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变循环发动机部件级建模技术

Component-level modeling technology for variable cycle engine

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中文摘要:

以双外涵变循环发动机为研究对象,建立了其整机部件级稳态及动态数学模型,建模过程中考虑了导叶角和导向器面积变化对压气机和涡轮部件特性的影响,考虑了模式选择活门面积变化对副外涵进口空气流量的影响,所建立的模型能够执行变循环发动机2种典型工作模式:稳态及模式切换过渡态仿真,仿真结果表明:随着模式选择活门逐渐关闭,前段风扇喘振裕度显著减小;双涵工作模式下发动机耗油率低,适用于亚声速巡航飞行;单涵工作模式下发动机单位推力高,适用于超声速巡航飞行。

英文摘要:

A steady and transient component-level mathematical model of a double bypass variable cycle engine (DBVCE) was constructed considering the effects of variable inlet guide vane and variable turbine nozzle area on component characteristics of compressor and turbine. Besides, the effects of the mode selector valve area on deputy bypass inlet air flow were also considered during the modeling process of DBVCE; two typical operation modes such as steady state and mode switching transient process were simulated. Results show that as the mode selector valve closes down, the surge margin of front fan block decreases obviously. When working in double bypass mode, the specific fuel consumption of DBVCE is lower, which is fit for subsonic cruise flight; otherwise, the specific thrust is higher in single bypass mode, which is fit for supersonic cruise flight.

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