UiO : Department of Mathematics
University of Oslo

Fluid structure interaction

Andreas Strøm Slyngstad

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This master's thesis is submitted under the master's programme *Computational Science and Engineering*, with programme option *Mechanics*, at the Department of Mathematics, University of Oslo. The scope of the thesis is 60 credits.

The front page depicts a section of the root system of the exceptional Lie group E_8, projected into the plane. Lie groups were invented by the Norwegian mathematician Sophus Lie (1842–1899) to express symmetries in differential equations and today they play a central role in various parts of mathematics.

Contents

Chapter 1

A motivation for studying fluid-structure interaction

Fluid-structure interaction(FSI) is an interdiciplinary field, appearing in many applications. In nature, FSI forms the basis of many physical phenomia. A fish swimming utpstream, generating thrust from the surrounding fluid by wave-like movements of its fin and body. Or a tree, bedning back and fourth due to strong winds of a storm passing by. Both examples are understandable, but points out two main instances of how FSI occur. When the fish swims, it deformes the fluid, altering the nearby flowfield. For the tree however, the swinging and bending is induced by the pressure of passing wind acting on the tree trunk and branches. Ultimatly, fluid-structure interaction occurs due to both initial effect of either fluid, structure or a combination.

Computational fluid-structure interaction (CFSI) has grown wast within engingeering in the recent years, and proved to be essential for design development and performance optimalizastion of many applications.
Within aeronautics, CFSI have proven to be crucial for advances within flight characteristics and fuel economy. Due to a wide range of wing materials and flow profiles to be studied, CFSI have made testing of proposed models possible, while saving expences regarding small and full-scale experiments.

Winglet, a near vertical tip replacement for a conventional wingtip of an aircraft, have reduced drag induced by wingtip vortices during flight. As a result, the overall fuel consumption of long-distance flights have been reduced by $\sim 5\%$, which is why winglets can be observed within many airliners today. Another consequence of installing wingelts is the recution of wingtip vortices, which in turn reduces trailing turbulence behind the aircraft. The trailing turbulence can intervene with flight controls of aircraft passing through it, making wingles an important safety feature for flight traffic.

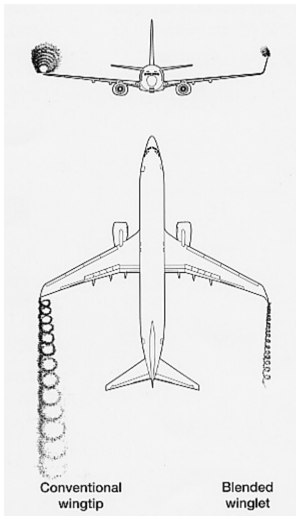

Figure 1.1: A comparison of shedding vortices from conventional wingtip, versious a winglet.

Computational stuff, why now, refer to computational power etc
Få med beregningsorienterte, to interdiciplinary.

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