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Title

Sonic boom of commercial hypersonic aircraft

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Abstract

Hypersonic air travel is becoming a reality through advancements in propulsion and related technologies. However, aircraft flying at such high speeds face regulatory challenges when it comes to noise emissions. Technological advances are sparking renewed interest in commercial high-speed flight and are driving important regulatory changes in Europe and beyond. Two large noise producers on high-speed aircraft are the engines and the sonic boom. A challenge for reducing engine noise, as with subsonic aircraft, is to reduce exhaust plume noise without sacrificing efficiency and complexity. Meanwhile, extensive research on minimizing or avoiding the sonic boom has been conducted and is being demonstrated in the sky. Further research is needed to apply these techniques to hypersonic aircraft.

This publication provides an overview of current research on noise emissions from hypersonic aircraft, including engine exhaust noise and sonic booms. It examines the potential environmental and health impacts of noise emissions and describes the techniques for reducing or avoiding them. Approaches for hypersonic noise reduction include optimizing the shape of the aircraft and designing new flight paths that avoid populated areas. Aerodynamic shape optimization to reduce the sonic boom has been successfully applied to supersonic aircraft. Further research is needed to apply these techniques to hypersonic applications, such as waverider designs. On the other hand, flying alternative routes is better done with hypersonic aircraft than with supersonic ones. This is by virtue of their ultra-long flight range, afforded by the synergy between hypersonic speed and efficient cryogenic hydrogen fuel.

A two-pronged approach is being pursued by Destinus to reduce noise and open long-range flight routes, including variable nozzle geometries, vehicle shaping, and collecting data on boom propagation and engine noise. Finding the best compromise between flight time, fuel economy, and noise emissions is an engineering challenge for this decade and a major step towards high-speed commercial flight. Overall, hypersonic travel has the potential to revolutionize the way we live and do business by drastically reducing travel time and connecting people and places in ways never before imagined.

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