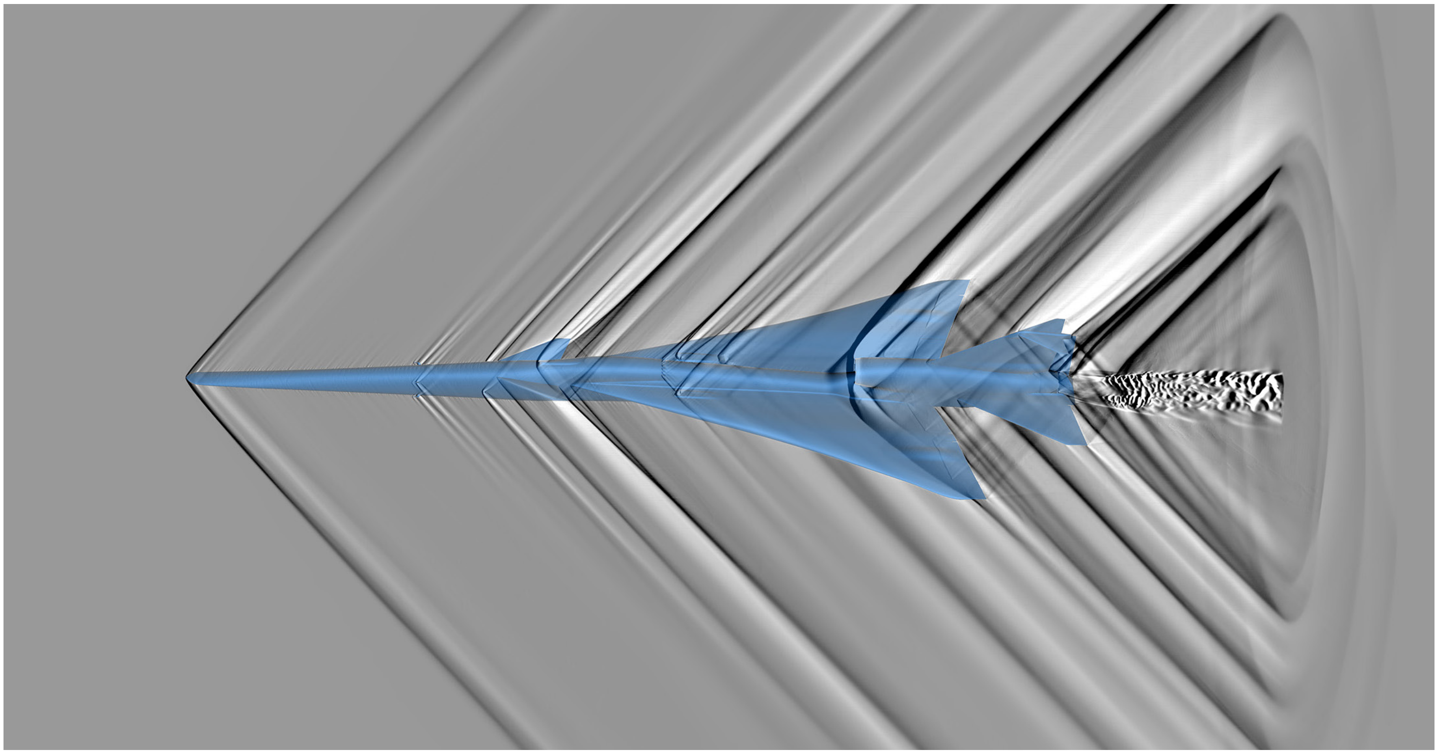
National Aeronautics and Space Administration

Color by Number



Although it may look like an abstract piece of aeronautical artwork that could hang as a painting over an enthusiastic pilot's fireplace, this image actually is the product of a complex computer simulation involving supersonic shockwaves. In this example the aircraft is the X-59 Quiet SuperSonic Technology airplane now under construction for NASA by Lockheed Martin in Palmdale, California. The X-59 is designed to generate sonic booms that are so quiet people on the ground will hear them as sonic thumps – if they hear anything at all. Eventually, the X-59 will be flown over select communities to measure public perception of the sound. Results will be given to regulators to use in determining new rules that could allow commercial faster-than-sound air travel over land. The airplane's shape is the key to low booms. As NASA's aeronautical innovators worked to finalize the airplane's design, they ran their ideas through a high-resolution 3D simulation using the Pleiades, Electra, and Endeavour supercomputers at NASA's Ames Research Center in California. The result was this computational schlieren image that visualized the X-59's supersonic shockwaves. Schlieren photography is a long-known technique that is based on the fact light rays are bent when they encounter changes in a fluid's density. But with no X-59 to photograph in flight – yet – the computer simulation was the next best thing. The dark and bright regions represent shockwaves and expansions, respectively. Significantly weaker shocks propagate from the lower surface of the aircraft, helping to confirm that quieter sonic thumps would be heard on the ground.

Image Credit: NASA/Marian Nemec and Michael Aftosmis
Text Credit: Jim Banke, Aeronautics Research Mission Directorate

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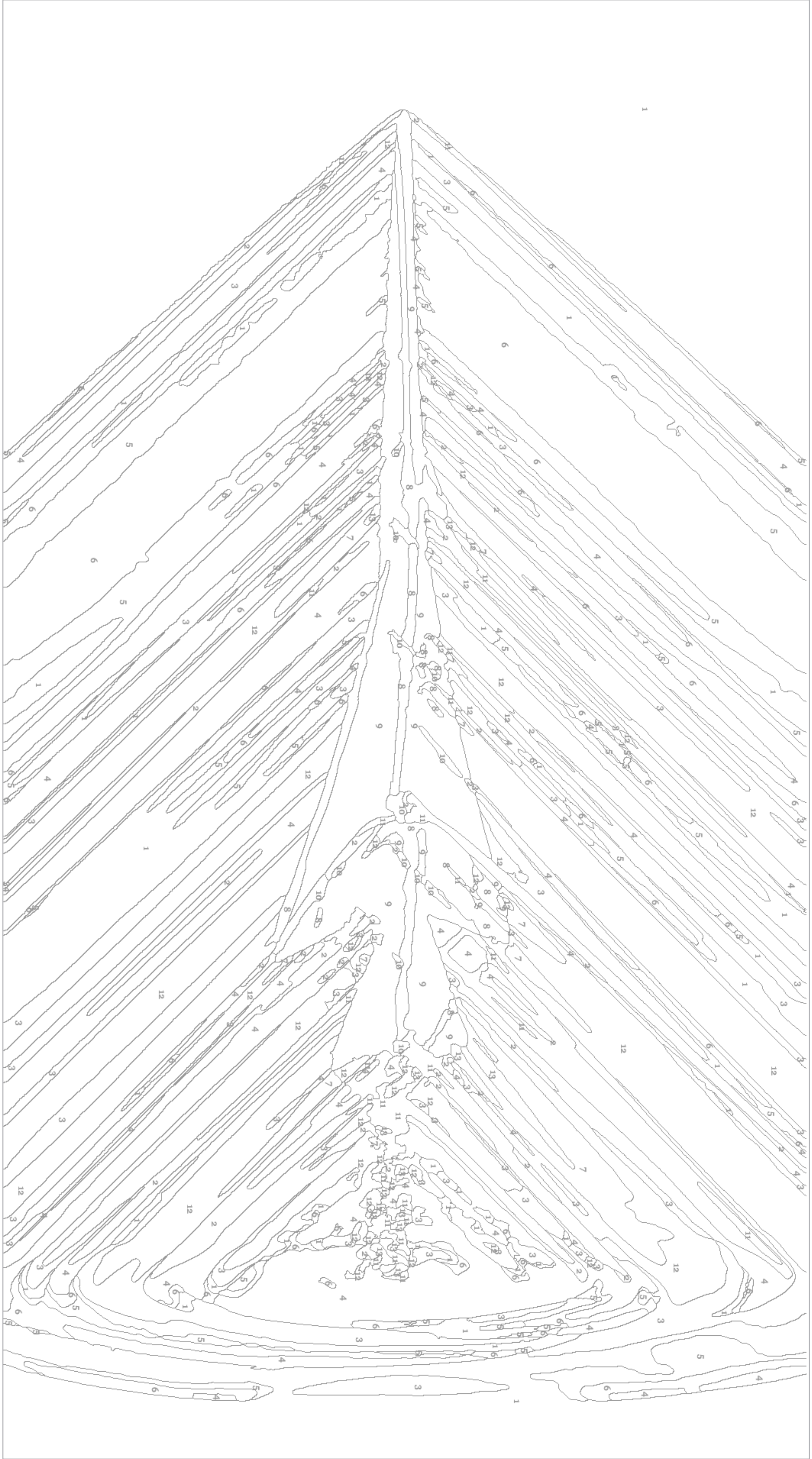

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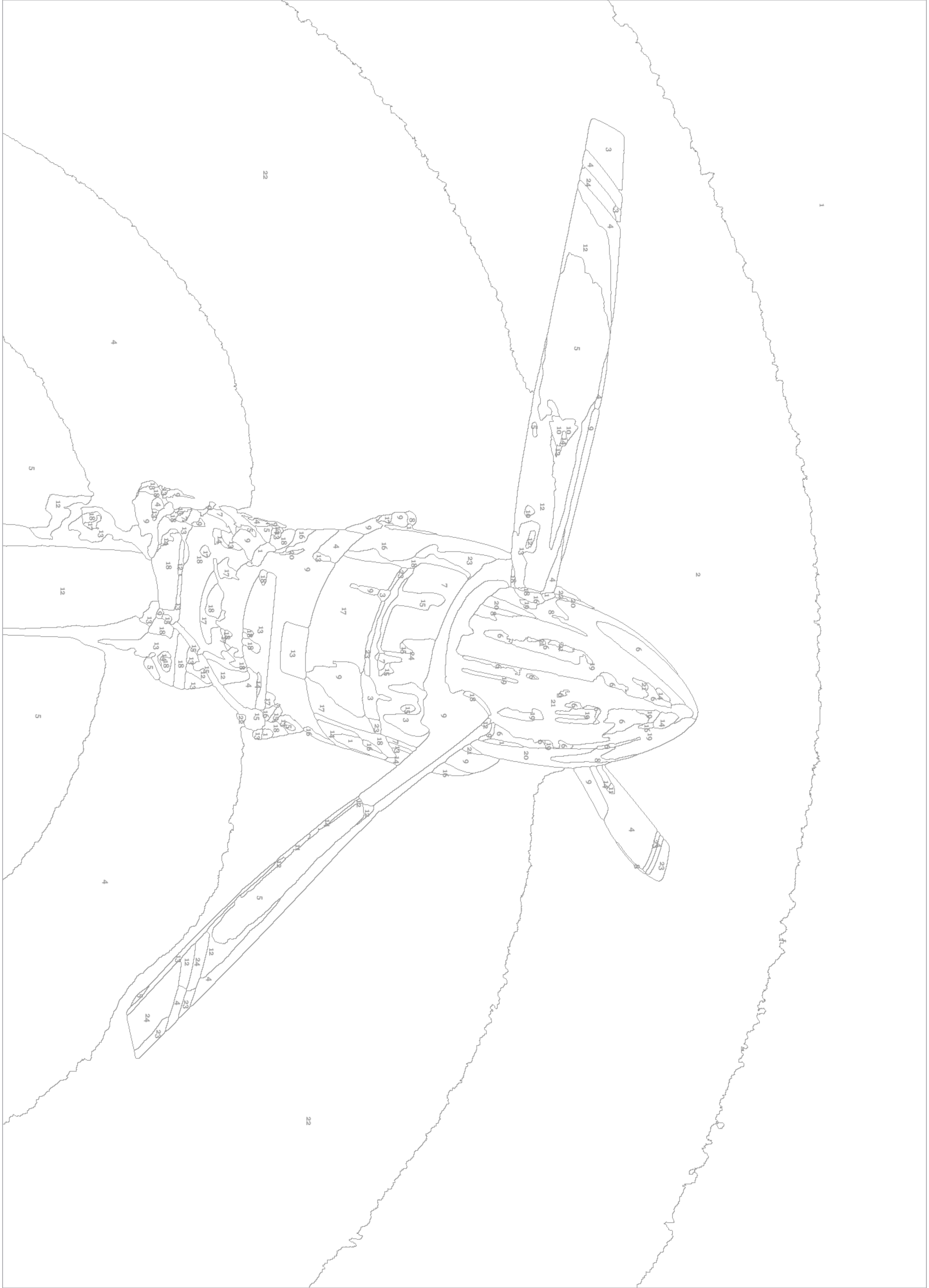
A JM-X57 cruise motor, designed and built by Joby Aviation in Santa Cruz, California, sits in its test position on the Airvolt test stand at NASA Armstrong Flight Research Center in California. Extensive testing is necessary to validate the motor system's safety and functionality in order to be deemed flightworthy according to NASA's flight qualification process. X-57 will be NASA's first all-electric X-plane.

Credits:
NASA / Lauren Hughes



Color by Number

Illustration of an Unmanned Aircraft System, or drone, in front of a smoke-filled sky. A goal of the Scalable Traffic Management for Emergency Response Operations project, or STEReO, is to make emergency response efforts more targeted and adaptable, for instance by integrating drones into wildfire fighting.

Credits:
NASA / Ames Research Center / Daniel Rutter

Color by Number

This image of the horizon was seen from the cockpit of NASA Armstrong Flight Research Center's F/A-18 research aircraft during a flight in support of the Quiet Supersonic Flights 2018 research series, or QSF18. NASA test pilots performed the quiet supersonic dive maneuver off the coast of Galveston, Texas, creating a quieter version of the sonic boom to obtain recruited community survey feedback data. The test pilot climbed to around 50,000 feet, followed by a supersonic, inverted dive. This maneuver creates sonic boom shockwaves in such a way that they are quieter in a specific area. Meanwhile, NASA researchers match community feedback to the sound levels of the flights, using an electronic survey and microphone monitor stations on the ground. This is preparing NASA for community response models for the future X-59 QueSST.

Credits:
NASA Photo/Carla Thomas