

The AFRL ICF Generic Gas Turbine Engine Model

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Abstract - This paper describes the generic Intelligent Controls Facility (ICF) engine model representing the thermodynamics of a 2-spool high bypass turbine engine, with a multi-function controller. This model is intended for use in the Air Force Research Laboratory (AFRL) ICF, where it forms the foundation for interchangeability of simulated and actual controllers, actuators and mechanical and electrical devices in a “Hardware-in-the-Loop” setup. The engine portion of the model incorporates standard thermodynamics so that it can duplicate the station temperatures and pressures for cycles represented by performance programs (“customer decks”) and can directly utilize the “Design Point” output of the NASA GRC NPSS program. The generic controller uses integral-proportional controls, with integral gains, proportional gains, delays, holds and transport times.

The authors posit that a real time model (using the dSpace tool set) can produce the interaction expected among engine, controller, sensors and actuators, so that any one of these simulated components can be replaced with the hardware that it represents without impact on the results. A goal is to use the ICF facility for V&V testing of actuators, controllers and life-extending algorithms.