Master Thesis - “Battery Usage Strategy for a Hybrid Electric Turbofan” (30 credits/20 weeks – 1 student)

About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With 33 manufacturing locations in 12 countries, 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

Along with several other concepts, the hybridization of turbofans with the help of electric machines is one of the methods with which the aerospace industry aims to achieve the net zero emissions goal of 2050. GKN has previously evaluated a few concepts making use of electric machines on both the high- and low-pressure spools in a turbofan with the assumption that no energy storage would be considered and thus power would only ever be transferred between spools. This assumption holds for analysing long flight segments such as cruise but does not allow any investigation of more transient flight segments such as taxi or take-off which are thought to show the most benefit for a battery hybrid turbofan.

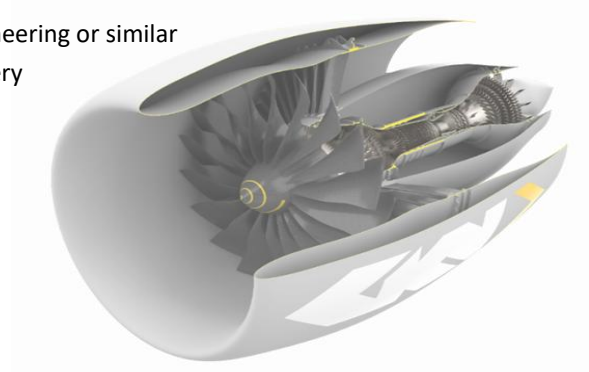
Assignment Description

This thesis aim is to develop a strategy for deciding when battery power would be used in a flight envelope and when the batteries would be recharged with the objective of decreasing block fuel consumption of a few typical passenger aircraft flight missions. Along with the usage strategy, some simple method for determining battery weight would need to be developed for GKNs engine performance tool NPSS and integrated with an existing more electric turbofan model. The project plan is expected to be:

- Literature review
- Familiarization with NPSS and GKNs engine performance models
- Development of battery element to be included in engine performance model
- Optimisation and development of battery usage strategy
- Comparison of different flight missions with and without battery
- 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 and turbomachinery
- Understanding of control logic and optimisation
- programming (C++/python)



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