



## The AHS International Forum 66 Presents a **Short Course on Rotorcraft Modeling**

**Presented by**  
**Mark Dreier, Bell Helicopter Textron, Inc.**  
Monday, May 10, 2010, 8:00 a.m. – 5:00 p.m.  
Phoenix Convention Center, Phoenix, Arizona

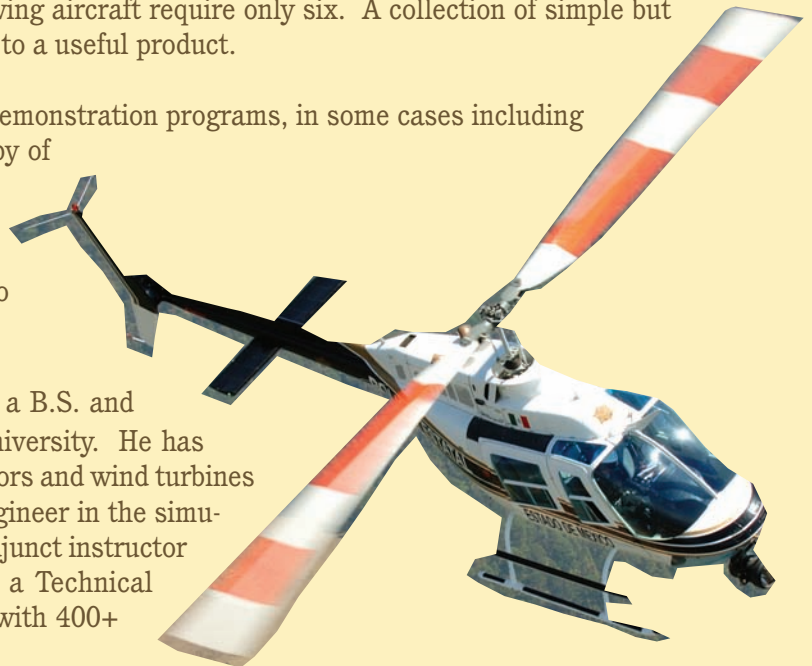
**A Short Course on Rotorcraft Modeling** is for the engineer who is new to the world of rotorcraft, the seasoned veteran who wants a refresher course on helicopter and tiltrotor dynamics and aerodynamics, and the engineering manager who wants a broader view of the cost drivers in rotorcraft modeling. This short course complements, but does not require, Dick Bennett's short course that introduces helicopters by adding the "how" to the "what."

Following a brief introduction to helicopters, which includes a fun quiz designed to seek and destroy some persistent helicopter myths, we will present the goals and challenges of modeling a vehicle that unites dynamics and aerodynamics intimately, and then dive right into the basic models used throughout our industry. Axis systems, the four rules for defining a vector and some basic mathematical methods begin our review. Kinematics and flight dynamics precede a skeletal flow chart for the equations of motion. The very important difference between inertial and aerodynamic velocity and the rules for generating them leads into aerofoil and wing aerodynamics and multiple methods to model them. Propeller theory prepares the way for rotor models, which includes the development of rotor flapping dynamics and aerodynamics, a discussion of hub types, hub restraints and control systems, and wake modeling, which has advanced considerably from the early days of uniform inflow and the momentum theory.

We will also talk about the most often used models and their influence on aerodynamic interference problems. Total aircraft performance is a function of all of this information and we will develop some simple sanity checks. Finally, issues associated with rotorcraft trim and dynamic behavior with a pilot in the loop are illustrated, as are the reasons why helicopters require ten DOF trims while fixed-wing aircraft require only six. A collection of simple but useful demonstration programs ties the information to a useful product.

The course material includes all lecture notes and demonstration programs, in some cases including the source code. The course fee also includes a copy of the presenter's AIAA text "An Introduction to Helicopter and Tiltrotor Flight Simulation." You will come to the course eager to learn, and leave with a tool belt full of mathematics and physics reduced to practical implementation.

**About the presenter:** **Mr. Mark Dreier** holds a B.S. and M.S. in Aerospace Engineering from Penn State University. He has been involved in the simulation of helicopters, tiltrotors and wind turbines for over thirty-five years, and is presently a staff engineer in the simulation group at Bell Helicopter Textron Inc. and an adjunct instructor at the University of Texas at Arlington. Mark is a Technical Fellow of AHS International and a fixed-wing pilot with 400+ hours.



For information on how to register for this fascinating short course please visit the AHS web site at [www.vtol.org](http://www.vtol.org) and click on the Forum 66 icon on the home page. Impress your employer and your colleagues with your knowledge of rotorcraft modeling. Space is limited so we urge you to sign up today!