

# DEPARTMENT OF MECHANICAL & AEROSPACE ENGINEERING

## WILLIAM MAXWELL REED SEMINAR SERIES

### “Uncertainty Quantification in Solid Rocket Motor Design: Application to Ablation Modeling.”

**Mark Ewing, Ph.D.**  
Northrop Grumman Propulsion Systems

#### Abstract:

This seminar focuses on the application of uncertainty quantification methods used at Northrop Grumman Propulsion Systems (NGPS) in the design and analysis of solid rocket motors (SRMs). An overview of NGPS is presented along with a description of various SRMs currently in development and production. This is followed by a brief description of solid rocket motors including their components, function, and an overview of various analyses used to predict their behavior. The importance of properly accounting for uncertainties in SRM design is discussed, and a general uncertainty quantification method is described. The method produces probabilistic descriptions of both the inherent variability and the predictability for a parameter of interest. This provides critical information to designers, decision-makers, risk analysts and resource managers. Details of the methodology are described and an example application to ablation heat transfer modeling in SRM nozzles is presented.

#### Speaker Bio:

Mark Ewing is Director of Analysis Engineering and Sr. Technical Fellow at Northrop Grumman Propulsion Systems. Mark has degrees in Mechanical Engineering – BS from Utah State, MS and PhD from Ohio State, and a Graduate Certificate in Decision and Risk Analysis from Stanford University. He has over 25 years of experience in the Solid Rocket industry and has specific expertise in ablation heat transfer, uncertainty quantification, and decision analysis. He has lead the development of ablation heat transfer codes used throughout the industry and has over 100 publications and presentations related to solid rocket motors. He is an Associate Fellow of AIAA, a registered Professional Engineer, and Adjunct Faculty at Utah State University, University of Idaho, and the University of Kentucky. He is a member of the advisory board for the NASA ACCESS Institute.

**Date:** Monday, November 7, 2022  
**Place:** Whitehall Classroom Building 106  
**Virtual:** <https://uky.zoom.us/j/81274735443>  
• Meeting ID: 812 7473 5443

**Time:** 4:00 PM EST  
**Contact:** Dr. Jesse Hoagg

Attendance open to all interested persons