High-Fidelity Simulations of Landing Gear Noise

Under a NASA partnership with Gulfstream Aerospace Corp. to research airframe noise, NASA Langley's Fully-Unstructured Navier-Stokes (FUN3D) computational fluid dynamics (CFD) code is being used to investigate the complex unsteady flowfield around the nose landing gear of a G550 aircraft. The present high-fidelity simulations are being used to advance knowledge in this field in several important aspects, including:

- Determination of the types of noise being generated (broadband, tonal, or a mixture of both)
- Identification of the locations and strengths of salient noise sources
- Establishment of best practices for the numerical, spacial and temporal resolution required to properly capture key noise-producing flow features
- Guidance for development of effective noise reduction technologies for application to current and future generations of civil transports

The immense computing power of NASA's Pleiades supercomputer, plus the post-processing capabilities available at the NASA Advanced Supercomputing facility, have enabled the resolution and visualization of the prominent flow features over a broad range of spatial-temporal scales.

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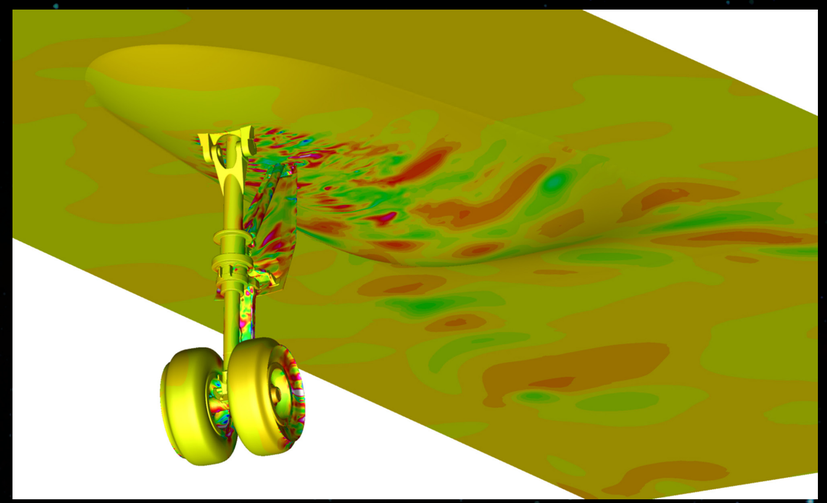
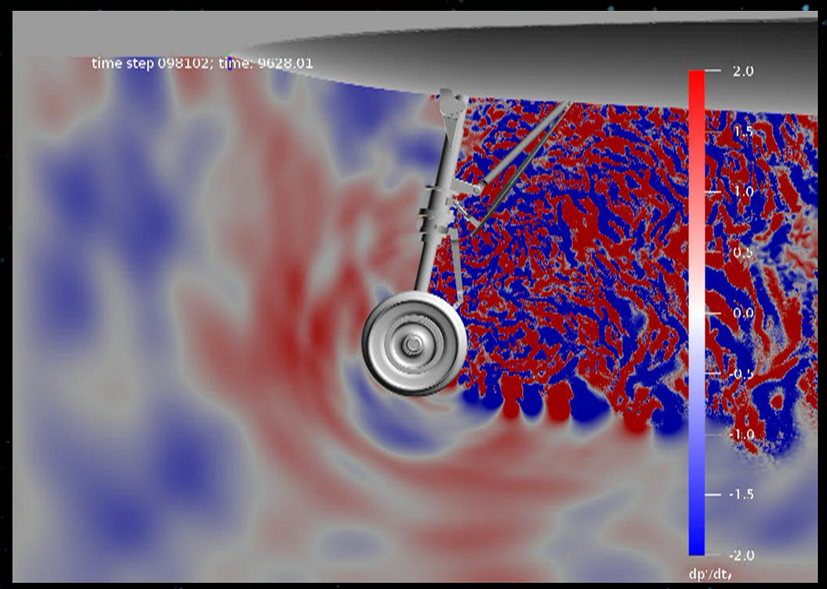


Fluctuating pressure field on nose landing gear and fuselage surfaces. *Airframe Noise Team, NASA/Langley*



Centerline pressure contours showing a combination of hydrodynamic wake and radiated acoustic field. *Airframe Noise Team, NASA/Langley*