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Eye-catching innovation in jet engine technology

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2023 published patents show interesting and remarkable innovations from jet engine manufacturers, with considerable emphasis on the challenges of greater efficiency and reduced environmental impact. In this first of a series of short blog posts, I cover an elegant innovation from General Electric (GE), which might be the key to unlocking the potential of the "open rotor" architecture.

For those unfamiliar with open rotor engines, imagine the normal turbofan jet engine of an airliner, but with a pair (normally) of large contra-rotating rotors not enclosed in the nacelle (engine casing). These contra-rotating rotors replace the fan (the large bladed rotor you normally see at the front of a turbofan engine). Open rotor engines have great efficiency potential by comparison with conventional turbofans, but face challenges associated with complexity, noise and managing "blade-off" failures.

In collaboration with Safran, GE have been giving genuine focus to the open rotor concept for their CFM "Rise" open rotor engine currently under development. A particularly eye-catching development for the "Rise" is to discard the 'traditional' pair of contra-rotating rotors, replacing them with only a single rotor in association with a downstream set of variable outlet guide vanes. The variable outlet guide vanes do not spin, but each vane is rotatable in its position (about a radial axis) to allow improved management of the wake from the upstream spinning rotor. This is said to offer important benefits in terms of noise reduction and use of a simpler gearbox, whilst continuing to provide the efficiency benefits associated with open rotor.

The single rotor and outlet guide vane combination seems like an important innovation, which made me wonder if CFM had managed to patent the technology to secure a monopoly. Searching revealed a GE patent application (EP4180644A1) published in May 2023, apparently directed at this technology for use in mitigating noise. Corresponding applications also exist in the US and China. All applications are still very much at the application stage and novelty objections have been raised in the US and Europe at least. However, this is not unusual and often objections can be overcome with suitable arguments/adjustments to proposed scope of protection. Additionally, there seem to be earlier GE patent families concerning this concept.

If GE can monopolise this technology via its patent applications, it feels that it would offer them a significant competitive advantage. Further, given that this appears to have been a GE innovation, Safran may see the CFM joint venture as correspondingly enhanced in importance in order that they maintain freedom to operate with this open rotor technology.

This article was prepared by HGF Patent Director John Hawtree