Jet Exit Test Facility

NASA Langley Research Center

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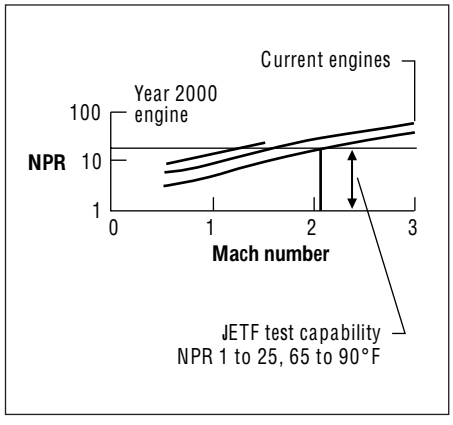
Wind Tunnel
ENTERPRISE
NASA Langley Research Center

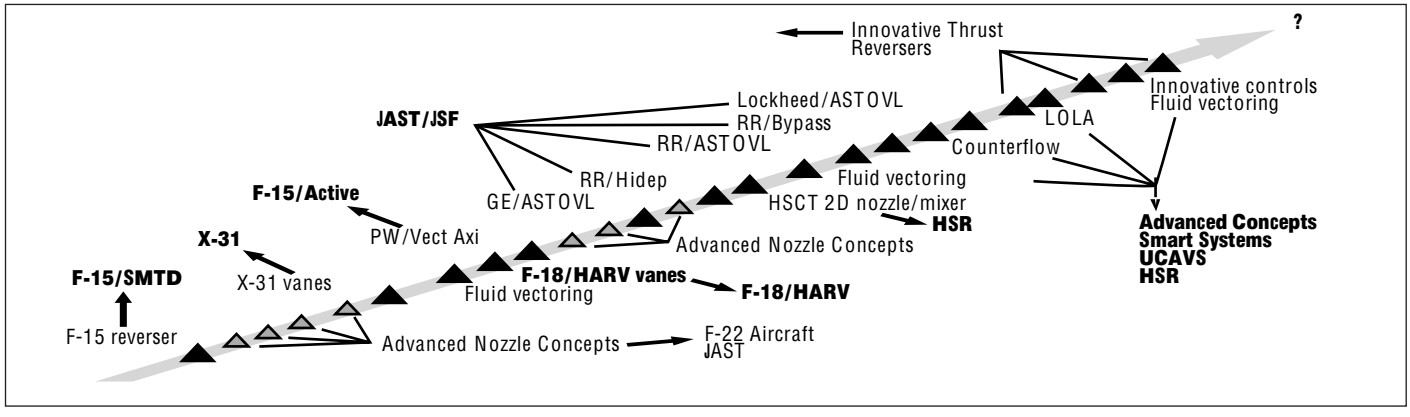
The Langley Jet Exit Test Facility (JETF) is a ground test stand consisting of a dual-flow test apparatus connected to two separate heated air supply systems. Exhaust flow of a nozzle configuration mounted on the test apparatus discharges to atmosphere inside the building and then vents through two mufflers on the roof.

Nozzle mass-flow rates (maximum of 15 and 25 lbm per sec) are measured using critical-flow venturi meters. Nozzle axial thrust up to 1200 lb is measured using a strain gage force and moment balance. Nozzles can be tested over a range of total pressures and temperatures from 15 to 350 psia and 60 to 95 degrees F, providing nozzle pressure ratios up to 25, simulating static conditions for up to Mach 3 flight. A run time of 300 min can be achieved for configurations with primary and secondary nozzle-pressure-ratio sweep combinations.



JETF nozzle pressure ratio (NPR) capability.

Static experimental investigation of counterflow thrust vectoring nozzle concept performed in JETF.



Test conducted in JETF.

Test Techniques

The Jet Exit Test Facility can provide nonintrusive flow-visualization techniques including conventional Schlieren, surface oil or paint flow, gas or fluid injection, and pressure sensitive paint.

Facility Productivity Rates

The average productivity rates for JETF for a given class of wind tunnel test in terms of data points per user occupancy hour (UOH) is

FY97, points/UOH 9.5
FY96, points/UOH 8.4

Type of Testing

The JETF has been used to perform the following tests:

1. Performance testing and calibration of conventional and advanced aircraft propulsion system components.

2. Testing and calibration of nozzles and other components of models to be tested in other wind tunnels and facilities.

3. Exhaust system simulation and performance determination for advanced exhaust system concepts. Such as direct lift devices and thrust reversers, discharge coefficient, thrust efficiency, pitch and yaw thrust vector angles, and reverser effectiveness.

4. Multiple secondary fluidic injection flows (up to 8 flows with 4 separately measured and controlled) for thrust vectoring, expansion control, throat-area control, or other applications.

5. Application of suction to the exhaust system (to lower limit of 8 psia) for thrust vectoring, performance augmentation, or other applications.

6. High-volume dual-flow propulsion simulation for ejector nozzles, combined core and fan exhaust configurations (including reversing of either flow) or other applications.

Instrumentation

Typical instrumentation in the JETF include internal 6-component strain gage balances, thermocouples, flow measurement devices, static pressure transducers, frequency counters, and an electronically scanned pressure (ESP) system. Typical corrections to the balance data are balance interactions and pressure and momentum (flow)tares.

The ESP System provides high accuracy measurement of steady-state model pressures. The system utilizes modules with individual transducers that range from ±5 psi to 250 psi. Online calibrations are performed as required to insure that overall system errors are not greater than 0.25 percent of full scale. Up to 45 independent static pressure transducers and up to 6 dynamic pressure transducers can be connected to the model.

Test Request Procedures

The first step of the test process is to submit a test request form. The form can be filled out electronically or printed for mailing at the Wind Tunnel Enterprise site. A posttest questionnaire is also available at this site.

The URL is http://wte.larc.nasa.gov
Our customers are encouraged to provide feedback to the facility for our continuous improvement process.

Safety and Design Criteria

Langley's LHB 1710.15 *Wind Tunnel Model System Criteria* is the guideline for model design and fabrication. Model installation and any exceptions to this document must have the approval of the JETF Safety Head on a case-by-case basis to assure personnel and facility hardware are not exposed to risk.

This document is available on the Wind Tunnel Enterprise web site at URL http://wte.larc.nasa.gov

High-Pressure Capability

Two individually controlled high-pressure (1800 psi) air lines are available for connection to model components. The first is capable of providing mass-flow rates up to 15 lbm per sec and the second is capable of 25 lbm per sec. Air is slightly heated to maintain a constant temperature at the model. A pair of multiple critical-flow venturis is used to measure the mass flow rate of the air.

Model Observation

Photographic and video coverage of the test stand is possible. Video images of the test stand can be recorded.

Data Acquisition and Processing

The standard data acquisition system consists of an analog-to-digital converter that is capable of acquiring 95 channels of analog data (up to 1000 Hz) and 100 channels of digital data, and a UNIX computer. A 6-channel dynamic data acquisition system is also available. Final data is reduced on a separate UNIX work-station. For data analysis, the facility provides UNIX and Macintosh computers. Customer supplied computers can be networked to the data reduction system if desired. Secure data links are available for classified projects.

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Operating Hours

The JETF operates
one shift per day
Monday through Friday
Hours 7:30 am - 4:00 pm

For more information contact

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