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CFM RISE PROJECT: A STEP TO A CARBON-FREE ATMOSPHERE

Reasons for the Creation of the RISE Program

The aviation industry is under increasing pressure to reduce its environmental impact, with global targets aiming for net-zero carbon emissions by 2050. Aircraft engines contribute significantly to greenhouse gas emissions, making it critical to develop next-generation propulsion technologies. The CFM RISE (Revolutionary Innovation for Sustainable Engines) program, launched by GE Aerospace and Safran Aircraft Engines in

2021, aims to tackle these challenges by developing highly efficient propulsion systems. The initiative focuses on open fan architectures, hybrid electric technologies, and compatibility with sustainable aviation fuels (SAF) and hydrogen [1; 4; 5].

Open Fan Architecture

The RISE program's centerpiece is its innovative open fan design, which departs from conventional turbofan engines by removing the nacelle (outer casing). This allows for a bypass ratio over five times greater than current turbofans, significantly enhancing propulsive efficiency. The fan has lightweight carbon-fiber composite blades to reduce weight and improve structural durability [2, p. 5-6; 3].



Advanced Compact Engine Core

The engine features a more compact core with ceramic matrix composites (CMCs), which can withstand temperatures higher than those tolerated by traditional nickel-based superalloys. This enables greater thermal efficiency and lower fuel consumption. Additive manufacturing (3D printing) is also used for critical components, reducing weight and improving performance [2, p. 7; 3].

Hybrid Electric Integration

One of the most forward-thinking aspects of the RISE program is its hybrid electric capability. By integrating an electric motor within the propulsion system, the engine can optimize power output and recover energy during various flight phases, further reducing fuel burn and emissions.

Alternative Fuel Compatibility

The RISE engine is being developed to run on 100% SAF, which can reduce lifecycle CO₂ emissions by up to 80%. Additionally, the engine is designed to be hydrogen-compatible, offering a pathway toward zero-carbon combustion [2, p. 9; 3; 5].

Expected Effects on the Aviation Industry and the World:

1. Environmental Benefits: A 20% reduction in fuel consumption and CO₂ emissions will contribute to the aviation industry's efforts to achieve carbon neutrality. The transition to SAF and hydrogen will further minimize the ecological footprint of air travel;

2. Economic Advantages: Airlines will benefit from lower fuel consumption, reducing operational costs [5].

REFERENCES

1. RISE: Revolutionary innovation for sustainable engines [Electronic resource]. – Access mode: <https://www.cfmaeroengines.com/rise/> (accessed: 2025.01.23). – Title from the monitor.

2. CFM RISE program: Revolutionary innovation for sustainable engines [Electronic resource]. – 17 p. – Access mode: <https://www.cfmaeroengines.com/wp->

content/uploads/2021/07/CFM_RISE_Whitepaper_Media.pdf/ (accessed: 2025.02.24). – Title from the monitor.

3. Delling D. 5 things to know about CFM RISE Program [Electronic resource] / D. Delling. – Access mode: <https://www.geaerospace.com/news/articles/5-things-know-about-cfm-rise-program/> (accessed: 2025.02.25). – Title from the monitor.

4. Webinar: CFM's RISE program: questions/answers [Electronic resource]. – Access mode: <https://aviationweek.com/knowledge-center/webinar-cfms-rise-program-answering-your-questions/> (accessed: 2025.02.26). – Title from the monitor.

5. Nehls G. CFM RISE program targets composites, additive manufacturing, and hybrid electric [Electronic resource] / G. Nehls. – Access mode: <https://www.compositesworld.com/news/ge-aviation-safran-launch-advanced-technology-demonstration-program-for-sustainable-engines/> (accessed: 2025.02.27). – Title from the monitor.