GSAW 2023 Tutorial N:

Model-Based Reviews for Systems

Overview:
Many program offices in government, industry, and FFRDCs are moving away from traditional document-based systems engineering practices and integrating model-based systems engineering (MBSE) approaches throughout the system lifecycle. Stakeholders now use descriptive models to communicate system definition characteristics such as requirements, V&V activities, architecture, interfaces, and ConOps. Throughout the lifecycle, milestone reviews play an important role in assessing a program's readiness to proceed to the next phase. The review process relies on experts to assess if the program is meeting established review criteria. Review artifacts are now often captured in models expressed using standardized modeling techniques (such as SysML) rather than documents, so it is critical that reviewers know how to access, mine, read, understand, and evaluate these model products. We will discuss what MBSE brings to the table in the review process, and what reviews can look like in an environment where systems attributes are captured in "living" descriptive models versus static documents. We will also share perspectives on how to prepare for and conduct design reviews using MBSE practices.

Class will be presented in three sections: Reviews in Digital Engineering Environment (Lerner), Review Planning (Stevens), and Review Execution (Kellogg).

Reviews in Digital Engineering Environment: Both future vision for data-driven, model-based reviews and current milestone review practices.

- Future: A vision of how digital reviews could look in context of a DE environment and "living" models. Not prescribing the way to do reviews, but rather describing various possible ways, and then in detail one method.
- Current practice: How do program offices do reviews now? We'll discuss lessons learned from previous reviews. Digital review continuum: Continuous MB review vs discrete big reviews.

Review Planning: Navigate third-party SysML models (including those provided by KTRs) Identify and create views that verify criteria are being achieved. Prepare for a review, identifying digital artifacts that support reviews and mapping them to review criteria. Discuss role of model-based CDRLs and preparation process including the following.

- Obtain entry/exit criteria from source docs
- Identify/create views in model that support criteria evaluation
- Map review criteria to supporting model views
- Create/Import Missing Elements
- Relate new elements with each other
- Generate Review "Dashboard"
- Publish model views

Review Execution: Verify model artifacts in KTR-provided models meet contractual obligations. Use model views to evaluate program elements of system of interest and evaluate veracity of model itself. Provide review comments in DE environment. Walk through example reviews.

Instructors: Rob Stevens, Fredda Lerner, and Robert Kellogg, The Aerospace Corporation

Biographies:
Rob Stevens is the Director of the Model Based Systems Engineering Office at The Aerospace Corporation in El Segundo, California where he has provided systems engineering analysis support for

numerous satellite programs, managed the corporation's Concept Design Center, and served as project systems engineer for several CubeSats in the AeroCube program. He currently manages teams that specialize in SysML modeling, space system concept design, concurrent engineering, space warfighting, and spacecraft digital twins.

Prior to joining The Aerospace Corporation, he served in the U.S. Navy for over 20 years operating, developing, and testing aerospace systems. During his military career, he flew as a Naval Flight Officer in E-2C Hawkeyes during Operation Southern Watch from the USS Constellation, managed satellite payload test programs, and served as an Assistant Professor and Director of the Small Satellite Program at U.S. Naval Academy.

He earned his B.S. in Aerospace Engineering from the U.S. Naval Academy, M.S. in Aeronautical and Astronautical Engineering from the Naval Postgraduate School, and his Ph.D. in Astronautical Engineering from the Air Force Institute of Technology.

Ms. Fredda Lerner is currently a Senior Engineering Specialist at the Aerospace Corporation focusing on digital engineering, enterprise systems engineering, and systems integration and interconnection in the System of Systems Office in Chantilly, Virginia. Ms. Lerner was an integral part and leader of the team that demonstrated the first successful simulated digital engineering ecosystem that interconnected disparate authoritative source of truth data sources through models at the National Geospatial-Intelligence Agency (NGA).

Prior to joining Aerospace, Ms. Lerner worked for a prime government contractor at the Kennedy Space Center in Space Shuttle Cargo Operations in Payload Testing and Integration. Prior to that she worked in the private sector supporting many diverse federal government customers to include US Army, US Air Force, US Space Force, Defense Logistics Agency, Missile Defense Agency, NGA, Office of the Director of National Intelligence, the Office of Secretary of Defense for Systems Engineering programs, and Intelligence Community customers.

Ms. Lerner holds a Bachelor of Science Degree in Mechanical Engineering from Georgia Tech in Atlanta, Georgia, and as a member of the Society of Women Engineers (SWE) she has mentored younger women engineers as they enter and progress through their engineering careers.

Robert Kellogg is a Model-Based Systems Engineer (MBSE) at the Aerospace Corporation who specializes in SysML satellite modeling. He has worked in the MBSE office, supporting MBSE and digital engineering (DE) activities from CubeSats to the enterprise level. His modeling work with the AeroCube program has been used within several of their design reviews. This type of work has led to him developing models to be used for two Aerospace University trainings: Applied MBSE for Spacecraft and Model Based Reviews. He also works on digital engineering ecosystems building interfaces between descriptive, analytical, and simulation tools.

Description of Intended Students and Prerequisites:
Familiarity with acquisition processes and lifecycle management.

What can Attendees Expect to Learn:
A process to prepare for and conduct program model-based reviews.