Development and Design of a Test Bed for Thermal and Hydraulic Analysis of Complex Aerodynamic Systems

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General Dynamics developed the one of the most renowned multi-role fighter aircraft, the F-16C Fighting Falcon, for the military in 1976. The overall goal of this senior design project is to fully fabricate a radio-controlled 1/6 scale model of the F-16C powered by a mini-gas turbine engine. The first phase encompassed designing a test stand for the engine in order to determine its thrust and exhaust gas temperature at various engine speeds. The thrust is measured using an S-shaped load cell operated using Labview. A computer software created by FADEC is utilized for the engine testing to obtain the temperature and rpm. The second phase includes the virtual simulation of the scale model using ANSYS Fluent Solver with verifications from wind tunnel testing conducted by both the students and NASA. This simulation models the F-16C in a cruise configuration and can be used to determine lift and drag of the aircraft at various angles of attack. The actual fabrication of the project requires significant forethought and time which includes installing several systems such as the electrical, fuel, and pneumatic systems. Ultimately, this project aims to expand the capabilities of the VMI ME Department by creating the test bed for several future research projects using the F-16C.