International Council on Systems Engineering
Delaware Valley Chapter Meeting (Non-members welcome to attend)

Speakers: **1. Dr David Kaslow: "Developing and Distributing a CubeSat Model Based Systems Engineering (MBSE Reference Model)" – A presentation that captures aspects of a CubeSat project using the Systems Modeling Language (SysML)**

2. Rick Grandrino: "Open Systems Architecture Condition Based Maintenance" – Insights into the Application of OSA for Condition Based Maintenance for DoD and Commercial Industries

Date: **Wednesday Evening, November 1, 2017**

Agenda:
6:00-6:30: Arrival and check in
6:30-6:45: Welcome to Drexel & Introductions
6:45 -7:00: Introduction of Drexel Student Chapter INCOSE Organization
7:00 -7:45: Dr. David Kaslow presentation and discussion
7:45 - 8:00: Break
8:00 -8:45: Rick Grandrino presentation and discussion
8:45-9:00: Networking with the students & Chapter business

Location:
Drexel University
Mechanical Engineering & Mechanics (MEM) Seminar Room, Curtis Hall Room 162
32nd & Chestnut Streets

RESERVATIONS

INCOSE Members and Nonmembers: James Finney jameswfinney@yahoo.com
Drexel & Other Students Contact: Chris Morse cmorse@coe.drexel.edu
University of Penn Students Contact: Dr. Pete Scott peter.crosby.scott@comcast.net

Meal Choices: Boxed sandwiches available, Served with Potato Chips, Whole Fruit and a Cookie. Indicate your selection when making Reservation

1) Smoked Turkey and Swiss Cheese
2) Ham and Swiss Cheese
3) Roasted Vegetables and Cheese

Cost: $10 for INCOSE Members and Nonmembers; Students are Free (Just present your student ID)

Deadline for Reservations and meal choices is Friday, October 27th

Abstracts and Bios

Dr. David Kaslow has thirty-four years of experience at Lockheed Martin in both the technical and management aspects of developing ground mission capabilities. He has five years of experience at Analytical Graphics creating their Standard Object Catalog and pursuing Model-Based Systems Engineering. Dave is a co-author of four chapters Cost-Effective Space Mission Operations. He is also the author and co-author of papers and presentation for INCOSE Annual International Symposiums and Workshops, the IEEE Aerospace Conference, the Small Satellite Workshop and the NDIA Systems Engineering Conference. Dave is the lead for the INCOSE Space Systems Working Group. He has participated in the Space Systems MBSE Challenge Team since its founding in 2007 and is a principal contributor to the CubeSat Challenge Team.

Abstract:
Model-Based Systems Engineering (MBSE) is a key practice to advance the systems engineering discipline. The International Council on Systems Engineering (INCOSE) established the MBSE Initiative to promote, advance, and institutionalize the practice of MBSE. As part of this effort, the INCOSE Space Systems Working Group (SSWG) Challenge Team has been investigating the applicability of MBSE for designing CubeSats since 2011. The goal of the team is to provide a sufficiently complete CubeSat Reference Model that can be adapted to any CubeSat project. The INCOSE Systems Engineering Vision 2020 defines MBSE as "the formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases." At the core of MBSE is the development of the system model that helps integrate other discipline-specific engineering models and simulations. The team has been creating this system model by capturing all aspects of a CubeSat project using the Systems Modeling Language (SysML), which is a graphical modeling language for systems engineering. SysML diagrams are used to describe requirements, structures, behaviors, and parametrics from the system level down to the component level. Requirements and design are contained in the model rather than in a series of independent engineering artifacts. In the past three phases of the project, the team has created the initial iteration of the reference model, applied it to the Radio Aurora Explorer (RAX) mission, executed simulations of system behaviors, interfaced with commercial simulation tools, and demonstrated how behaviors and constraint equations can be executed to perform operational trade studies. The modeling effort starts anew in this fourth phase. The CubeSat Reference Model starts with an identification of potential stakeholders. A stakeholder is any entity that has an interest in the system including sponsor, end user, procurer, supplier, and regulatory agencies. The each stakeholder's needs, objectives, constraints, and measures of effectiveness are incorporated in the model. Constraints are those items fixed and not subject to trades such as mission budget and schedule. One of the stakeholders is the Cal Poly CubeSat project. The Cal Poly CubeSat Specification has been populated into its own SysML model to enable the content of the specification to be related to the CubeSat Reference Model. The CubeSat mission enterprise

consists of the space system, ground system, launch services, launch vehicle interface system, and communication services. Since the reference model is being developed by a team effort, there is an obligation to protect the investment of time and knowledge of each team member. There also needs to be a licensing environment that is conducive to a user organization supporting the development of and use of the model. There will be a license that allows for non-commercial use and prohibits incorporating the model or model features into a commercial product.

Rick Grandrino is an Associate Teaching Professor at Drexel University in the College of Engineering. He has a BS in Mechanical Engineering (1980), an MBA in Operations Management (1990), both from the Drexel University, and a Professional Engineering License in the state of Pennsylvania (since 1986). Rick was hired as a full time professor for Drexel COE in September 2016. Prior to that he was an adjunct and part time professor for the department since 1994. Rick was actively involved in developing the systems engineering MS curriculum and program that was launched at Drexel in 2014. Rick also spent 32+ years at Lockheed Martin where he worked in various capacities as a systems engineer, project manager, and systems engineering manager. His most recent assignments were a manager of a maintenance and field service group as well as subject matter expert for condition based maintenance and sense and respond logistics applications. He has been an active member of INCOSE since 2014.

Abstract:
The OSA-CBM specification is a standard architecture for moving information in a condition-based maintenance system. A more in depth look reveals a way to reduce costs, improve interoperability, increase competition, incorporate design changes, and further cooperation in the realm of condition-based maintenance.
Condition based maintenance (CBM) is a maintenance strategy that monitors the actual condition of the asset to decide what maintenance needs to be done. CBM dictates that maintenance should only be performed when certain indicators show signs of decreasing performance or upcoming failure. The implementation of condition-based maintenance systems must take on the task of integrating a wide variety of software and hardware components as well as developing a framework for these components. OSA-CBM simplifies this process by specifying a standard architecture and framework for implementing condition-based maintenance systems. In short, it describes a standardized information delivery system for condition based monitoring. It describes the information that is moved around and how to move it. It also has built in meta-data to describe the processing that is occurring.
This presentation will discuss applications of OSA-CMB systems in DoD and commercial industries. It will also elaborate on the technology that will enhance CBM systems in the near future.

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For further information about the International Council on Systems Engineering please visit the INCOSE website at http://www.incose.org/ and the Delaware Valley Chapter website at http://www.incose.org/ChaptersGroups/Chapters/ChapterSites/delaware-valley/chapter-home

Meeting Location Directions and Parking:
There is a train station at 30th and Market Streets, a subway station at 34th and Market, and a trolley station at 33rd and Market. The MEM seminar room, Curtis hall building is accessible from the main building located at the corner of 32nd and Chestnut Streets on the North side.

For those driving, you can park at the Drexel Parking Garage; entrance located on Ludlow Street between 33rd and 34th Street – Cost $8 (Directly around the corner and a few blocks away from Curtis Hall).

To get to the MEM seminar room (Curtis Hall room 162) from the parking garage, follow red path below on map from the garage to the Main Building. Enter the Drexel Main Building at the corner of 32nd and Chestnut Streets. Upon entering the main building, procced to the marble stairway and go to the right passage way to Curtis hall. There will be signs posted to direct you to Curtis Room 162. There may also be someone to greet you in the main building. In the event you need help in getting to Curtis room 162 once on campus, call Rick Grandrino's cell phone 856-723-1799.