Validation of the fluid structure interaction with the Structural Mechanics Solver (SMS)

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At the start of the week… :

Video 1

➔ Objective : validation of the test case

Proposal for Numerical Benchmarking of Fluid-Structure Interaction between an Elastic Object and Laminar Incompressible Flow , Stefan Turek and Jaroslav Hron , 2006

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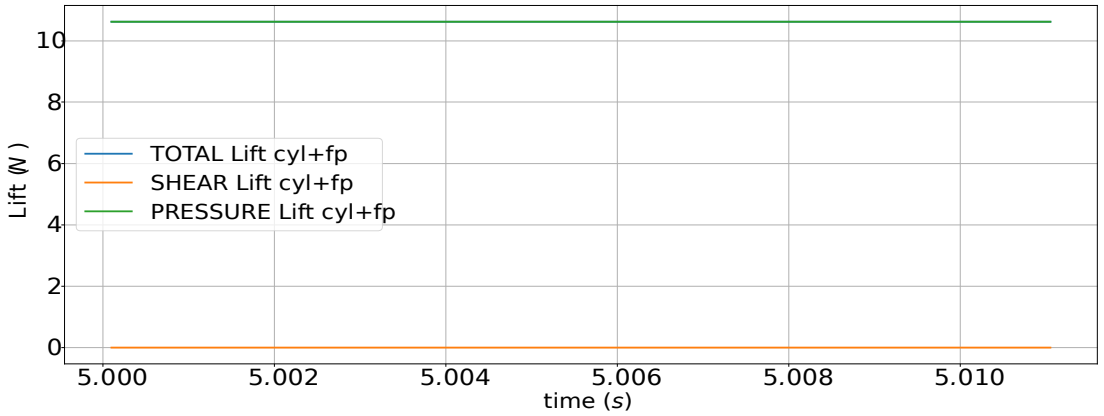
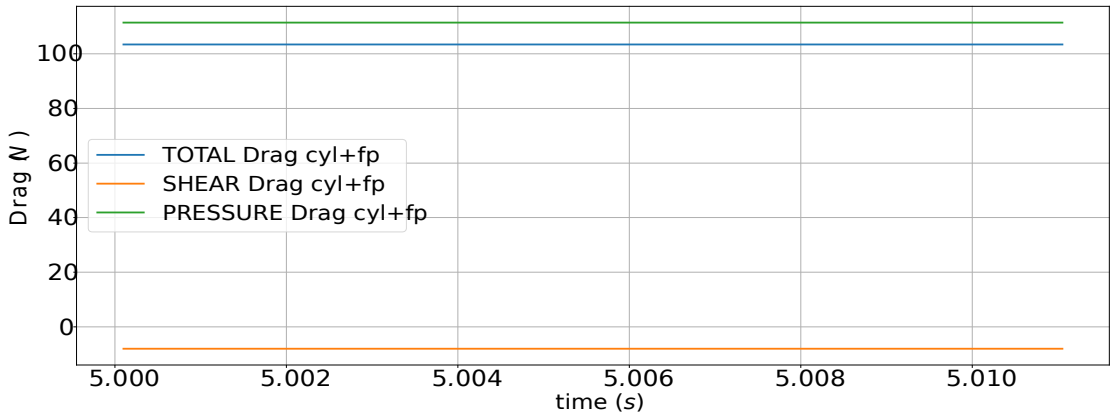
Results on the CFD case :

	Lift (N)	Drag(N)
REF	136,7	10,53

$$\tau_w = \mu \left(\frac{\partial \mathbf{u}}{\partial y} \right)_{y=0}$$

➔ Wrong computation (problem in calc_wall_normal_gradient but also in calc_tau_wall_vector)





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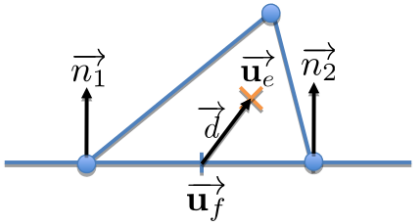
$$\tau_w = \mu \left(\frac{\partial \mathbf{u}}{\partial y} \right)_{y=0}$$

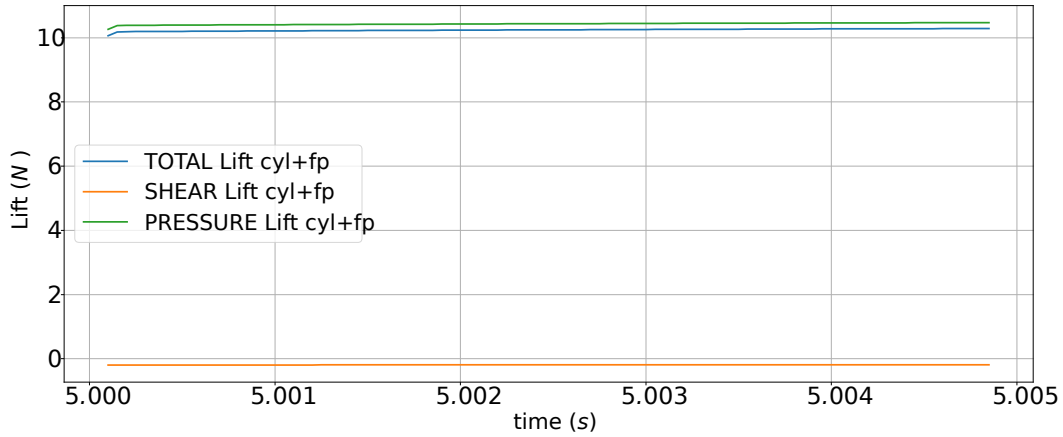
$$\overrightarrow{\tau_w} = \frac{\sum \omega_i \overrightarrow{\tau_{w,i}}}{\sum \omega_i}$$

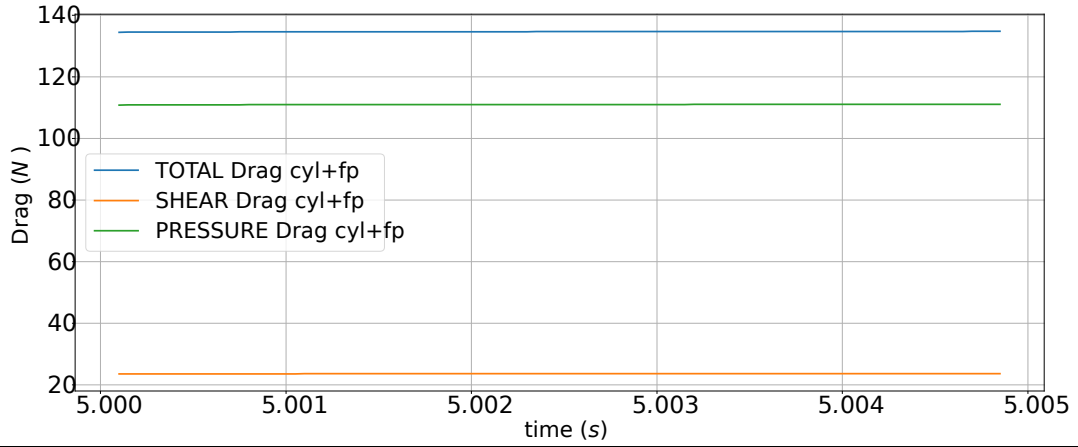
$$\overrightarrow{\tau_{w,1}} = \mu \overrightarrow{g_1}$$



$$\overrightarrow{g_1} = \frac{\overrightarrow{\mathbf{u}_e} - \overrightarrow{\mathbf{u}_f}}{\overrightarrow{d} \cdot \frac{\overrightarrow{n_1}}{||\overrightarrow{n_1}||}}$$

$$\overrightarrow{g_1} = \overrightarrow{g_1} - \left(\overrightarrow{g_1} \cdot \frac{\overrightarrow{n_1}}{||\overrightarrow{n_1}||} \right) \frac{\overrightarrow{n_1}}{||\overrightarrow{n_1}||}$$





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Results on the FSI case with the new shear computation :