Training Summit Presentation Abstracts

110 Redstone Gateway (2nd & 3rd floor)
Huntsville, AL 35806

September 1st 2026

RAM Training Summit XVIII

Day Time	Room	Ses #	Presenter	Title	Abstract
Session# 1 Time: 0900 - 1030	A	A1b	Rachel Boydston	Incorporating AI into Data Analytics and Visualization	This session will detail various data analytics and visualization AI tactics used within the Naval Aviation Enterprise (NAE). The brief is intended to demonstrate how AI, visualization tools, and data analytics are being used to solve practical, real-world problems and streamline communication across the NAE logistics community. These typical reliability engineering processes and tools are being applied and utilized in the field today in order to provide tangible benefits to the warfighter. The benefits are realized in the form of better maintenance practices and scheduling, more accurate supply availability and predictions to prepare for operations, and determination of root causes of deficiencies. While this brief focuses on DoD applications, the processes and tools used are applicable to other industries.
		A1c	Gregory Clayson	Potential to Functional Failure	This paper challenges the implicit assumption that the P to F (Potential to Functional failure) interval is deterministic and singular, an assumption sometimes inferred from on condition inspection logic in NAVAIR 00 25 403. We demonstrate, through computational examples, that treating P to F as a random variable (rather than a fixed number) changes inspection scheduling, risk allocation, and program decisions in materially important ways. We compare four practical propositions for setting inspection intervals: (1) Minimum observed P to F, (2) Mean P to F, (3) Fleet "time to first failure" quantile derived from a time to failure distribution, and (4) CDF anchored "target risk" quantile that directly meets a reliability requirement (e.g., 1×10^{-6} per unit). With detection probability (PoD) considerations and realistic right skew in progression, the first three propositions can produce inconsistent risk outcomes if not accompanied by model adequacy checks and distribution uncertainty sensitivity. The fourth proposition provides a reproducible path to meet program risk targets by selecting inspection intervals via quantile constraints of the P to F distribution and adjusting for PoD and the number of inspection opportunities. To avoid any appearance of "cherry picking," we recommend: reporting model adequacy (e.g., Anderson–Darling, K–S, AIC/BIC), presenting order statistics behavior for the minimum, quantile behavior for time to first failure versus fleet size, and sensitivity to distribution family (Weibull, lognormal, gamma) and parameter uncertainty (bootstrap/CIs). For programs where operational data censored before failure dominate, the approach that anchors inspection intervals to a target risk via the P to F CDF provides a transparent, auditable method. Practical Recommendation: Use the quantile based, target risk method (Proposition 4) as the primary policy.
	B	B1b	Nathan Rigoni	Failure Modes of Large Language Models	As the Aviation and Missile Center (AvMC) transitions from legacy systems to the Age of AI, Reliability, Availability, and Maintainability (RAM) logistics engineering requires modern solutions to overcome traditionally tedious and time-consuming administrative workflows. Legacy documentation, manual requirements analysis, and complex database querying often create bottlenecks in critical engineering processes. To address these challenges, our team has developed a suite of secure, locally-hosted Large Language Model (LLM) tools tailored specifically for AvMC RAM use cases. This presentation will explore how AI is actively revolutionizing enterprise knowledge accessibility and task automation without compromising data security. We will showcase how tools like Protocol Plus and ASAP LLM bridge the gap between legacy data and modern efficiency by transforming scanned documents into interactive knowledge bases and enabling natural language querying of complex databases. Furthermore, we will discuss how automated workflows for requirements analysis, document comparison, and CDRL generation are reducing turnaround times for many common tasks. Ultimately, this talk will demonstrate how integrating these targeted AI capabilities serves as the foundational interface for the future Digital Engineering (DE) environment.
		B1c	Philip Reine	Leveraging AI & Digital Engineering Tech. for RAM	As the Aviation and Missile Center (AvMC) transitions from legacy systems to the Age of AI, Reliability, Availability, and Maintainability (RAM) logistics engineering requires modern solutions to overcome traditionally tedious and time-consuming administrative workflows. Legacy documentation, manual requirements analysis, and complex database querying often create bottlenecks in critical engineering processes. To address these challenges, our team has developed a suite of secure, locally-hosted Large Language Model (LLM) tools tailored specifically for AvMC RAM use cases. This presentation will explore how AI is actively revolutionizing enterprise knowledge accessibility and task automation without compromising data security. We will showcase how tools like Protocol Plus and ASAP LLM bridge the gap between legacy data and modern efficiency by transforming scanned documents into interactive knowledge bases and enabling natural language querying of complex databases. Furthermore, we will discuss how automated workflows for requirements analysis, document comparison, and CDRL generation are reducing turnaround times for many common tasks. Ultimately, this talk will demonstrate how integrating these targeted AI capabilities serves as the foundational interface for the future Digital Engineering (DE) environment.

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Session#2 1045 - 1215	A	A2	**Fayssal M. Safie**	**An Overview of Reliability Engineering Tools and 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.
	B	B2a	**Richard Morgan**	**Verification as the Trust Anchor: AI-Assisted Development of High-Assurance Software**	Engineers approaching AI code generation face a legitimate concern: the generator cannot be trusted. This talk accepts that premise rather than arguing against it, and presents a development pattern in which an AI coding assistant serves as a prolific but untrusted producer whose output earns confidence only by passing an independent verification toolchain. The case study is ok_json, a formally-verified, MISRA-compliant RFC 8259 JSON parser in C99, developed as an AI-assisted experiment and gated by formal verification, full structural coverage, static analysis, dynamic memory checking, and fuzzing against an external conformance suite.
		B2b	**Sai Sreekanth Geddam (Grad Student)**	**An Empirical Study on Explainable AI Interfaces forTime-Critical Autonomy**	The primary challenge of integrating artificial intelligence (AI) into defense and healthcare systems lies not in algorithmic capability, but in operational opacity. While AI significantly enhances target detection, terrain mapping, and navigation, systemic cognitive overload frequently precipitates catastrophic human error during high-stakes missions. The study addresses this critical trust and transparency gap by systematically modelling human-AI collaboration under acute time constraints. Specifically, this research evaluates how system response latencies and varied algorithmic explanation formats modulate an operator's real-time decision accuracy. To capture the underlying mechanisms of human choice under stress, this study deploys a multi-modal empirical framework. This includes real-time biometrics telemetry—specifically eye-tracking and head-position metrics—paired with subjective workload questionnaires and economic performance data. By isolating the physiological and behavioral markers that differentiate optimal decisions from operational failures, this work maps time-sensitive human-AI interaction dynamics. Finally, this research synthesizes these quantitative data streams with descriptive qualitative metrics to deliver actionable design principles. The goal is to optimize explainable AI (XAI) interfaces, bridge human-autonomy trust deficit, and prevent catastrophic failures in deployed autonomous systems.

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Session #3 1315-1415	A	A3	**Joseph Osowski** NASA	**Risk Communication Tips for Probabilistic Risk Assessments**	Probabilistic Risk Assessment (PRA) is a valuable tool that can be used to quantify and manage risk. Risk is itself a complex and layered idea that can be difficult to communicate, and an assessment of that risk is likewise prone to miscommunication. The complexity of PRA models and the nonintuitive nature of low likelihood events can further hinder understanding of results, particularly when audiences are unfamiliar with PRA. If the results of a PRA cannot be properly understood and communicated to stakeholders, the value of the PRA is lost. This presentation aims to provide both recommendations to embrace and pitfalls to avoid when attempting to communicate the results of a PRA. It will cover items such as how to visually display data & results, how to organize your presentation, and how discussions can be tailored for different audiences.
	B	B3a	**Sheri Leder (Grad Student)** THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	**Digital Twins for AI/ML Train & Test in Reliability**	As artificial intelligence (AI) and machine learning (ML) become more integrated into complex engineering systems, digital twins (DTs) are increasingly explored as a way to support model development and evaluation before real-world deployment. This research presents a systematic literature review examining how DTs support AI/ML training, testing, updating, and validation across reliability-critical contexts. A total of 91 studies were selected through title, abstract, and full-text screening. Using structured data extraction, the review examines how DTs and AI/ML are combined, how training and testing are supported, and what benefits are reported across the product lifecycle stages and application contexts. Preliminary findings indicate that AI/ML training is often present within DT-AI/ML systems, and many studies emphasize broader system objectives such as prediction, optimization, control, diagnosis, or decision support. The results suggest that DTs support AI/ML through several roles, including supplying real-time, historical, experimental, synthetic, or real-world data; generating virtual training data; enabling controlled testing; and supporting feedback, retraining, or model refinement. These roles help clarify how DTs are being used to support model development, evaluation, updating, and validation before or during deployment. By distinguishing these uses, this review helps identify when earlier AI/ML training may be appropriate, when additional operational data are needed, and how virtual environments may reduce the risk of deploying insufficiently tested models. These insights are especially important for mission-critical and human-centered systems, where digital engineering must account for physical effects, cognitive demands, system integration constraints, and operational reliability before real-world implementation.
		B3b	**Dylan Wright (Grad Student)** THE UNIVERSITY OF ALABAMA IN HUNTSVILLE	**Modeling or Muddling Machines? Tool-Operator Paradigm of Explainable AI**	Modern Explainable Artificial Intelligence frameworks face a reliability bottleneck: an identical machine-generated explanation may optimize situational awareness for one operator while potentially muddling the perception of another. This variance exposes an outdated engineering assumption, namely that human cognitive faculties behave as static, plug-and-play components that any explanation can address uniformly. To close this dependability gap, this research advances a unified Tool-Operator paradigm that replaces the binary interaction model with an integrated semantic communication framework. Two complementary studies locate the problem. Field data from a tactical hostage rescue operation (n=30) isolate tightly coupled decision-making, where operator cognitive load and system usability varied along a dynamic axis driven by individual comprehension rather than by explanation volume. A simulated Command and Control experiment (n=32) then isolates loosely coupled decision-making, where explicit static explanations may introduce cognitive overhead and shift the operator's clarity threshold. Read together, the two settings show the governing axis itself moving as coupling changes, which a fixed explanation strategy cannot track. These results indicate that explanatory reliability requires an architecture aware of real-time operator expertise. The 3C Model supplies that awareness, letting the system transition from static outputs to dynamic perceptual alignment through cognitive scaffolding. The shift reframes explainability from a property of the algorithm to a property of the coupled tool-operator system, strengthening teaming reliability by engineering meaning rather than operational noise.

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Session #4 1430-1600	A	A4a	Ben Smallwood	US Army Av. EWIS Integration & Sust.	Discussion of current US Army Electrical Wiring and Interconnect System Mechanical System Integration Program implementation and status, as well as a look forward into future endeavors.
		A4b	Shane Spradling	EWIS Fault Summary from ASAP Scored Data	This presentation focuses on one continuing system fault with emphasis on the unspoken cost of aircraft downtime due to system unavailability. Opening with an overview of RAM Engineering & System Assessment Division competencies, Aviation System Assessment Program (ASAP) capabilities, and the ASAP Analysis Process sets the foundation of understanding for the core of the presentation; a chronological depiction of a recurring UH-60 intermittent fault as seen through the eyes of RAM analysts. After briefly discussing the aircraft back story, the fault entries and associated actions are presented in chronological order. The presentation closes with a graphic timeline of component replacements, suggested courses of action to improve EWIS fault isolation and a summary of cost and aircraft downtime.
		A4c	Mcallister David	Field Report Analysis & Metric Engine	FRAME (Field Report Analysis and Metric Engine) is a webapp designed to analyze field reports. While originally conceived as an interface for the Sgt Stout missile system, FRAME is a general toolset that can be applied to availability metrics for any fielded system. React was used to create an intuitive interface that both filters the field reports by date range, location, or system instance and showcases the availability across time in interactive graphs. For the RAM summit demonstration Operational Readiness (OR) is the availability metric used. The heart of the FRAME application is a python backend API. The systems' state, recorded in field reports, are analyzed across the user provided filters to give a day-by-day view of an evolving OR. Additionally, a Named Entity Recognizer (NER) AI model was developed to identify failed component names from raw technician notes. Together the OR analysis and the NER model let a user identify which components are downtime drivers with no supplementary datasets needed. All analysis performed in the FRAME app is deliverable in a customizable excel document.
	B	B4a	Landon Womack (Grad Student)	Digital Twin Analytical Framework (DTAF) AI	Digital twin (DT) technologies are increasingly used to improve design, production, and lifecycle operations, yet adoption remains difficult for many small and medium manufacturers because implementation is often hindered by unclear methods, uncertain return on investment, and limited data readiness. The Digital Twin Analytical Framework (DTAF) was developed to address this challenge by consolidating the major activities required for DT planning into a single framework. It integrates capability identification through the Digital Twin Consortium (DTC), data readiness and Digital Thread grounding through Data Element Mapping and Analysis (DEMA), maturity levels of the DT through the 4R framework, simulation alignment through the 4S framework, and trust support through Digital Twin V (DTV). The DTAF AI Pipeline serves as the workflow layer that helps users apply these elements in practice. Through a guided, question-based process, the AI captures use-case context, prompts users for relevant data and implementation details, and produces logged outputs and actionable recommendations for DT development. This work contributes a more practical and scalable pathway for early-stage DT planning and supports future expansion toward fuller integration of maturity planning, simulation selection, and verification and validation.
		B4b	Gavin Grann (Undergrad Student)	AI Systems Validation.: Addressing Gaps & Characterizing Methods	What does it mean for a system enabled by artificial intelligence to be verified and validated? This question has become increasingly consequential for systems engineers as AI (artificial intelligence) is introduced in complex, high-stakes applications, where mission critical scenarios require quick and accurate AI decision support. Traditional systems verification and validation (V&V) practice may be built on the assumption that system behavior can be specified in advance and then confirmed against requirements and the intended operational performance as a stage gate process. However, unlike traditional systems, AI-enabled systems are often adaptive [1], probabilistic and data-dependent [2], introducing new V&V challenges. Without proper V&V, AI systems may be unreliable when fielded. To further AI systems validation practice, which ensures the right system or model is built and behaves appropriately in any given operational context, this systematic literature review has been formulated.
		B4c	Ryleigh Claire Stokley (Undergrad Student)	Affordability	Affordability is a common natural language variable used in systems engineering, particularly for organizations seeking to develop large complex systems on stable or reduced budgets, such as NASA. While most discussion of engineering decision making is rooted in profit-seeking, NASA's lack of a traditional profit motive brings into question what it means for an expenditure to be considered reliable and worthwhile. A survey on the differing definitions of affordability was completed by 172 employees at NASA Marshall Space Flight Center. Such definitions were then mathematically modeled using objective functions and constraint frameworks. Out of nine possible definition categories, eight definition categories were observed in the participant definitions, using the dimensions of cost and benefit. Following the analysis of affordability definitions, this research contains a supporting mathematical exemplar that discusses how the modeled affordability definitions can cause conflicting system design choices, potentially negatively impacting the future reliability of the design.It is demonstrated that the different definitions indicate conflicting system design decisions that can lead to different reliability outcomes. This research has significant impacts on organizations involved in system design and acquisition such as NASA which must operationalize natural language directives including reliability, maintainability, or affordability. This research demonstrates that different definitions of affordability are held by employees within NASA and to discuss the potential impacts of natural language directives.