Prediction of Jet Engine Fan Noise Using Computational Aeroacoustics

Aeronautics Research Mission Directorate

To support NASA's goal to improve aircraft performance while reducing noise, emissions, and fuel burn, we are providing a state-of-the-art computational code to predict the noise signature of a realistic jet engine fan.

The NASA Broadband Aeroacoustic Stator Simulation (BASS) computational aeroacoustics (CAA) code is designed to accurately predict the unsteady flow and noise in highly complex flows such as those in jet engine fans. This tool will be invaluable for developing methods for reducing fan noise with minimal performance penalties.

In this project, experimentally measured rotor wakes from the NASA Source Diagnostics Test are imposed upstream of the baseline stator, and the resulting noise is predicted. Two-dimensional results are shown here, and the extension to three dimensions is underway.

Even with the high-resolution capabilities of the BASS CAA code, a large number of grid points and time steps are required to accurately predict the unsteady flow and noise in a jet engine fan. Supercomputing and storage resources at the NASA Advanced Supercomputing (NAS) facility provide the enormous computational horsepower required to compute the flows and then store the resulting solutions.

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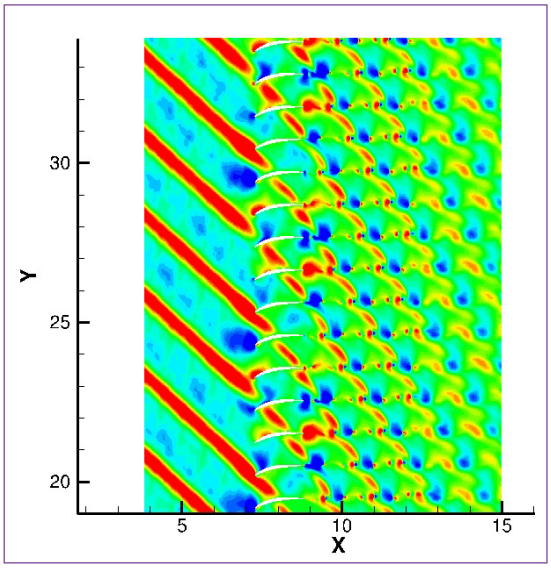

Snapshot of the interaction of rotor wakes with stator vanes at a radial location of 8.8 inches.
Duane Hixon, NASA/Glenn