McGill

Mechanical Engineering Colloquium

Dr. Walter Silva
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22 September 2015; 2:35-3:55pm
Macdonald Engineering Building 267

Lecture #1: Computational Aeroelastic Analysis of a Low-Boom Supersonic Configuration (2:35-3:15pm)

Abstract:
An overview of NASA's Commercial Supersonic Technology (CST) Aeroservoelasticity (ASE) element is provided with a focus on recent computational aeroelastic analyses of a low-boom supersonic conguration developed by Lockheed-Martin and referred to as the N+2 conguration. The overview includes details of the computational models developed to date including a linear nite element model (FEM), linear unsteady aerodynamic models, unstructured CFD grids, and CFD-based aeroelastic analyses. In addition, a summary of the work involving the development of aeroelastic reduced-order models (ROMs) and the development of an aero-propulso-servo-elastic (APSE) model is provided.

Lecture #2: Evaluation of Linear, Inviscid, Viscous, and Reduced-Order Modeling Aeroelastic Solutions of the AGARD 445.6 Wing Using Root Locus Analyses (3:15-3:55pm)

Abstract:
Reduced-order modeling (ROM) methods are applied to the CFD-based aeroelastic analysis of the AGARD 445.6 wing in order to gain insight regarding well-known discrepancies between the aeroelastic analyses and the experimental results. The results presented include aeroelastic solutions using the inviscid CAP-TSD code and the FUN3D code (Euler and Navier-Stokes). Full CFD aeroelastic solutions and ROM aeroelastic solutions, computed at several Mach numbers, are presented in the form of root locus plots in order to better reveal the aeroelastic root migrations with increasing dynamic pressure. Important conclusions are drawn from these results including the ability of the linear CAP-TSD code to accurately predict the entire experimental flutter boundary (repeat of analyses performed in the 1980's), that the Euler solutions at supersonic conditions indicate that the third mode is always unstable, and that the FUN3D Navier-Stokes solutions stabilize the unstable third mode seen in the Euler solutions.

Biography:
WALTER SILVA received his B.S. in Aerospace Engineering from Boston University, M.S. in Aerospace Engineering from New York University, and Ph.D. in Applied Mathematics from the College of William and Mary. Dr. Silva's interests include computational/experimental aeroelasticity and aeroservoelasticity, reduced-order models (ROMs), system identification, computational fluid dynamics, and nonlinear dynamics. Dr. Silva has 30 years of experience working in industry, government, and academia. At Grumman Aerospace Corporation, he was awarded a Grumman Master's Fellowship working loads and dynamics, including flutter analyses of the shuttle trainer aircraft and the tiltrotor. He is an Adjunct Professor for applied mathematics at the College of William and Mary and for aerospace engineering at Old Dominion University. Dr. Silva has taught several invited short courses at national and international organizations. He pioneered the application of the Volterra theory to aeroelasticity and is the recipient of NASA's Exceptional Achievement Medal and a Patent for his contributions to the development of unsteady aerodynamic reduced-order models. He is the Technical Lead for Aeroservoelasticity for NASA's Commercial Supersonic Transports Project. Dr. Silva is a NASA Floyd Thompson Fellow and an Associate Fellow of the AIAA.