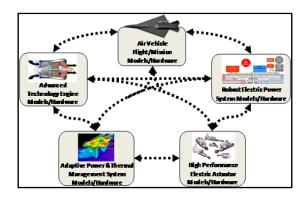# Modeling, Simulation, Analysis, & Test (MSAT) Laboratory

Description:

The Modeling, Simulation, Analysis, & Test (MSAT) Laboratory enables the analysis of integrated aircraft systems. Methods include off-line integrated modeling and simulation of dynamical systems using co-simulation techniques such as Distributed Heterogeneous Simulation and real-time integrated testing using plant and controller Hardware-In-the-Loop (HIL). For HIL research, a combination of real-time simulators, hardware emulators, and actual hardware components are brought together to form an interconnected system. Using this approach, the transient interactions between components can be captured in a closed-loop system test.

The following are some of the resources that enable such valuable research:

- 48-core simulation cluster
- Three real-time simulators
- Real-time turbine engine emulation
- Three 350 hp drivestands
- Two 440 hp four-quadrant direct drive drivestands capable of speeds up to 32,000 rpm
- Linear and rotary actuator load frames
- Advanced Load Emulator
- Bi-directional power supplies
- Data acquisition system
- Multiple simulation platforms:
    - Matlab/Simulink
    - NI Labview/Veristand
    - AMESim
    - NPSS

Purpose:

The objectives of the MSAT laboratory are to:

(1) Develop techniques, tools, and processes to enable HIL testing using a combination of hardware and simulated components
(2) Conduct HIL experiments for technology risk reduction
(3) Employ Verification & Validation (V&V) techniques to build confidence in HIL test results.

Products:

The MSAT Laboratory showcases a variety of one-of-a-kind technologies aimed at improving aerospace vehicle system integration. The MSAT Lab has the ability to develop a dynamical model, implement that model using Distributed Heterogeneous Simulation, and employ the model to drive actual or emulated hardware in a simulation loop. The MSAT Lab can also provide the capability to conduct a V&V of hardware/models.

Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-6236.