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Abstract ;
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Advanced Hybrid-Electric Propulsion Systems and Integration in Airliner

Author

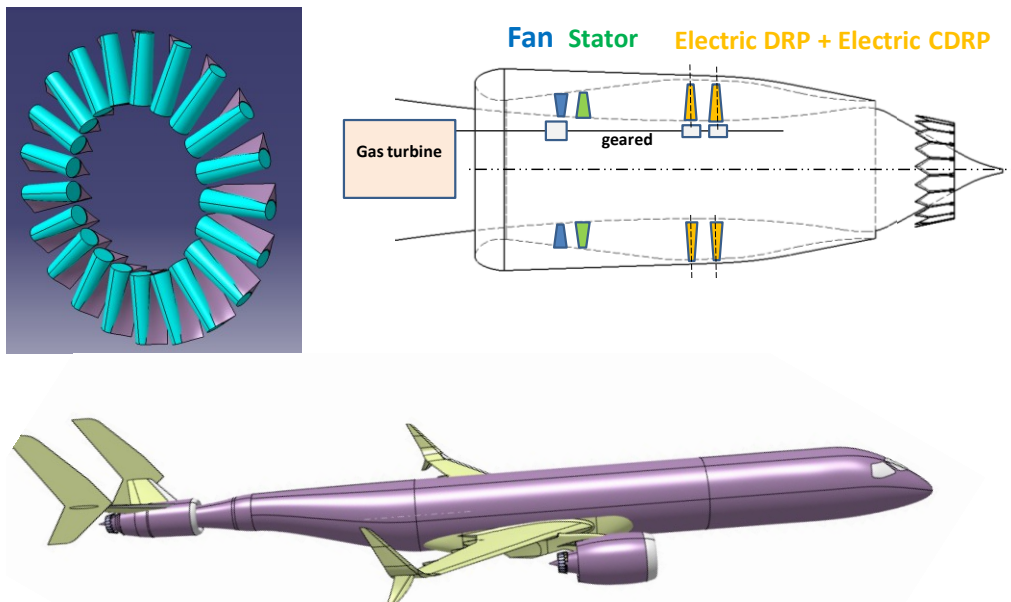
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Abstract

There are electric or hybrid-electric propulsion systems known, which use magnus-rotors - and the integration of these systems in commercial passenger aircraft. These magnus-rotors are also called Flettner rotor, and can be preferably be driven (rotated) electrically. Originally they have been used for ship propulsion. With combination of conventional combustion propulsion systems in aircraft they make up hybrid-electrical propulsion systems.



Hybrid-Electric propulsion system with Electric Flettner Rotors integrated in two rotors in an aft propulsor of a single-aisle aircraft

Such embodiments of hybrid electric propulsion systems have been already shown, integrated on single-aisle aircraft, in an ducted- aft propulsor with boundary layer ingestion. This system so far, realized in an un-optimized manner- showed up fuel savings in the scope of minus 45% compared to conventional thrust, generated in state-of-the-art turbofan aircraft engines.

Advanced Conventional aft propulsors with boundary layer ingestion, but without magnus rotors, which were e.g. treated in the Sugar Research Project of Boeing and in various interdisciplinary research collaborations like DisPURSUAL or Centreline have only shown for the aft propulsors fuel savings up to minus 36% [1], compared to present thrust generation.

Aft propulsors in general, encircling the fuselage, with boundary ingestion are generally quite unusual for airliners, like passenger aircraft, so far, and appear complex in integration.

In the scope of these research contribution it should be figured out how these flettner rotors (or magnus rotors) can be integrated in today's or future turbofan and geared turbofan engines for airliners, - to make up a hybrid-electric propulsion system for aircraft propulsion.

Several variants (architectures) for integration of these electric flettner rotors as propulsors are shown and discussed.

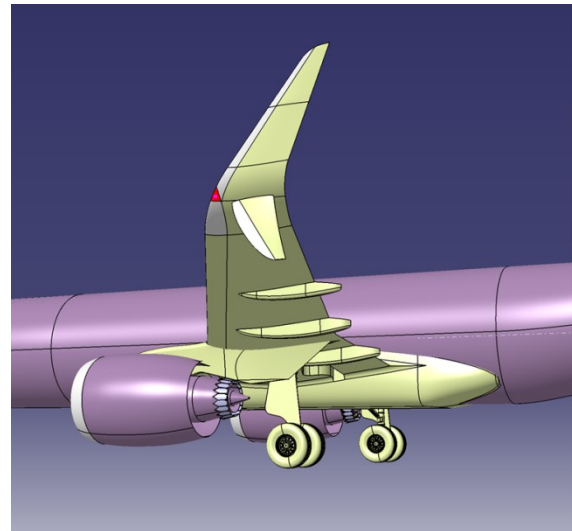
Finally these modified engines are shown on a future single-aisle aircraft with estimation of fuel savings and overall efficiency on aircraft level.

References

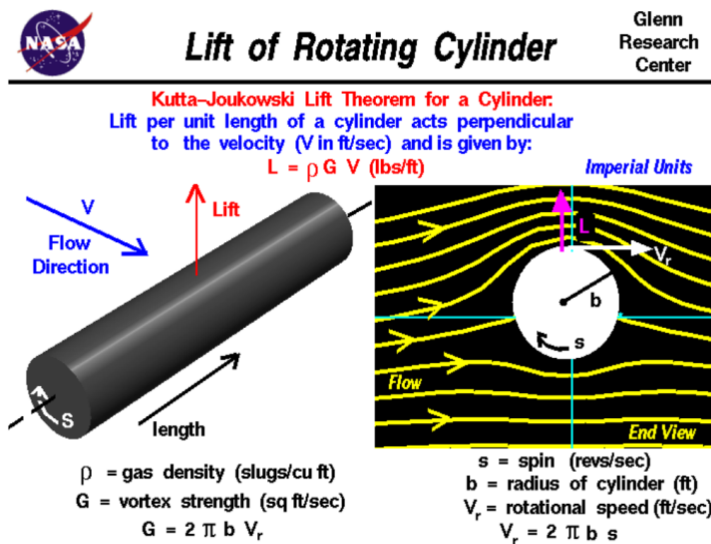
[1] Bauhaus Luftfahrt Jahresberichte

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Aim is the integration of these propulsion systems in turbofan engines



Force generation e.g. (lift) by magnus rotor, also called flettner rotor