Basic Information	
Company Name: Assurant Design Automation	
Proposal Title: Fully Known, Deterministic Truth Models That Aid in AI Prompt-Engineering, Training, Validation, and Session-Startup Calibration	
TRL: 2 "Analytical and experimental critical function and/or characteristic proof of concept"	**Location:** Kennesaw, GA
Number of Employees: 7	**Previous DOD Business:** Yes
Capital Raised Total: $400K	**Website:** https://logicdesigntool.com/
Primary Contact Name: David McFarland	**Primary Contact Email:** dave@logicdesigntool.com
Secondary Contact Name: Quang Luong	**Secondary Contact Email:** Quang.Luong@kihomac.com

Part 1: Introduction (3%)

AI systems cannot yet be trusted in critical areas of the battlefield. AI applications may contain vulnerabilities such as adversarial manipulation, data poisoning, and malicious code. ADA's AI Validation Tool (AVT) removes this challenge by creating deterministic truth models that rigorously validate AI-generated solutions. AVT consists of two components: Spock Charts (SC) for continuous decision-making and the Logic Design Tool (LDT) for discrete (software) decision-making.

AVT ensures that AI solutions are deterministic, provable, repeatable, requirement-traceable, complete, unambiguous, demonstrable, scalable, and trustable. These truth models are essential for AI prompt-engineering, training, validation, and session-calibration. They enable the Army to deploy AI solutions with confidence in mission-critical scenarios.

Assurant Design Automation (ADA)'s strategic partnership with KIHOMAC brings expertise in embedded systems, cybersecurity, and Agile/DevSecOps software development. As a CMMI Level 3 appraised and AS9100/CMMC Level 2 certified partner, KIHOMAC delivers consistent and secure software quality, that aids ADA to further develop, mature, and deliver AVT as a scalable, secure, and rigorous cloud-native solution for trustworthy Army AI-applications.

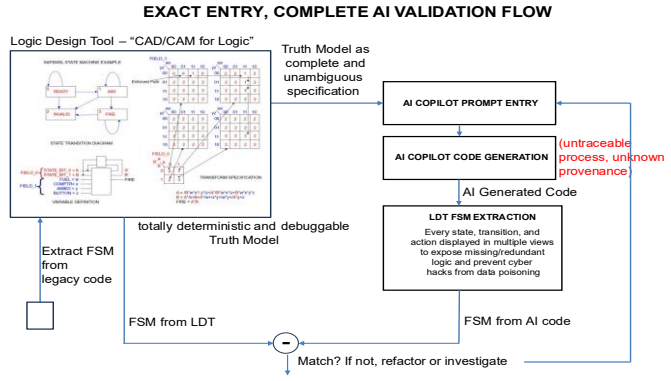

Figure 1 – LDT adds trust to AI-generated solutions in both the front (design entry) and back (output) end of AI development

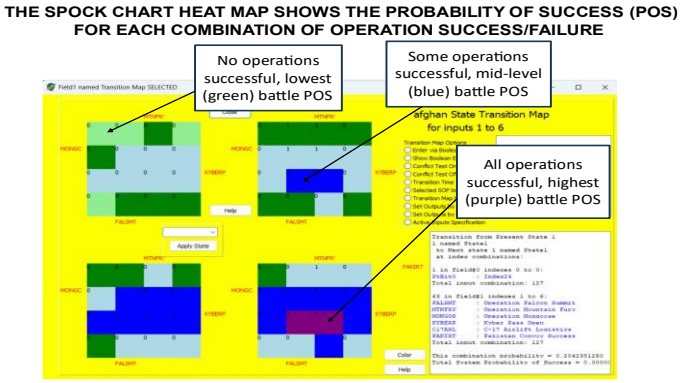

Figure 3 – Spock Charts objectively calculate and show operations that will contribute most to overall mission POS

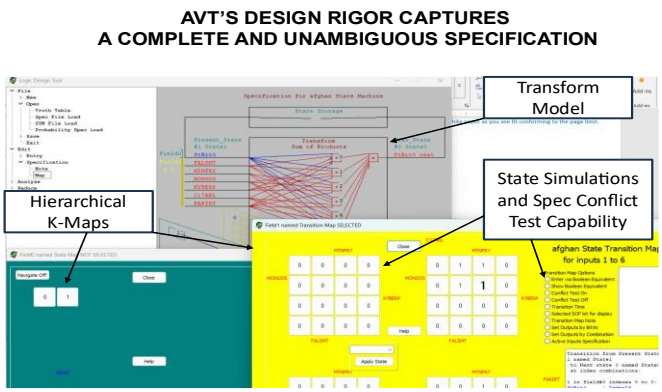

Figure 2 – AVT's Model-Based Systems Engineering (MBSE) promotes rigor and error detection over all possible conditions

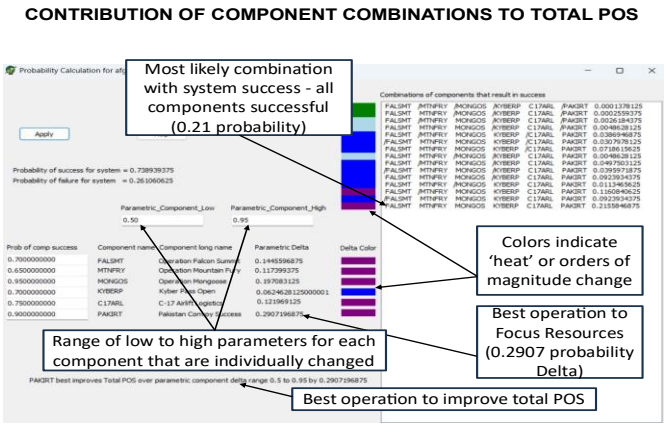

Figure 4 – Spock Charts deterministically identify the best areas to focus resources for complete battle success

Part 2: Army Benefits (15%)

Alignment: The AI Validation Tool (AVT) directly aligns with the Army's priorities by addressing the critical need for trustworthy AI in battlefield applications, specifically in ***Human-Machine Interface (HMI) for Effective Decision-Making***. *AVT provides advanced visualizations and Spock Chart (SC) driven decision-support systems to reduce cognitive burden on operators as well as UIs tailored to the mission context, reducing operator workload. AVT's UIs present critical data in a user-friendly format, enhancing situational awareness and rapid decision-making while minimizing distractions.*

Current AI systems are vulnerable to adversarial techniques, kill switches, and malicious code, which can compromise mission success and endanger warfighters. AVT mitigates these risks by providing deterministic truth models that rigorously validate AI-generated solutions over all possible conditions. By ensuring compliance with emerging standards such as NIST's AISIC and RTCA/DO-178C, AVT supports the Army's goal of deploying safe and reliable AI technologies in high-stakes environments. Furthermore, AVT's ability to validate AI solutions incrementally in bounded domains ensures that the Army can confidently scale AI applications to more complex scenarios without compromising safety or reliability.

Solution's Advantages: AVT offers 35 unique advantages over competing tools, making it the preferred choice for high-assurance AI applications. Key features include comprehensive validation, rigorous requirement traceability, and scalability for complex operations. Unlike traditional validation methods, AVT provides complete and unambiguous specifications, ensuring that all operations are explicitly defined and free from conflicts. This level of rigor is essential for mission-critical systems where even minor errors can have catastrophic consequences. Additionally, AVT's ability to optimize logic models for minimal size and maximum execution speed accelerates AI convergence, enabling faster and more efficient decision-making for dynamic battlefield environments.

Solution's Impact: AVT represents a transformative innovation that significantly improves the state of the art in AI validation. With an incremental validation in bounded domains, AVT accelerates AI development yet still ensures safety and reliability. This approach allows the Army to deploy AI solutions with confidence, knowing that they have been exhaustively tested and validated against deterministic truth models. The impact of AVT extends beyond validation; it also enhances AI training, prompt engineering, and session calibration, so that AI systems operate as intended, every time, under all conditions. AVT has exposed, corrected and retrained errors in AI generated SW code and POS predictions. With AVT, the Army can achieve higher operational readiness and resilience, making it a valuable tool for modern warfare.

#	LDT Options Comparison	LDT	Stalemate	Simulink	VectorCast	Weibull++	SafeState
1	Universal application	X		X			
2	Universal HW or SW specification	X		X			
3	Complete and unambiguous specification	X					
4	Lawyer-proof	X			X		X
5	Active entry check	X					
6	Patterned view	X					
7	Spaghetti diagrams managed	X			X		X
8	Black-box approach	X					
9	Metrics gathered	X	X		X	X	X
10	Source-code analysis / reverse engineering	X					
11	Minimized, animated SOP in transform display	X					
12	Selectable rigor	X					
13	Larger, more-manageable logic space	X					
14	No input-arrival-time assumptions	X					
17	Conflict check	X					X
18	Separable states and transform	X					
19	Trivial unit test	X	X				X
20	Minimal gate size & execution time	X	X		X		X
21	Repeatable hardware-in-the-loop behavior	X					
22	Table-driven change with no re-compile or test	X					
23	Focus on small portion of larger logic space	X					
24	Computable execution time for all state paths	X					X
25	Probability-prediction application	X					
26	One-page display	X					
27	Minimal verification needed	X					
28	Generalization enables more options	X					
29	Storage size not a function of # variables	X					
30	Specify both Mealy or Moore finite-state machines	X					
31	Methodology patented	X					
32	Interface to simple solver	X					
33	Interface to T-VEC	X					
34	Interface to Espresso	X					
35	Reverse-engineer source code	X					

Figure 5 – List of 35 AVT's LDT advantages compared to other MBSE tools

Part 3: Technical Approach (35%)

Scientific Feasibility: AVT is built on sound scientific and engineering principles. Spock Charts (SCs) leverage methodologies similar to Boeing's patented mean-time-between-failure analysis, which has proven essential in validating redundant flight control systems. The Logic Design Tool (LDT) employs finite state machine (FSM) modeling to verify all combinations of inputs and states, ensuring repeatable outcomes. These methodologies provide a robust foundation for AVT's validation capabilities, making it a reliable tool for high-assurance applications.

Enabling Technologies: AVT has demonstrated its utility through 12 proofs of concept, stress tests, and two DoD contracts. These tests have validated AVT's ability to expose and correct hazardous conditions in AI-generated code, ensuring compliance with safety standards. Our proposed solution includes integrating emerging cyber-secure GenAI tools, such as Ask Sage, a FedRAMP-High platform. Ask Sage provides secure chat, application programming interfaces (API), prompt engineering, and personas to augment and improve CUI-compliant Large Language Models (LLMs), such as OpenAI's ChatGPT and Anthropic's Claude. Ask Sage is compliant with IL5/ITAR CUI safeguarding requirements, with potential deployment capability to IL6 environments. This integration ensures that AVT is not only technically robust but also compliant with stringent cybersecurity standards, enabling its deployment in sensitive Army environments. ***Our enabling technologies does not introduce risks—it reduces them.*** ADA's strategic partnership with KIHOMAC brings expertise in

embedded systems, RMF cybersecurity, and Agile/DevSecOps to ensure successful integration, maturation, and deployment of AVT that is both secure and scalable for Army applications. Out **Technical Team** includes:

- **Dave McFarland (ADA):** Principal investigator for AI neural networks research, executed F-22 and C27J critical flight control software validation.
- **Jordan Jenkins (ADA):** AI, DevOps, and nation-state cybersecurity specialist.
- **Steve White (ADA):** CFO with extensive experience in scaling businesses.
- **Tom McFarland (ADA):** Retired Air Force Colonel with expertise in software projects, serial SW, AI entrepreneur.
- **Kevin Greeley (ADA):** Retired Air Force Colonel and Lockheed engineer, Air Force Special Operations command.
- **Quang Luong (KIHOMAC):** CIO, Avionics, Cybersecurity, AI/ML, and DevSecOps SME
- **Cory Pendergraft (KIHOMAC):** Director of Software Development with Agile Program Management Expertise

Technical Risks and Mitigation Plans: The primary risk is ensuring user proficiency in AVT's meticulous specification entry process. ADA and KIHOMAC will provide comprehensive training programs, user-friendly interfaces, and automated tools to simplify specification entry and reduce the learning curve.

Data Quality: LDT has undergone rigorous testing, including its use in optimizing A-10C avionics software. These tests have demonstrated LDT's ability to reduce software size and execution speed while maintaining high assurance. Detailed white papers and test data are available upon request.

Part 4: Programmatic Potential (20%)

Army Customer Discovery and Validation: ADA has actively engaged with 35 industry experts and Army stakeholders to validate AVT's utility. DEVCOM AvMC's publication on machine learning concerns in airworthiness applications highlights the relevance of AVT in addressing these challenges. Feedback from these engagements has informed AVT's development and ensured alignment with Army needs.

Army Transition Pathway: Following this award, ADA and KIHOMAC aim to secure additional contracts to integrate AVT into Army systems. The next steps include scaling AVT for broader applications, enhancing its user interface, and ensuring compliance with emerging standards. This pathway will enable AVT to become a standard tool for AI validation across the Army.

Part 5: Commercial Potential (25%)

R&D to Product Revenue: ADA has successfully transitioned research into products, as demonstrated by the deployment of the Logic Design Tool (LDT) in U.S. Air Force contracts. These efforts optimized mission-critical software for the A-10C aircraft, achieving a 9.3% increase in execution speed and a 43% reduction in code size. Letters of support from Lockheed Martin, Ask Sage, and KIHOMAC further validate ADA's ability to deliver impactful solutions. LDT's capability to extract simplified Finite State Machines (FSMs) from legacy code addresses a critical commercial need for code modernization, while its programmed learning tutorial has potential for adoption in academic institutions. ADA projects to capture 10% ($5M in year 1) the annual market (est. $50M) for AI code validation solutions; and scaling to 30% ($15M/yr after) through direct sales, licensing agreements, and integrations with AI safety tools.

Competitive Edge: ADA holds 10 patents related to complete and unambiguous truth models and risk assessment, providing a strong intellectual property foundation. AVT delivers a unique, innovative, and robust approach that yields trustworthy GenAI development automation, yet does so safely at the speed of need. KIHOMAC's software development quality, cybersecurity certifications, and expertise in avionics and cybersecurity further strengthens the team's competitive edge, ensuring successful delivery and commercialization of AVT.

Other People's Money: SCs and LDT have substantial commercial potential beyond DoD applications. SCs could partially amass a use as widespread as Excel spreadsheets, which have an estimated annual revenue of $14 Billion. LDT could set industry standards for high-assurance applications and maintenance. Companies typically pay $361,000 per 100,000 lines of code for legacy SW maintenance, and legacy SW has no end. These tools have the potential to revolutionize industries ranging from finance to healthcare, providing complete validation for both complex AI and deterministic systems.