FAA's Full-Scale Aircraft Structural Test Evaluation and Research (FASTER) Facility

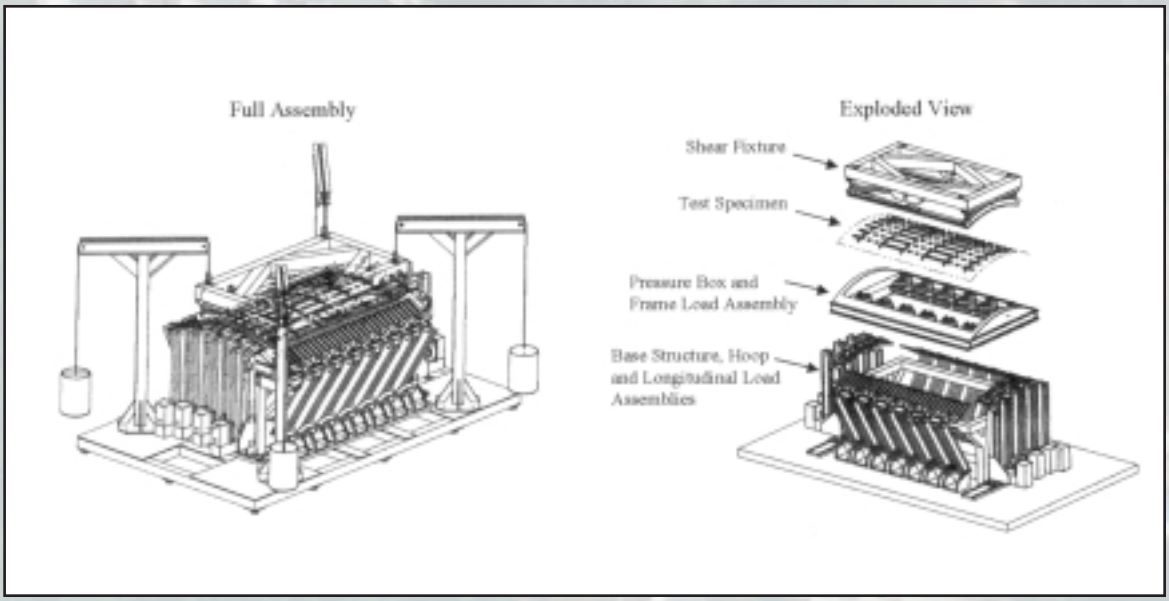
Completed in 1998, the Full-Scale Aircraft Structural Test Evaluation and Research (FASTER) facility, Building 211, located in the Safety Research and Development area of the FAA William J. Hughes Technical Center, is capable of testing full-scale curved-panel specimens under conditions representative of those seen by an aircraft in actual operation.

The data obtained from the tests will be used to support and validate analytical models being developed by the FAA to predict the residual strength of fuselage structure in the presence of multiple-site cracking.

The test system was developed under contract with the Boeing Company, Long Beach, CA, and features a unique adaptation of mechanical, fluid, and electronic components capable of applying pressurization, longitudinal, hoop, and shear loads to a curved-panel test specimen.

The internal pressure is applied using water as media, eliminating the possibility of a catastrophic accident. The system is capable of dynamically cycling the internal pressure as well as performing a static pressurization to levels above flight gradients.

The hoop and longitudinal stresses are simulated by the controlled application of distributed loads around the perimeter of the test panel. Hoop forces are distributed by individual loading linkages using a two-tier coaxial whiffle tree assembly which generates four equal forces from each



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controlled load point. A total of seven load assemblies are used on each side of the specimen, creating a total of 28 attachment points. Longitudinal forces are created using similar loading devices on each end of the panel, consisting of four load control assemblies and 16 attachment points. Similar devices are available to apply bending and tension loads at each end of a frame.

An innovative shear loading system was developed that uses two load distribution points in the longitudinal direction at the edges of the specimen. The force is applied as a couple and is reacted by a couple in the hoop direction. A unique feature of the shear loading system is the elastomeric coupling between the loading mechanisms and the test specimen. The elastomer, which has a soft shear modulus, creates a close approximation to uniform shear distribution in both the applied and reacted couples.

All forces are generated using water as the fluid medium. The external loads are generated by applying water pressure to bladder type actuators, which are controlled by pressure activated dome valves. The dome valves are automatically controlled by the use of electro/pneumatic control valves. The valves are driven by a computer control system in a closed-loop configuration.

A graphical interface allows the operator to control the loads, speed, and type of test desired. Data acquisition from strain transducers, load transducers, pressure transducers, etc., are displayed on color monitors in real time, as well as stored for off-line analysis. A remote control crack monitoring (RCCM) video system is integrated with the FASTER fixture to track and record crack propagation and measure

crack opening during the testing of the curved panels. The RCCM system automatically tracks and records the crack growth and has the capability to view the entire test panel or to zoom to the narrow field of view required to observe the crack tip behavior.

To find out more about the FASTER facility, contact:

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