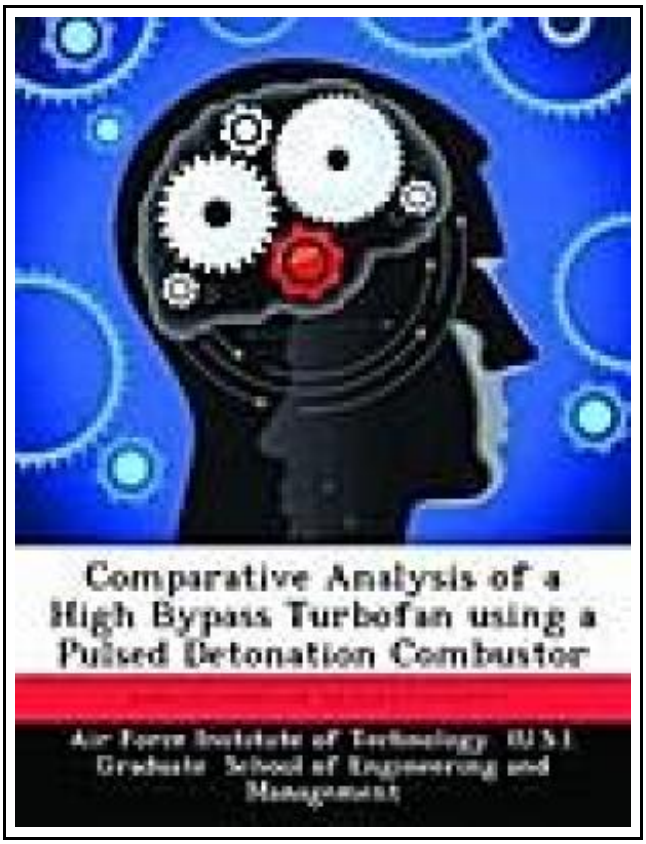
Comparative Analysis of a High Bypass Turbofan using a Pulsed Detonation Combustor



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COMPARATIVE ANALYSIS OF A HIGH BYPASS TURBOFAN USING A PULSED DETONATION COMBUSTOR

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Biblioscholar Sep 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x9 mm. This item is printed on demand - Print on Demand Neuware - It has been proposed that the implementation of a pulsed detonation combustor in a high-bypass turbofan engine would result in an engine that is both more efficient and more reliable. The validity of the performance claims are evaluated based on a comparison between the baseline and hybrid turbofans as modeled in the Numerical Propulsion System Simulation (NPSS). The engine cycle of the baseline high-bypass turbofan is evaluated and compared using both the Aircraft Engine Design System (AEDsys) and NPSS programs. The baseline engine agreed to within 1% on the net thrust calculation and specific fuel consumption between the two programs. Differences are traceable to the variation in specific heat models and to different methods of calculating temperature across the turbine and compressor components. The hybrid pulsed detonation engine model shares a common architecture with the baseline turbofan model. Inlet mass flow and core mass flow are maintained, but the combustor of the baseline engine is replaced with a pulsed detonation combustor for the hybrid engine. The effect of detonation on the core airflow is calculated using a closed form solution of the Chapman-Jouguet Mach number with a total energy correction applied. Cycle time is calculated to provide a reasonable estimate of frequency for the user input geometry. Effects of sub-component design choices within the pulsed detonation combustor are evaluated using simple parametric studies. These studies are used to select an optimal architecture for the combustor. The effects of detonation are accounted for by applying pressure and temperature losses to the fluid exiting the combustor. A parametric study was performed to demonstrate what level of loss continues to yield a more efficient engine. Results show improvement in thrust specific...

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