

## Master Thesis - “Off-design performance modelling of an open fan aero engine”

(30 credits/20 weeks – 1-2 students (2 preferred))

### About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With manufacturing sites and technology centers around the globe, we serve over 90% of the world’s aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world’s advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

### Project Background

Multiple concepts for increasing the efficiency of the aero engine are studied in order to support the aeronautical industry’s aim to reach net zero by 2050. As the traditional ducted turbofan is starting to reach its size limit, the open fan is a concept that allows a radically increased by-pass ratio and efficiency. The open fan can come with a variable pitch rotor which could act as an additional control parameter of the engine thrust (in addition to the fuel flow control parameter). An aero engine is often designed at one operating condition but must be able to run off-design in the whole flight envelope under varying conditions and thrust settings, so called ratings. These ratings require control schedules of key engine parameters.

### Assignment Description

The aim of this project is to address several aspects of off-design performance modelling and apply them to an open fan configuration engine performance model. The strategies, methods and tools developed may be applicable also to other engine architectures. A focus will be around engine thrust ratings and control schedules. The preliminary project plan would be:

- Literature review
- Familiarisation with the tools and existing design point model
- Establish suitable propeller (/open fan) maps and implement in the model
- Optimize the split of air flow between core, by-pass and open fan
- Develop a control strategy and schedule for open fan (e.g. fuel flow, propeller (/open fan) pitch etc. ) and implement in the model
- Develop a (thrust)ratings- strategy (with accompanying control schedules) and implement in the model
- Create modules for calculation and book keeping of engine emissions and implement in the model
- Run the model through a typical flight mission, to component sizing points and sweep through the envelope
- Document the work in a report
- Present the work

### Qualifications

Final year Master’s student in Aeronautical, Mechanical, Physics Engineering or similar. Knowledge in jet engine / gas turbine performance, turbomachinery, controls, optimisation and programming (C++/python).

### Apply by

Send your resume and cover letter to Eric Blidmark,  
[eric.blidmark@gknaerospace.com](mailto:eric.blidmark@gknaerospace.com).

Last date for application: 2022-11-15. Interviews will be held continuously and the position could be filled prior to the last application date.



Photo: Safran