# NASA Facts

National Aeronautics and
Space Administration

**Langley Research Center**
Hampton, Virginia 23681-0001

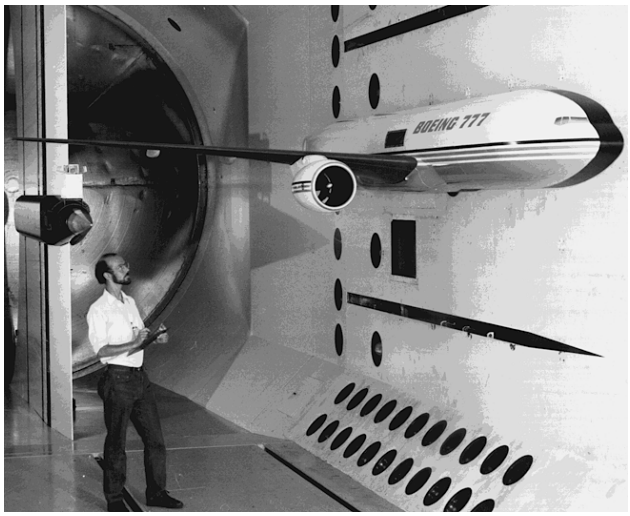
May 1996 FS-1996-05-01-LaRC

# Triumph of Technology:
## NASA Contributions to the Boeing 777

Basic and applied research performed at NASA's four research centers contributed significantly to technology applications for Boeing 777's design concepts. According to Boeing Co. estimates, the 777 fleet has captured three-quarters of the market for airplanes in its class, further strengthening this country's positive balance of trade in aeronautics.

The precedent-setting 777 was designed for medium- to long-range passenger flights and is the largest twin-engine jet to be manu-

**The B-777 airframe incorporates durable lightweight composite aircraft structures, including graphite-epoxy floor beams, flaps and tail assembly.**




**Wind tunnel tests confirming the structural integrity of 777 wing/airframe integration were conducted in the NASA Langley Transonic Dynamics Tunnel.**

factured. Its first passenger-carrying flights were conducted by United Airlines in May of 1995.

NASA Langley-developed analytical technologies and facilities used by Boeing in its product development work included:

- fundamental mathematical procedures for computer-generated airflow images which enabled advanced computer-based aerodynamic analysis.

- wind tunnel testing for flutter and vibrational characteristics of wing structure (for which Boeing directly reimbursed NASA).

- knowledge of how to reduce engine and other noise for passengers and terminal area residents.

Radial tires like those used on the 777 recently underwent strength and durability testing at Langley's Aircraft Landing Dynamics Facility.

NASA Langley can claim credit for advances that led to the aircraft's:

- modern glass cockpit, a system that uses computer technology to integrate information and display it on monitors in easy-to-use formats

- digital data system, an easily reconfigurable computer network that allows an aircraft's computers to communicate with each other

- "fly-by-wire" system for control of wing and tail surfaces, replacing bulkier and heavier hydraulic control systems

- increased use of lightweight aerospace composite structures for increased fuel efficiency and range

The 777's aerodynamically-efficient wing cross-section concept evolved from many years of analytical and wind tunnel work performed as part of NASA's aeronautical research program.

Other NASA centers that contributed to fundamental research and technologies adopted for the 777 include Ames, Dryden and Lewis.

Taken as a whole, these advances contribute to airline profit margins and passenger service, savings and safety.

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