# Modelling of an Aircraft Aileron in Simulink

(Mechatronics 201)

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## Abstract

We have designed a model of aileron using Simulink for control and moving it using an electric subsystem, for the "Hands On" assignment 2 as a part of our coursework.

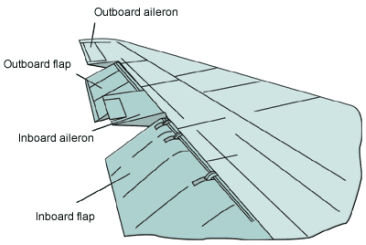

*Keywords:* Simulink, Aileron.

## Introduction

The focus of the project is to make a circuit with a DC motor based system which enables the movement of the aileron. In order to achieve the goal, we are making use of the Simulink environment. This tool allows us to construct a circuit which facilitates the movement of the aileron.

## What is an Aileron?

An aileron is a hinged flight control surface usually forming part of the trailing edge of each wing of a fixed-wing aircraft. Ailerons are used in pairs to control the aircraft in roll, which normally results in a change in flight path due to the tilting of the lift vector. When they move up and down, they cause lift to increase (when they go down) or decrease (when they go up), allowing the pilot to roll the airplane to a desired bank angle or return from a bank to wings level.



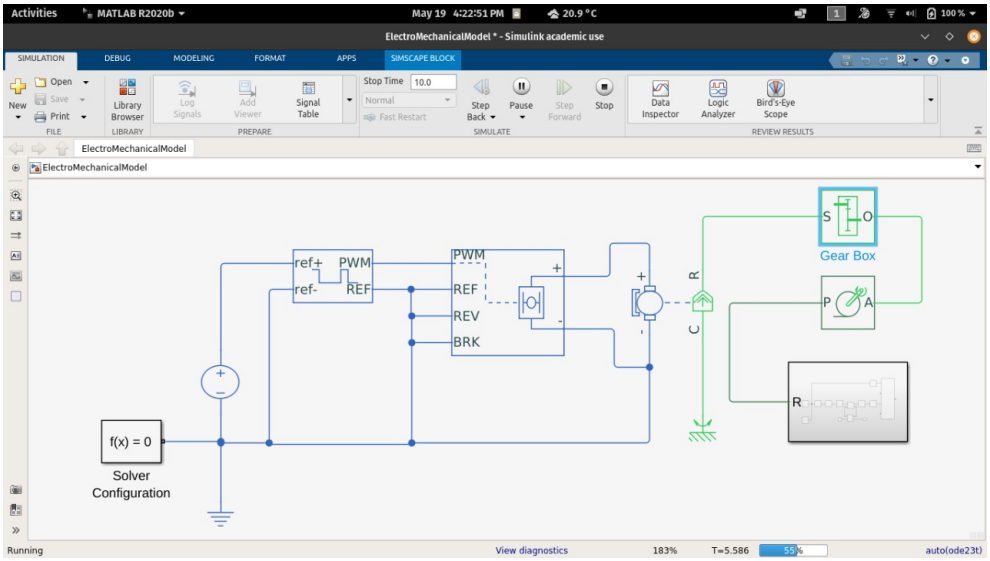

When you turn the control wheel (also known as the yoke), the aileron on one wing deflects upward, while the aileron on the other wing goes down. This increases and decreases lift on the wings. Climbing and descending is directed through use of movable control surfaces on the horizontal portion of the tail.

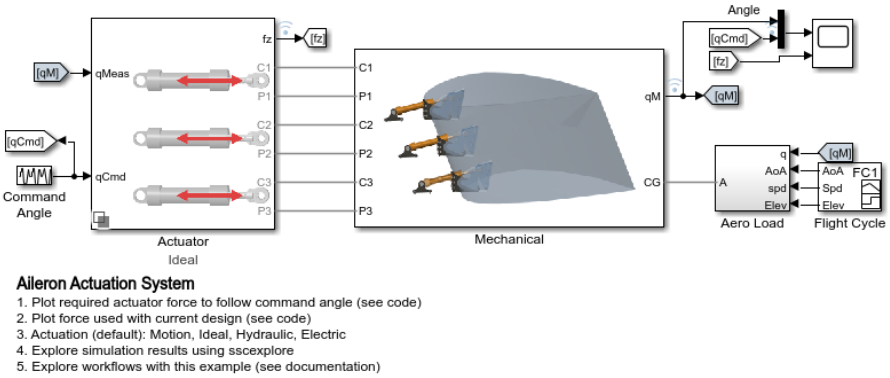
## What is Simulink?

Simulink is a MATLAB-based graphical programming environment for modelling, simulating and analysing multi domain dynamical systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. We can use Simulink to view the model and change its configurations by giving specific sets of information. Here we are going to move the aileron up and down.

## Our Model

This is the model of an aileron for vertical movement. Using Simulink Design Optimization, parameter values of the motor model are modified until the results of the simulation match measured data. Multiple parameters are tuned simultaneously. To ensure rapid convergence of the optimization problem, the sensitivity of the simulation to the parameter values is calculated.The mechanical model of the aileron was created in a CAD system. That CAD model was imported into Simscape Multibody, including the joints.






## Conclusion

Through means of this hands-on assignment, we gained an understanding of how an aircraft's ailerons work, how we can use Simscape to model (in 3D) an object quickly, and also how we can make use of MATLAB's Simulink for visualising complex systems.

## References

1. IEEE. 2009. IEEE Standard for Information Technology – Systems Design –Software Design Descriptions. IEEE Std 1016-2009 (Revision of IEEE Std 1016-1998)(July 2009), 1–58.
2. Andreas Rau. [n. d.]. Integrated Specification and Documentation of SIMULINK Models. ([n. d.]). http://www.it-designers.info/uploads/media/iac2002.pdf Inter-national Automotive Conference.
3. Marc Bender, Karen Laurin, Mark Lawford, Vera Pantelic, Alexandre Korobkine,JeOng, Bennett Mackenzie, Monika Bialy, and Steven Postma. 2015. SignatureRequired: Making Simulink Data Flow and Interfaces Explicit. Science of ComputerProgramming 113, Part 1 (2015), 29–50. https://doi.org/10.1016/j.scico.2015.07.005Model Driven Development (Selected & extended papers from MODELSWARD2014)