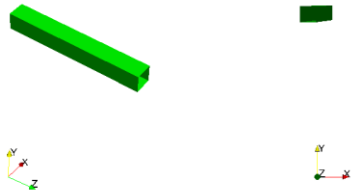
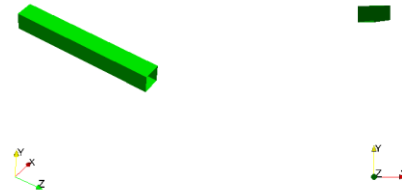


Vortex shedding past square cylinder

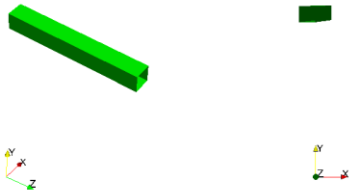
Vortex shedding past square cylinder



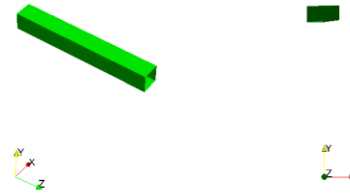
URANS (K-Omega SST with no wall functions) – Vortices visualized by Q-criterion
www.wolfdynamics.com/wiki/squarecil/urans2.gif



LES (Smagorinsky) – Vortices visualized by Q-criterion
www.wolfdynamics.com/wiki/squarecil/les.gif



Laminar (no turbulence model) – Vortices visualized by Q-criterion
www.wolfdynamics.com/wiki/squarecil/laminar.gif



DES (SpalartAllmarasDDES) – Vortices visualized by Q-criterion
www.wolfdynamics.com/wiki/squarecil/des.gif

Vortex shedding past square cylinder

Turbulence model	Drag coefficient	Strouhal number	Computing time (s)
Laminar	2.81	0.179	93489
LES	2.32	0.124	77465
DES	2.08	0.124	70754
SAS	2.40	0.164	57690
URANS (WF)	2.31	0.130	67830
URANS (No WF)	2.28	0.135	64492
RANS	2.20	-	28246 (10000 iter)
Experimental values	2.05-2.25	0.132	-

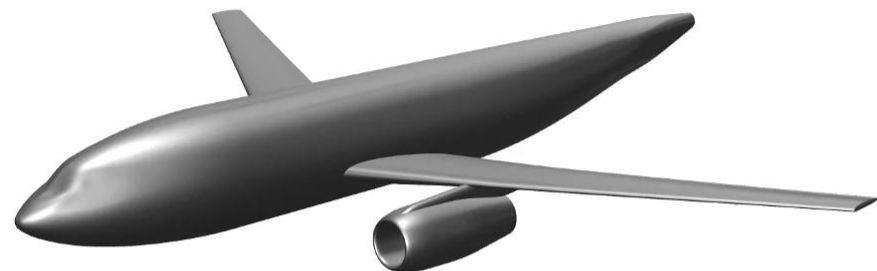
Note: all simulations were run using 4 cores.

References:

D. A. Lyn and W. Rodi. "The flapping shear layer formed by flow separation from the forward corner of a square cylinder". *J. Fluid Mech.*, 267, 353, 1994.
D. A. Lyn, S. Einav, W. Rodi and J. H. Park. "A laser-Doppler velocimetry study of ensemble-averaged characteristics of the turbulent near wake of a square cylinder". *Report. SFB 210 /E/100*.

DLR-F6 aircraft model – RANS simulation

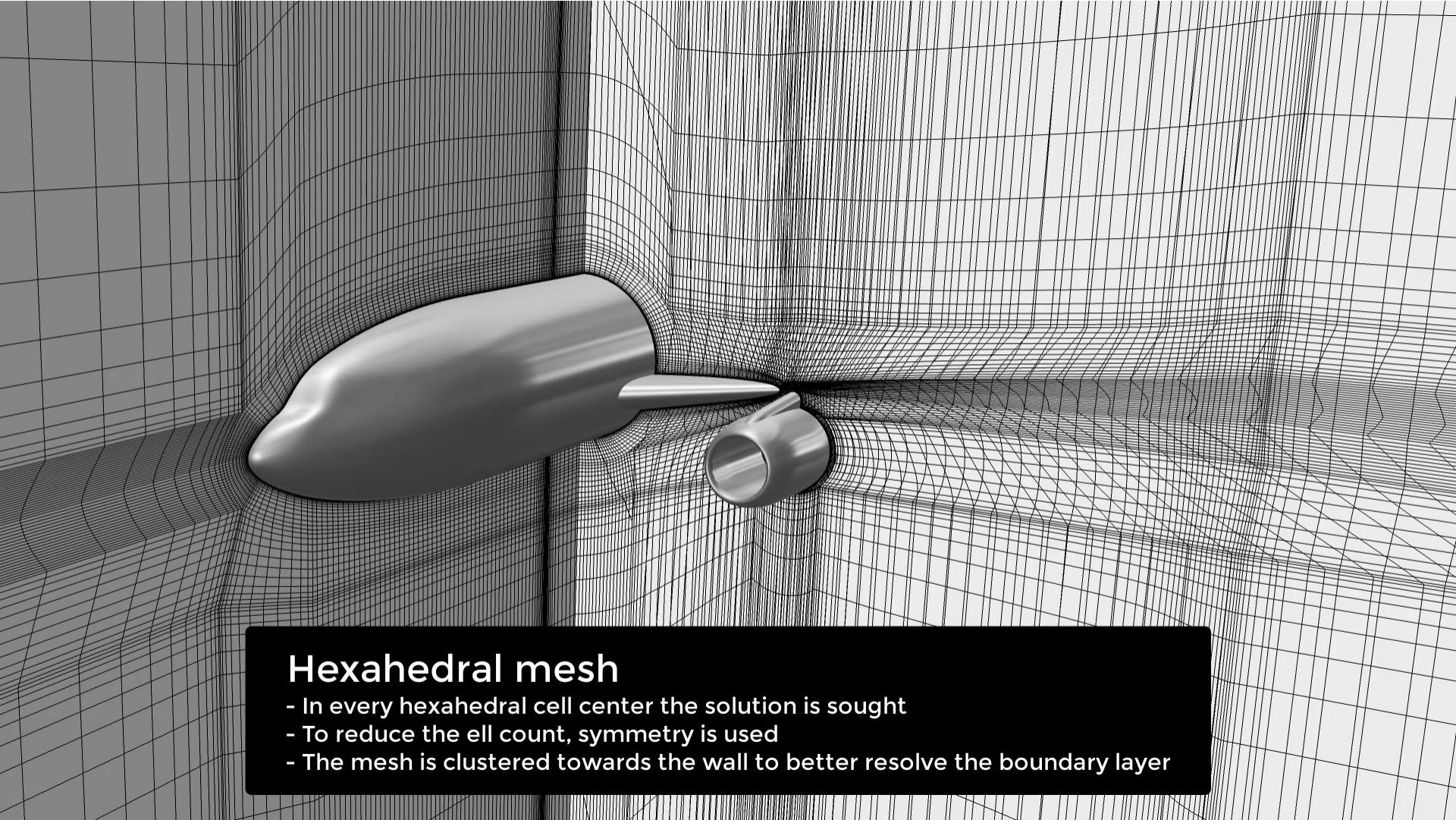
DLR-F6 aircraft model – RANS simulation



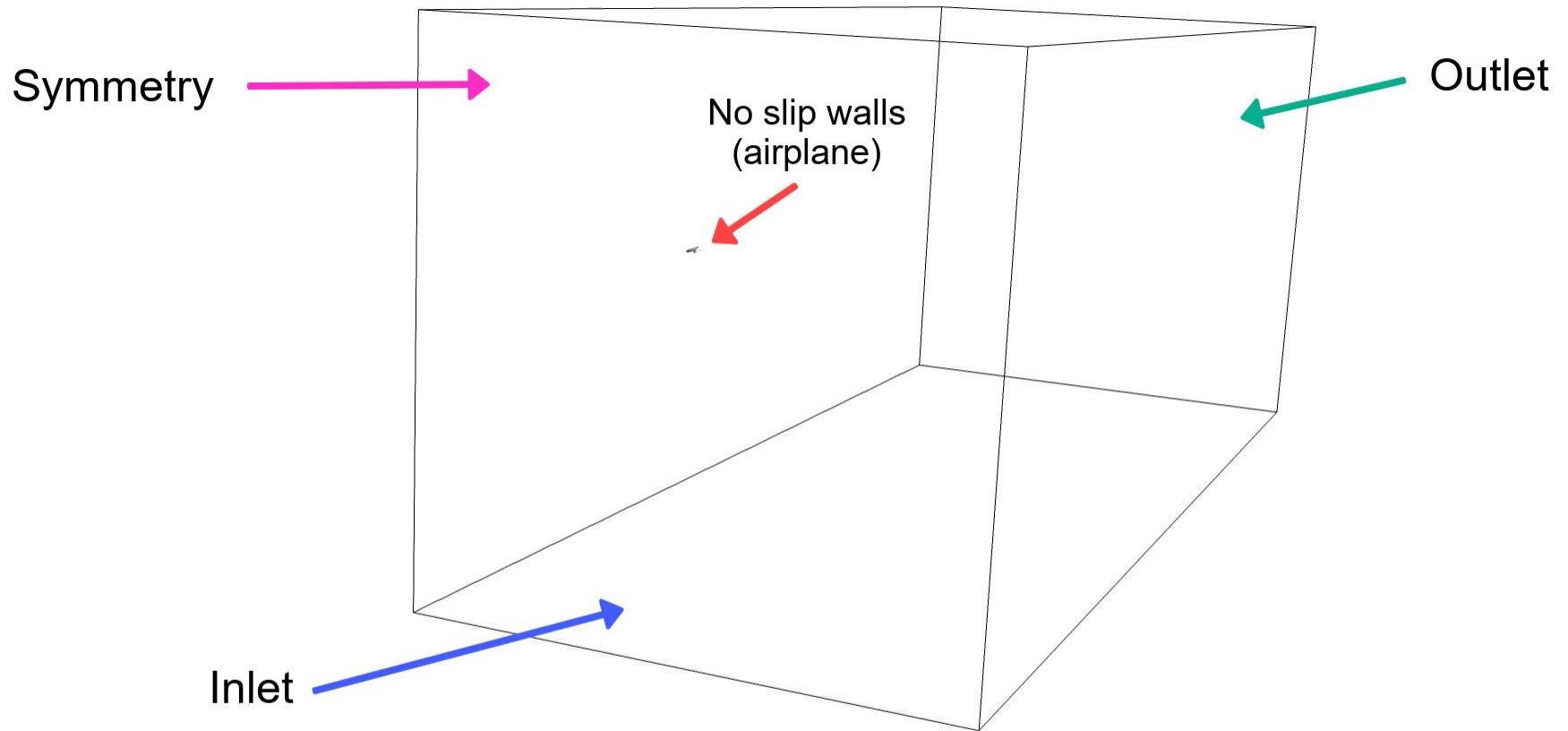
DLR-F6 aircraft model - CFD validation test case

- Mach number = 0.75
- Angle-of-attack = 0 degrees

DLR-F6 aircraft model – RANS simulation



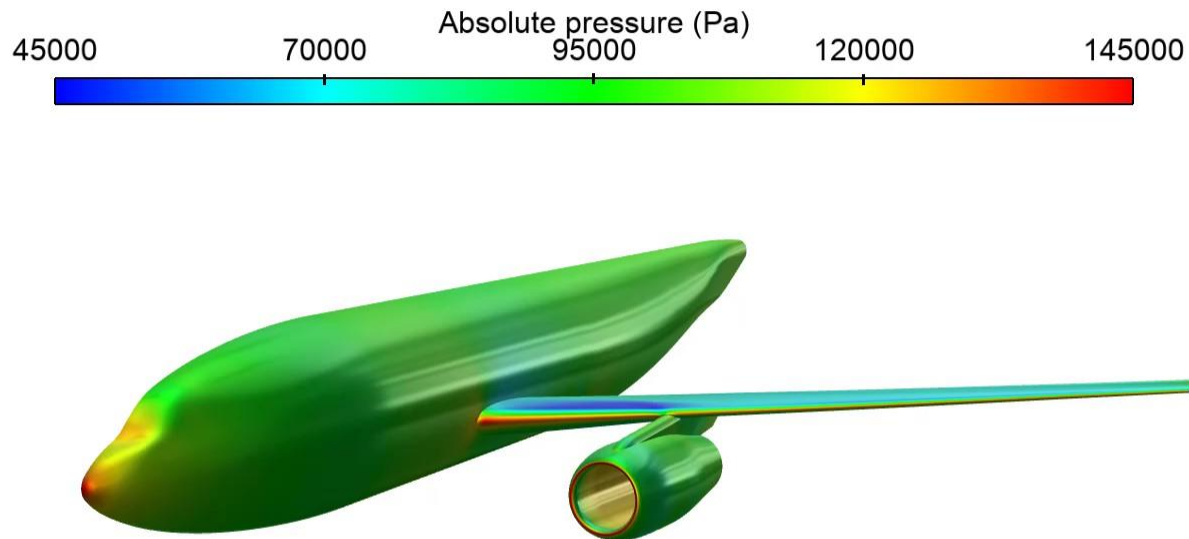
DLR-F6 aircraft model – RANS simulation



Computational domain and boundary conditions

- To reduce the cell count, symmetry is used

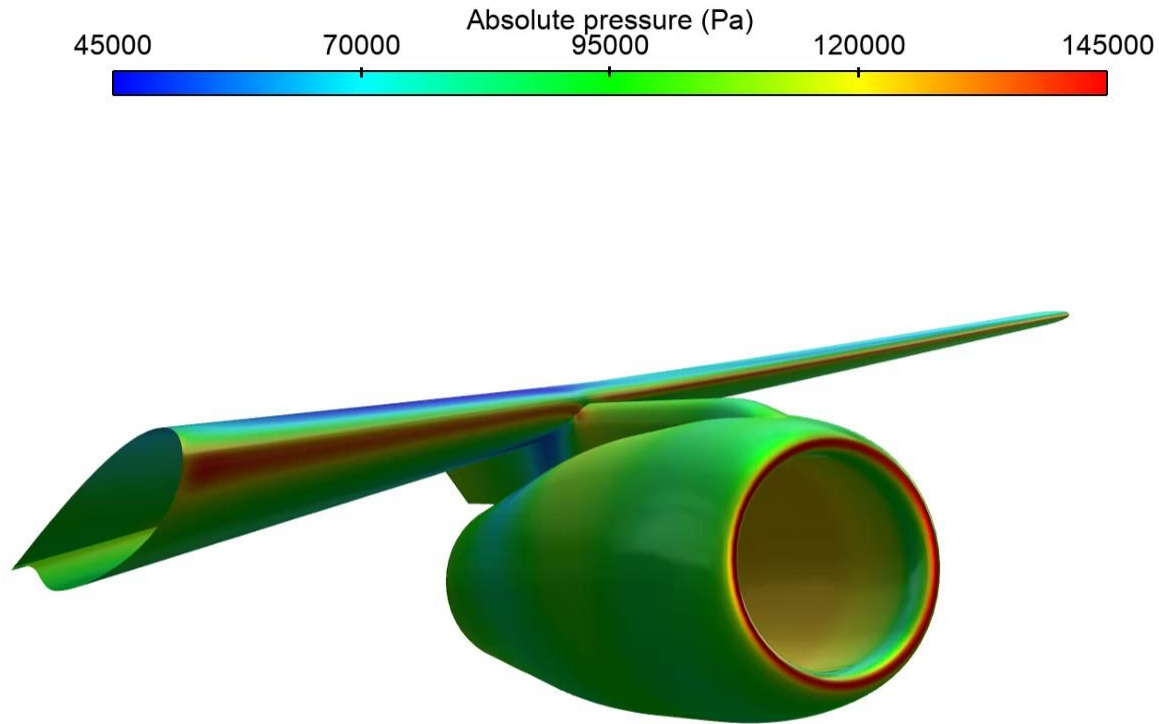
DLR-F6 aircraft model – RANS simulation



Pressure contours visualization

- Solution method: Pressure based solver, steady solver, ideal gas, k-omega SST turbulence model with no wall functions

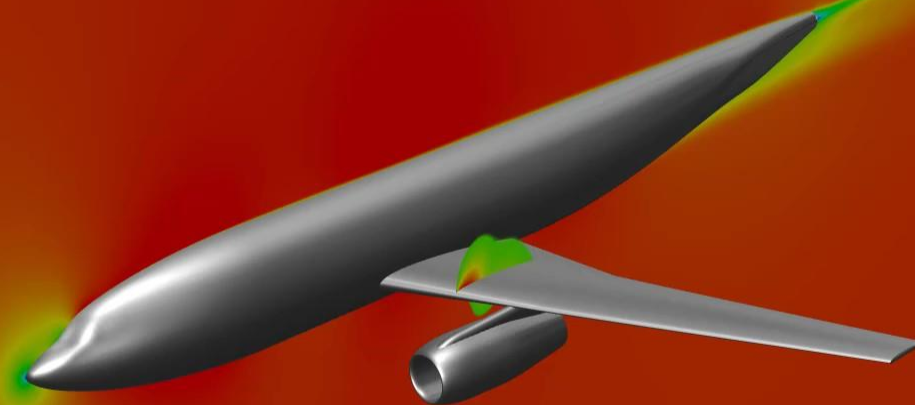
DLR-F6 aircraft model – RANS simulation



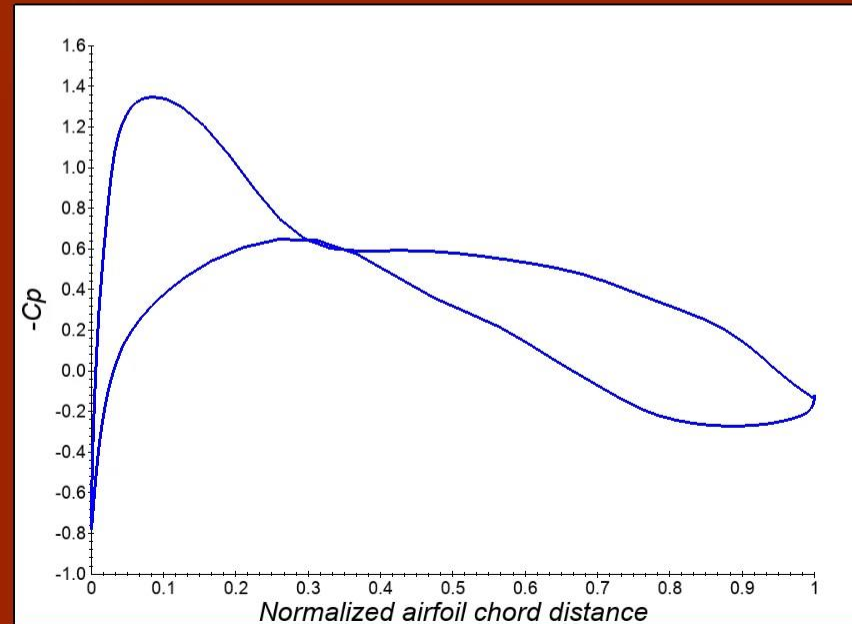
Pressure contours visualization

- Solution method: Pressure based solver, steady solver, ideal gas, k-omega SST turbulence model with no wall functions

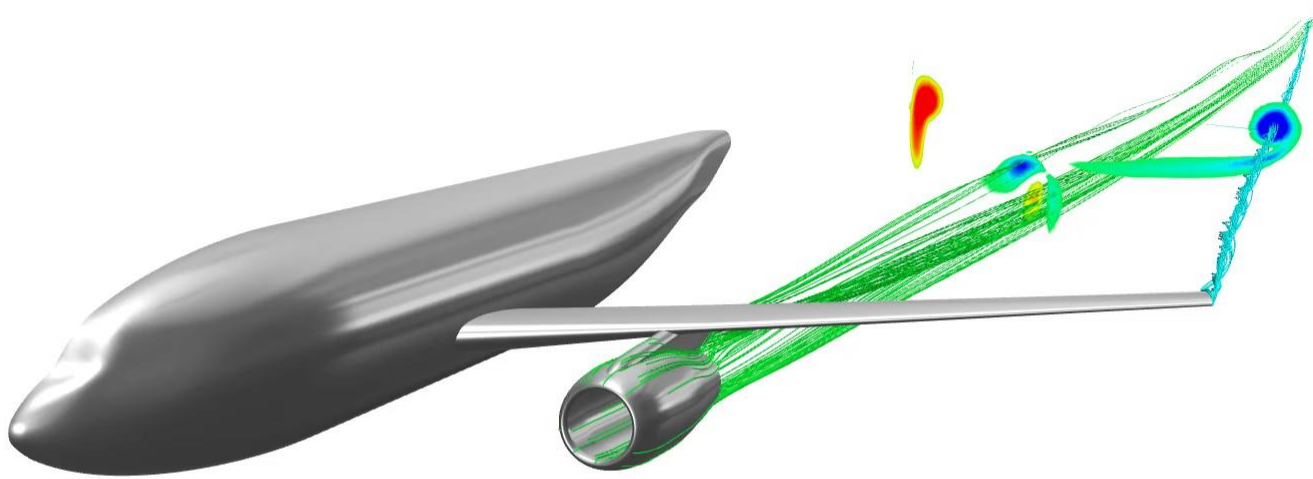
DLR-F6 aircraft model – RANS simulation



- Symmetry plane colored by Mach number
- Cut-plane over the wing colored by pressure coefficient C_p



DLR-F6 aircraft model – RANS simulation



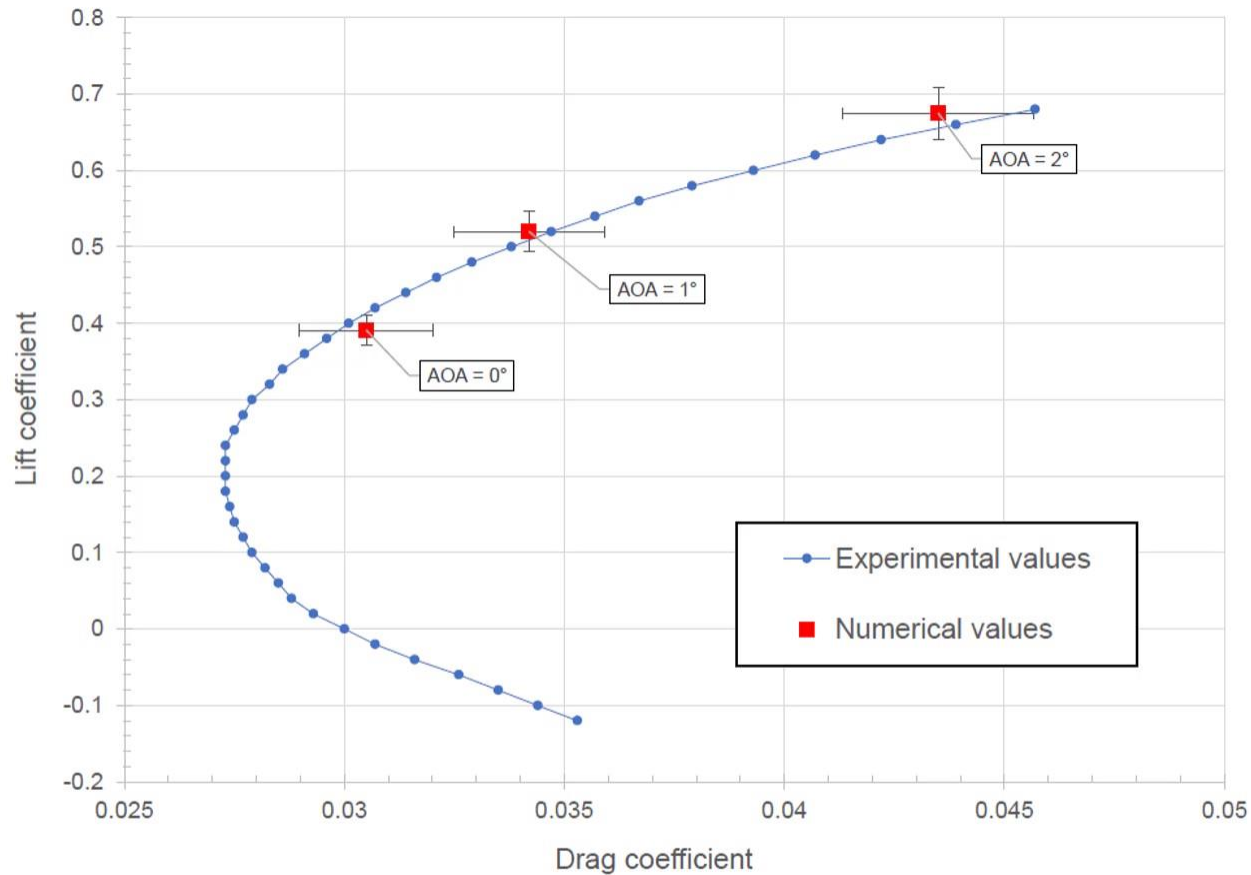
- Streamlines released from the wing-tip (cyan) and engine nacelle (green)
- The Wake behind the airplane is visualized using vorticity contours.
- Blue represents counter-clockwise rotation and red clockwise rotation

DLR-F6 aircraft model – RANS simulation

Side of body (SOB) separation



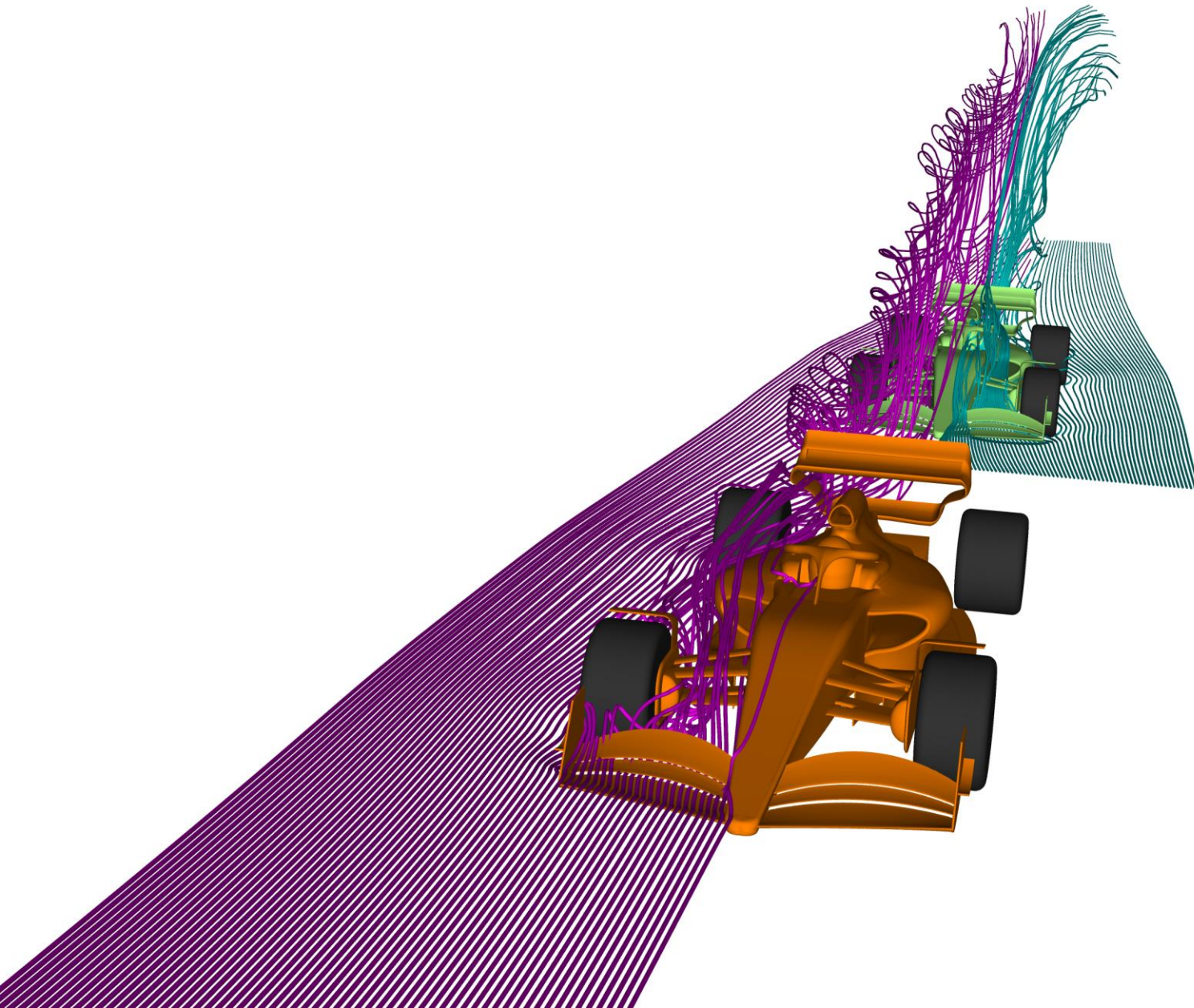
DLR-F6 aircraft model – RANS simulation



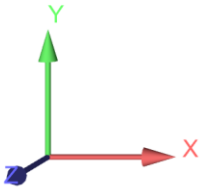
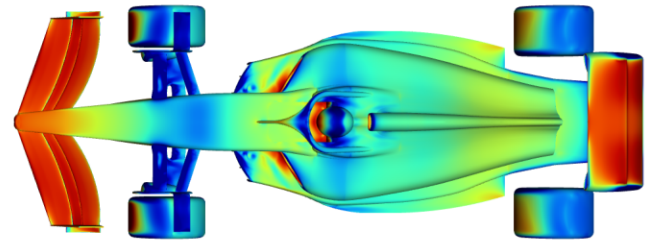
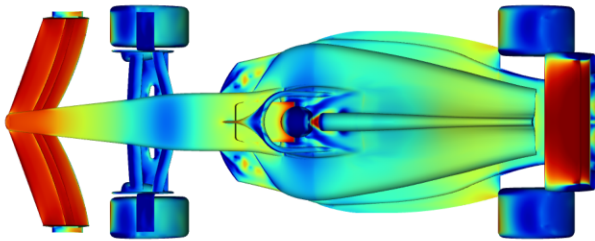
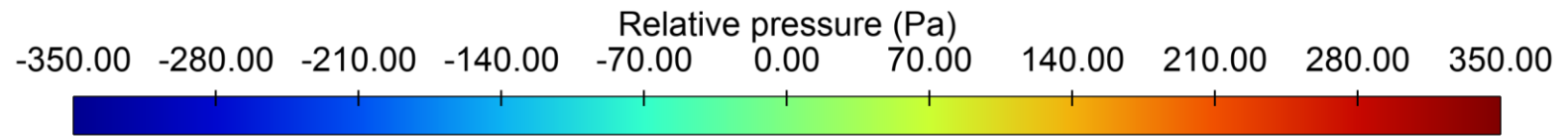
Polar plot (numerical results are plotted with 5% error bars)

F1 in platoon formation – RANS simulation

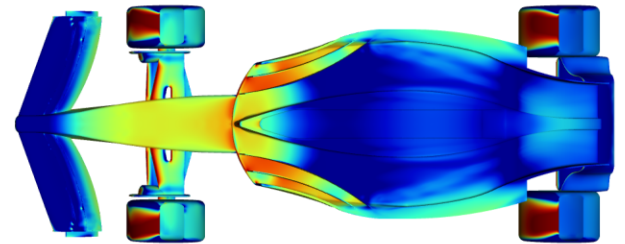
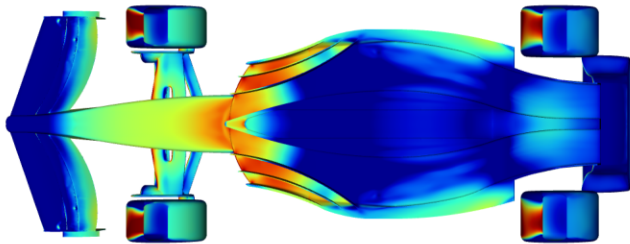
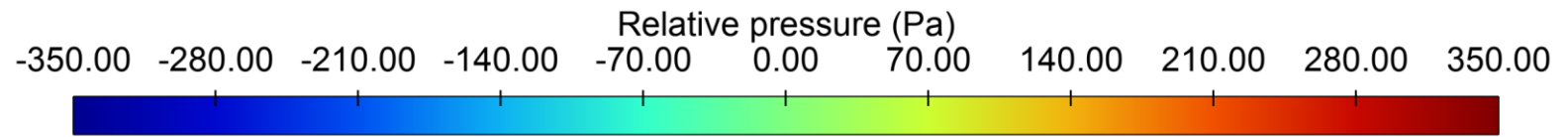
F1 in platoon formation – RANS simulation



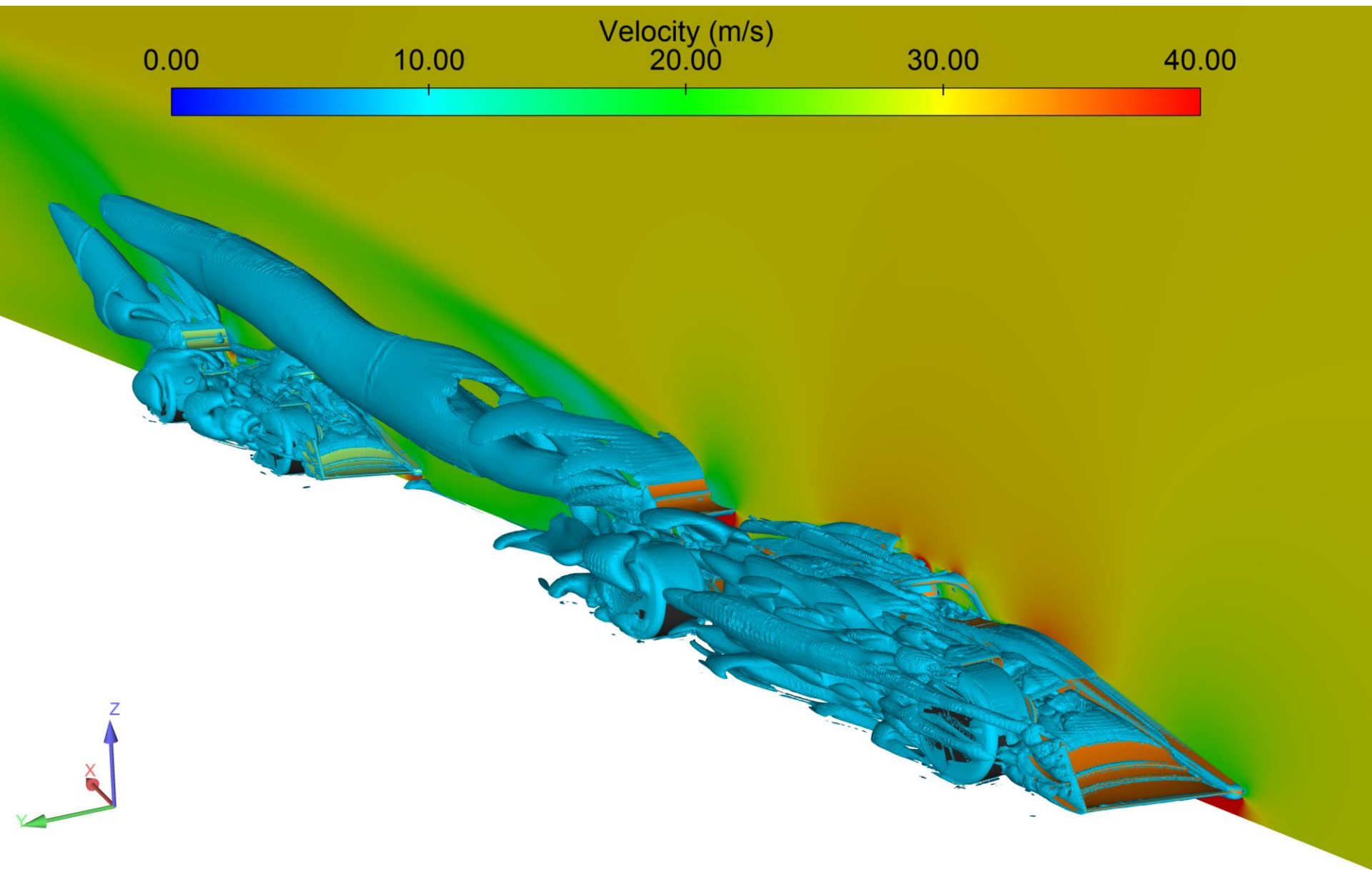
F1 in platoon formation – RANS simulation



F1 in platoon formation – RANS simulation



F1 in platoon formation – RANS simulation



F1 in platoon formation – RANS simulation

