



Seminar



Peretz P. Friedmann

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On Blade Control of Rotor Vibration, Noise and Performance – Just Around the Corner?

A concise review of the evolution of active control approaches for vibration reduction in rotorcraft that have resulted in Higher Harmonic Control (HHC) and Individual Blade Control (IBC) is presented. It is shown that despite the success of these approaches, demonstrated by both full scale wind tunnel and flight tests, these implementations have not managed to earn their way onto a production helicopter. A more recent alternative, On Blade Control (OBC) is defined as a special implementation of IBC, where the control surfaces are located on the rotating blade and each blade has its own controller. The evolution and description of three OBC devices : (1) the actively controlled flap (ACF), (2) the active twist rotor (ATR), and the (3) deployable Gurney flap, or microflap (MF), is presented. A detailed outline of an aeroelastic response modeling capability used to simulate active vibration and noise reduction using flaps or microflaps is presented. Next, selected scaled wind tunnel model tests are shown to produce excellent insight on the operational and modeling aspects of these systems. Full scale wind tunnel and flight tests are described and presented as culmination of the sustained effort invested in research on OBC. The talk concludes with lessons learned and speculation about the potential implementation of OBC on a future production rotorcraft.

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2:00 pm

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Biography: Peretz P. Friedmann is François-Xavier Bagnoud Professor of Aerospace Engineering in the Aerospace Engineering Department of the University of Michigan, Ann Arbor. He received his Sc.D. (1972) in Aeronautics and Astronautics from M.I.T. He has been with the University of Michigan since January 1999. Between 1972 and 1998 he was a Professor in the Mechanical and Aerospace Engineering Department of the University of California, Los Angeles. Between 1988 and 1991 he served as the Chairman of the Department. Dr. Friedmann has been engaged in research on rotary-wing and fixed wing aeroelasticity, active control of vibration and noise using on blade control, hypersonic aeroelasticity and aerothermoelasticity, flutter suppression, structural dynamics and structural optimization with aeroelastic constraints. A total of 35 Ph.D. students have graduated, under his mentorship, several of them hold faculty positions as well as senior positions in the aerospace industry and government research labs in the US. He has also served on a number of national award boards and review committees engaged in review of research funding, as well as review of Aerospace Departments and he has published extensively (340 journal and conference papers). His accomplishments have been recognized by several awards: 2013 AHS Alexander A. Nikolsky Honorary Lectureship, AIAA Ashley Award for Aeroelasticity (2009), The Dryden Lectureship in Research (AIAA, 2009); the Spirit of St. Louis Medal (ASME, 2003); the AIAA Structures, Structural Dynamics and Materials Award (1996); and the ASME/Boeing Structures and Materials Award (2010, 2004, 1984). He served as the Editor-in-Chief of the AIAA Journal (2009-2014) and he is a Fellow of AIAA and the American Helicopter Society.