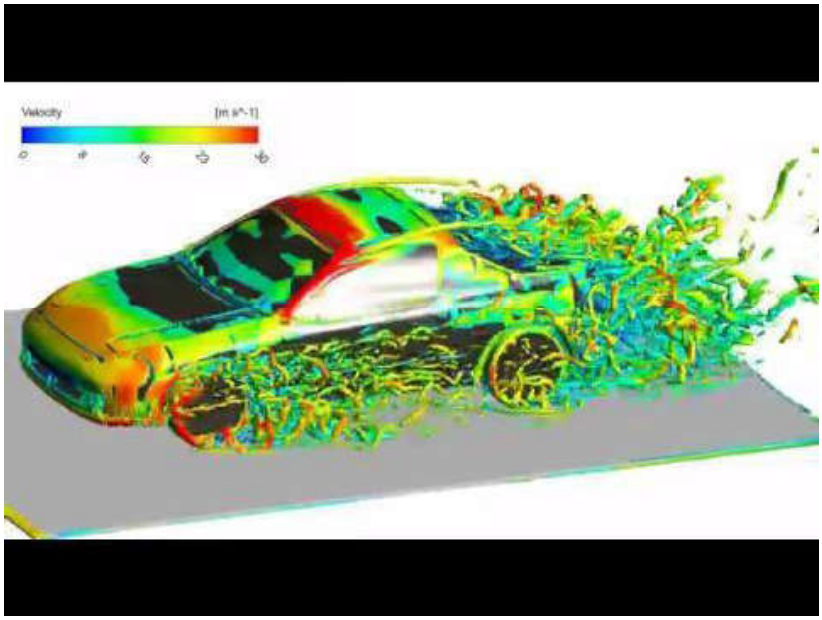
CFD - preparation

- Model of the car standing on the elevated platform
- CFD calculations performed in Ansys 3D Fluent



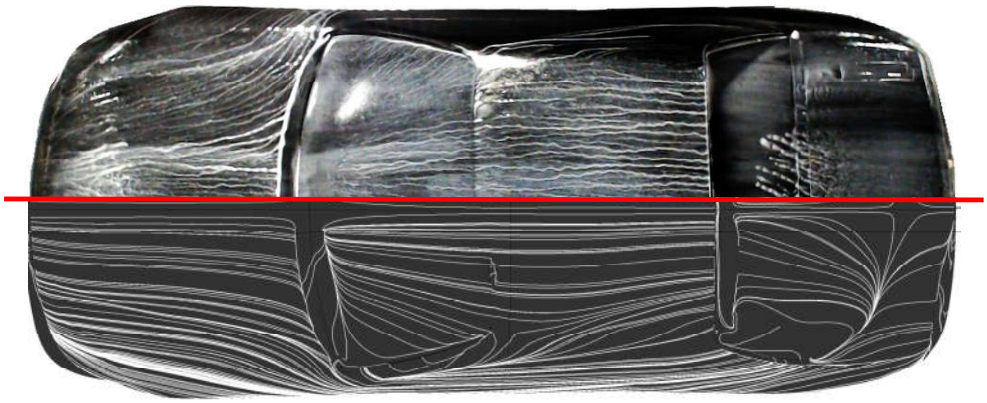
CFD - results

- Surfaces of Q Criterion coloured by velocity – Ansys Fluent SAS SST Turbulence model calculations



CFD - Experiment - Surface visualisations

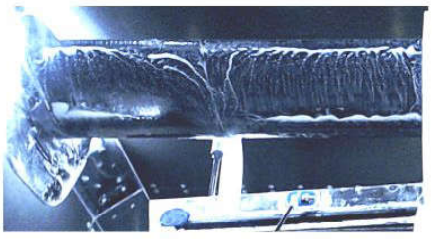
- Experiment – oil flow visualisations



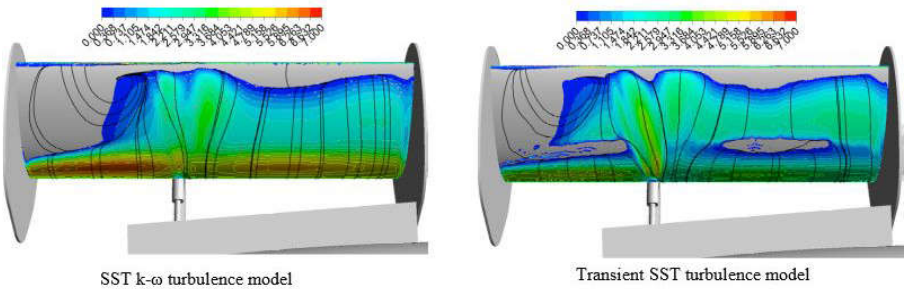
- Ansys Fluent SST k-ω Turbulence model - streamlines by wall shear

CFD -Experiment - Comparison of visualisation

Experiment - Oil flow visualisation:



Ansys Fluent - Contours by wall shear X and streamlines by wall shear:



SST k-ω turbulence model

Transient SST turbulence model

Summary and remarks

- CFD, Wind tunnel and Road tests were conducted
- High downforce increment was successfully achieved with use of small moving surfaces.
- Good agreement of cfd and experimental results.

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