



Low-Boom Flight Demonstration



Artist concept of the X-59 QueSST flying over a U.S. community where residents will be asked to share their perceptions of the airplane's quieter sonic booms—if they hear anything at all. Ground-based sensors also will measure sound levels. Credit: NASA

Quiet Supersonic Flight Over Land

NASA is working to transform aviation by enabling a whole new commercial market for supersonic travel over land. The centerpiece of this effort is NASA's faster-than-sound X-59 Quiet SuperSonic Technology (QueSST) aircraft. NASA will use the experimental X-59 QueSST to provide data that could change the rules that ban supersonic flight over land by proving a sonic boom can be reduced to a barely-audible sonic thump heard on the ground.

Sonic Boom 101

When an aircraft travels faster than the speed of sound, shockwaves form and travel away from the aircraft. Normally, these shockwaves merge and generate distinct sonic booms heard on the ground for miles on either side of the aircraft's flight path. The X-59 is shaped in a way that prevents the shockwaves from coming together, resulting in a gentle sonic thump instead of the loud sonic boom produced by other supersonic aircraft.



This computer simulation shows how shockwaves move away from the X-59 as it flies faster than sound. The pattern is different from the way shockwaves from a conventional supersonic aircraft come together to produce a sonic boom. Instead, the X-59 will produce a quieter sonic thump. Credit: NASA

Testing the X-59 QueSST Aircraft

NASA is working with Lockheed Martin Skunk Works of Palmdale, California, to design, build, and conduct initial flight testing of the X-59.

When fully assembled, the single-seat X-59 will be 99.7 feet long, 29.5 feet wide, and will cruise at an altitude of 55,000 feet while moving at a speed of Mach 1.4, or 925 mph.

Through a series of flight tests in 2022, NASA and Lockheed Martin will work together to prove the X-59 performs as designed and is safe to fly in the U.S. airspace system. After these tests, NASA will conduct a series of validation flights to demonstrate the quiet supersonic technology works and sonic thumps are heard on the ground as expected.



Artist concept of the X-59 taking off from a runway close to where the airplane is being assembled at Lockheed Martin's Skunk Works factory in Palmdale, California. Credit: Lockheed Martin Skunk Works

Collecting the Data

In 2024, NASA will begin flying the X-59 over several communities (yet to be selected) and ask residents for input about the sonic thumps they may or may not hear. That information will be delivered to the Federal Aviation Administration and international regulators for their use in considering new rules that would allow commercial supersonic flight over land.

Collaborative Effort

All four of NASA's field centers in California, Ohio, and Virginia that conduct aeronautics research have key roles in developing and evaluating the X-59. Together with its partners in government, industry, and academia, NASA hopes to enable a new era in supersonic commercial aviation.