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## ***MAE SEMINAR SERIES***

### **Computational Fluid Dynamic Challenges and Solutions for Rotocraft Applications**

Dr. James D Baeder, University of Maryland  
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**Monday, November 12, 2007, 1pm**  
**Phillips Hall 7<sup>th</sup> Floor Conference Room, #736**

#### **Abstract:**

Rotorcraft applications of Computational Fluid Dynamics (CFD) remain challenging due to unsteady transonic compressible flow with the possibility of dynamic stall, tip vortex formation, vortex and wake evolution, the need for vehicle trim and structural coupling, and strong interference effects. A brief overview will be given of the progress achieved at the University of Maryland over the last decade in simulating many of these complex phenomena. However, one of the main enabling technology developments has been the increased application of overset grid technology to handle the rotating and non-rotating components. Therefore, the talk will highlight two new approaches to improve overset grid technology: Implicit Hole Cutting (IHC) and Vortex Tracking (VT). IHC provides an approach to determining the connectivity between various overlapping curvilinear meshes that is achieved in a simple manner that tends to provide optimal interpolation at the boundaries between the various meshes while implicitly cutting holes inside of solid bodies. VT grids are developed to provide off-surface refinement in the vicinity of vortices in order to model their convection and distortion over large distances. Improvements due to IHC and VT are demonstrated for simple model problems as well as the solution around a Quad-Tilt Rotor in forward flight. Ongoing and future work for other rotorcraft CFD applications will also be discussed.