

Training Summit Presentation Abstracts

Westin, Bridge Street Town Centre, Huntsville, AL 35806

October 23rd & 24th, 2018



Day	Time	Med	Ses #	Ses Name	Presenter	Title	Abstract
1	0830-0915	4			<p>Dr. Jan Davis Bastion Technologies, Inc.</p> 		<p>Bio: Dr. Jan Davis was recently named as Program Manager for the new Bastion Technologies, Inc. contract for Safety and Mission Assurance at the National Aeronautics and Space Administration's (NASA) Marshall Space Flight Center (MSFC) in Huntsville, Alabama. Prior to that, she worked as a Vice President and Deputy General Manager for Jacobs. Jacobs provides engineering, scientific, and technical support for projects and programs at Marshall. Dr. Davis began her NASA career at Marshall in 1979 as an aerospace engineer. After supporting major NASA programs and projects, including the Hubble Space Telescope and the Chandra X-ray Observatory, she became a team lead and lead engineer for the redesign of the Shuttle Solid Rocket Booster External Tank attach ring.</p> <p>In 1987, Dr. Davis was selected to join the Astronaut corps at the Johnson Space Center in Houston, Texas. She spent more than 670 hours in space as a mission specialist over the course of her three Space Shuttle flights: STS-47 (1992), STS-60 (1994), and STS-85 (1997). During these flights, she orbited the Earth 325 times. In 1998, she became the Director of the Human Exploration and Development of Space Independent Assurance Office for NASA Headquarters. Dr. Davis returned to MSFC and served as the Director of the Flight Projects Directorate at the Marshall Center until August 2003. Prior to retiring from NASA in 2005, Dr. Davis was the Director of Safety and Mission Assurance at MSFC leading up to the successful Return to Flight of the Space Shuttle in 2005.</p> <p>Dr. Davis did her graduate research work in mechanical engineering at the University of Alabama in Huntsville and is a 1971 graduate of Huntsville High School. She also has degrees from the Georgia Institute of Technology and Auburn University in biomedical engineering and mechanical engineering, respectively.</p> <p>She was elected to the Alabama Aviation Hall of Fame and the Alabama Engineering Hall of Fame. In 2002, she was given the Presidential Rank of Meritorious Executive, and she has received NASA's Exceptional Service Medal, Space Medal, and Outstanding Leadership Medal. In 2012, she received Auburn University's Lifetime Achievement Award and in May 2013, she received the Christine Richard Girl Scouts Lifetime Achievement Award. She has also received the Momentum Award for Courage and was named in 2015 as one of the Women Who Shape Alabama. Auburn University named her as a Distinguished Engineer in 2017.</p> <p>She serves on the Madison County Bicentennial Committee, and was nominated by Mayor Tommy Battle to serve on the board of the Huntsville Iceplex. She is also on the board of the United States Association of Space Explorers. In her spare time, she and her Labrador retriever mix dog are Therapy Partners in the community, and they serve with the Partners Achieving Literacy (PAL) program at Whitesburg Elementary School in Huntsville. Her husband is Alabama 23rd Judicial Circuit District Judge Dick Richardson and they have two grown children and one grandchild.</p>
1	0930-1030	4	A4	Software FMEA	Ann Marie Neufelder Sofrel	Proven benefits and FAQ about Software (FMEA)	The software failure modes effects analysis is successful for identifying software failure modes that effect mission success. This session will answer the most frequently asked questions and provide an overview of how to get started with the software. Are there military standards to provide guidance? When is the analysis performed? Who performs the analysis? What are the software failure modes? What is it used for? Why not just test the software instead? What are some lessons learned?
1	0930-1030	5	A5		Steve Carter 	Vibration Data Acquisition and Processing	Vibration data is frequently used to test and analyze the durability of systems. However, the chosen measurement and data processing techniques can significantly affect test results, leading to misinterpretations of data. This presentation will provide practical knowledge on vibration test, measurement, and data processing techniques that can be applied directly to projects. This includes transducer types, data acquisition set-up, and frequency spectrum calculation. It will also cover common pitfalls that are encountered in the test and analysis process.
1	0930-1030	6	A6a		Steve Slaughter	Improvement Projects	
1	0930-1030	6	A6b		Lu Tsai Ching	Machine Learning	
1	1100-1230	4	B4	Software FMEA	Ann Marie Neufelder Sofrel	Use Case Software FMEA Applied at the System of System Level	The software FMEA can be applied at several different levels of architecture. This session starts with analyzing what can go wrong at the very top level. In this session we will discuss the failure modes that effect the entire software or most or all use cases. At the very highest level one of the most common failure modes is missing essential functionality which means that something that there is an unwritten assumption. In addition, the software can lose track of its state; it can encounter a failure in a common function such as data logging; it can encounter faulty data in common messages.

Day	Time	Med	Ses #	Ses Name	Presenter	Title	Abstract
1	1100-1230	5	B5		Dr. Fayssal Safie 	Addressing Uniqueness & Unison of Reliability & Safety	<p>This tutorial is intended to address the question: "Safety and Reliability – Are they unique or unisonous?" To answer the question, the uniqueness and unison of Safety and Reliability are discussed in terms of their roles, requirements, approaches and tools. The tutorial concludes that reliability and safety are unique but closely related, and compensating each other and need to be integrated. With better defined distinct roles and responsibilities, enhanced integration, shared resources, and improved tools and techniques, both disciplines will be better positioned to support product design and development.</p>
1	1100-1230	6	B6		Dr. Yvette Rice LLVE, LLC 	Analytics of Leadership Part 1 of 2	<p>The analysis of data or information can reveal patterns and associations; thus, eliminating the need for guessing and only relying on our intuition. In fact, through the power of analytics, we can derive answers to questions or problematic situations we face on a daily basis regarding Leadership when we study the characteristics and qualities of those we know to be great leaders. Relative to this workshop, the word "Analytics" will involve the study of the effects of certain decision making and actions of leaders, while evaluating various reactions created in different leadership scenarios.</p> <p>Also, during this workshop, the word, "Force" will be used through a simple acronym to demonstrate how a leader's interaction with his or her organization, combined with their organization's reaction to the engagement, can be the driving force behind the success or failure of their organization's mission.</p>
1	1330-1500	4	C4	Software FMEA	Ann Marie Neufelder Sofrel	Case Software FMEA Applied at the Element Level	<p>In this session the analysis focuses on what can go wrong with a specific use case or feature. State diagrams, timing diagrams, sequence diagrams, data flow diagrams are useful for identifying failure modes within a use case. At the use case level for example, there may be dead or missing states, missing alternative processes, problems with concurrency, race conditions, etc. These failure modes are difficult to identify when reviewing the use cases one step at a time but easier to identify when employing visualization techniques.</p>
1	1330-1415	5	C5a	Tutorial	Daniel Sottiaux	Reliability & Maintainability of Elastomeric Bearings for Rotary Wing Aircraft	<p>Presentation areas:</p> <ol style="list-style-type: none"> 1. Elastomeric Bearing and Damper Construction/Configurations 2. Elastomeric Bearing and Damper types and uses 3. Elastomeric Bearing Life Testing Comparisons and Endurance limits 4. Recent Technology and Material Improvements 5. Failure modes of Elastomeric Bearings
1	1415-1500	5	C5b		TBA		
1	1330-1500	6	C6		Dr. Yvette Rice		See Session B6

Day	Time	Med	Ses #	Ses Name	Presenter	Title	Abstract
2	0900-1030	4	D4	RCM/CBM	<p>David Sada Andromeda</p> 	Fundamentals of Reliability Centered Maintenance	Reliability Centered Maintenance (RCM) provides the optimum Preventive Maintenance strategy for equipment availability and safety at lowest possible cost. This workshop is designed to provide an introduction to the RCM process, its terminology and concepts. The workshop will provide the history of RCM and discuss the current DoD RCM Policy as well as various implementation options. Additional workshop topics will include an overview of RCM Decision logic, Failure Modes and Effects Analysis (FMECA), types of Preventive Maintenance tasks, and RCM sustainment. It will also provide a discussion of the expected benefits and common pitfalls. The workshop will provide RCM Case studies and examples of previously executed programs.
2	0900-1030	5	D5		<p>Dr. Letha Etz Korn</p> 	Software Quality & Reliability	Software reliability will be defined, and its relationship to dependability, fault avoidance, and fault tolerance will be discussed. The particular characteristics of software reliability relative to the software lifecycle will be examined. Reasons why software reliability has become more difficult over the years to achieve will be discussed. Failure behavior and metrics to describe failure behavior will be defined. Various methods to achieve software reliability will be presented. Various characteristics of software reliability models will be examined, including their limitations/failures and the advantages and disadvantages of predictive models vs. estimator models. The difficulties in combining different models in order to achieve a better overall reliability model will be discussed. The relationship between software metrics and software reliability will be examined, including limitations of software metrics overall and in respect to determining software reliability. The relationship between software reliability and code inspections will be discussed. Recent software reliability and software metrics research will be presented.
2	0900-1030	6	D6	Tutorial	<p>Dr. Harry Delugach</p> 	Python Programming	Python is a programming language that is becoming widely popular due to its ease of use and its incorporation of object-oriented features. This tutorial will cover some of the history of the language's development, and give some examples of its powerful features. Some time will be spent discussing some object-oriented programming principles, why they are important, and how Python incorporates them. Attendees will leave the tutorial with a better understanding of both programming and object-oriented principles, as well as specific features of Python.
2	1100-1230	4	E4	RCM/CBM	<p>David Sada Andromeda</p>		See Session D4
2	1100-1230	5	E5a		<p>Dr. Mohamed Seif</p> 	Reliability & Survivability Analysis of 3D Printed FDM Parts	The work aims to study the performance and failure of 3D-printed parts under In-Plane and Out-of-Plane shear stresses. The test articles are made from Acrylonitrile Butadiene Styrene (ABS) and High Impact Poly-Styrene (HIPS) by the 3D printing process (Fused Deposition Modeling - FDM). The testing procedures have been performed according to the ASTM D3846-02 method for defining the In-Plane shear strength while the ASTM D5379 method has been used for determining the Out-of-Plane shear properties. The statistical distribution functions were determined for both test data. Failure analysis has been performed for determining the Probability Density Function, the Survival Function, and the Hazard Function. The probability of failure at a certain stress level has been determined. A comparative study between parts manufactured using the 3D printer and the commercially manufacturing process has been performed using the nonparametric two-sample Kolmogorov-Smirnov normality test of the underlying distributions and also supported by Mann-Whitney test.
2	1100-1230	5	E5b	Tutorial	<p>Dr. Andrew Yu</p> 	Risk-Based Facility Maintenance Prioritization	There are many facilities and associated assets in a large industrial complex. Some of them are more mission critical than others. With limited resources, the challenge for maintenance management is how to prioritize maintenance tasks and allocate limited maintenance resources. This research focuses on how various maintenance tasks for facility assets can be prioritized for their scheduling, and how the maintenance workforce allocation for different craftsmen shops can be optimized. The objective of the problem is to minimize the overall mission or program risk in an environment where the criticality of various assets at different levels in facilities may not be equal, and traditional reliability prediction is infeasible due to the maintenance decision level, huge volume of components, unavailability of reliability data at component level.

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2	1100-1230	6	E6a	Student	Victor Lopez 	Using SysML models as a complexity assessment tool	<p>System complexity is often associated with multiple issues such as schedule and cost overruns, poor performance and reliability or even program failure. With engineered systems becoming ever more complex it is of great interest to be able to assess the complexity of a system easily and earlier in the design process. Since Model Based Systems Engineering (MBSE) is becoming a widely used tool in systems development, a method to assess complexity using a SysML model and the information that is already usually depicted in a model is developed. The complexity estimation in SysML will be done by adapting the complexity metric developed by Sinha and Suh for a design structured matrix (DSM).</p>
2	1100-1230	6	E6b	Student	Christopher White 	Exergy-Efficiency Optimization of a Rocket Launch Vehicle	<p>Rocket launch vehicles are highly complex multi-disciplinary systems with multiple subsystems. These subsystems may vary significantly, complicating the selection of an objective function. While some metrics may be of great importance to certain subsystems, they may be irrelevant for others. Exergy efficiency has been suggested as a suitable objective function with relevance across a diverse set of subsystems. At its core, exergy is the amount of work available from a system for a certain environment. Exergy efficiency is a measure how much of that work remains available as the system is used. A simple formulation for launch vehicles would focus on the conversion of energy from the fuel to kinetic and potential energy of the rocket throughout a simulated launch. This metric is used as the objective function for the optimization of a physics-based rocket trajectory model. Results are compared to Saturn V and analyzed. Due to the importance of mass in mechanical energy calculations, exergy efficiency can favor designs with more massive final stages.</p>
2	1100-1230	6	E6c	Student	Shahrom Doneshwar 	Using Value Modeling and Design Structure Matrices for the NASA MarsBee Mission	<p>The MarsBee is a NASA funded mission to study and create a three dimensional topographic map of Mars using flapping wing Micro Air Vehicles (MAVs). A flapping wing MAV design inspired by the Japanese Hummingbird is being developed for the mission since conventional aerial vehicles are inefficient in generating lift in the low density Martian atmosphere. The study envisions using a swarm of such MAVs provided with a charging dock transported to Mars. The multidisciplinary study involves teams from The University of Alabama in Huntsville, Tokyo University of Science and George Washington University. The team at UAH is tasked with examining the MarsBee mission from a systems engineering perspective. Stakeholder preferences will be represented using mathematical models and Design Structure Matrices (DSMs) will analyze the couplings between the subsystems (such as the motor and the gear assembly). DSMs help us understand the strength of various couplings and also give us a visual representation of the system. The value models and DSMs will facilitate a consistent system design process, a better understanding of emergent behavior and the impact of human designers on the mission. The work presented will be the preliminary DSMs and the research framework for capturing the stakeholder preferences.</p>
2	1330-1500	4	F4	RCM/CBM	David Sada Andromeda		See Session D4
2	1330-1500	5	F5	NASA			
2	1330-1500	6	F6		TBD		Student papers and Student Awards