Characterization of urban air mobility vehicle operational noise and community noise impact

Dr Stephen A. RIZZI

Senior researcher for Aeroacoustics, NASA Langley Research Center

Short bio

Dr. Stephen Rizzi is the NASA Senior Researcher for Aeroacoustics. He leads a diverse research team focusing on development of revolutionary tools and methods for perception-Influenced acoustic design of transformative air vehicles, with application to all of NASA Aeronautics Research Mission Directorate programs. He is author/co-author of over 150 journal and conference publications and is recipient of a NASA Exceptional Service Medal for «sustained and exceptional contributions to the acoustics discipline.» He is a Fellow of the AIAA, past-Chair of the AIAA Aeroacoustics Technical Committee, and Co-Lead of the NASA Urban Air Mobility Noise Working Group. Dr. Rizzi received his M.S. and Ph.D. in Aeronautics and Astronautics from Purdue University, and his B.S. in Aerospace Engineering from the State University of New York at Buffalo.

Abstract

This presentation focuses on the process for predicting urban air mobility (UAM) vehicle noise at the source and how that can be used to estimate the impact on the community. Following conceptual design, in which the vehicle is appropriately sized for its intended mission, a comprehensive analysis must be performed for a range of operating conditions spanning the flight envelope to determine the corresponding configurations of the vehicle, that is, the trimmed states. Many UAM vehicles have redundant controls, so the trimmed state for any particular operating condition may not be unique, with some states producing more noise than others. For each trimmed state, the noise produced by each source, for example, steady and unsteady rotor noise, inclusive of propulsion airframe aeroacoustic effects, may be computed and so-called source noise (hemi)spheres generated. Land use planning tools, including those using simulation and integrated modeling approaches, use these (or derived) data to generate noise exposure maps on the ground. Alternatively, these data may serve as input to auralization, turning the numerical data into an audible sound that can subsequently be used as part of a perception-influenced acoustic design process that takes into account human response.