Casing Treatment - Recirculation Channel Design Methodology

Optimized casing treatment boosting turbine stall margin with minimal efficiency loss for aviation.

A common way to extend the operating range of compressors in gas turbine engines without impacting efficiency is to use casing treatments to modify the flow field within the compressor. While casing treatments are widely studied, there aren't open resources to facilitate the design of processes that increase stall margin while preserving efficiency. Researchers at Purdue University have developed a design methodology for recirculation channelâ€“type casing treatments through the optimization of pitchwise clocking of the injection and extraction locations of the channel. This enables the minimization of the time duration where the pressure gradient between the extraction and injection points is negative, resulting in adverse flow. This technology can be integrated into existing compressors and turbofan designs would be beneficial to companies designing gas turbine engines.

Advantages

- Significantly improved stall margins

- Minimal impact to efficiency

- Compatible with existing compressor/turbofan geometries

Applications

- Gas Turbine Engines

- Fluid Mechanics

Technology Validation:

This technology has been validated through computational fluid dynamics (CFD) simulations

TRL: 3

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Aerospace & Defense/Hypersonics & Propulsion Systems
Aerospace & Defense/Thermal Management & Combustion Optimization

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