Fact Sheet

National Aeronautics and
Space Administration

Langley Research Center
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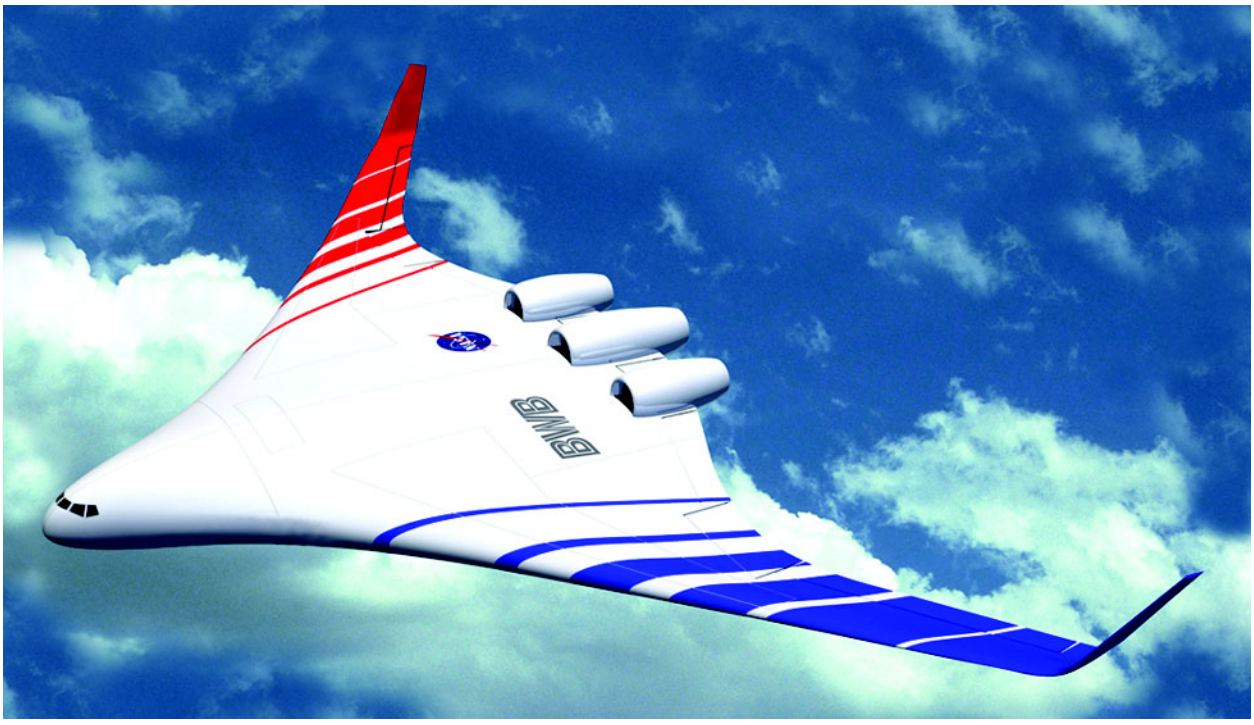
Blended Wing Body—A potential new aircraft design

NASA and its industry partners are investigating a blended wing aircraft concept for potential use as a future air transport for both civilian and military applications. The concept is called the blended wing body (BWB). The BWB is a hybrid shape that resembles a flying wing, but also incorporates features from conventional transport aircraft. This combination offers several advantages over conventional tube-and-wing airframes. The BWB airframe merges efficient high-lift wings with a wide airfoil-shaped body, allowing the entire aircraft to generate lift and minimize drag. This shape helps to increase fuel economy and creates larger payload (cargo or passenger) areas in the center body portion of the aircraft.

The basic concept for a blended wing body was first developed decades ago and variations of it have been used in the famous B-2 bomber (a blended wing) and the lesser-known YB-49 (a pure flying wing from the 1940's). Like the B-2, the BWB design uses composite materials that are stronger and lighter than conventional metal construction. The BWB also has several control surfaces on the trailing edge, like the B-2, instead of the conventional tail assembly.



Artist concept of one version of the blended wing body aircraft.

The BWB shape allows unique interior designs. Cargo can be loaded or passengers can board from the front or rear of the aircraft. The cargo or passenger area is distributed across the wide fuselage, providing a large usable volume. For passengers in the interior of the craft, real-time video at every seat would take the place of window seats.

NASA and industry studies suggest that a large commercial BWB aircraft could be developed. Because of its efficient configuration, the BWB would consume over 20 percent less fuel than a comparable conventional aircraft flying at high subsonic cruise speeds over a 7,000 nautical-mile range. An aircraft of this type would have a wingspan slightly greater than a Boeing 747 and could operate from existing airport terminals. The BWB would also weigh less, generate less noise and emissions, and cost less to operate than an equally advanced conventional transport aircraft.

NASA BWB Research

NASA is studying the flying characteristics of the BWB. Because it is a configuration that has only been used in military missions, there are a number of critical questions that researchers must address before a BWB can be commercially certified. The primary goals of the research are to study the flight and handling characteristics of the BWB design, match the vehicle's performance with engineering predictions based on computer and wind tunnel studies, develop and evaluate digital flight controls, and assess the integration of the propulsion system to the airframe. Future research must also address the wide, flat pressurized payload bay of the BWB.

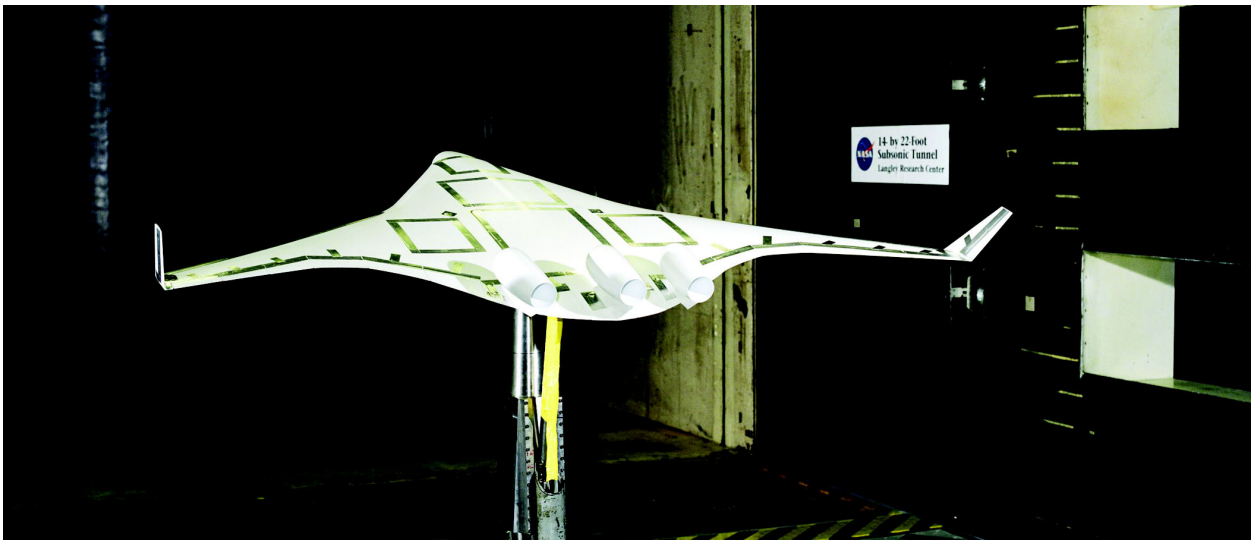
Over the past several years, wind tunnel and free-flight model tests have been conducted to study particular aerodynamic characteristics of the BWB design. At the NASA Langley Research Center in Hampton, Virginia, researchers tested five wind tunnel models of three versions of the BWB to evaluate the concept's aerodynamic, noise, stability and control, and spin and tumble characteristics. Data obtained during these tests were used to develop computer performance models and flight control laws. The researchers will incorporate all wind tunnel (and later flight) data into simulations of a full-scale BWB to evaluate the flying characteristics.

Research and Test Team

The NASA BWB Project is managed by Langley Research Center.

The BWB shape, called the outer mold line, was developed by The Boeing Phantom Works of Huntington Beach, California.

The Langley Full Scale Tunnel operated by Old Dominion University will be used for free-flight model tests of the BWB.



A scale model of an early blended wing body design was tested in one of the NASA Langley wind tunnels.