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基于高压涡轮叶片寿命损耗的航空发动机功率控制

Aero-engine power control based on life consumption of high pressure turbine blade

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中文摘要:

提出了基于高压涡轮(HPT)叶片寿命损耗计算的功率控制策略.通过飞机和发动机模型在不同环境条件下进行飞行任务仿真,得到推力需求及HPT叶片温度等参数,采用逆向工程方法进行HPT叶片寿命损耗计算.结果表明:在满足推力需求的同时,采用降低HPT叶片温度的控制策略能明显减少在不同环境条件下HPT叶片寿命损耗.通过不断调整发动机高压涡轮环境温度使之工作在推力需求基线附近,达到了有效延长发动机寿命的目的,验证了高压涡轮叶片寿命损耗计算方法简单可行.表明基于HPT叶片寿命损耗的发动机功率控制降低发动机寿命周期成本的有效性.

英文摘要:

Engine rating control strategy based on the life consumption of high pressure turbine (HPT) blade was put forward. The thrust requirement temperatures of HPT blade in various environments were obtained by flight mission simulation using aircraft and engine models. Reverse engineering method was used to calculate the life consumption of HPT blade. Results show that the control strategy of reducing HPT blade' temperature can significantly cut down the life consumption of HPT blade in various conditions while meeting the thrust requirement. It verifies that the life consumption calculation method of HPT blade is simple and feasible. By continuously adjusting the engine HPT environment temperature approaching the thrust requirements baseline, the service life of the engine could be effectively extended. Results state that the engine rating control based on the life consumption of HPT blade is effective to reduce the engine life cycle cost, playing a significant role for civil aviation engine control and operation.

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