Training Summit Presentation Abstracts

Jackson Center *6001 Moquin Drive Northwest, Huntsville, AL 35806*

November 1st & 2nd 2022

RAM XIV

Day Time	Room	Ses #	Presenter	Title	Abstract
Day #1 Ses# 1 Time: 0930 - 1030	A	A1a	Dr. Russ Alexander	Reliability Improvement Cost Models	To perform optimization, cost-benefit, or break-even analyses for operational and maintenance costs with regards to reliability, assumptions need to be made as to the cost of reliability improvements. This presentation summarizes a review of recent literature on empirical models which explore the relationship between reliability improvements and their related costs. The focus is on studies using data from defense systems. Model advantages and disadvantages, as well as their applicability to current systems are discussed.
	A	A1b	Joseph Osowski	Expectation vs. Reality: The Sunrise Problem Applied to Probabilistic Risk Assessment	The Sunrise Problem is succinctly stated as a question: "what is the probability that the sun will rise tomorrow?" Attempts to answer this seemingly simple question reveal incongruities between statistical/probabilistic estimates and "real-world" expectations. Rather than being a purely philosophical problem, similar incongruities can be found in reliability and probabilistic risk assessment (PRA) analyses. These differences between statistical predictions and demonstrated reliability can result in analysis shortcomings that should be addressed and resolved. This presentation will begin by discussing the nature of the Sunrise Problem and how it applies to PRA and reliability. Examples of the Sunrise Problem in a PRA estimate will also be included, along with tips to identify and resolve the shortcomings that result from these anomalous situations.
	B	B1	Ernesto Primera	Applied Predictive Analytics to Evaluate Centrifugal Pumps Reliability Based on Hydraulic Op Regions	The objective of this project was to identify which operating variables had the greatest effect on pump reliability in terms of mechanical condition (Vibration), and thus validate the hypotheses of the previous research by Barringer and Block, and directly identify the operating variable that most affects pump vibration. We developed the case of a 10-stage high energy pump, as shown in Figure #2. For the project, 19,755 data are available for each variable, collected over one year in 2021. Overall, we wanted to identify the most important factors that influence pump reliability and find the levels of these that maximize pump reliability.
	C	C1a	Jason Rogers	MBSE Methodologies for System Safety Analyses	The United States' military systems continue to have a growing need to be designed and manufactured with the intent that the required behavior of the system and its components are operating safely during mission operations. The author will explain methodologies to incorporate Model Based Systems Engineering (MBSE) processes for system safety analyses within the system life cycle process to better ensure system safety. MBSE serves as a critical implementation to address the Department of Defense (DoD) Digital Engineering (DE) strategies for formalizing the development, integration, and the use of models to bridge the gap between various engineering disciplines, which includes safety and traditional systems engineering. Currently, the DoD uses MIL-STD-882, Standard Practice for System Safety, as a documented approach to effectively address system safety. This approach conforms to the governing document entitled, DoD Instruction (DoDI) 5000.02 Operation of the Defense Acquisition System. In most practices today, safety analyses and assessments are captured within independent safety tools and documentation where there is a lack of integration between safety models and the systems engineering MBSE models we see today. As noted by Kimberly Lai, David Shindman, Thomas Robert, and Alison Olechowski, in their paper Integrating Safety Analysis into Model-Based Systems Engineering for Aircraft Systems: A Literature Review and Methodology Proposal, "with the increase complexity of aircraft systems in recent years, inconsistency between system and safety domains is a common challenge."
	C	C1b	Altricia Jordan	Data Science Knowledge and Skills that Reliability Engineers Need: A Survey	This presentation describes the results of a survey that was conducted to determine the knowledge and skills that reliability engineering practitioners utilize in their everyday work. The survey consisted of twenty-two (22) questions and was conducted in person at two (2) events. The first event was the 13th Annual Training Summit event held by the Society of Reliability Engineers (SRE) – Huntsville Chapter, in Huntsville, Alabama on November 29-30, 2021. The second event was the 68th Annual RAMS in Tucson, Arizona on January 24-27, 2022. In all, there were fifty (50) respondents to the survey with two being determined ineligible for lack of working in a reliability engineering role. Results showed that the vast majority of reliability engineers who participated in the survey were interested in having better data science skills for themselves and were also interested in having a teammate with data science skills. Approximately 56% of practitioners that were surveyed showed preference for having a reliability engineer with data science skills on their team. By contrast, 26% preferred a data scientist with reliability engineering knowledge and 14% had no preference. Survey results also showed that the data science skills used most frequently by reliability engineers are statistical summaries and analysis, data modeling, predictive modeling, data visualization, data cleansing/preparation, and data mining. Finally, survey results showed not only an interest hiring reliability engineers with data science skills, but also a significant openness to hiring data scientists with reliability engineering skills.
Day 1 Ses#2 1100 - 1230	A	A2	Ann Marie Neufelder	Reliable Software SOW	Software is unreliable for many reasons. From an organizational standpoint many of the problems start at the beginning of the contract with the Statement Of Work (SOW). When the SOW doesn't require reliable software, there isn't a contractual means to acquire reliable software. A year long effort was executed to develop a Reliable Software SOW that provides the Government with reliable software from the beginning of the contract. It starts with including software in the system model and allocations. Then there is a risk assessment to ensure that there aren't any key issues that would derail the reliability from the start of the program. From there the predictions for the software are updated during development. Once the software is in a testable state the reliability can be directly evaluated. During development a software FMEA is conducted to identify failure modes that require fault injection and controls. The test plans include tests that demonstrate reliability in addition to demonstrating requirements. There is also language for ensuring that software failures are included in the FRACAS system. The deliverables are included in the hardware reliability Data Item Descriptions. This presentation will discuss the language, the DiDs and tailoring guidance.
	B	B2a	Dave Locker	Parts, Materials, and Processes	So you've read DoDI 5000.88 (Engineering of Defense Systems), and noted that essentially all programs must institute a "Parts Management Plan" for most program phases. If you don't already have a Parts Management Plan, where should you start? This presentation will discuss how to set up a Parts Management Program for military systems by leveraging existing industry and military standards, such as MIL-STD-3018, MIL-STD-11991, and Society of Automotive Engineers EIA-STD-4899. The discussion will include suggestions on programmatic implementation, contracting approaches for prime contracts, establishing flow down of requirements to lower tier suppliers, and technical content that Plans should include to effectively address the challenges of fielding military systems.
	B	B2b	Tom Lunz	Logistics Modeling and Simulation	With the constant push within the aircraft (AC)community to increase performance while simultaneously reducing fleet downtime, there is a strong demand today to be a partner rather than a make-to-print supplier. The typical catalog type bearings no longer fit the envelope or the application requirements. Often, there are multiple challenges that arise when an aircraft moves from developmental phase to production. This was the case during the AC migration to production when a deep groove ball bearing was experiencing increased vibration mandating the removal of the bearing. Bearing analysis revealed a series of unknowns of the surrounding environment and mating components. The problem was severe enough that the customer issued a new Statement of Work (SOW) to re-design and validate a permanent fix. The case study presented will make a strong case for a true technology development partnership between bearing supplier and helicopter suppliers in the future.
	C	C2	Dr. Safie Fayssal	Reliability Tool & Techniques	This tutorial is intended to provide a better understanding of reliability as an engineering design discipline, with focus on selected reliability tools and techniques commonly used by engineering professionals throughout Government and industry. The tutorial also discusses reliability engineering relationships to other disciplines such as maintainability, supportability, affordability, safety, and risk assessment. The material in this tutorial is based on over 30 years of extensive industry and Government experience in reliability engineering and risk assessment.

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Day #1 Ses#3 Time: 1330 - 1430	A	A3	Gwyer Sinclair (NASA)	Data-Informed Environmental Conversion Factors	Using over five decades of field data on electric and non-electric parts, we revisit the environmental conversion methodology described in MIL-HDBKs -217 and -338. These Reliability Engineering Handbooks' predicted values are compared to new tables, developed using observed data. This observed data approach is also used to develop environmental conversion factors for non-electric parts, which were out of scope of MIL-HDBK-217 and -338.
	B	B3	Jake Phillips (AVNIK)	Logistics Modeling and Simulation	The Combat Capabilities Development Command – Aviation and Missile Center (DEVCOM AvMC) Logistics Engineering Laboratory (LogLab) uses advanced modeling and simulation to influence aircraft design for supportability. The LogLab's Logistics Simulation (LogSIM) is a discrete-event simulation used to model aircraft flight operations and track all the various events which occur during the aircraft's life cycle. The simulation is utilized by the LogLab to assess the impacts of various design decisions on key sustainment metrics including availability and affordability. The LogLab team has worked with stakeholders in the program management offices to develop a model for the PM to be used in LogSIM for sustainment analysis. The aviation baseline model was developed at both the fielded battalion level and at the full fleet depot level. At the field level, a single battalion flies a mission set derived from a draft OMS/MP yielding key sustainment metrics such as availability and cost. Modeling the aircraft at the depot-level required the extension of a single battalion model to a fleet-wide model where an entire fleet of aircraft fly their life cycles as they are fielded (and later removed from service) over the course of the simulation. This analysis yields an in-depth look at the repair, replacement, and sparing requirements of the fleet on a year-by-year basis over the lifecycles of the aircraft.
	C	C3a	Dr. Justin Brown (BELL)	R&M Digital Transformation Best Practices & Lessons Learned	Presentation provides an overview of R&M lessons learned, tips, and observations made during major military developmental program for the rotor aircraft industry. The presentation attempts to highlight some of the challenges and opportunities made by the R&M group while interfacing with internal and external customers, suppliers, and IPT leads. The objective of the presentation is to present the information in a manner that is consumable by the R&M community in benefit for similar programs.
	C	C3b	Drew Hardwick (INTUITIVE Research and Technology)	Auto ID of Actionable Relationships Between IVHMS Sensor & Maintenance	This presenting provides a method to find IVHMS indicators for unscheduled maintenance actions without prior physical knowledge of the system. The unsupervised learning techniques used in the method are reviewed, then the method itself is outlined, and, finally, some preliminary results are shown.
Day #1 Ses#4 Time: 1500 - 1600	A	A4a	Paul Britton (NASA)	The Reliability Function	Mathematically, reliability is the probability of success. First, we will present the calculus needed to comprehend basic probability theory. Second, we will introduce The Reliability Function and its basic properties. Last, we will demonstrate The Reliability Function in a notional fatigue life example.
	A	A4b	Jeff Craven & Wai Chan (AVNIK)	Intelligent Frequency Modulated Continuous Wave (iFMCW) Cable Ass. and Prognostic Tool	The intelligent Frequency Modulated Continuous Wave device is a handheld device with the capability to detect, locate, and classify cable faults. Using a waveguide-based approach, the device performs Frequency-Domain Reflectometry (FDR) to send a frequency-modulated signal through the test cable to yield a reflection signal. A Fast Fourier Transform (FFT) conversion on the reflection reveals frequency-domain information that, with signal processing and RADAR techniques, produces an assessment of a cable's faults. The iFMCW device consists of three parts: the signal generator, microcontroller, and power. The signal generator module is situated on a printed circuit board (PCB) that is responsible for sending a frequency-modulated signal down a wire under test. The PCB also contains signal acquisition and processing circuits that accept the reflection signal and digitally converts it so that the signal is recordable. The microcontroller accepts user input (i.e., prompt to start measurement) and computes the results of an acquired signal.
	B	B4a	Troy McFarland & Will Fullerton (BELL)	Discrete Event Simulation	Predicting problems before they happen has been a challenge for industry. Bell has developed a discrete-event simulation (DES) to model aircraft sustainment for program metrics in the design phase, in order to better inform design decisions. A DES models the operation of a system as a (discrete) sequence of events in time. Each event occurs at a particular instant in time and marks a change of state in the system. The DES uses existing aircraft knowledge and distributions to model aircraft reliability, availability, and maintainability (RAM). The presentation will walk through this approach, basics of the model, and typical metrics which are tracked by the Bell tool.
	C	C4a	Sheri Leder (Grad Student) (The University of Alabama in Huntsville)	Requirements Formation in Interdisciplinary Teams for Autonomous Systems	Interdisciplinary collaboration is increasingly important for the demands of the competitive multistakeholder market. As new scenarios are encountered through the autonomous system development process, system requirements need to be added and adjusted. Autonomous systems must meet expectations from various stakeholders and multiple types of requirements. Requirements are typically developed based on stakeholder expectations; however, factors such as the concept of operations, measure of effectiveness, and industry safety standards should also be considered. This presentation will elaborate on findings from interviews with undergraduate students and industry mentors to identify how best to approach the requirements formation process. The findings will be discussed in relation to engineering project management to provide guidance in the system requirement development process of autonomous systems.
	C	C4b	Andrew Couch (Grad Student) (The University of Alabama in Huntsville)	Intl/External Precursors to Favorable Adoption of Industry 4.0 Technologies	In the modern era of rapidly emerging technologies, organizations are faced with pressing concerns about how to strategically maneuver their trajectory and corresponding operations to accommodate the rapidly changing environment. Associated with this dilemma is a dynamic perception of importance and urgency. Just as the physical environment is capable of guiding human behavioral tendencies, the competitive climate of the marketplace as well as internal organizational tendencies hold influential power over how organizations innovate over time. In the context of Industry 4.0 adoption, the benefits for organizations are not universally identical. Rather, the benefits are situationally associated with operational trends of the surrounding industry space. Thus, this publication offers a discussion on a subset of the research findings pertaining to Industry 4.0 adoption ventures. For Industry 4.0 considerations, the first hurdle that confronts organizations is the decision about how extensively to adopt Industry 4.0 technologies, if at all. As such, an urgency-importance matrix is considered from a reliability context to help organizations identify favorable circumstances that are generally associated with higher levels of Industry 4.0 adoption necessity and success. Monitoring the competitive environment is essential to tailoring organizational strategies. The Industry 4.0 dimension plays an instrumental role in this area.

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Day #2 Session 5 Time: 0900 - 1030	A	A5	Lisa Bates Raytheon Technologies	Smart Maintenance Engineering Decision Assist Tool (SMEDAT)	How to recharge yourself and make your organization stronger together utilizing familiar thought construct for all levels of Engineering to align processes, train, onboard, work proposals, operationalize algorithms in semi-automated fashion and then tying all of that together in Cameo through exploring Model Based Engineering Interdependencies.
	B	B5a	Samantha Rawlins (Grad Student) UAH	Reliability of Nuclear Thermal Propulsion	This presentation describes why the Test-Fail-Fix methodology commonly utilized in chemical rocket engine development is not viable for a nuclear thermal rocket engine development program and how a reliability-driven design and development program can minimize uncertainty margins leading up to a flight demonstration. Space nuclear technology programs face two fundamental challenges early in the project life cycle: 1) development and testing will be more expensive than a non-nuclear alternative, and 2) failure consequences will be more severe. Accordingly, space nuclear programs, including nuclear thermal propulsion, should be designed to minimize testing and maximize their probability of success: their reliability.
	B	B5b	Casey Eaton (Grad Student) UAH	Systematic Review of Relationships Between Project Success and Failure	Few other topics have experienced the repetition and continuity of investigation as project success and failure. Despite the longevity of study on failure and success, the relationship between success and failure is often an avoided topic. This study aims to integrate past knowledge through large-scale analysis of previously developed project failure and success factors, criteria, relationships, and definitions in order to better understand the implicit and explicit relationships between project success and failure. 239 categorizations that present failure and/or success factors and/or criteria are identified through systematic literature review. 511 criteria and 2,103 factors and definitions of failure and success are extracted via content analysis and analyzed. The explicit relationships between failure and success are first examined directly. The types of definitions are compared for success and failure. Then the implicit relationships are investigated by comparing success factors and failure factors. Finally, whether definition types for project outcomes are dependent upon the focus on criteria versus factors or failure versus success is investigated. Three aspects of definitions for failure and success are identified to aid researchers in identifying more specifically what they are studying within the terms of failure and success: subjective, multidimensional, multiple, and comparative.
	B	B5c	Jenna Cotter (Grad Student) UAH	Assessment of Reliability in Autonomous Systems from Multiple Disciplines	The consistency in definitions of "-ilities" (e.g., availability, maintainability, etc.) are essential to limit confusion in collaborative projects pulling from different disciplines. The definition for reliability, and the way that it is measured, varies greatly across different professional fields. One such discrepancy is the fact that reliability is defined from both a binary and objective perspective. The binary definition is that the system performs or fails under specific conditions, while the objective definition is the degree or percentage measuring the system performance. This inconsistency presents issues as individuals from different disciplines collaborate on projects for which the very definition of the same construct can vary greatly across those disciplines, leaving open potentials for inefficiencies and miscommunications. Standardizing the definition across fields, will clarify the meaning of reliability, and provide an axiom from which collaborations which focus on the development of systems can build. This presentation will provide academics and industry professionals with a unified definition of reliability constructed from key elements of definitions from various fields. Bringing the community's attention to the inconsistency of how reliability is defined can provide practitioners with the knowledge to successfully navigate the real world challenges of system evaluation, while also narrowing gaps in the literature for academics.
Day #2 Session 6 Time: 1100 - 1230	A	A6	Ann Marie Neufelder Mission Ready Software	Software Common Effect Denumeration	Software Failure Modes Effects Analysis approaches are largely not standardized. The SAE ARP 5580 is outdated and doesn't identify the entire range of software root causes. Most of the document describes a line-by-line code analysis which has been proven to be costly and not terribly effective. Other standards such as the IEEE 1633 describe the types of failure modes for software but don't identify the many root causes. There is a need for cohesive guidance that can be referenced in a statement of work to ensure that the software FMEA is applied to the root causes that are most likely to cause an operational failure. The Common Defect Enumeration (CDE) is a numbered list of software root causes that have been associated with operational mission failures. The CDE identifies the root cause, when it is applicable, how detectable the root cause is and an example. The root causes are applicable for the entire software, a specific capability, a specific software requirement or an interface.
	B	B6a	Joseph Schwalb (Grad Student) UAH	Understanding Human-AI Teaming Performance Using Autonomous Systems in Virtual Environment	Search and Rescue Operations (SRO) are notoriously difficult as they typically involve human operations in high risk and low visibility environments. Often, stakeholders only have a general perception of the possible adversities in the situational environment. Ultimately, the success of these operations is a function of the manpower available, the terrain of the region, informed-decision making based on available intelligence. Some situations, such as a combat search and rescue mission (CSAR), might call for a cooperative effort between a Human and AI Agent, whereby both are able to share intelligence and coordinate in decision-making tasks. In this research, we examine the impact Artificially Intelligent/Assistive Automation (AI/AA) systems (AI Agent) have on the User (Human Agent) in a CSAR scenario. We measure the impact of the AI Agent by measuring the time to rescue each hostage, the frequency of Human - AI interactions, the total time of Human - AI interaction, and their affect on the paths taken to complete the mission. The research outcomes from this study will form the basis for the evaluation of Human - AI teaming performance.
	B	B6b	Daniel Pham (Grad Student) UAH	Analysis of AI-Driven UAV Autonomous System Sim. for Use in Hostage Rescue Scenarios	With the advancement of artificial intelligence (AI), many aspects of human life and society have been enhanced, whether it means having an automated assistant like Siri or Alexa or having a Roomba vacuum cleaner clean your house on a schedule. However, one of the most promising applications of AI systems is their functionality in the fields of combat, defense, and especially hostage rescue. In hostage rescue scenarios specifically, time is of great essence, especially since hostages may be spread out over a larger geographical area with various obstacles and adversaries either stationed in certain positions or moving in certain regions of the overall area. It is therefore imperative for decisions to be made swiftly and efficiently since the lives of hostages are at stake. Recent AI and machine learning (ML) techniques have demonstrated potential in assisting human teams in the military to improve terrain mapping, environment navigation, target detection, and obstacle identification. Such methods are ideal to evaluate the effectiveness of an AI-driven drone autonomous system for combat search and rescue (CSAR) missions. This study aims to analyze the reliability of our drone-based AI target detection system to determine if the classification accuracy of multi-view targets-of-interest are sufficient to be applied in the CSAR environment. Overall, we want to ensure that unmanned rescue vehicles can be trusted to make swift and accurate decisions in a dynamic environment while correctly distinguishing between various obstacles and targets.
	B	B6c	Taylor Yaezitzis (Undergrad Student) UAH	Biases in Stakeholder Elicitation as a Precursor to the Architecting Process	Stakeholders are a fundamental source of information and perspective involved in organizational projects. These stakeholders are often consulted during various stages of projects as they are directly impacted by the outcomes of the project at hand. Many projects begin with a stakeholder analysis process as a way to understand the motivations of each stakeholder as well as their relevancy to the project. Some stakeholder analyses involve eliciting stakeholder opinions and including them in decision-making processes throughout the project. Other stakeholder analyses take this a step further with systematic analyses of stakeholders taking into account roles, relationships, and influence. Regardless of the stakeholder analysis approach taken, numerous biases may exist within the process. There are several biases inherent to stakeholders in a general sense that may impact the overall outcome of a project. There are also biases inherent to the actual processes of selecting stakeholders and eliciting information, wherein the project may end up with an unbalanced or misrepresented group of stakeholders that influence decision-making. Though it may not be possible to remove bias entirely from a project, mindful approaches can be taken to either mitigate or utilize an existing bias. This presentation will review a number of biases related to the stakeholder analyses process and provide information on mitigation or utilization techniques to create a balanced and adequately represented group of stakeholders.

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Day #2 Session 7 Time: 1330 - 1430	A	A7	Dr. Lisa Vangsness, THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	How We Make Judgments about Human and Automation Teammate	Increasingly, people work alongside human and automation teammates. Within these contexts, an important question is whether people interact with and make judgments about human teammates in the same way they do automated teammates. The studies presented in this talk demonstrate that humans make very different judgments about automated teammates than they do human teammates. They also – for the first time – offer a cognitively-grounded explanation for why this phenomenon occurs. Such work offers a road map for improving the calibration of judgments made by human teammates and strengthening the cohesion of human-automation teams.
	B	B7a	Kelly Campo (Undergrad Student), THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	Analyzing Technical Measurement Guidance in Literature	Technical measures such as cost, schedule, and risk are used to monitor a system to enable preventative and corrective action during system development. Technical measures inform decision-making, risk assessment, evaluation, and forecasting for many systems. A selection guide for technical measures criteria is necessary for stakeholders and engineering managers to consistently measure a system's progress. The selection guide will provide a standardized starting point that is based on an aggregation of literature rather than a systems engineer's best judgment or experience. This research conducted a literature review of 31 academic sources identifying how technical measures are chosen, the qualities that a measure should have, how many measures should be chosen, when measures should be chosen, and examples of measures. From the 31 sources, 332 guidance statements were identified. The findings of this research show that the literature suggests technical measures should be derived from other technical measures, stakeholder requirements, technical requirements, expert experience, predetermined metrics lists, and other sources. The literature points to choosing fewer measures with the recommendations ranging from an individual measure to 15 measures to dozens of measures. The literature is also consistent that measures should be selected early in the life cycle of a system. Most of the guidance centers around qualities that the measures should exhibit such as being measurable, insightful, and critical. The findings of this research can be used to evaluate guidance criteria for stakeholders and systems engineering managers in the selection process of technical measures.
	B	B7b	Tom Teper (Undergrad Student), THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	Developing Model-Based Systems Engineering Pseudo-Value Models for Industry Application	As companies and organizations face increasing pressure to implement Model-Based Systems Engineering (MBSE) tools across their projects, the key factors driving the digital engineering transformation discussion remain poorly understood. The factors include project robustness, consistency, and maintainability, as well as overall project life-cycle costs. Other important factors, such as documentability, communication, and program structure can also impact the viability of MBSE to an organization's needs. To make a well-informed decision on whether to implement MBSE, decision-makers need to holistically understand the benefits and drawbacks of MBSE not only to industry as a whole but specifically to their sector or organizational needs. This understanding of MBSE attributes and their perceived importance to a specific industry application can be qualitatively captured and represented in a pseudo-value model. This research presents the development process of several MBSE pseudo-value models based on industry applications (i.e., government, commercial, and system applications). The described pseudo-value models are driven by an open-ended thematic literature analysis in which attributes of MBSE and their direction of impact were identified. These MBSE pseudo-value models can provide the foundation for developing a quantitative representation of the preference of a company or organization, also referred to as a value model. A key finding of the research is that companies' and organizations' perceptions of MBSE vary between different industry sectors as well as between different system types. Targeted pseudo-value models can highlight the critical considerations and areas of interest that may be needed by decision-makers when evaluating the value of an MBSE transition in their organization. This research is intended to be used in workshops and brainstorming sessions to develop a better understanding of discussion points and commonly-referenced improvements and issues identified by authors of MBSE literature. Importantly, the research builds on previous studies into the perceived strengths and weaknesses of MBSE—especially with regard to reliability and maintainability over time—to identify key aspects of MBSE that may be overlooked in digital transformation decision-making for a particular application.
Day #2 Session 8 Time: 1500 - 1600	A	A8	Richard Meshell, BASTION TECHNOLOGIES	It Depends	How do you understand the data and assumptions in your probabilistic analysis? The PRA analyst needs to understand the data and input assumptions to effectively communicate the system/mission's risks. The decision maker also needs to understand conservatisms and how to interpret uncertainty in the PRA results. Properties such as assumptions on the distributions, uncertainty, use of test data, and common cause modeling can be the subject of much discussion, but often are the leading drivers of a risk profile.
	B	B8a	Meredith Bates (Undergrad Student), THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	Challenges in the Use of Historical Data	Aerospace systems engineering frequently employs mathematical models in design and analysis. Due to the scope and complexity of many aerospace systems, however, it can be difficult to collect recent data for those models. As a result, historical analogues and case studies are often used as data for the development of aerospace systems. The usefulness of historical data is dependent on a number of factors including the similarity of the past systems to the current system of interest, the accuracy of that past data for present systems, and the completeness of that data. However, the accessibility of historical data is not equal for all past systems. Publication biases can manifest when certain types of data or data on certain types of systems are published more often, and thus, potentially overrepresented in data repositories. Survivorship biases result from data being more easily accessible on systems that passed certain criteria than those that failed. For example, while it may be easy to obtain data for the finalized system design which entered operation, data for preliminary alternative designs could be highly informative for future design but unobtainable. These factors and more can impact the applicability or usefulness of data for future systems engineering models and analyses. This research analyzes how publication bias can appear in aerospace system development. A comparative analysis on sets of Apollo missions are performed to showcase that reliance on case studies may be introducing bias. The missions are categorized into sets of 1) highly successful first-achievement missions, 2) disaster missions, and 3) mundane missions.
	B	B8b	Eric Sung (Undergrad Student), THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	Evaluation of AI-based Drone Assistive Automation Systems in Search and Rescue Missions in a Simulated Environment	Unmanned aerial vehicles (UAVs) or drones have become a widely accessible technology over the past few years for both the public and private sectors. Their ability to navigate and offer means for remote surveillance of challenging environments have become a great utility for many remote sensing defense applications. One of the most humanitarian uses of drones is its operation in search and rescue missions as an AI-based assistive automation utility, in order to successfully detect our targets of interest using AI as well as navigate environments which have limited visibility or adversaries. Hence, in potentially hazardous situations like firefighting, disaster response, and hostage situation, drones-based AI autonomous systems can provide information related to the victims (hostages) through multiple views and angles that are unreachable from the ground. However, the processing of the information relayed by the drones in a time-sensitive manner is another burden on the human agents in the field. This delay between a drone's data transfer and human decision making is an inefficient byproduct that may be eliminated with an intelligent drone that seeks, filters, and transmits the most essential information about the situation at the moment. In this study, we present an evaluation study of an AI-based drone assistive autonomous system with respect to its performance in terms of object detection, path planning, and decision-making capabilities. Our goal is to design an intelligent drone-based autonomous drone system that effectively facilitates human agents in better execution of tasks in a simulated hostage rescue scenario.