



# DEPARTMENT OF MECHANICAL ENGINEERING Purdue School of Engineering and Technology

## FALL 2004 SEMINAR SERIES

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Date: **Wednesday, December 22, 2004**

Time: **11:00 – 12:00 pm**

Room: **SL 165**

*Reception at 10:45 am. Cookies and refreshments served. Everyone is invited*

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### DYNAMIC DERIVATIVE PREDICTIONS OF AIR VEHICLES USING COMPUTATIONAL FLUID DYNAMICS

**Dr. Erdal Oktay**

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**Abstract.** A method to predict pitch and roll damping derivatives of missile geometries using an unsteady Euler solver is presented. A three-dimensional unstructured Euler solver based on the arbitrary Lagrangian - Eulerian (ALE) formulation with a dynamically deforming mesh algorithm is used and validated with the wind tunnel and ballistic range data available in the literature. Roll and pitch damping derivatives are calculated from load history of the unsteady flow around the missile. To validate the applicability of the present method, a standard research configuration, known as the Basic Finner, is studied under forced pitching and rolling conditions. Pitching and rolling motions with constant rates are analyzed at supersonic Mach numbers ranging from 1.5 to 2.5. Predicted results showed good agreement with the available wind tunnel data.

**About the Speaker.** Dr. Erdal Oktay is the founder and General Manager of EDA Engineering Design and Analysis Company, Ankara, Turkey. His research interests and expertise are in Computational Fluid Dynamics, Fluid Structure Interaction for the Solution of Aeroelasticity Problems, Parallel Computing, Grid Generation, Design Optimization areas, including code development. He has worked with NATO-RTO on various working groups. He is well published in conferences and journals and serves as a reviewer on several international journals. Dr. Oktay has received his B.S. degree in 1982 from Aeronautical Engineering Department of Mechanical Engineering Faculty of Istanbul Technical University, followed by M.S. and Ph.D. degrees in Mechanical Engineering in 1986 and 1991, respectively from the Middle East Technical University. During this period, he has been a research assistant and a lecturer in the same department. In 1991-92 he worked as in as a postdoctoral research associate in Old Dominion University and NASA Langley Research Center. He has worked in Roketsan Missile Industries between 1993 and 2003 as an engineer, chief engineer and director of aerodynamics department. Dr. Oktay is the 1992 recipient of the Middle East Technical University Parlar Research Foundation "Research and Encouragement Award".

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