

Integrated study of advanced open rotor powered aircraft

New technology

The advanced open rotor concept is one of the few propulsion technologies that has the potential to make significant reductions in aviation emissions.

By using open rotor propelled aircraft for short-haul flights, it may be possible to reduce the average trip fuel burn by as much as 30%. However, the open rotor propeller faces major challenges if the advantages are to be achieved. Foremost amongst these are the very significant noise and safety issues, which led to the rejection of the concept when it was considered in the 1980s. Technological progress has gone some way toward lessening the inherent noise of open rotors, but other factors, such as lower flight speed, contribute to an increased community noise footprint and these remain to be solved.

The way forward

This study will focus on the issue of noise. It will investigate the likely impact of a number of generic designs of large open rotor powered aircraft during an entire flight operation from take-off to landing. Looking at community noise factors involved if open rotor powered aircraft were to become widely used in civilian fleets, study results will show the likelihood of such aircraft meeting noise restrictions. It will provide noise constraints and operational parameters for a number of aircraft. The study will also indicate whether a more detailed multidisciplinary research project (including engine performance, airframe design, aircraft operations, atmospheric impact, noise emission and airline economics) is needed.

The key to completing this project will be the development and integration of modelling methods for all major noise sources and installations. Researchers will review existing tools and methods available for noise prediction.

Lead: University of Southampton
Duration: 24 months
Partner: University of Cambridge

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Models will be developed that can be applied to open rotor powered aircraft. These will be used to assess the relative merits of a conventional jet aircraft and a number of generic open rotor aircraft suited to typical short haul routes, using standard acoustic metrics for community and cabin noise. A number of flight operation scenarios will be investigated.

The project will improve understanding and deliver practical solutions needed to make open rotor aircraft possible. It will also produce new methods for combining engine noise prediction with flight operations which will be applicable to all aircraft types.

Industry involvement benefits

The project will be informed by real industrial imperatives and shaped by what is technically and commercially feasible. It aims to guide policy to prioritise the introduction of new technologies. Researchers will draw upon longstanding collaborations with industry and other aircraft-interested stakeholders.

Industry and government will be able to apply the results of this project to scope the viability of future aircraft operations from a noise perspective. They will also be able to guide the development of open rotor propulsion to a higher technology readiness level at reduced risk.

Principal investigator: Dr Rod Self
E-mail: rhs@isvr.soton.ac.uk

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