Establishing the Effect of Rolling Resistance on Torque Measurements of Rotor Test Rig

Project Outline

The MERIT test rig is a whirl tower featuring an 85kW motor and constant-rpm control, capable of monitoring rotor blade behaviour in a variety of extreme flight conditions, most notably deep dynamic stall in a two-blade configuration. The torque sensor from which power is calculated is currently located above the coupling, but below the bearings, meaning the resistive torque that the bearings add to the system are not considered.
There is a way around this: we could implement a series of strain gauges on the mast near the rotor head, adhered in such a way that the deformation of the rotor mast can be measured, and correspondingly the torque applied to the mast be calculated. That way the torque measured would only be that which is exerted on the mast by the blades, excluding that caused by resistive losses in the bearings.
Using this method, the inaccuracy of the existing system can be established, and, if needed the new system could replace the existing. If alternative methods are established during the literature review, these can be considered and implemented if preferred.

Project Plan and Milestones

- Familiarisation with the Test Rig hardware, and literature review on other Test Rigs, focusing on the problems they faced during development.
    - **MS1: Establishing optimal method of measuring torque at the rotor head, and (if applicable), most appropriate way to apply strain gauges**
- Implementation of the desired hardware, and DAQ chain completed
    - **MS2: Acquiring the first raw data from the newly implemented sensors**
- Finalisation of Post Processing procedure
    - **MS3: Comparison with existing torque measurement equipment**
- Conclusions
    - **Final Report**

Prerequisites:

Basic understanding of DAQ and sensory equipment
Systematic Approach to Problem Identification and Solving

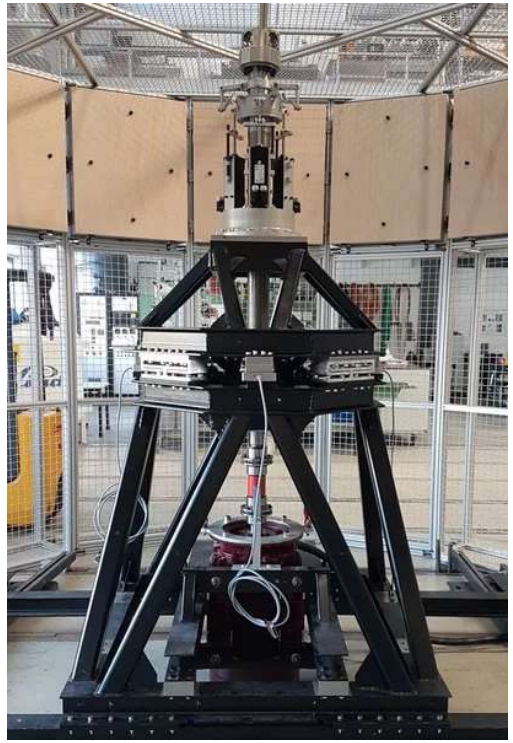

Fig 1: The MERIT Test rig, without blades attached

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