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# Benchmark Active Control Technology Special Section: Part II

## Introduction

THE Benchmark Active Control Technology (BACT) research project was conducted at NASA Langley Research Center, in collaboration with related research from Duke University, Texas A&M, University of Minnesota, Vanderbilt University, University of Florida, University of Nevada, The Boeing Company (St. Louis), The Boeing Company (Long Beach), and Honeywell. The BACT project tested a standard instrumented wing model with the NACA 0012 airfoil section that was mounted on a pitch and plunge apparatus in the Langley Transonic Dynamics Tunnel, with the objectives to 1) measure and archive unsteady aerodynamics data in the transonic flow regime and 2) study, record, and actively control various critical transonic flutter instability phenomena. This vast collection of benchmark data was used for verification and validation of computational fluid dynamics analyses techniques and robust flutter-suppression control law synthesis methodologies. For flutter suppression control laws, a wide variety of design techniques (e.g., classical, minimax, H-infinity, robust passification, structured singular value, $\mu$-synthesis, and neural network) was used. A set of control laws was implemented digitally and tested for active flutter suppression in the wind tunnel. Eighteen papers that describe this collaborative research are presented in this special section, six papers in three issues of the *Journal of Guidance, Control, and Dynamics*. We hope that these papers will be of enduring interest to both the fluid mechanics and control communities.

This special section presents the second set of six papers on this subject. The first paper, by Bartels and Schuster, compares two Navier–Stokes computational methods with the experimental data. The second paper, by Scott and Pado, deals with control law design using neural network technique. This control law was also successfully tested for suppressing flutter. The next paper, by Xing and Singh, explores an adaptive output feedback control technique. The subsequent paper, by Guillot and Friedmann, also investigates adaptive control combined with unsteady computational fluid dynamics technique. The next paper, by Strganac, Ko, Thompson, and Kurdila, studies limit cycle oscillation when structural non-linearity is introduced in the system. The final paper, by Prasanth and Mehra, also deals with nonlinear aeroelastic system using Euler-Lagrange theory.

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