OVERVIEW OF FLIGHT TESTING OF GE AIRCRAFT ENGINES' UDF® ENGINE

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ABSTRACT

This paper provides a brief overview of the results of the two flight test programs completed on GE Aircraft Engines' UDF® "Proof of Concept" demonstrator engine. This is a revolutionary engine featuring directly driven (i.e., no gearbox) counter-rotating, ultra high bypass, variable pitch, unducted fans. With a propulsive efficiency in the mid-90's at subsonic speeds equivalent to current turbofan powered aircraft, this engine provides the next major breakthrough in fuel efficiency for commercial and military subsonic transports. Flight testing in a modified Boeing 727 and McDonnell Douglas MD-80 successfully checked out the engine and associated aircraft characteristics with respect to operability, performance and acoustic signatures. The capability of projecting installed altitude flight performance and acoustic characteristics from scale model windtunnel and full scale sea level bench testing was also confirmed. Future potential commercial and military applications for a product UDF® engine and planned test activity for the demonstrator engines and wind tunnel models are presented.

INTRODUCTION

The completion of the second flight test phase on an MD-80 aircraft, which followed testing on a Boeing 727, marks an important milestone in the demonstration and development of the unique UDF® engine concept. This "proof of concept" program was launched just over four years ago, with NASA Lewis participation, with the major objectives of demonstration and validation of:

o Performance - demonstration of high propulsive efficiency levels in the 90's, as illustrated in Figure 1, at high subsonic Mach numbers (.75-.85 range). This would translate into the installed benefits shown typically for commercial application in Figure 2 and for military applications would provide enhancement of payload/range, time-on-station, and endurance capability.

o Acoustic Signature - demonstrate that without an acoustically attenuated duct around the fan, the community noise levels and internal cabin noise levels of such an unducted fan configuration would be acceptable and certifiable. This is the issue which perhaps was of greatest concern to the industry prior to the start of the program.

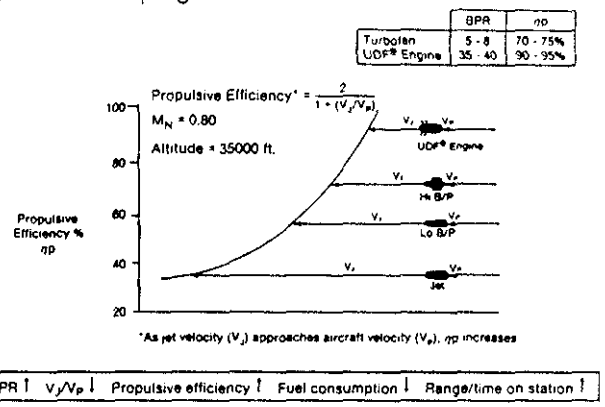

Figure 1. The Propfan Cycle Advantage

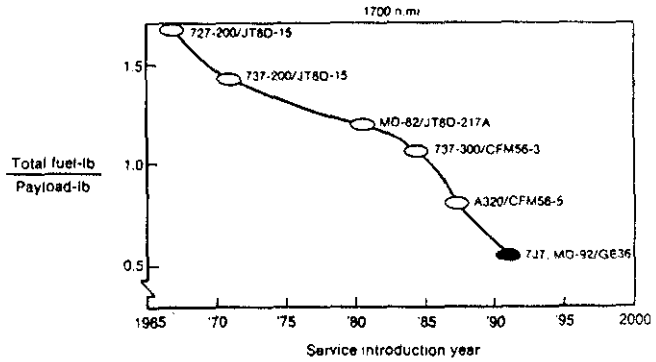

Figure 2. Fuel Efficiency Trends - Commercial Applications

o Operability - demonstrate that such an engine could be operated throughout the flight envelope with the same facility and confidence as a conventional turbofan engine.