GKN AEROSPACE

Master Thesis - "Compressor Map Extension"

(30 credits/20 weeks – 1 to 2 students)

About us

GKN Aerospace is the world's leading multi-technology tier 1 aerospace supplier. With 55 manufacturing locations in 15 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

Engine system models include component characteristics (maps) for modules, as compressors and turbines. The characteristics do appear in tabular form mostly and originate from module tests. In some engine models the component maps do not cover the complete operating range of the modules, but only a normal "steady state" operating regime. This leads to difficulties when to simulate e.g. engine starts, shut downs and "windmilling" operation during flight.

A possibility for engine system model improvement, is to extend the compressor maps to be valid all the way down to 0 rpm and for low pressure ratios, even < 1. The compressor behavior must be physically representative even in the extended regions of the maps and the extensions must be thermodynamically and physically justified. The thesis work is supposed to result in well justified map extensions and a verification test, documented in a thesis report.

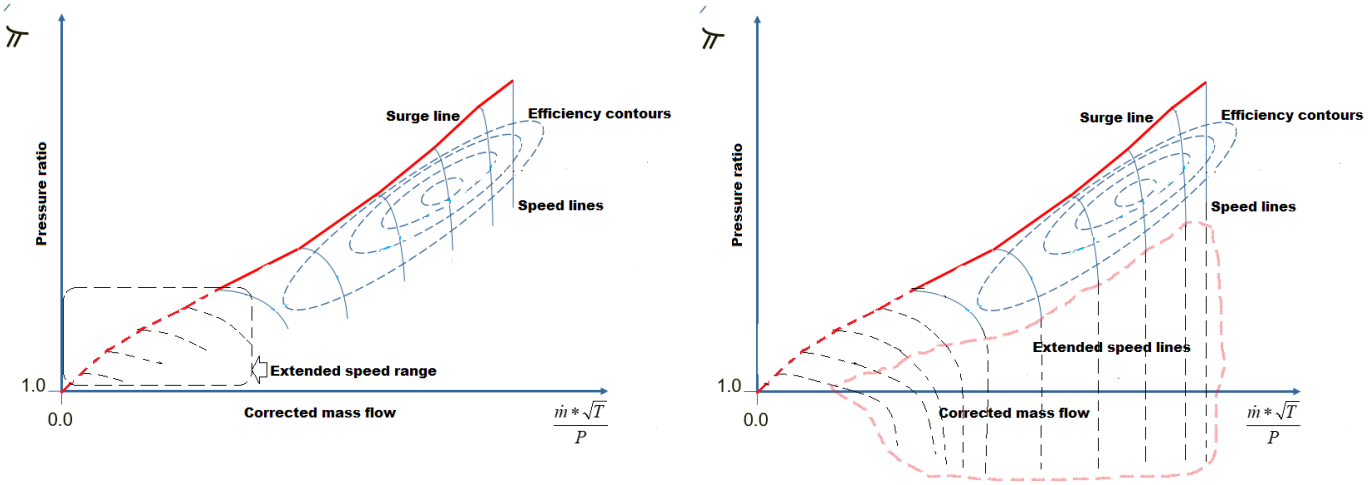

Figure 1: Compressor map with extended rpm range (left) and compressor map with extended speed lines (right)

Assignment Description

There are several dignities possible for a thesis work as:

- Extending compressor map downwards in rotational speeds, down to 0
- Extension of speedlines below π = 1
- Extension of speed lines to low pressure ratios, even π <1 enables simulation of compressor "windmilling" characteristics, which in turn enables "in flight windmilling" engine relights.
- Generation of updated compressor map tables with extensions

Milestones and content

The following project milestones are suggested:

1. Information survey on research results from similar topics and available software for compressor analysis
2. A 1D mean line compressor performance (stage stacking) code.
3. Updated compressor maps with extensions.
4. Inclusion of updated compressor maps, in engine system model.
5. Verification results produced with engine system model, updated. compressor maps included.
6. Thesis report including background, description of tasks, targets and methods, suggestions for future work, list of scripts etc. created during work

Qualifications

- Bachelor/Master's in Applied Mechanics, Engineering Physics or other relevant field
- Basic knowledge in gas turbine theory preferred
- Object-oriented programming skills meriting but not required

Apply by

Send your resume and cover letter to:

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Interviews will be held continuously.