COMPUTATIONAL AEROACOUSTIC ANALYSIS OF A ¼ SCALE G550 NOSE LANDING GEAR AND COMPARISON TO NASA & UFL WIND TUNNEL DATA

In conjunction with the NASA-Gulfstream and Gulfstream-University of Florida wind tunneltesting of a generic nose landing gear model, Computational Aero-Acoustics research was conducted at Gulfstream using the commercial Navier-Stokes Finite Volume CFD solver STAR-CCM+. The simulation modeled the ¼ scale G550 nose landing gear mounted in the NASA Basic Aerodynamics Research Tunnel (BART) wind tunnel test section. The model was run at the 0.166 Mach Number condition on the simplified nose landing gear with the gear cavity closed. Prior to simulation execution,dynamic pressure probes were inserted onto the surface of the model at the exact locations of the dynamic pressure transducers on the nose landing gear wind tunnel model. Delayed Detached Eddy Simulation (DDES) was run with a 58 million cell unstructured grid on 47 3.0 GHz quad-core processors for approximately two weeks to obtain a total of 0.05 seconds of statistically limit-cycled pressure data was processed. Results of the simulation were compared to data from the NASA BART and University of Florida anechoic wind tunnel results at both surface mounted steady and unsteady pressure transducers.The simulation showed good agreement in comparisons of power spectral density up to 5 kHz at mesh/time step dependent frequencies at all locations captured. In addition, the simulation was in somewhat good agreement with the measured mean turbulence levels at the wheel hub height and good agreement at static pressure taps located on the starboard wheel.

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