

Working Towards The Novel 'Silent' Aircraft Engine

July 22 2004

"When I started at Rolls-Royce last September, I didn't think I would have the chance to work on a new engine concept." Angel Gallo, graduate trainee, Rolls-Royce.

Researchers from Cambridge University and graduate trainees from Rolls-Royce are currently working together in a quest to explore possible future designs for **a completely new type of aircraft engine.**

Engine manufacturer Rolls-Royce is a partner in the Cambridge-MIT Institute's 'Silent Aircraft' Initiative. This is a unique three-year project, bringing together researchers from Cambridge University and the Massachusetts Institute of Technology with industrial partners, to produce the novel design for a passenger aircraft that will be radically quieter than today's airplanes.

Engine noise is an increasingly acute environmental problem for the civil aviation industry in the UK. As part of its work on the project, Rolls-Royce is currently hosting researchers from Cambridge at its site in Derby, where its civil aerospace business is based. The Cambridge researchers — who earlier this year attended a Rolls-Royce 'noise appreciation' course to improve their understanding — are now working alongside Rolls-Royce graduate trainees. Both are learning how to use GENESIS, a highly sophisticated, multi-million pound design software tool developed by Rolls-Royce. They are hoping it will help them test out potential designs and technologies for a next-generation engine that will be much quieter during take-off and yet highly fuel-efficient when the

aircraft is cruising at high altitude.

Senior project engineer Joe Walsh, who works in the Noise Engineering department at Rolls-Royce, says “We use tools like GENESIS to carry out the preliminary design assessment of new engines, and it contains much of the knowledge we have built up. It helps us to evaluate what the performance, weight and noise characteristics of an engine will be.

Chez Hall, Cambridge University research associate, says: “It’s going to help us explore potential designs for new engines. The Silent Aircraft engine is likely to need a completely new design. Because of this, and because we are really pushing the boundaries and coming up with some bold ideas, we were concerned about how applicable current software, like GENESIS, would be in helping us. But we have been really impressed with it so far.”

In a radical departure from current configurations, it has been decided that in the design for the Silent Aircraft, the engines will not hang below the wings. Nor will they sit in a pod above the rear of the plane — another potential design option. The project team has decided that the engines will be embedded into the body of the aircraft itself to help minimise the engine noise transmitted to the ground.

“The advantages are that this gives us more opportunities to reduce noise, as we integrate the engine with the airframe systems”, says Chez Hall. “By managing airflow over the wing and into the engine, we could have a much more efficient and quieter propulsion system. However, there are also difficulties. If there are losses in the air intake into the engine, there will be a lot of difficulty in ensuring the engine remains stable. But we ran a very thorough study of the pros and cons of embedding the engine into the airframe, and we are convinced that this is the best option.”

The collaboration on this work between Rolls-Royce and Cambridge University is two-way. Rolls-Royce, which undertakes its own research in aircraft engine noise reduction, will be sending several of its graduate trainees to spend a few months working on the project. Already, two trainees have been at Cambridge University for a month, using commercially available software to begin setting objectives for the performance of the engine during cruise. Angel Gallo, a trainee who came to Rolls-Royce after graduating from the University of Bilbao in Spain, says, “When I started at Rolls-Royce last September, I didn’t think I would have the chance to work on a new engine concept. But that is the idea in what we are doing. We are starting with basic engine configurations, and then we’ll be using the design tools to go on and study new configurations that haven’t been tried yet.”

The Cambridge researchers, meanwhile, say they are deriving great benefit from being at Rolls-Royce. “An important part of being here,” says Hall, “is having access to particular experts. People here have a huge amount of relevant knowledge, and we have the opportunity to go and bounce ideas off them and get feedback. It is very important for us to know whether they think our ideas — on fan systems, noise and operability etc — are credible. We are coming up with some very new ideas, and it is very valuable to have experts from a company like Rolls-Royce giving us feedback on the potential problems and advantages.”

Source: [The Cambridge-MIT Institute](#)

Citation: Working Towards The Novel 'Silent' Aircraft Engine (2004, July 22) retrieved 25 April 2024 from <https://phys.org/news/2004-07-silent-aircraft.html>

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