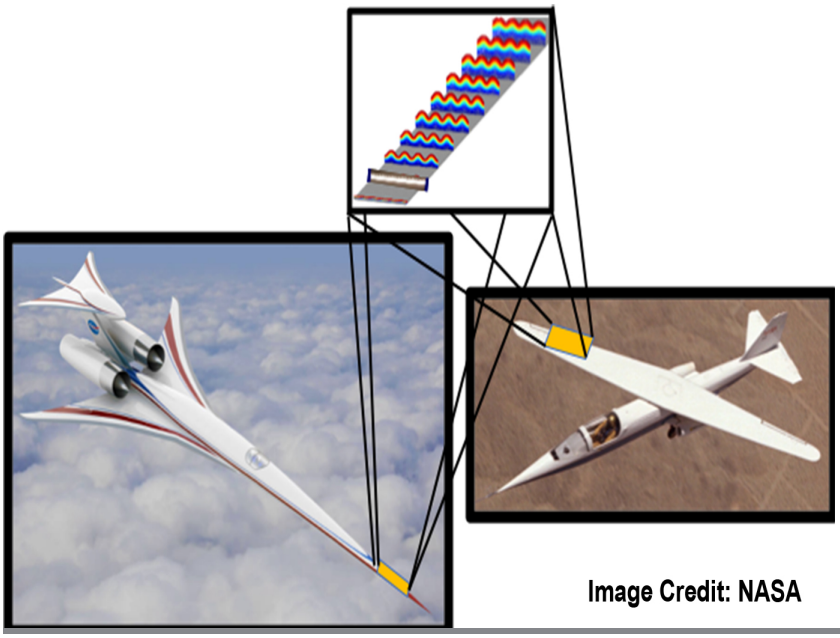


Image Credit: NASA

National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Aerospace

Supersonic Laminar Flow Control

Controls laminar flow over all major components of the airframe

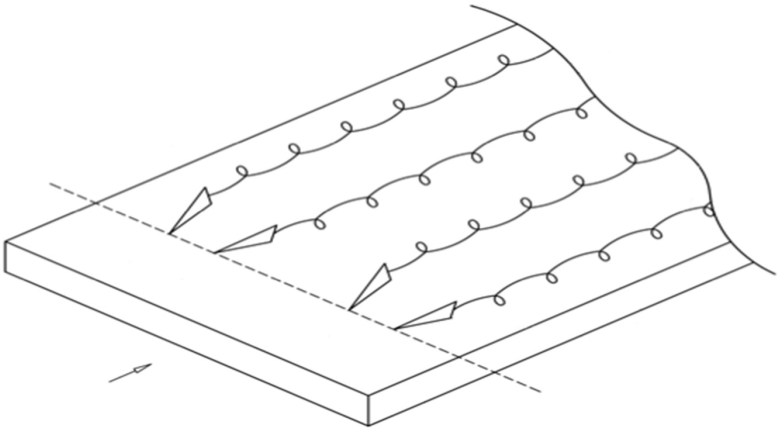
NASA's Langley Research Center has developed a technology that is projected to extend the laminar flow area over supersonic flight configurations by delaying the transition of boundary layer flow from laminar to turbulent state. This controls laminar flow over airframe components including wings, empennage, engine nacelles, and the nose region of an aircraft fuselage. It can be used in combination with many of the existing techniques for passive and active laminar flow control, but is particularly well-suited for a supersonic natural laminar flow design by virtue of avoiding the space, weight, system complexity, and maintenance penalties associated with suction based laminar flow control.

BENEFITS

- Potential to reduce skin friction drag up to 10-20%
- Can be used in combination with many of the existing techniques for passive and active laminar flow control
- Well-suited for a supersonic natural laminar flow design
- Applicable to multiple components of airframe
- Can be retrofit to current aircraft

THE TECHNOLOGY

This technique injects precisely defined stationary transient growth disturbances into the free air slipstream over a wing that develop into streamwise elongated "streaks." These streaks are created with an alternating pattern of low and high streamwise velocity in the boundary layer flow adjacent to the aerodynamic surface of interest. Judicious selection of streak wavelength, amplitude, and profile allows the first-mode instability waves responsible for transition via oblique mode breakdown to be damped while the remaining, uncontrolled waves are kept below an amplification threshold. A similar control concept is also applicable to second mode transition at hypersonic Mach numbers.



A possible embodiment of control device as micro vortex generators. Image Credit: NASA

APPLICATIONS

The technology has several potential applications:

- Commercial Supersonic aircraft
- UAVs
- Military strike aircraft

PUBLICATIONS

Patent No: 10,745,112

technology.nasa.gov

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.

LAR-18974-1, LAR-TOPS-311

More Information

National Aeronautics and Space Administration

Agency Licensing Concierge

Langley Research Center

Mail Stop 020
Hampton, VA 23681
202-358-7432
Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

NP-2019-04-2681-HQ