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Graduate Seminar

COMPUTATIONAL NONLINEAR AEROELASTICITY FOR MULTIDISCIPLINARY ANALYSIS AND DESIGN OF FLEXIBLE AIR VEHICLES

Dr. Philip Beran
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Air Force Research Laboratory, WPAFB

Date: February 15th, 2002
Time: 3:00 – 4:30 p.m.
Place: 755 Baldwin Hall
Refreshments: 3:00 p.m.

ABSTRACT

In the Multidisciplinary Technologies Center, we have been investigating the science issues related to the design of flexible aerospace vehicles for operation in the transonic regime. Two themes dominate the research. The first is the application of numerical simulation techniques to the increased understanding of the nonlinear physical processes arising from the interaction between air vehicle structure and surrounding flow field. The second theme is the development of new methodologies that can account for nonlinear aeroelastic effects at the design level through dramatic improvements in computational efficiency. By achieving an increased understanding of interaction physics and by incorporating nonlinear techniques into new design procedures, we anticipate two payoffs: i. decreased cost of vehicle design and flight testing, and ii. ability to design over a wider range of vehicle concepts, particularly those that take advantage of structural flexibility. Results are shown for reduced-order aeroelastic models constructed with the Proper Orthogonal Decomposition, predictions of aeroelastic behavior of wings with stores, and numerical predictions of aerodynamics for joined-wing configurations.

BIOGRAPHICAL SKETCH

Dr. Philip Beran is currently Principal Research Aerospace Engineer at the Multidisciplinary Technologies Center, Air Vehicles Directorate, Air Force Research Laboratory, and is also Adjunct Associate Professor in the Department of Aeronautics and Astronautics, Air Force Institute of Technology, Wright-Patterson AFB, Ohio. Dr. Beran received his Ph.D. in Aeronautics from the California Institute of Technology in 1989 where he studied the steady and unsteady breakdown of vortices using novel CFD techniques. Dr. Beran has considerable experience in the modeling of 2-D and 3-D, laminar and turbulent, steady and unsteady flow fields, including those that interact with structures to cause flutter and limit-cycle oscillations. He has advised six doctoral and eleven master students to successful completion of their research and has nearly 60 publications, 19 of which are in archival journals. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics.