



INTERNSHIP - YEAR 2020

Internship tutors:
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Internship with ISAE SUPAERO - Toulouse

Location: **ISAE SUPAERO - Toulouse**
Grant: 3,75 €/hour \Rightarrow 577,50 €/months (22 days, 7 hours/day)

Duration: **5 to 6 months**

Title : CONTROL OF HYSTERESIS

ISAE-SUPAERO is an institute dedicated to aerospace engineering higher education and research. ISAE-SUPAERO develops a research focused on the future needs of aerospace or high-tech industries. The ISAE-SUPAERO Department of Aerospace vehicles design and control (DCAS) supports activities related to the design and development of aerospace systems. The DCAS researchers collaborate on the following topics:

- Design and operation of safer aircraft
- Integrated multidisciplinary design of aircraft
- Advanced space concept.

The internship is related to the control of hysteresis in aircraft air conditioning systems. Aircraft air conditioning relies on several subsystems to collect air at the high pressure stages of the reactors (bleed air system), regulate temperature and flow to ensure comfort passengers (air conditioning system) and control the pressure of the cabin of the aircraft (cabin pressure control system). One difficulty for controlling these systems is their nonlinearities and in particular large hysteresis which limits their performance. Limiting the influence of hysteresis on the system performances would be a breakthrough but is an arduous task because of significant variations of hysteresis characteristics with operating conditions (altitude, flow, operating regimes) and because of dispersions of system components characteristics (due to manufacturing tolerances).

Objective of the internship

In this context, the objective of this internship is to control the hysteresis phenomenon of a Fan Air Valve of an air conditioning system.

Two strategies can be adopted: control with integration of an inverse model of the hysteresis in the control scheme and control without integration of an inverse model.

Two issues have been identified linked to the specificities of the application: large dispersion in the system and large inertia on some phenomena (e.g. thermic) of the valve which induces low dynamics detrimental to the control of the hysteresis.

Up to now, studies have been performed to synthesize control strategies and assess them in presence of dispersion.

The objective of internship is to synthesize control strategies, with or without inverse model, taking into account the inertia issues.

Student profile: Master or engineer student
Knowledge: Control and modeling of systems, simulation of multiphysics systems
Software skills: Matlab-Simulink

