

# Flight Mechanics Modelling for Optimisation

January 21, to February 27, 2015

University of Freiburg

Teachers: Greg Horn and Mario Zanon (U Freiburg & KU Leuven)

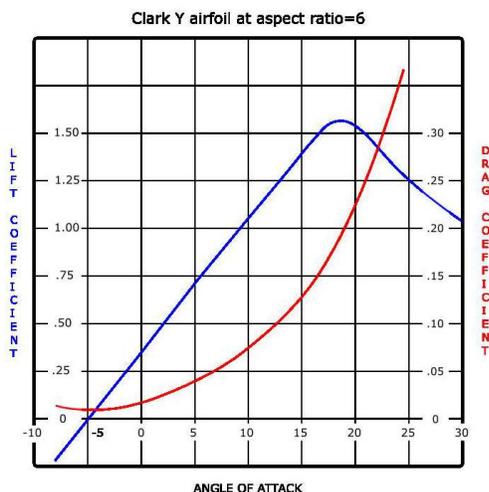
**Abstract:** The aim of this 6-day course is to give a basic knowledge of flight mechanics, and modeling of mechanical systems aimed at optimisation and optimal control of aircraft. When modelling the kinematics of a mechanical system, several choices are possible both for the choice of coordinates and for deriving the equations of motion. Different mathematical representations of the same model can have very different numerical complexity and behavior: in this course, the models will be derived so as to be optimisation friendly. Flight mechanics is an involved physical process which can be extremely difficult to model in detail. A simplified aerodynamic model which incorporates most relevant aerodynamic phenomena will be presented in order to give the student the ability to derive himself a complete aircraft model. Homework will include modeling and simulation of rigid bodies with aerodynamic forces, and related optimal control problems.

## Topics:

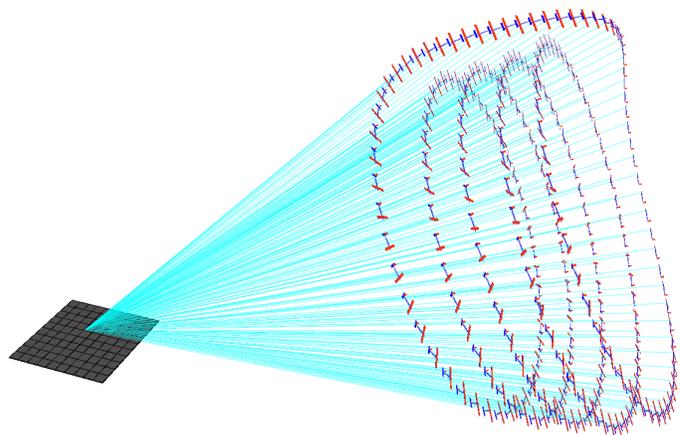
- Modelling of aerodynamic forces and torques
- Modelling rigid body rotations
- Euler-Lagrange equations and modelling of multi-body systems
- Modelling of airborne wind energy systems
- Optimal control: tips and tricks

## Dates and Rooms:

- January 21, 10:00-12:00; Building 102, Room SR 02-012
- February 2, 10:00-12:00; Building 101, Room SR 01-018
- February 4, 10:00-12:00; Building 101, Room SR 01-018
- February 20, 10:00-12:00; Building 102, Room SR 02-012
- February 24, 10:00-12:00; Building 102, Room SR 01-012
- February 27, 10:00-12:00; Building 101, Room SR 01-016



(Image courtesy of wikipedia)



(Image courtesy of Greg Horn)

**Organisers:** Prof. Dr. Moritz Diehl, Greg Horn, Mario Zanon, Christine Paasch, University of Freiburg and University of Leuven.