National Aeronautics and Space Administration

technology solution

Aeronautics

Variable Geometry Aircraft Wing Supported By Struts and/or Trusses

Fuel-Efficient, Airport-Friendly, Multi-Speed Transport Aircraft Configuration with Novel Structural Approach

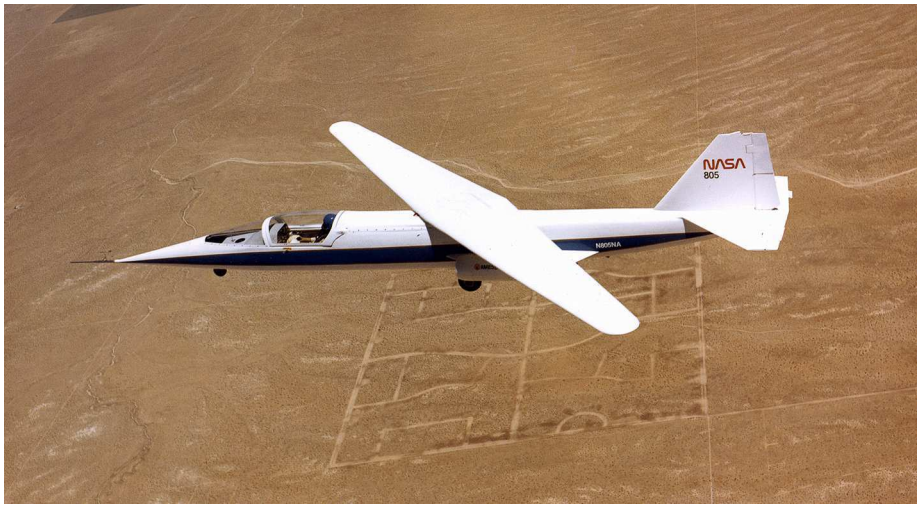
NASA has patented a new technology for an aircraft configuration that utilizes a strut/truss-braced oblique variable-sweep wing mounted on a constant cross-section geometry fuselage. In practice, the wing would start in a position closely aligned with the fuselage. This allows the aircraft to easily maneuver within the terminal/ramp area, and promotes higher density terminal operations. During the runup/checkout before takeoff, the wing would be rotated to the unswept position for increased climb performance. Once airborne, the wing would be pivoted to the sweep angle that provides the best aerodynamic performance and noise abatement at the current speed. During cruise, both speed and sweep angles could be adjusted accordingly. Before final approach, the wing would again be rotated to the perpendicular position in order to improve the aircraft's low-speed performance. As the aircraft departs the runway for the taxiway, the wing would be rotated again to align with the fuselage, greatly reducing the possibility of collisions during taxiing.

BENEFITS

- Reduced noise during takeoff and landing
- Weight penalty can be substantially reduced by using the strut/truss brace
- Simplified lightweight high-lift (flap) systems
- Approach and landing speeds would be greatly reduced
- Improved aerodynamic performance
- Reduces the possibility of collision during taxiing and improving gate access
- Flexibility in cruise speed operations

THE TECHNOLOGY

This innovation utilizes a strut/truss-braced oblique variable-sweep wing mounted on a constant cross-section geometry fuselage. The combination of the strut/truss-bracing with the oblique wing greatly reduces the structural and weight penalties previously associated with unbraced oblique wing configurations while maintaining the oblique wings improved aerodynamic performance. Strut/truss bracing helps to further reduce the wing weight, and can be used to automatically align wing-mounted engines with the oncoming flow. The synergistic combination of these design elements provides the aircraft with a wide and efficient cruise speed range when the wing is at intermediate sweep positions, and superior low speed performance when the wing is unswept. The wing could remain aligned during taxiing, reducing the chance of collisions with other taxiing aircraft. This wide speed envelope provides future air traffic systems with additional flexibility when scheduling efficient arrivals and departures. The improved climb performance of the straight wing reduces the neighborhood noise footprint of the aircraft as it departs the airport. Efficient aircraft designs are increasingly desired in order to support the continued growth of the air transportation industry. Continued expansion of this vital mode of transportation is threatened by ever-increasing challenges in emissions, noise, and fuel efficiency.



NASA's AD-1 Oblique Wing in Flight

APPLICATIONS

The technology has several potential applications:

- Aerospace Engineering
- Systems Engineering
- Unmanned Aerial Vehicles (UAV)
- Aircraft
- Manufacturing

PUBLICATIONS

Patent Pending

More Information

National Aeronautics and Space Administration

Technology Partnerships Office

Ames Research Center

MS 202A-3
Moffett Field, CA 94035
855-627-2249
ARC-TechTransfer@mail.nasa.gov

http://technology.nasa.gov/

www.nasa.gov

NP-2015-05-1816-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

ARC-16752-1