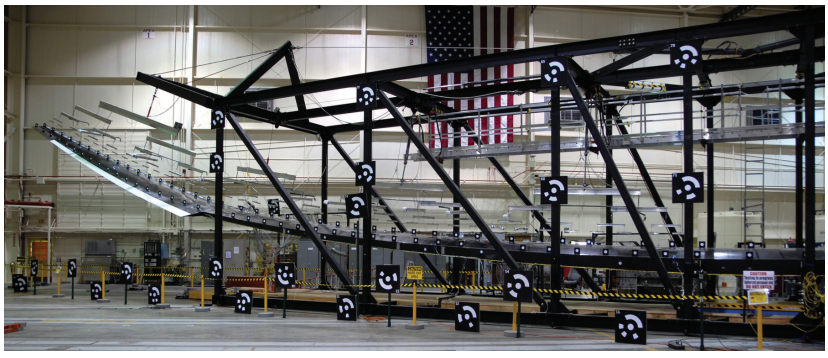
National Aeronautics and Space Administration

NASA'S Aeronautics Test Program

Flight Loads Laboratory

The Flight Loads Laboratory (FLL) was constructed at NASA's Dryden Flight Research Center in 1964 as a unique national laboratory to support flight research and aircraft structures testing. FLL personnel conduct mechanical-load and thermal tests of structural components and complete flight vehicles in addition to performing calibration tests of vehicle instrumentation for real-time determination of flight loads. Mechanical loads and thermal conditions can be applied either separately or simultaneously to simulate combined thermal-mechanical load conditions. FLL personnel also conduct modal survey and structural mode interaction testing to support structures research and assess aircraft for flutter airworthiness.

The FLL's experienced and skilled technical staff provides expertise in ground and flight test design and operations; load, stress, dynamic, and thermal analysis; and instrumentation and measurement systems development. This expertise, coupled with a large array of capital equipment and advanced data acquisition and control systems, make the FLL an ideal laboratory for research and testing of aerospace vehicles and structures flying in the subsonic through hypersonic flight regimes.



Facility Benefits

- Single facility capable of conducting mechanical, thermal, and structural dynamics research and testing.
- Combined thermal, mechanical, and structural dynamics testing allows for study of the effects of these combined conditions.
- Verification of static or dynamic structural performance at realistic flight temperatures.
- Conventional and high-temperature instrumentation for ground and flight testing.
- Fiber optic sensing technology for real-time distributive strain and temperature sensing.
- Photogrammetry system for non-contact strain and deformation measurements.
- Transient thermography for non-destructive evaluation of materials and structures.
- Location allows direct access to Dryden Flight Research Center and Edwards Air Force Base taxiways and runways, including the Rogers Dry Lake.

Facility Applications

- Component and full vehicle testing
- Thermal, mechanical, and structural dynamics testing
- Key projects supported: X-15, X-24, YF-12, Space Shuttle, F-111 AFTI/MAW, X-30, F-15 ACTIVE, X-37, X-38, X-43, Orion Crew Module, F-18 AAW, E-2C Advanced Hawkeye, Global Observer

Facility Characteristics

High-Bay Dimensions	164 ft wide by 120 ft deep by 40 ft high
Mechanical Testing	
Capability	Proof and loads calibration testing of aircraft components and structures
Channels	84 channels of hydraulic load control
Loading equipment	Actuators and load cells for loads up to 300 000 lbf, load frames (220k, 100k, 25k lbf)
Thermal Testing	
Capability	Large-scale air and inert atmosphere testing
Channels	264 channels of independent model-free adaptive control
Temperature range	-320 to >3000°F
Heating systems	Quartz lamp and graphite heating
Support systems	Large nitrogen atmosphere test chamber, 4000 gal liquid nitrogen supply, thermal-spray systems
Structural Dynamics Testing	
Capability	Modal survey and structural mode interaction testing
Systems	Portable data acquisition with 336 channels
Soft support	Self-jacking system (60k lb), overhead suspension systems (up to 14k lb)
Sensors	Room- and high-temperature, seismic and low frequency accelerometers
Data Acquisition and Monitoring Systems	
Data acquisition	1920 data channels (expandable)
Fiber optic data acquisition	Distributive strain/ temperature systems with 10's of thousand sensors at sample rates up to 100 sps
Data display	Interactive Analysis and Display System (IADS)
Video	Networked video system
Communication	Wireless communication

Contact Information

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