2024

Major General Harold J. "Harry" Greene

Awards *for* **Acquisition Writing**

An Enduring Force For Continuous Improvement In Acquisition, Shaping Better Outcomes

by Lt. Gen. Robert M. Collins

"What I'll always remember about Harry is that he was a true patriot and the epitome of what we hope and expect of our senior leaders—a leader who is competent, able to do whatever job is given to him and to do it to the best of his ability with commitment to Soldiers, the Army, the nation, the mission and able to balance that with commitment to his family."

—then-Army Chief of Staff Gen. Ray Odierno, Aug. 14, 2014

Each year, the Major General Harold J. "Harry" Greene Awards for Acquisition Writing showcase the tremendous talent and creativity within our defense acquisition community and those associated with it. The competition, in its 11th year, has proven to be an amazing success in driving the dialogue on the important role of acquisition in delivering capabilities to our joint warfighters. I can think of no one who would take greater pride in its success than Maj. Gen. Greene. He constantly sought out ways to improve the acquisition process and obtain better outcomes.

As an Army family, we continue to mourn his loss on Aug. 5, 2014, while serving as deputy commanding general, Combined Security Transition Command – Afghanistan. We remember an inspirational leader who loved the acquisition profession, and readily shared credit with those whose efforts improved it. In 2009, on the occasion of Maj. Gen. Greene's promotion to brigadier general, he said, "In every job I had, we got things done that I think made our Army better, and it was done by other people … All I did was try to pull people in the right direction and they went and did great things." That is why these awards are a fitting tribute to him, his 34 years of distinguished service, and his ultimate sacrifice.

With this special supplement of Army AL&T magazine, we publish the works of the 2024 winning authors and those who received honorable mentions in the categories of acquisition reform, future operations, innovation and lessons learned. Along with my congratulations to them, I would like to thank all who participated in the competition, as well as the families and teammates who supported them. I would also like to express my appreciation to our outstanding panel of judges who generously contributed their time and expertise.

The contributions of Maj. Gen. Greene to the acquisition profession, the men and women in uniform we serve, and the Army will be felt for many years to come. He was an inspirational leader who left an indelible mark on us all.

2024

Major General Harold J. "Harry" Greene
Awards for Acquisition Writing

The winners and honorable mentions are:

Category: Acquisition Reform

Winner: Artificial Intelligence (AI) Literacy: An Imperative Competency

Author: **Maj. Mathew Henderson** currently serves as a Department of the Army systems coordinator with the Intelligence and Simulation Directorate, within the office of the U.S. Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)). He previously served as the first assistant product manager for Project Linchpin, the Army's solution to enable the development and delivery of Artificial Intelligence (AI) solutions to AI-enabled programs. He is a Project Management Institute Certified Agile Practitioner and holds an M.S. in systems engineering management from the Naval Postgraduate School in Monterey, California and an M.A. in business and organizational security management from Webster University in St. Louis, Missouri.

Abstract: "Artificial Intelligence (AI) Literacy: An Imperative Competency" explores the critical importance of AI literacy in the context of Army modernization and acquisition reform. It emphasizes the need for acquisition professionals to understand AI fundamentals to effectively procure, develop and leverage AI solutions for military applications. The article highlights key dependencies for successful AI implementation, including the quality and quantity of data, infrastructure requirements, interdisciplinary expertise and integration considerations. Furthermore, it underscores the significance of AI literacy in making informed decisions, managing risks, ensuring cost efficiency and promoting agility and innovation within the acquisition process. The article also offers methods to enhance AI literacy, which include implementing comprehensive training programs, prioritizing investments in AI technologies and human capital and advocating for policy reforms to support AI acquisition and integration.

Honorable Mention: Mini Portfolio Prioritization Sprints with Overarching Integrated Product Teams (O-IPTs)—Adapting to Changes within the DOD Decision-Making System

Author: **Elizabeth "Liz" Smith** is the program officer at the Joint Project Manager for Chemical, Biological, Radiological and Nuclear Medical's Accelerated Defense Pharmaceutical program and brings a wealth of experience, with over 10 years supporting the Chemical Biological Defense portfolio. She can be reached at Elizabeth.l.smith165.civ@army.mil, cell: 301-660-0475.

Abstract: Our acquisition community will continually experience changes in processes and procedures, which demand innovative ways to adapt and reform, while maintaining a balance across resource, acquisition and materiel domains. One such adaptive strategy is the implementation of a hybrid portfolio prioritization process utilizing increased engagement with joint services via an overarching integrated product team (O-IPT), to ensure that solutions are delivered timely and mission-aligned. This adaptive strategy is actionable, admits various acquisition reforms and ensures delivery to the warfighter remains resilient, timely and cost effective.

As many PMs will state, change is a constant and therefore to remain current and continually providing value to the services, peers and stakeholders, a response to the disruption is needed. While the DOD acquisition community starts to address some of these reforms and recommendations, meaningful optimized action can be taken now at expansive levels to increase agility in delivering at speed and to aligned mission capabilities. Such incremental efforts further ensure our delivery to the warfighter remains resilient, timely and cost effective.

Category: Future Operations

Winner: Human-Machine Integration and Future Operations

Author: **Lt. Col. Christian A. Abney** is a U.S. Army lieutenant colonel with 20 years of operational and defense acquisition experience. He currently serves as the product manager for the Improved Turbine Engine Program within the Program Executive Office, Aviation. He is a systems engineering Ph.D. candidate at Colorado State University and has received an M.S. in industrial and operations engineering from the University of Michigan, an M.B.A. from the University of Michigan, and a B.S. in engineering management from the U.S. Military Academy at West Point.

Abstract: In future contested environments, human-machine integration within tactical formations will be essential as Soldiers are confronted with situations where humans alone cannot accomplish tasks due to overwhelming cognitive workloads and machines alone cannot perform tasks due to technology limitations. To enable human-machine integration, stakeholders throughout the defense community must consider critical factors within human factors and ergonomics throughout the design and development processes. This article provides analysis and recommendations for developing a framework for how tasks are allocated within human-machine integrated teams.

Winner: Software Independent Verification and Validation at the Speed of Relevance

Authors: **Megan Buford** is the IV&V team lead for two major weapons systems and also leads the development effort for the Integrated Verification Platform (IVP). She has worked at DEVCOM AvMC Software, Simulation, Systems Engineering and Integration Directorate (S3I) for 4 years.

Rebecca Hennessy, Ph.D., leads the largest IV&V team in the DEVCOM AvMC Simulation, Systems Engineering and Integration Directorate (S3I) V&V Division. She has worked at S3I for 4 years and co-leads the AvMC DevSecOps Community of Practice.

Abstract: Department of Defense software modernization aims to quicken feedback loops and field high quality software on demand. As the acquisition community responds with solutions to develop software faster, supporting tasks to verify and validate software before fielding must also be completed faster. The Integrated Verification Platform (IVP) at Army Futures Command (AFC) within the U.S. Army Combat Capabilities Development Command (DEVCOM) Aviation and Missile Center (AvMC) Software, Simulation, Systems Engineering and Integration Directorate (S3I) is a Verification and Validation (V&V) DevSecOps capability that identifies software issues early. Through continuous integration and continuous deployment (CI/CD) pipelines, commercial off-the-shelf (COTS) tools, and a custom-built web application, the IVP supports the future of DOD software acquisition by delivering better software faster into the hands of the warfighter.

Honorable Mention: Learning to Expand the Aperture: Translating Emergence to Capability in Medical Evacuation and Other Operational Domains

Author: **Capt. Mahdi Al-Husseini** is an aeromedical evacuation officer and the director of the Medical Evacuation Doctrine Course at the Department of Aviation Medicine. He recently served as the operations officer for C/3-25 Lightning DUSTOFF in Hawaii and as deputy director of Lightning Labs, the 25th Infantry Division's modernization office. Al-Husseini holds an M.S. in computer science from the Georgia Institute of Technology and an M.S. in aeronautics and astronautics from Stanford University. He is a Ph.D. student at the Stanford Intelligent Systems Laboratory researching multi-agent system control in degraded communications environments. Al-Husseini is a registered patent agent, licensed professional engineer, and inventor with 30 plus patents and patent applications, many of which operationalize artificial intelligence to enhance medical evacuation.

Abstract: Multi-agent artificial intelligence can provide wartime planners with valuable insights when dealing with large and challenging operational scenarios burdened by severe constraints. Emergent properties and behaviors arise from the multiplicity of simple interactions between decision-makers. Translating these properties and behaviors into meaningful warfighter capabilities requires a

critical analysis by domain experts and a well-informed and progressive implementation strategy. An eight-step emergence translation process is introduced that begins with problem identification and ends with capability deployment. The translation process is demonstrated from start to finish using the maritime ambulance exchange point, a concept initially envisioned by 25ID aviators to extend the operational reach of medical evacuation platforms in maritime environments beginning at the littorals.

Category: Innovation

Winner: Driving Innovation: Propelling the U.S. Department of Defense's Acquisition of Hybrid-Electric Tactical Vehicles to Win the Wars of Tomorrow

Author: **Maj. Curtis N. Cranston** is an associate professor at The Judge Advocate General's Legal Center and School (TJAGLCS) in Charlottesville, Virginia. He has an LL.M. from TJAGLCS, a J.D. from Boston College Law School and a B.S. from the United States Military Academy at West Point. A former infantry officer and currently an Army judge advocate, Cranston offers this winning essay as a condensed version of his more comprehensive article concerning the same crucial topic, for which he worked closely with leaders from across ASA(ALT), Army Futures Command, the Office of the Chairman of the Joint Chiefs of Staff, and industry. Publication of the full article is forthcoming in Spring 2025 in the American Bar Association's Public Contract Law Journal.

Abstract: The U.S. Department of Defense (DOD) has relied solely on petroleum-powered tactical wheeled vehicles for over a century, creating logistical vulnerabilities and operational risks in future conflicts. As hybrid-electric propulsion technology rapidly advances in the commercial sector, the DOD faces both an opportunity and an imperative to integrate these innovations into its ground vehicle fleet. This essay examines the warfighting benefits of hybrid-electric tactical vehicles at the tactical, operational and strategic levels, highlighting their potential to enhance battlefield survivability, reduce fuel dependency and improve force mobility. However, political and procedural barriers continue to hinder progress, from misperceptions about climate policy motivations to bureaucratic acquisition challenges. To overcome these obstacles, DOD leaders must clearly communicate the warfighting advantages of hybrid-electric drive technology, refine acquisition strategies to integrate commercial innovations and prioritize modular open systems approaches. By embracing this novel roadmap to innovation, the DOD can ensure its ground forces remain agile, resilient and prepared to triumph on future battlefields.

Honorable Mention: Bridging the Gap and the Path to Real-time Intelligence: Advancing A-ISR Through Acquisition and Innovation

Author: **Eric Braun** is a government contractor employed on behalf of Semper Valens Solutions Inc. for Project Director Sensors-Aerial Intelligence (PD SAI) at the O-6 level. As the senior logistician/logistics coordinator for PD SAI, he serves as a property manager and logistics advisor for multiple programs and is currently working to incorporate the Project Directors' sensor centric strategy into the Multi-Domain Sensing System (MDSS) program. Eric has prior experience as the DOD civilian property book officer of the U.S. Army Aberdeen Test Center. He also recently retired from the Maryland Army National Guard as a E-8 master sergeant with 17 years of experience in the Infantry, Ordnance and Quartermaster branches. He has served overseas on two deployments in Egypt and Afghanistan. Before becoming full time active guard reserve in 2017, he spent 12 years in local law enforcement as a police officer, instructor and under-water recovery officer.

Contributors: **Susan Tyndall** is the PD SAI PL MDSS assistant program manager (APM) for the ARES, ARTEMIS and ATHENA aerial Intelligence, Surveillance and Reconnaissance (ISR) platforms. She is a DEVCOM C5ISR Center electronics engineer with experience supporting various program executive offices and U.S. Army Communications-Electronics Command (CECOM) Integrated Logistics Support Center (ILSC). She spent the first half of her career working as a product engineer in the automotive and consumer products industries and brought her experience to the DOD to work Army acquisition programs. She holds a bachelor's degree in mechanical engineering and master's in systems engineering.

Lauren Scicchitano is a product support manager with over 20 years of experience in Army logistics. She specializes in managing complex programs portfolios for Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEWS). She currently serves as the Product Support Manager for PD SAI-MDSS, where she oversees all aspects of logistics for that portfolio. Prior to this role, she has leadership positions in logistics at other program offices and at PEO IEW&S.

Michael Amabile is a systems engineer supporting PD SAI, focusing on SIGINT (Signals Intelligence) sensor systems, cooperative sensor operations and end-to-end systems integration. Over the course of 30 years within the DOD community, he has participated in all phases of the acquisition life cycle, from requirements development, research, system design, implementation, testing and fielding. Within the last ten years at PD SAI, Amabile has focused on efforts to quantify sensor performance, to design methods for enabling sensor interoperability within the joint and national architectures, and in the development of a modernized data architecture for PD SAI sensor systems. He holds a bachelor's degree in mechanical and aerospace engineering.

Abstract: In December 2018, the operational environment called for an improvement to the capabilities of Army Aerial Intelligence, Surveillance and Reconnaissance (A-ISR) systems. Within the 2018 National Security Strategy, the White House recognized the need to be prepared for full spectrum, multiple domain combat operations. Recognizing the need to provide the best continued service and technology to the warfighter in today's world of ever-growing peer and near-peer threats, the assistant secretary of the Army (Acquisition, Logistics and Technology) (ASA(ALT)) approved the use of technical demonstrator aircraft in Executive Order (EXORD) 215-20 Aerial Proof of Concept Technical. Since then, Project Director Sensors-Aerial Intelligence (PD SAI) under the command of Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEW&S), Project Manager Fixed Wing (PM FW) under the command of Program Executive Office Aviation (PEO AVN), and several other key stakeholders have already fielded three contractor owned and contractor operated (COCO) high altitude jets with onboard sensor systems as demonstrators, with more on the way. These new A-ISR aircraft have advanced the Army's A-ISR technology and capabilities, while providing continued support in critical missions across the world.

Category: Lessons Learned

Winner: Enhancing Army Acquisition Through Collaborative Communication

Author: **Mark Rashford, Jr.** has been affiliated with the DOD for the last 14 years, working as an active-duty service member, a government contractor and a government civilian in the fields of security, information technology and most recently, acquisition analytics. He has worked with the Army, Air Force and the Navy and has formed some unique perspectives of federal service from this experience. His current long-term goals include driving effective change within the federal government to strengthen the nation's processes and procedures in a manner that is conducive to efficient success.

Abstract: Effective communication and collaboration are critical to the success of the Army acquisition community, yet existing structures often create information silos and hinder real-time problem-solving. This paper explores a concept inspired by a successful Navy initiative that leveraged Microsoft Teams to enhance knowledge-sharing, streamline processes and drive innovation. By implementing a similar platform within Army acquisition, personnel at all levels could engage in open discussions, address challenges efficiently and share best practices in a secure, structured environment. This concept promotes professional development, enhances decision-making and ultimately improves acquisition outcomes to better support mission readiness. Through leadership endorsement and clear guidelines, such a platform has the potential to foster a more connected, responsive and effective acquisition workforce.

During my time working in the security career field with our sister service branch, the U.S. Navy, I witnessed firsthand, the transformative power of open communication and collaborative problem-solving … all through a platform that most of us use every day now, Microsoft Teams. The director of Personnel Vetting, Steven Santomauro, has established, for the benefit of everyone in the security community, a place to pose questions, share ideas and address issues in real-time. I would like to propose a similar solution within the Army acquisition community to bridge communication gaps, enhance innovation and streamline processes.

Honorable Mention: Rethinking the Role of C2 in Army Acquisition: Lessons from FCS and DCGS-A

Author: **Col. Matthew Paul** is project manager for Integrated Personnel and Pay System – Army at Program Executive Office for Enterprise, has supported and led software-intensive and major defense acquisition programs. His 25 years of Army service include 16 years in the Acquisition Corps and nine years as an infantry officer at home and abroad.

Abstract: This article examines the role of command and control (C2) structures in Army acquisition programs by analyzing two major case studies: Future Combat Systems (FCS) and Distributed Common Ground System-Army (DCGS-A). The author argues that the common binary approach to C2, assigning either complete government or industry control, is often ineffective and that the choice of C2 structure is not the direct cause of program success or failure. Rather, misaligned C2 structures exacerbate issues related to technology maturity, integration complexity and rigid requirements. The author demonstrates how both FCS (industry-led) and DCGS-A (government-led) suffered from these issues despite their differing C2 structures. The author argues that effective C2 decisions require nuanced analysis based on program-specific characteristics. The author proposes using the military decision-making process (MDMP) as a framework for making C2 decisions, advocating for mixed government-industry responsibilities rather than binary choices. This approach enables programs to leverage both government domain expertise and industry technical capabilities while mitigating cognitive biases in decision-making. The analysis concludes that optimal C2 structures should be tailored to each program's unique characteristics rather than following predetermined models.

Major General Harold J. "Harry" Greene Awards for Acquisition Writing Distinguished Judges

Vincent E. Boles, Maj. Gen. USA (Ret.), Defense Acquisition University (DAU) professor of Life Cycle Logistics and former assistant deputy chief of staff, Army G-4

Charles A. Cartwright, Maj. Gen. USA (Ret.), cattle rancher, former DAU faculty member, and former program manager, Future Combat Systems

John T. Dillard, Col. USA (Ret.), senior lecturer (Ret.), Department of Systems Engineering, Naval Postgraduate School

Steffanie Easter, senior vice president and chief sustainability officer for CAES and former acting assistant secretary of the Army (Acquisition, Logistics and Technology), Army acquisition executive, and senior procurement executive

Professor Raymond D. Jones, chair, Department of Defense Management and professor of practice, Naval Postgraduate School

Roger A. Nadeau, Maj. Gen. USA (Ret.), senior vice president, American Business Development Group and former commanding general, U.S. Army Test and Evaluation Command

Robert L. Marion, Lt. Gen. USA (Ret.), senior vice president and corporate strategic advisor for CACI and former principal military deputy to the assistant secretary of the Army (Acquisition, Logistics and Technology) and director, Army Acquisition Corps

Gary Martin, president of GPM Consulting LLC and former program executive officer for Command, Control and Communications – Tactical

Dana J.H. Pittard, Maj. Gen. USA (Ret.), vice president of Defense Programs, Allison Transmission and former commanding general, 1st Armored Division

Ken Rodgers, Col. USA (Ret.), director, strategic defense and C4I, Cypress International, Inc. and former deputy program director, Ground-based Midcourse Defense, Missile Defense Agency

Michael A. Santaspirt, Ph.D., deputy chief of staff, G2, and chief futures officer, U.S. Army Combat Capabilities Development Command Armaments Center

Cedric T. Wins, Maj. Gen. USA (Ret.), superintendent, Virginia Military Institute and former commanding general, U.S. Army Combat Capabilities Development Command

Category: Acquisition Reform

WINNER

Artificial Intelligence (AI) Literacy: An Imperative Competency

By the following author:
Maj. Mathew Henderson

Adopting the internet was like building a new road to connect businesses more efficiently; adopting artificial intelligence (AI) is like stepping into an expansive, untapped metropolis where every street corner offers new possibilities. Successfully adopting AI depends not just on finding the right path, but on understanding and leveraging the entire city's complex, interconnected infrastructure.

In the rapidly evolving landscape of technology, AI stands at the forefront of transformative change. As the Army shifts to adopting Agile software development practices, alongside significant acquisition reform, AI literacy is an imperative. Without a baseline understanding of AI, acquisition professionals risk making suboptimal decisions that could result in the inefficient use of resources or delivering insufficient solutions to the warfighter.

AI Fundamentals

AI refers to the ability of machines to perform tasks that would typically require human intelligence such as learning from data (machine learning), recognizing patterns, making decisions and understanding natural language. The potential applications of AI for commercial and military purposes are endless. In the digital arms race, acquisition professionals owe it to the warfighter to deliver the best AI solutions that shorten the sensor to shooter kill chain, optimize human-machine integration and enable the Army to dominate in complex and continuously changing environments.

Machine Learning (ML) is a subset of AI that focuses on training algorithms to learn from and make predictions based on data. Rather than being explicitly programmed for each task, ML systems improve their performance over time as they are exposed to more data. This learning process enables AI to adapt to new information and changing environments (Allen, 2020).

Neural Networks are a type of ML model inspired by the structure of the human brain. They consist of layers of interconnected nodes (neurons) that process data and extract patterns. Deep learning, a more advanced form of neural networks, has been instrumental in achieving breakthroughs in image recognition, natural language processing and other complex AI tasks (Allen, 2020).

Learning Types to train AI models vary depending on use case and model requirements. Supervised learning uses labeled data to train models, allowing them to make predictions or classify new data based on clear examples. Unsupervised learning works with unlabeled data, discovering patterns or groupings without predefined categories or labels. Semi-supervised or hybrid learning combines both labeled and unlabeled data, leveraging a small amount of labeled data to guide learning while exploring the broader, unlabeled dataset (Allen, 2020).

Key Dependencies:

Data: AI systems require large amounts of quality data to function effectively. The performance and effectiveness of a model are directly correlated with the quantity and quality of the data on which it is trained (Chennai & Nadu, 2023).

Quantity: The more data a model has access to, the better it can learn the underlying patterns and nuances of the task it is designed to perform. This is particularly important in military applications, where variability and complexity are high. Merely having large amounts of data is not enough. The right data for the specific context is critical. Overhead imagery of a target in a tropical environment is not useful for recognizing the same target in a desert environment. Our future fight is highly variable and acquisition professionals will need to address data availability for the theater, threat, environmental conditions, data formats and more as they seek to acquire AI solutions.

Quality: Having a large amount of data is not enough. On average, only 10% of data from a given dataset is useful for model training. Data quality includes several factors such as the elimination of errors, biases and inconsistencies, and ensuring the data accurately represents real-world scenarios the AI system will operate in. Distilling an initial larger data set into data that is useful for model training is costly. Acquisition professionals must account for data preparation costs to clean, curate and label data as this can represent more than half of the overall cost of an AI project (Human-Centered Artificial Intelligence, 2024).

AI literacy increases understanding of the relationship between data quantity/quality and model performance. For the future fight, warfighters will need to collect and store the high-quality data required to train models. Acquisition professionals must be conscious of these factors as well as the costs to collect, store, clean, curate and label data. They must be cognizant these costs will recur through the model's life cycle. Employment of AI includes a recurrent feedback loop where new data collected from the operational environment is used to improve or re-train the model for relevant and accurate performance.

Infrastructure: Developing and implementing AI at scale requires a robust infrastructure and resources. This includes high-performance computing resources, cloud services, development tools and services, and network and storage systems. Without the necessary infrastructure, AI initiatives may struggle to deliver on their potential. For example, improperly forecasted cloud compute requirements could result in development bottlenecks with cost and schedule impacts.

Interdisciplinary Expertise: Developing and deploying AI systems requires collaboration across multiple disciplines, including data science, software engineering, cybersecurity and domain-specific knowledge. AI literacy enables acquisition professionals to horizontally integrate these diverse teams and ensure the variable aspects of AI development are aligned with operational goals.

Integration/Interoperability: Acquisition professionals must understand system interdependencies and how AI solutions might interact with other technologies. Ignorance could lead to horizontal integration failures as data, infrastructure, and AI tools and services must come together to develop and deploy a model. The model is also integrated and employed by a system which is then connected back to the model development process for model monitoring, feedback and re-training purposes (Allen, 2020). Understanding integration and interoperability issues is important for avoiding vendor lock and creating silos of information.

AI Literacy: A Key Competency For Acquisition Reform

AI literacy is a strategic competency. It enables acquisition professionals to engage more effectively with stakeholders, ask the right questions, challenge assumptions and make informed decisions aligned with the Army's strategic goals. It also allows acquisition professionals to anticipate and mitigate risks, ensuring AI solutions deliver value to the warfighter.

AI literacy must be a cornerstone of the Army's acquisition reform efforts to make processes more agile, innovative and responsive to emerging threats. Incorporating AI literacy into the professional development of acquisition professionals is essential for several reasons:

Enhanced Decision-Making: AI literate professionals can make better-informed decisions regarding the selection, development and integration of AI solutions. They can better evaluate AI's capabilities and limitations against operational requirements, ensuring the Army acquires solutions that meet the needs of warfighters. Not every problem requires an AI solution. AI literacy enables the acquisition community to discern when AI is an appropriate solution.

Risk Management: Understanding AI's risks, including biases, ethical concerns, cybersecurity threats and limitations allows the workforce to implement robust risk mitigation strategies. This is critical for maintaining trust and ensuring that AI systems operate as intended.

Cost Efficiency: Understanding AI's real-world applications and limitations enables resources to be more efficiently allocated to achieve more effective outcomes.
The cost to develop and train a model varies depending on model complexity, data quantity/quality and infrastructure requirements. Acquisition professionals must understand cost-driving variables such as data preparation, infrastructure, computation, development and operating costs.

Data preparation may represent 50% or more of a project's cost and includes data acquisition, cleaning, curating and labeling. Infrastructure costs may represent 10-20% of cost and vary based on whether cloud computing or on-premises resources are leveraged. Computation costs for model training, optimization and tuning may also represent 10-20% of cost. Development and operating costs may account for 20-30% of project cost. Estimates can vary significantly depending on project specifics, data availability/readiness, model complexity, desired model performance/accuracy and scale of deployment (Human-Centered Artificial Intelligence, 2024).

Ethical and Legal Compliance: As AI becomes more prevalent in military operations, ensuring compliance with ethical standards and legal frameworks is crucial. An AI literate acquisition workforce is better suited to navigate these complex issues.

Agility and Innovation: An AI literate workforce is better equipped to adapt to new developments and adopt cutting-edge technologies. AI literacy fosters a culture of continuous learning and innovation and promotes agility that is vital for keeping pace with rapidly evolving threats.

Practical Steps To Enhance AI Literacy

Army Directive 2024-02 "Enabling Modern Software Development and Acquisition Practices" illustrates the Army's inclusion of modern software practices as part of wider acquisition reform. To capitalize on this progress and promote AI literacy, the following initiatives should be considered:

Training Programs: Develop and implement comprehensive AI training programs tailored for acquisition professionals. These programs should cover AI fundamentals, military applications, ethical considerations, and best practices for acquisition and integration. Additionally, advocate for greater access to training resources through Defense Acquisition University (DAU) and Chief Digital and Artificial Intelligence Office (CDAO).

Upskill and Cultivate Our Own Talent: In tandem with training programs, establish mechanisms for continuous learning and professional development for AI competencies. Additionally, focus talent management strategies on recruiting, retaining and developing personnel with AI expertise to ensure the Army has the necessary human capital to support AI initiatives. The Army should continue to attract non-traditional talent and expand assessing new officers with specialized skills higher than entry level. While the Army builds AI competency, leverage acquisition professionals with demonstrated software and AI competencies in positions where those skills would most benefit the Army.

Prioritization of Investments: A 2021 report from Georgetown University's Center for Security and Emerging Technology (CSET) estimates China's military invests at least $1.6 billion annually in AI (Fedasiuk, Melot, & Murphy, 2021). Investments in AI technologies and human capital must be prioritized to pace the threat and win the future fight.

Policy Reform and Support: The Acquisition Reform Agenda for Fiscal Years 2024-2025 highlights AI, under digital transformation, as a focus area for reform. The Army must continue to advocate for institutional change and reform policies to support the acquisition of AI. Future efforts could also include advocating for reform to processes supporting acquiring software and AI.

Commit to Modernization: Prioritize AI literacy as a strategic objective to foster a culture that values and invests in AI education across the organization. The Army should continue to support the use of modern software development practices and cross-disciplinary collaboration. This facilitates knowledge transfer and promotes AI literacy across the acquisition workforce.

Conclusion

AI literacy is a catalyst for acquisition modernization. Those who do not understand AI will struggle to accurately assess the cost, capabilities and limitations of the technology. The path to successful AI adoption lies in the hands of AI literate acquisition professionals. Building AI competencies enables the Army to acquire the right technologies, mitigate risks and achieve modernization goals. Ultimately, AI literacy will empower the acquisition workforce to make informed decisions, enhance operational effectiveness, protect ethical standards and ensure the Army remains at the forefront of technological innovation.

Notes:

Allen, G. (2020). Understanding AI Technology. Washington, DC: Joint Artificial Intelligence Center (JAIC).

Chennai, G., & Nadu, T. (2023). AI and Data Engineering: Harnessing the Power of Machine Learning in Data-Driven Enterprises. International Journal of Machine Learning Research in Cybersecurity and Artificial Intelligence, 195-226.

Fedasiuk, R., Melot, J., & Murphy, B. (2021). Harnessed Lightning: How the Chinese Military is Adopting Artificial Intelligence. Washington, DC: Georgetown University Center for Security and Emerging Technology.

Human-Centered Artificial Intelligence. (2024). Artificial Intelligence Index Report. Stanford: Stanford University.

Honorable Mention: Mini Portfolio Prioritization Sprints with Overarching Integrated Product Team (O-IPTs) – Adapting to Changes within the DOD Decision-Making System

By the following author:
Elizabeth "Liz" Smith

As many PMs will state, change is a constant and therefore to remain current and continually providing value to the services, peers and stakeholders, a response to the disruption is needed. While the DOD acquisition community starts to address some of these reforms and recommendations, meaningful optimized action can be taken now at expansive levels to increase agility in delivering at speed and to aligned mission capabilities. Such incremental efforts further ensure our delivery to the warfighter remains resilient, timely and cost effective.

Introduction – Current Environment For Big 'A' Reform

Over the past several years, there have been various instances where recommendations for acquisition reform have been identified,[1,2,5,6] but it has not been until recently, with the issuance of the 2023 Biodefense Posture Review (BPR) and in conjunction with the 2024's Commission on Planning, Programming, Budget and Execution (PPBE) reform, that the Department of Defense (DOD) Acquisition and Medical community now face a holistic 'Big A' reform for more agile portfolio management and prioritization to increase mission capability deliveries to the DOD.

Recalling the DOD decision support system, or 'Big A' process, the simplified core facets are Requirements (accomplished by the Joint Capabilities Integration and Development System (JCIDS)); Resources (accomplished by the PPBE); and Materiel Solutions (accomplished by the Defense Acquisition System (DAS)). Since all 'Big A' processes are integrated, it is naturally anticipated that recommendations and reforms in one facet would directly impact the others. This fact was highlighted with DAS's implementation of the Adaptative Acquisition Framework in 2020.

While there is still much discussion about implementing 2024 PPBE reforms, some pertinent recommendations include "strengthening the defense resourcing guidance" and "establish(ing) continuous planning and analysis"[4]. Similarly, the 2023 BPR highlights recommendations for both requirements and materiel 'Big A' facets, urging for a strengthened requirements pipeline for biodefense, via "improved JCIDS interaction" and "aligning policies; authorities; research, development and acquisition (RDA) responsibilities" to enhance responsiveness to emerging threats[3].

Impact To Program Managers (PMs) And Portfolio

Underneath these extensive reforms and recommendations to the 'Big A' process, several constants remain: speed of relevance and mission-aligned capabilities. Amidst these looming reforms, DOD acquisition leaders still need to manage their portfolios with these constants at the forefront of their considerations.

At its core, portfolio management is focused on collecting a series of projects and programs that, when combined, best achieve the strategic goals and objectives for an organization.[7] For the DOD, this can be distilled down to the operational utility and relevance being delivered to the services, to achieve a mission capability.

Under the current 'Big A' paradigm, all facets are driven by either a specific gap, an event, or calendar cycle. As such, managing a portfolio and selecting projects to deliver a capability in a timely manner can be severely hindered due to the inherent nature of the current process.

Potential Solution: Mini Portfolio Prioritization Sprints With O-IPTs

To start adapting to these pending reforms and ensure the services are receiving the most useful solution requested in a timely manner, a proposed solution is through the implementation of a hybrid portfolio prioritization process.

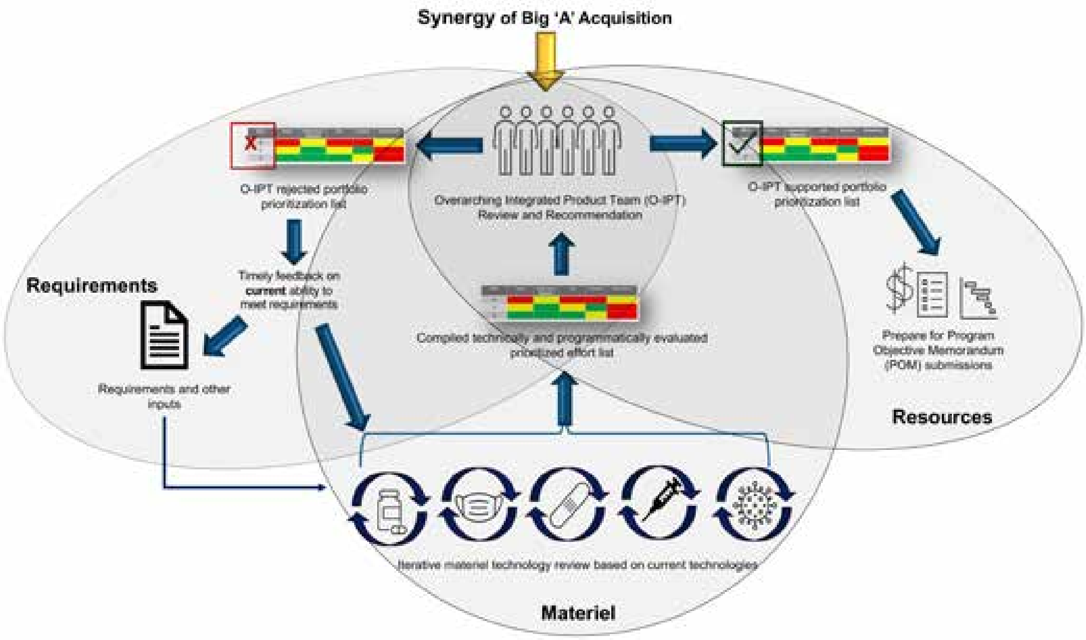

FIGURE 1

Example of Hybrid Portfolio Prioritization at Joint Project Manager (JPM) Level. Even at such a focused level, the various inputs and outputs from the engagements with O-IPT members can still be seen to mirror the major facets of the 'Big A' decision making system. (Graphic courtesy of the author)

The concept of prioritization for programs and portfolios is not new; rather, a similar comment has been raised by both the Government Accountability Office (GAO)[1] and the National Defense Authorization Act's Section 809 Panel.[2] Distinguishing differences for agile portfolio prioritization are the engagement levels and frequency.

Ensuring that the newly evaluated efforts aligned to the mission capabilities remain critical. No value is obtained if an effort is delivered on time and within budget but provides no use to the services. Therefore, the selection of prioritization criteria used to evaluate such efforts is vital. For this reason, engaging with the services, resource stakeholders and subject matter experts (SMEs) through a charted O-IPT is paramount. This forum offers the unique capability to devise and review a holistic snapshot of various decision criteria that align to mission needs.

Such criteria can include:

- Requirement and directive alignment.
- Militarily utility.
- Clinical relevance.
- Technology Readiness Level (TRL).
- Addressing threats.
- Programmatic considerations (cost, schedule).
- Risks to effort and portfolio.

Additionally, the O-IPT provides an established engagement frequency in alignment with the existing programming cycle of PPBE to inform the Program Objective Memorandum (POM). While the 2024 PPBE Reform highlights that "the current PPBE process does not provide the Department's senior leadership with the ability to implement change at the scale and speed the DOD requires,"[4] establishing increased engagements and feedback from the services and SMEs on the curated prioritized effort list will proactively preposition PMs to provide timely and informed resourcing opportunities through existing PPBE process, with additional ways to accelerate. Outside of the traditional timetable for POM, PMs and O-IPT should meet at least twice a year to remain current on the prioritized list of potential efforts.

As mentioned earlier, PMs must also balance 'mission alignment' with 'speed of relevance.' As both the 2023 BPR and 2024 PPBE reform have stated, under current processes, this can be significantly hindered. To alleviate this, solutions can be achieved through the iterative reviews and engagements with O-IPTs. As depicted in Figure 1 (above), the iterative review of materiel technology solutions is constant throughout the fiscal year, producing a curated list of the most current information to be reviewed and discussed with O-IPTs. A second-order effect and benefit of such a process, is that this creates an iterative feedback process to the services, resource stakeholders, and SMEs on the current technological landscape and how capabilities gaps and requirements are being fulfilled. Such information is extremely beneficial, as this can further augment additional materiel analysis, such as market research and other supporting analysis of alternative efforts.

Summarized impacts of a hybrid portfolio prioritization process include:

- Direct engagement with the services and resource decision makers to confirm the 'right' solutions are included.
- Direct line-of-sight from both the service and national requirements to enhance informed resourcing decisions.
- Expedited identification of resourcing demands and collaboration opportunities on cost-sharing initiatives across the enterprise.
- Evaluating and providing solutions at speed of relevance and pacing with technology advancements.
- A scalable process to fit various levels. While Figure 1 depicts an example at a medical Joint Project Management (JPM) level, this process could be scaled up or down to meet the intended needs for that portfolio.

Conclusion

As many PMs will state, change is a constant and therefore to remain current and continually providing value to the services, peers, and stakeholders, a response to the disruption is needed. While the DOD acquisition community starts to address some of these reforms and recommendations, meaningful optimized action can be taken now at expansive levels to increase agility in delivering at speed and to aligned mission capabilities. Such incremental efforts further ensure our delivery to the warfighter remains resilient, timely and cost effective.

Notes:

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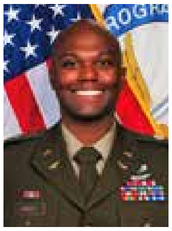
Category: Future Operations

WINNER
Human-Machine Integration and Future Operations



By the following author:
Lt. Col. Christian A. Abney

In future contested environments, human-machine integration (HMI) will play a critical role in enabling the distribution of relevant information and creating knowledge throughout rapidly changing battlefields. In these environments, HMI teams will evolve from the initial concepts developing though experimentation today into dynamic knowledge network systems that incorporate artificially intelligent ground and air machine teammates that leverage high degrees of autonomy while collaborating

FIGURE 1

with humans. These future HMI teams will be complex systems with diverse components and intricate relationships. Altogether, these systems will incorporate humans supervising, collaborating with and ultimately, relying upon intelligent machine agents to accomplish tasks and achieve mission success.

It is within the imagination to consider a scenario in which an advanced HMI team operates as a dynamic knowledge network system to perform reconnaissance operations on the near-term future battlefield. In conducting its mission of determining route trafficability before friendly force movement, the team will leverage the strengths of human-machine teaming. Prior to mission execution, the team performs a thorough map reconnaissance using an AI-capable mission planning system to develop an optimized list of routes and hazards based on all available data, including equipment characteristics, weather reports and pattern-of-life information. During mission execution, the team leverages its machine counterparts' strengths in pattern recognition and data processing to conduct routine tasks, such as collecting visual images and performing calculations to determine route distances, terrain gradients and road curvatures. Additionally, machines are employed to identify signals in the mission area, such as lights, movement, noise and electromagnetic signatures. Finally, machines provide early warnings to prevent errors, such as cautioning against unintended route deviations and identifying equipment anomalies.

As the machine teammates carry out these tasks, they enhance the humans' perception of the environment. This, in turn, enables humans to focus on higher-level cognitive tasks, such as determining courses of action, responding to potential threats and making real-time adjustments to mission objectives based on the commander's intent. Overall, this optimized human-machine team enhances the ability to collect and distribute relevant information across the battlefield, generating the knowledge that enables the unit commander to comprehend the environment and project future mission actions based on identified risks and opportunities.

In July 2024, the New York Times reported on a Ukrainian engineering company's demonstration of AI-capable drones that leverage deep learning algorithms to track moving targets in dynamic environments autonomously.[1] This demonstration is only one in a series of recently increasing attempts to integrate artificially intelligent autonomous systems within human military formations. Along with other examples from the Russo-Ukrainian war, it provides compelling evidence that scenarios such as the HMI reconnaissance operation previously described are rapidly becoming a combat reality.

What Challenge Is Human-Machine Integration Addressing?

For the Department of Defense (DOD), the integration of intelligent machines within human formations addresses a serious military concern. For the past quarter century, the U.S. and its allies have been involved in wars and military operations throughout the Middle East. During this time, four significant conditions have developed.

First, strategic competitors have observed U.S. capabilities and adapted their doctrines to better compete on the battlefield. Second, new military competition domains, such as space and cyberspace, have emerged on a large scale alongside the traditional land, air and maritime domains. Third, military applications for technologies leveraging autonomy and artificial intelligence have matured. Finally, access to advanced technologies for both state and non-state actors has increased as previous barriers, such as costs, have decreased.

Additionally, the DOD recognizes the progress of the People's Republic of China in leveraging machine learning and human-machine integration. In its annual military and security report to Congress, the DOD highlighted China's continuing efforts to transform its forces from an 'information-centric' to an 'intelligentized' military, in which AI technologies are integrated into human formations to improve Soldier cognitive processing abilities, which in turn enables more efficient and accurate information processing on the battlefield.[2]

These conditions highlight the overarching challenge that the military must address. Ultimately, the pace of combat decision-making in future operations will accelerate, and the need to rapidly collect and distribute relevant data across the battlefield will increase. At the same time, Soldiers' capabilities to accomplish mission objectives alone will become more challenging. Integrating intelligent machine technology into human formations to perform mission tasks is one potential solution to this emerging problem.

Leveraging Human Factors To Prepare For An Integrated Future

The Army's recently announced Continuous Transformation Strategy addresses how its forces will begin organizing and resourcing human-machine formations now and in the future. It outlines a process of transformation in contact between 2024 and 2026, deliberate transformation between 2026 and 2030, and concept-driven transformation between 2030 and 2035 that will enable iterative fielding of progressively more advanced HMI systems as technologies mature.

What must also evolve as technology advances and modernized HMI systems are introduced within tactical formations is the framework for how the warfighter

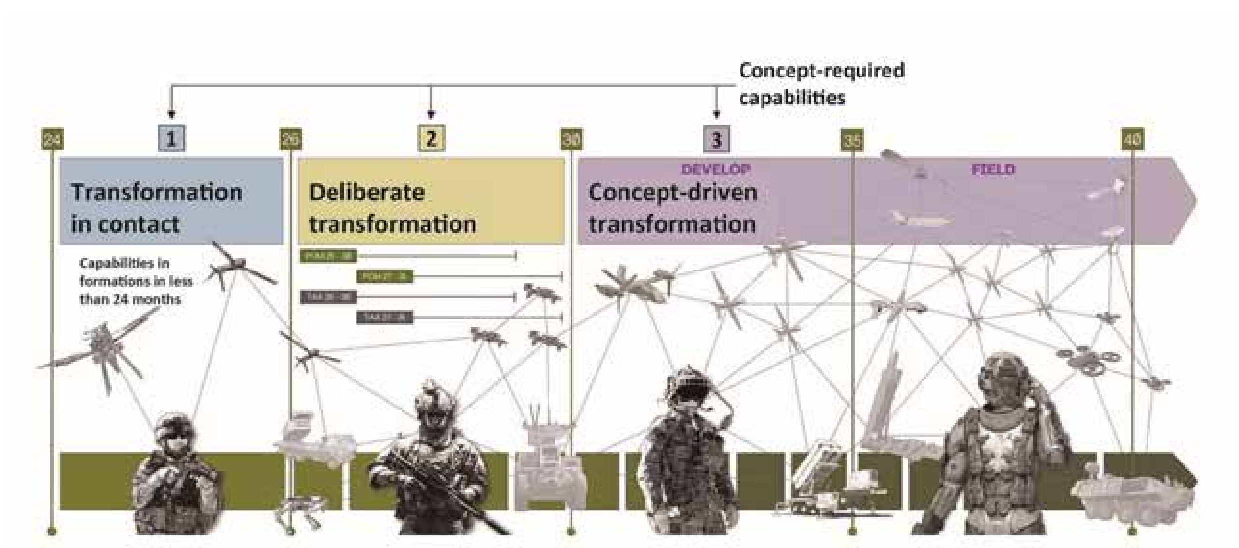


FIGURE 2

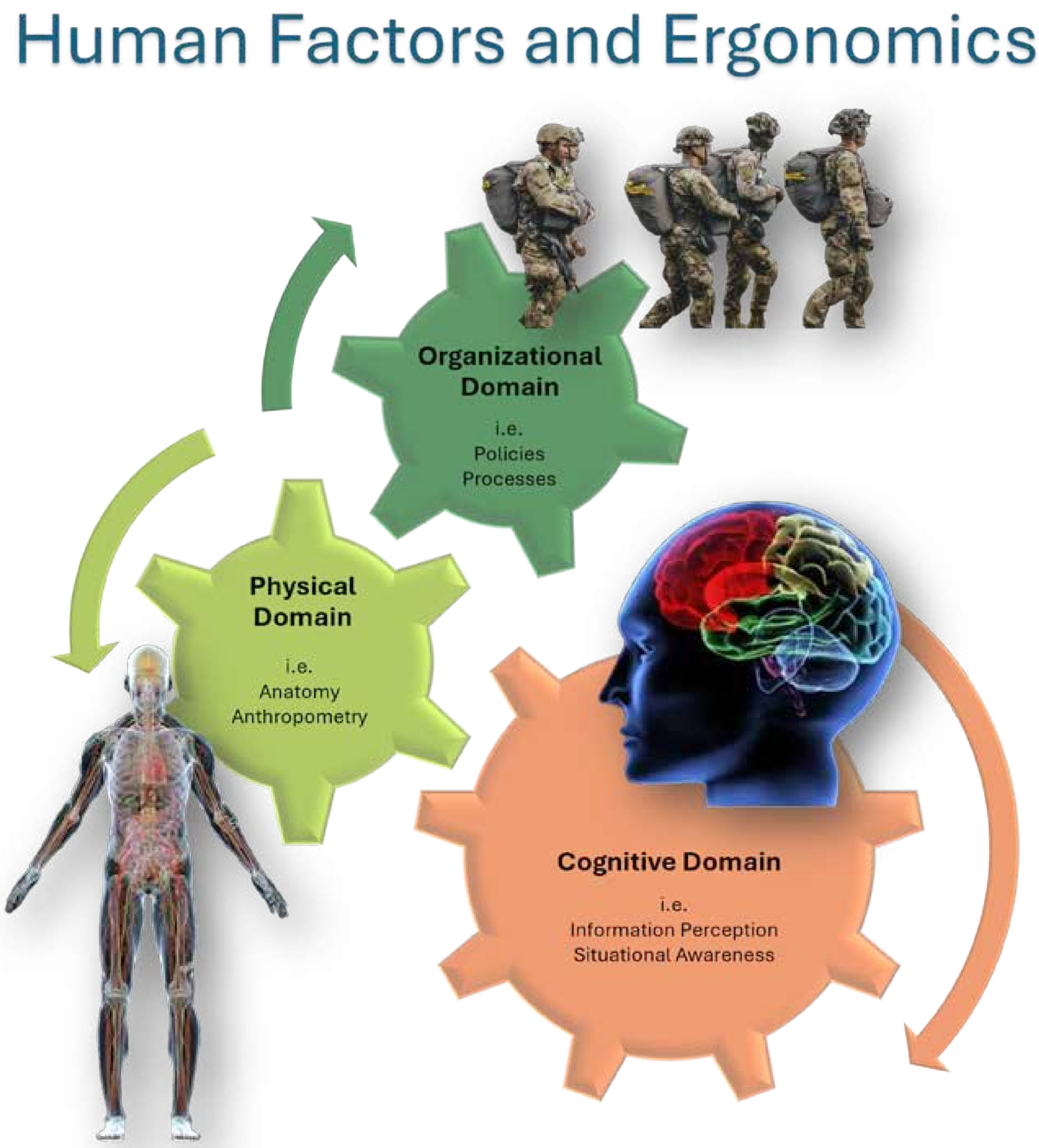

Human Factors and Ergonomics
Organizational Domain
i.e.
Policies
Processes
Physical Domain
i.e.
Anatomy
Anthropometry
Cognitive Domain
i.e.
Information Perception
Situational Awareness

FIGURE 3

allocates tasks between Soldiers and intelligent machines. This task allocation framework must be continuously evaluated as the domains in which AI and autonomous capabilities are broadened, and the levels of trust in system effectiveness are strengthened. Human factors will play an essential role in enabling the development of an adaptable task allocation framework.

Human factors and ergonomics (HFE) is the scientific field that focuses on understanding how humans interact with other system elements.[3] Two core values within the study of HFE that directly relate to acquisition professionals are that technology is a tool to assist humans, as are the weapon systems the acquisition community designs, develops, and delivers to support warfighters, and there is a continuous responsibility to all stakeholders.

HFE is generally described within three domains: cognitive, physical and organizational. The cognitive domain within HFE focuses on the mental processes that affect interactions among humans and other system elements. The physical domain studies considerations such as human anatomical and anthropometric features and how they influence physical activity. Finally, the organizational domain explores opportunities to improve policies and processes by understanding how organizations communicate, distribute resources and make decisions. HMI development will rely on addressing factors within each domain; however, exploring how cognitive domain considerations impact task allocation between humans and machines will have a particularly powerful influence on improving Soldier and team performance on the battlefield.

Cognitive ergonomics is the study of cognitive domain considerations within HFE. It explores how people interact with systems and how those interactions affect human mental abilities. Information perception is one of several cognitive ergonomic considerations and describes how humans detect and understand the information in their environments. This specific cognitive consideration can greatly influence HMI system design and is a key factor when allocating tasks within human-machine systems. Therefore, when considering information perception during HMI system development, system designers must leverage the understanding that people commonly perceive information in three ways: as signals, signs or symbols.

Signals are indicators that provide time and space data to guide reactions and decisions. For example, a Soldier's physical movements while navigating a battlefield are often informed by signals, such as lights, sounds and movements. An auditory signal, such as an explosion, and a visual signal, like a flash of light, can elicit a reflexive response to seek cover from a nearby threat.

Signs are environmental elements that provide direct information, carry some explicit meaning, and often trigger a predetermined response. For instance, a team of Soldiers on patrol in a civilian-populated area will recognize nearby personnel in military uniforms as a sign indicating a potential threat; therefore, the Soldiers will carry out a predetermined "if-then" decision process. If the uniforms are those of friendly forces, then the threat level remains low; however, if the uniforms are those of an enemy or unknown element, then the threat level is elevated. Uniforms, street signs and commonly understood pictures or images are examples of signs that provide specific, unambiguous information that initiates programmed responses.

Finally, symbols are the indications that carry intrinsic meaning and can be challenging to understand without context, knowledge or cultural understanding. Military rank is an example of a symbol, as it provides both explicit hierarchical information and implicit cultural information that requires experience and understanding inherent within the organization. For instance, in military hierarchy, officers outrank enlisted Soldiers. However, years of military, technical and operational experience can often enable a talented enlisted Soldier to earn the general military authority within the organization that all unit members recognize and leverage to enable team success.

Defining how humans perceive information as signals, signs and symbols is essential for determining how humans and machines share information and execute tasks to enhance HMI team performance. This information can be leveraged in conjunction with other factors to develop the framework for allocating tasks within HMI teams.

Task Allocation Examples

The following examples show how, when considering information perception alone, HFE can be leveraged to provide a framework that enables HMI system designers and the warfighter to determine how tasks are allocated within an HMI team. A more robust task allocation framework, currently in development, will include additional considerations, such as human performance, error prevention and situational awareness.

When a machine is technically capable and available to perform a task, it can be selected over a human to identify indicators within the environment that provide time and space data (signals). This can include identifying lights, sounds, movement, smoke or electromagnetic signatures, thus decreasing the cognitive burden on humans within the HMI team.

Both humans and machines are sufficiently capable of being trained or programmed to identify environmental elements that provide direct information and carry explicit meaning (signs), such as identifying nearby personnel in military uniforms and conducting a predetermined "if-then" response. Therefore, both humans and machines can be selected to perform such tasks based on ability, availability and prioritization.

Humans are currently more capable and/or more reliable and should be selected over machines at identifying environmental elements that require comprehensive and cultural understanding (symbols), such as using criteria like military rank to determine a person's authority and ability to carry out and achieve a mission objective.

Conclusion

In summary, HMI teams will be critical enablers in contested environments and essential on future battlefields as Soldiers confront situations where humans alone cannot accomplish tasks due to overwhelming cognitive workloads and machines alone cannot accomplish tasks due to technology limitations. As the defense community becomes more familiar with fundamental concepts within HMI teaming, such as human factors and ergonomics, stakeholders will be more capable of positively influencing how tasks are allocated between humans and machines.

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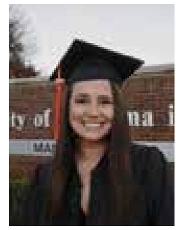
WINNER

Software Independent Verification and Validation at the Speed of Relevance

By the following authors:



Megan Buford

Rebecca Hennessy, Ph.D.

You are a product manager leaving a program management review, and your software-intensive defense system is over budget and underperforming. Of course it is. You've started hearing from your leadership that end users need the product more than ever, so things need to start moving faster. You joke to yourself, "Be over budget and underperform faster? No problem, that's easy!," but really you recognize acquiring defense software better and faster is necessary to field reliable capability that supports Department of Defense (DOD) readiness.

Software modernization is a DOD goal under their strategic priority to "Transform the Foundation of the Future."[1] National Defense Authorization Acts (NDAAs) for the implementation of modern software practices and workforce training are becoming frequent[2] and include guidance to engineer "new software capabilities quickly."[3] The software acquisition pathway, now available to the acquisition workforce, slashes the release cycle time down to a required 1-year cycle, a significant reduction from the DOD historical average of 2 to 10 years.[4] To guide the defense acquisition workforce, the Office of the Under Secretary of Defense for Research and Engineering reiterates the call for DevSecOps and Agile practices in their System Engineering Guidebook.[5] These steps to modernize the DOD's approach to software development aim to bring software development up to speed with real-world needs, but software being "invisible" and "never complete" continues to challenge the defense acquisition community.

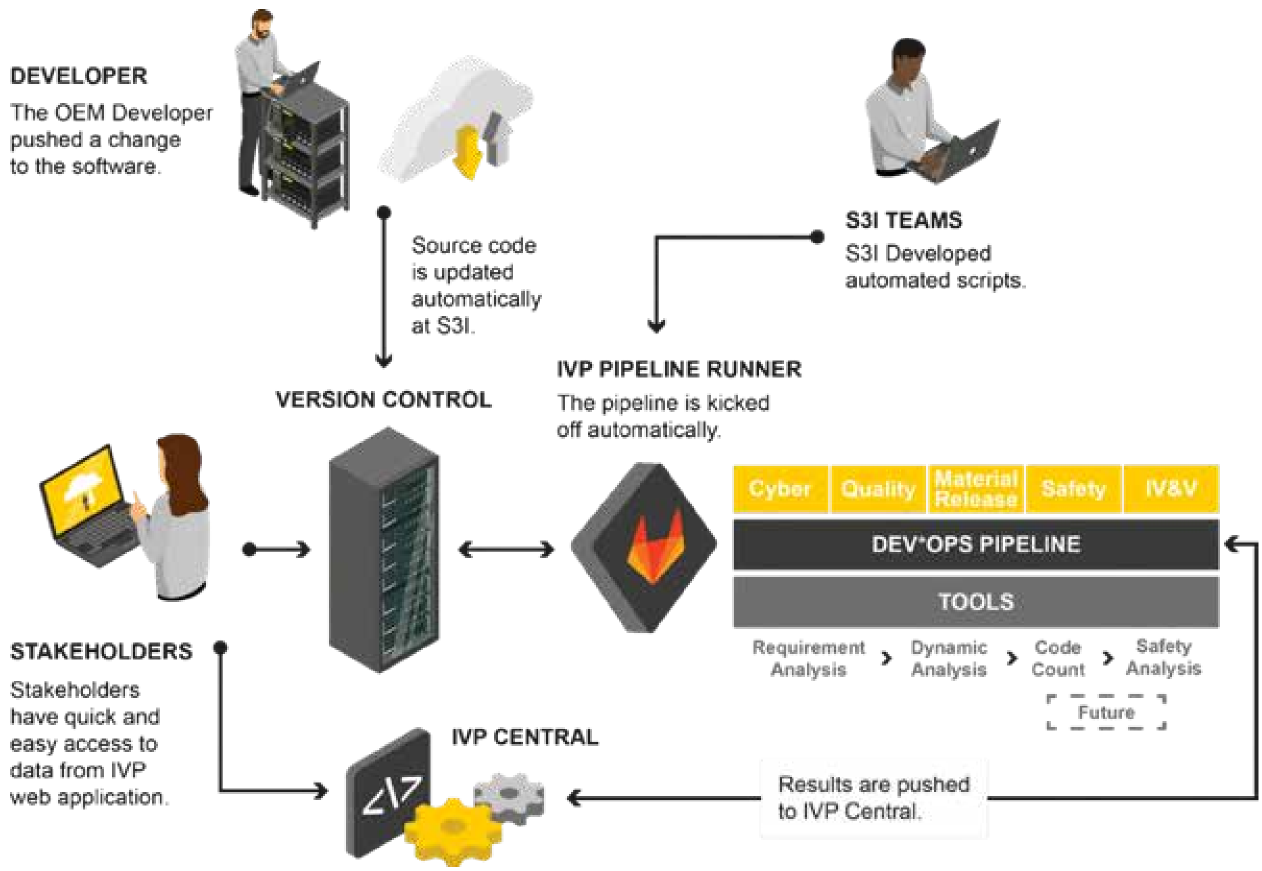


FIGURE 1

Software Independent Verification And Validation (IV&V)

Software Independent Verification and Validation (IV&V) confronts software acquisition challenges through two questions: Did we build the software right? Did we build the right software? IV&V teams analyze software and software artifacts independently from the developer to provide objective evidence about software requirements, design, implementation, test and operation.[6] Applicable throughout the acquisition life cycle of defense systems, IV&V is a customizable process that allows acquisition professionals to identify, track and correct software deficiencies early in development, and should be performed in-phase as code is being developed for maximum return. Teams apply system subject matter expertise to perform activities like requirements and design analysis, static code analysis and dynamic code analysis. Software IV&V reduces the effort required to fix software issues,[7] provides improved system operation, lowers sustainment costs and equips the acquisition community with information to make informed fielding decisions.

Moving IV&V Into The Future

At Army Futures Command DEVCOM Aviation and Missile Center (AvMC) Software, Simulation, Systems Engineering and Integration Directorate (S3I), we are performing IV&V that supports software development at the speed of relevance through a capability called the Integrated Verification Platform (IVP). In early 2022, the S3I V&V Division Chief directed a group of team members to gather information about common processes across S3I's IV&V portfolio to identify candidate activities to optimize and standardize. The team's fact finding revealed a need for a single source of truth between teams and pointed to several processes ripe for automation due to their repeatable nature and consistent inclusion in IV&V analysis. IV&V analysts were typically dividing their time between repetitive processes (e.g., executing command line tasks, formatting reports) and critical thinking work (e.g., investigating potential system impacts, prioritizing findings and coordinating with the developer about software fixes).

With the intent of performing IV&V faster and shifting repetitive work off analysts and onto software, the team began implementing DevSecOps principles into the optimization effort. The optimization solution needed to accommodate both standardized data collection and tools, while also being appropriate for a wide range of weapon systems in various life cycle stages. While some members of the IVP team began to conceptualize and document various technical solutions, the rest of the team investigated how best to approach security restrictions. As the need for software modernization grew in the acquisition community, our optimization effort grew into our IV&V DevSecOps solution, IVP.

Integrated Verification Platform (IVP)

IVP is a continuous software verification capability developed through continuous integration and continuous deployment (CI/CD) pipelines, commercial off-the-shelf (COTS) tools, and a custom-built web application, called IVP Central. It is a single source of truth for software deliveries, source code repositories, analysis, results, historical reach-back and licensing/tooling for S3I IV&V. IVP is accessible to all S3I IV&V teams, is deployed in multiple instances on both classified and unclassified networks and is equipped with a unique tool suite that has controlled tool, project, user, security, lab and network permissions. (Figure 1).

CI/CD pipelines are automatic runners, either in docker containers or a Kubernetes cluster, that enable the automated initiation of a series of tasks through the capture of command line tasks. The IVP framework uses these pipelines through Gitlab and Azure DevOps, configured in YAML, for metrics gathering, compiling, code scans (e.g., linting, style checks, standard checks, static analysis), testing (e.g., unit, integration, system, regression), dependency scanning and data aggregation through a tool called Software Risk Manager. Outputs from the pipeline are sent to IVP Central, where analysts can delve into the raw data and provide meaningful information to stakeholders.

IVP Central is a secure platform for performing daily workplace activities and includes a standard code counter, an automated report generation tool and a findings manager capability. IVP Central acts as the single source of truth where data from the version control software (i.e., Gitlab, Azure DevOps) and Software Risk Manager is automatically aggregated. Analysts can manually enter project specific information, adjust software issue priority and provide resolution recommendations to the developers. IVP Central automatically generates reports tailored to the project's desired deliverables, supports project specific report formats and integrates into version control tools to automatically update software stakeholders.

IVP is compatible with both modern software development practices and legacy software workflows. Some software-intensive defense programs still rely on CD/DVDs, spreadsheets and manual processes, while others use real-time data transfers. IVP supports modern workflows through instantaneous software artifact delivery, and analysts manually import software code, binaries and other artifacts to support legacy workflows. Gitlab mirroring enables us to mirror the repository from developer environments to the S3I IV&V environment. The same workflow can be inverted so IVP Central, after analyst approval, transmits software defect data back to the developer and stakeholders. This promotes a core principle of DevSecOps, delivering small batch sizes often instead of large reports infrequently. Both the modern and legacy workflows allow software artifacts to enter IVP, where IV&V analysts can then perform their work faster and more efficiently.

IVP Future Direction

The future of IVP includes providing a platform to apply these best practices to other functional areas of software support. S3I houses functional areas of Cybersecurity, Software Material Release, Software Safety, and Quality Assurance, and Software Development. S3I's DevSecOps compliant software development environment, called Software Principles for Development Solutions (SPDS), supports agile development and continuous software improvement. Through future integration of our platforms, we will achieve maximum automation of IV&V tasks, delivering unmitigated reports immediately, or mitigated reports within 1 to 2 days, thus shortening iteration cycles to aid fielding-on-demand capabilities.

Soldier Impact

Embracing DevSecOps practices and implementing short feedback loops in mission software support significantly accelerates the process of testing and fielding systems. By embedding continuous test, continuous integration, and continuous delivery within IVP, IV&V teams can swiftly identify potential issues, enhancing overall system reliability and reducing timelines. Short feedback loops facilitate rapid iterations and refinements based on real-time testing and user input, allowing developers to make timely improvements, and for IV&V to evaluate those improvements quickly. Regularly sharing these results and findings with stakeholders ensures that critical information is disseminated promptly, enabling swift decision-making and alignment. This iterative approach not only expedites the development and verification cycles but also ensures that systems are more effectively tailored to operational needs, leading to faster and more efficient fielding and deployment for our Soldiers.

Conclusion

Back in your program management office, the phone rings. Leadership is requesting an update on software because news just came in that it's needed even more urgently. Fortunately, you implemented continuous in-phase software V&V and can provide a well-informed, evidence-based answer immediately. The current software build in-progress is fully verified, fully validated and ready to deploy.

DOD software modernization not only requires faster software development but also requires adjacent software tasks to be completed faster. Since the speed of fielding doesn't rely exclusively on the speed of software development, it is crucial for other functional areas to examine their role in software acquisition and how they can modernize their software support. At S3I, the IVP modernizes IV&V by maximizing automation, shortening feedback loops and identifying software issues earlier. Implementing DevSecOps through IVP brings IV&V into the future and supports delivering better software faster into the hands of the warfighter.

Notes:

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Honorable Mention: Learning to Expand the Aperture: Translating Emergence to Capability in Medical Evacuation and Other Operational Domains

By the following author:
Capt. Mahdi Al-Husseini

The increasingly complex and disordered battlefield of tomorrow necessitates an intelligent and principled approach to capability development today. Emergence in artificial intelligence refers to properties and behaviors that organically arise from the multiplicity of simple interactions between agents. A naturally occurring example of emergence is the ant colony, in which simple tasks undertaken by individual ants results in an adaptable system capable of finding food and building nests. Emergence can provide wartime planners with valuable insights when dealing with large and challenging operational scenarios burdened by severe constraints. This starts by developing realistic multi-agent models and artificial intelligence algorithms that can be simulated to identify emergent properties and behaviors. However, translating emergence into capabilities that actually benefit the warfighter requires a critical analysis by domain experts and a well-informed and progressive implementation strategy. Consequently, expanding the aperture of military capability via the sub-fields of reinforcement learning and planning is a collaborative undertaking involving artificial intelligence researchers, domain subject matter experts and field operators.

This paper introduces and demonstrates a domain agnostic "translation" process, shown in Figure 1, by which emergent properties and behaviors realized from multi-agent models can be operationalized to arrive at useful military capabilities. We consider the medical evacuation domain to provide specificity and context. Medical

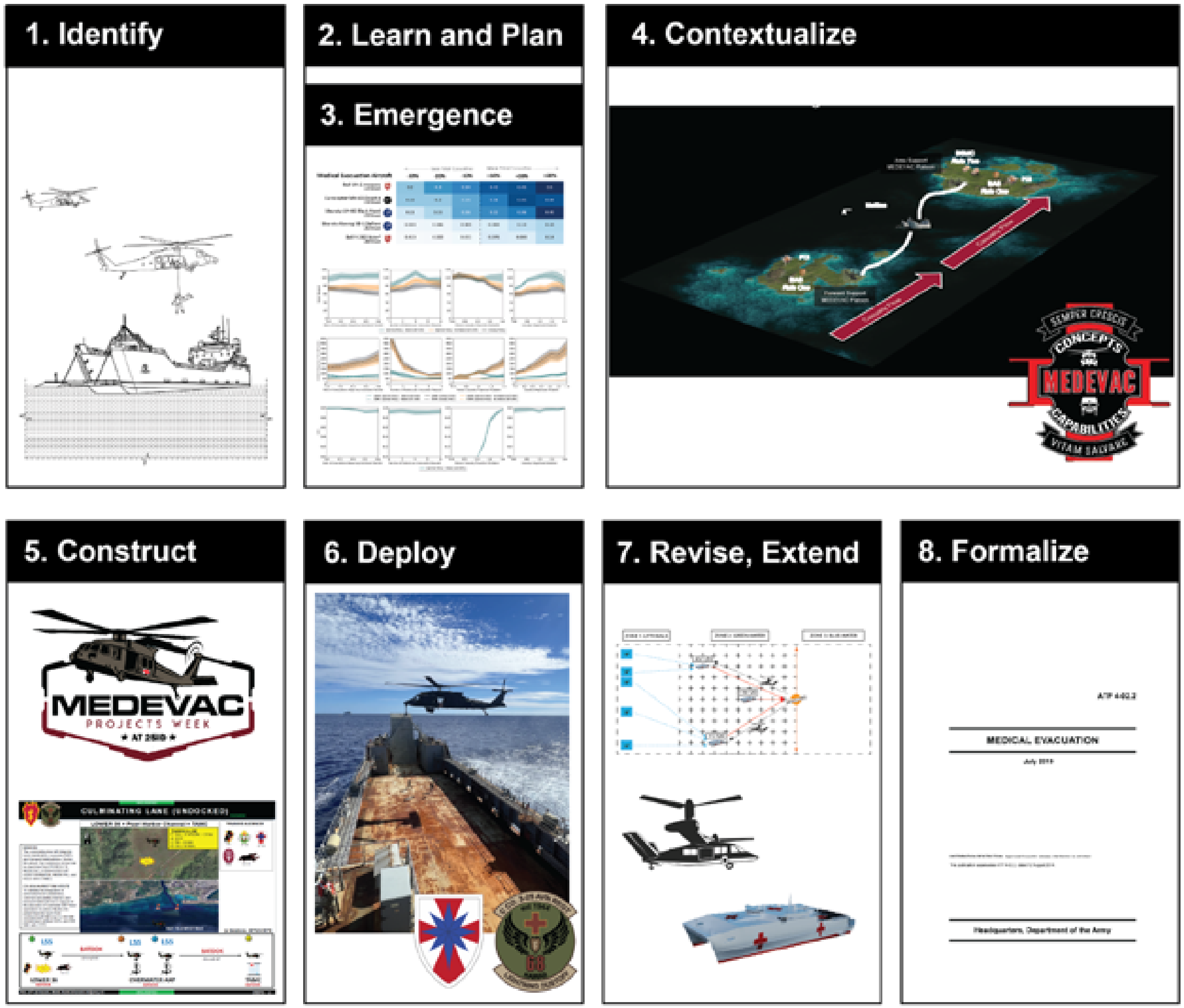


FIGURE 1

evacuation planners coordinate multiple evacuation platforms to facilitate the efficient and expedient transfer of patients in time and space. Each translation process step is discussed with reference to an ongoing medical evacuation research initiative involving the Army Research Laboratory (ARL), Stanford University, the 25th Infantry Division (25ID), and the Department of Aviation Medicine. The proposed process further supports military education, enables joint service integration and informs platform procurement. Ultimately, we arrive at a comprehensive framework for generating capability beginning with the underlying mathematics that represent the operating environment, current tactics and techniques and existing force structure.

Learning And Planning

Problem identification is the first step. There are several approaches to defining a problem in a manner befitting artificial intelligence methods. Three problem categories are especially suitable while also being relevant to future operations. They are: 1.) Emerging platform integration, 2.) Challenging operational environments, and 3.) The novel combination or application of existing platforms. Problem examples include how to integrate the Bell V-280 Valor into existing organizational hierarchies, how to dispatch evacuation platforms and transport patients in a degraded communication environment, and how to coordinate aircraft and watercraft to transfer patients across vast maritime distances beginning at the littorals. We consider the third problem, which is a focus of an ongoing cooperative research and development agreement between ARL and Stanford. The strategic coordination of aircraft and watercraft to bridge patient movement in the Indo-Pacific can substantially improve patient outcomes, facilitate battlefield clearance to enable movement and maneuver, and increase return to duty rates. Figure 1, step one, depicts a utility patent drawing of two medical evacuation aircraft conducting a patient handover over a watercraft. This concept is generally referred to as the maritime ambulance exchange point and was envisioned for use at scale by 25ID aviators.

After problem identification comes learning and planning, which involves the use of models and reinforcement learning and planning algorithms to accurately represent and simulate relevant operational scenarios. We distinguish between reinforcement learning and planning, the former which must learn the model environment, and the latter which knows it at the onset of simulation. ARL is no stranger to complex dynamic networks and data driven control. Multiple ARL active broad agency announcements (BAAs) are concerned with multi-agent network control, human-system team interactions and knowledge systems. Similarly, the mission of the Army Artificial Intelligence Integration Center (AI2C) is to lead and integrate operationalized artificial intelligence. AI2C recently issued a BAA of its own, with listed areas of interest including decision support structures, human-artificial intelligence integration and distributed system control. While several research vehicles for learning and planning exist, linking them to appropriately scoped operational problems and deploying them in the field remains challenging. Emergent properties and behaviors generated from the learning and planning step are then captured in simulation. Figure 1, steps two and three, depict figures summarizing simulation data for, and highlighting emergent properties of, the maritime ambulance exchange point.

Transparency And Interpretability

It is essential to contextualize simulation data and the realized emergent properties and behaviors with the help of domain experts. Planning and reinforcement learning algorithms are concerned with the mathematical optimization of some defined objective function and often operate as "black boxes." They are therefore focused on what (maximizing reward), how (actions taken), and when/where (environment state) rather than why. Although promising in simulation, recognizing why a given process works well results in a more nuanced understanding of risk and reward. This is essential to ensuring accountability and building trust in artificial intelligence—especially when Soldiers are involved. More generally, discussing experimental results with domain experts helps researchers identify limitations, operational risks and opportunities for future work. Figure 1, step four, depicts a battlefield architecture diagram that integrates the simulated maritime exchange point capability into an operational scenario. The Medical Evacuation Concepts and Capabilities Division (MECCD) received and reviewed the experimental results from Stanford and ARL's maritime exchange point simulation research and provided valuable feedback and context.

Deployment

Steps five and six involve constructing and executing the deployment of the realized and now contextualized emerging capability in an informative manner. The practical integration of artificial intelligence models and algorithms can be challenging, and certain steps should be taken to ensure a safe and reliable running application. The continuous monitoring of deployed programs and their proposed guidance can enhance overall performance and mitigate regulatory, reputational and operational risks. Integrating a human in the loop, well-defined operational safeguards and model update infrastructure can further improve operations. These considerations do not preclude the steps outlined in the Army's eight step training model: Plan the training event, train and certify leaders, reconnaissance training sites, issue the operations order, rehearse, train, conduct after action reviews and retrain. Initial capability deployment should be treated like any other training event, but with an added component of risk to be appropriately mitigated by a combined team of field operators, researchers, and domain experts. Figure 1, steps five and six, show the emblem of, a training concept slide from, and a photograph taken during the 2023 MEDEVAC Projects Week in Honolulu, Hawaii. MEDEVAC Projects Week was a deliberately constructed military exercise conducted jointly by 25ID and the 8th Theater Sustainment Command (8TSC) to demonstrate the maritime ambulance exchange point capability, as seen in Figure 2. Two HH-60M MEDEVAC helicopters were dispatched to the underway Army watercraft per the models and artificial intelligence algorithms developed by Stanford and ARL. The participating aircrews trained progressively for several months in the lead-up to deployment, and the artificial intelligence dispatching guidance was compared against the results of manual flight planning as an additional safeguard.

FIGURE 2

Revise, Extend And Formalize

The after-action review following initial deployment provides valuable insights into the proposed capability's feasibility for a given operating environment. Lessons learned in the field, likely spanning the DOTMLPF, may result in revisions to existing research objectives and the introduction of new ones. The successful first deployment, often constrained in scope, results in fertile ground for a second, more ambitious deployment of a similar or adjacent capability. Proposed capabilities that prove their worth—on paper, in the lab and in the field—may be formalized in doctrinal publications as a tactic or technique. This is best suited for the Army Techniques Publication (ATP), which provides non-prescriptive methods and mechanisms for accomplishing mission tasks. Figure 1, step seven, depicts two emerging evacuation platforms, the Army V-280 Valor and Navy Expeditionary Medical Ship, whose characteristics complement the use of maritime ambulance exchange points. Step seven also depicts the Flying MEDEVAC Traveling Watercraft problem, a maritime medical evacuation offshoot of the well-known and actively studied Flying Sidekick Traveling Salesman reinforcement learning problem. Step eight shows the cover of ATP 4-02.2 "Medical Evacuation." The maritime ambulance exchange point is being considered for inclusion in ATP 4-02.2, where it would be formalized for use by medical planners in perpetuity. Translating emergence into capability further enables enhanced educational wargaming, force restructuring and platform procurement considerations. For example, a framework similar to the process in Figure 1 is being applied to develop and pilot interactive medical evacuation wargames for the Medical Evacuation Doctrine Course at Fort Novosel, Alabama in partnership with the University of California, Berkeley. Students participating in the wargames 1.) Compete against an adversarial artificial intelligence agent seeking to obstruct their medical evacuation efforts, and 2.) Compare their performance against optimized medical evacuation planning and dispatching conducted by an autonomous decision-making system.

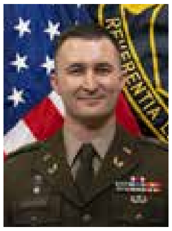
Conclusion

The proposed eight-step process for translating emergent properties and behaviors into meaningful military capabilities can result in novel tactics and techniques, improved military educational outcomes, optimized force restructuring and informed platform procurement. A defining characteristic of this process is the continuous and deliberate cooperation of technical and tactical experts, both in the laboratory and the field. We demonstrate the translation process from start to finish using the maritime ambulance exchange point, a concept initially envisioned by 25ID aviators to extend the operational reach of medical evacuation platforms in maritime environments beginning at the littorals. The maritime ambulance exchange point was modeled and simulated at scale by Stanford and ARL, and the experimental results contextualized by MECCD. The resulting concept, supported by the Stanford and ARL models and algorithms, was then successfully deployed in the Hawaiian Islands by 25ID and 8TSC. The maritime ambulance exchange point has since been the focus of multiple utility patent applications and academic journal papers and is being considered for inclusion in ATP 4-02.2 "Medical Evacuation." Expanding the aperture of military capability is about more than developing improved artificial intelligence—it's about methodically operationalizing the unexpected advantages it creates. In the evolving landscape of military operations, we may find that the greatest strength lies not in what we design, but in what emerges.

Category: Innovation

WINNER

Driving Innovation: Propelling the U.S. Department of Defense's Acquisition of Hybrid-Electric Tactical Vehicles to Win the Wars of Tomorrow



By the following author:
Maj. Curtis N. Cranston

Disclaimer: The views expressed in this article are those of the author and do not necessarily reflect the views of the DOD or the U.S. Army. This article has been approved for public release.

"Energy is the lifeblood of our warfighting capabilities."
—General David Petraeus (2011)[1]

"Adapt or perish, now as ever, is nature's inexorable imperative."
—H.G. Wells, THE MIND AT THE END OF ITS TETHER (1945)[2]

Since its shift from horses to motors in the early twentieth century, the U.S. Department of Defense (DOD) has depended solely on oil-derived petroleum fuel to power its land-based tactical and combat vehicle fleet. This reliance on a single operational energy source has only intensified and made the DOD's global operations increasingly vulnerable over the last century. At the same time that this "Achilles heel" has worsened in recent years, the commercial vehicle industry has achieved near-daily technological advances in hybrid-electric propulsion. Nevertheless, the antiquated way in which the DOD sustains its tactical wheeled vehicle fleet today looks largely the same as it did a century ago, underscoring the DOD's risky "tether of fuel" in future land-based ground conflict.[3]

This paper first highlights the DOD's opportunity for innovation by integrating hybrid-electric drive (HED) capabilities to revolutionize how it propels and sustains itself across the battlefield. Second, it emphasizes the DOD's intensifying need for innovation, not merely to reduce its single-fuel reliance but also to achieve the immense warfighting advantages—at the tactical, operational and strategic levels of warfare—that hybrid-electrified tactical vehicles promise over their engine-only counterparts. Third, it identifies the barriers to innovation, including the formidable political and procedural roadblocks that have thus far stalled the DOD's efforts to acquire HED for its ground fleet. Finally, it presents a simple but promising roadmap to innovation for DOD policymakers and acquisition leaders to procure such game-changing HED capabilities for U.S. ground forces in time for the next global armed conflict.

The Opportunity For Innovation

Although the DOD is simultaneously pursuing several lines of efforts to hybrid-electrify its air- and sea-based platforms, the U.S. land-based vehicle fleet—with its massive size and potential to capitalize on commercial vehicle industry advances more readily—presents the most compelling opportunity for innovation. The DOD's operational ground fleet includes hundreds of thousands of vehicles of two types: ground combat vehicles (GCVs, i.e., heavily armored, predominantly tracked platforms that perform a specific combat function, such as the Abrams tank, Bradley Fighting Vehicle and Stryker)[4] and tactical wheeled vehicles (TWVs), ranging from light utility vehicles (such as the High Mobility Multipurpose Wheeled Vehicle (HMMWV)), which comprise about half of the force's total operational vehicles) to medium and heavy equipment transporters.[5] In total, TWVs outnumber GCVs ten-to-one and support the widest variety of combat operations by transporting warfighters, equipment, and materiel like munitions, water and fuel across the battlefield.[6]

Regardless of the vehicle type and purpose; however, they all have one common requirement—one critical vulnerability—oil. Or more specifically, one of a few petroleum-based fuel types, such as JP-8 or F-24.[7] As a result of its single-fuel reliance, the DOD has become the single largest institutional consumer of petroleum-based fuel in the world, spending more than $10 billion in bulk fuel annually and consuming more than 360,000 barrels of oil each day—only 35 countries consume more.[8,9] Nevertheless, the cost of the DOD's fuel addiction is far more than financial, as highlighted in the recent conflicts in Iraq and Afghanistan, where near-constant enemy attacks on U.S. fuel resupply convoys accounted for more than one-quarter of all U.S. casualties.[10]

The Need For Innovation

Experiences from recent and ongoing armed conflicts—such as Russia's infamous "40-mile-long" convoy on roads outside Kyiv, where its military was forced to abandon hundreds of stalled combat vehicles after running out of fuel—underscore that the DOD's need to procure hybrid-electric capabilities is no longer a long-term policy aspiration but a crucial warfighting imperative.[11] This need is even more crucial in light of the battlefield advantages that hybrid-electric tactical vehicles promise over their engine-only legacy counterparts at the tactical, operational and strategic levels of warfare. These benefits are not merely theoretical but already demonstrated through testing of both retrofit anti-idle kits and purpose-built HE TWV prototypes by organizations like Ground Vehicle Systems Center (GVSC, DEVCOM-AFC) and JPO-JLTV (ASA (ALT)).[12]

First, at the lowest, tactical level, the benefits of hybrid-electrified tactical vehicles include the following:

- Lower thermal (10:1 reduction) and audible (5:1 reduction) signatures to reduce targetability.
- Higher torque allowing for faster sprint speeds to increase survivability (10 percent decrease in vehicle strikes); and
- Greater onboard electric power generation (replacing the need for towed generator trailers, which currently comprise over half of a brigade TOC's footprint).[13]
- Second, at the operational level of war, the benefits of HE TWVs include:
- Extended operational duration from 3 to 5 days to outlast the enemy.
- Reduced maintenance demands (i.e., 25% less time "off-line").
- Dramatically reduced fuel needs (30% reduction); and
- Less frequent and targetable LOGPAC convoys.[14]

Finally, at the strategic level, the advantages of hybrid-electrification are immeasurable, including the potential to shift limited DOD resources currently focused on securing critical oil shipping lanes to other national security threats around the world.

Ultimately, HED acquisitions also support the DOD's strategic focus on fighting multidomain and large-scale combat operations. Given the increasing investment in HED capabilities by peer adversaries, the DOD's timely prioritization of acquiring such capabilities may even help deter future armed conflicts at the outset.

The Barriers To Innovation

Despite a demonstrated need for such capabilities, the DOD's efforts to acquire hybrid-electric tactical vehicles remain stalled by two formidable barriers that continue to halt timely innovation and threaten to leave U.S. ground forces lagging dangerously behind their peer adversaries.

First, there are political challenges that continue to block necessary funding for these acquisition programs from the start. Most significantly, these include the polarizing misperception that past Executive Branch climate change policies are behind the DOD's hybrid-electrification efforts. More generally, these policy-based challenges also include Congress's increasing reliance on continuing resolutions and the DOD's relatively low prioritization of ground vehicle research and development (R&D) projects in favor of much costlier and less productive air and sea platform modernization efforts.

Even if HE TWV programs can overcome these initial political barriers, they also face daunting procedural challenges that persist across the DOD's acquisition systems. Most significantly, common shortfalls include programs' failures in planning for future technological advances such as by obtaining key intellectual property and data rights from initial development contractors. These types of deficiencies often result in delayed delivery schedules and ballooned financial costs of major weapon systems. They also sometimes lead to reductions or even cancellations of higher-prioritized and -funded acquisition programs, so such deficiencies pose an even greater danger to lower-funded programs like those for hybrid-electric ground tactical vehicles. However, even if those programs can avoid such pitfalls, the weak U.S. defense industrial base and the lack of a broader DOD modernization strategy for its tactical vehicle fleet make communicating requirements to industry a constant challenge for the acquisitions workforce.

The Roadmap To Innovation

To answer these challenges and achieve timely innovation, DOD leaders must recognize the immediate warfighting need to acquire hybrid-electric tactical vehicles. This first means appreciating and responding to key criticisms against such efforts, like concerns over the current technical limitations and brittle supply chains of electric vehicle batteries. Nevertheless, by recalling the DOD's historic role as a driver of game-changing battlefield technology (as opposed to merely remaining a "fast follower" behind industry innovation), Congress and DOD acquisition leaders can use a novel roadmap to best evaluate, communicate and meet U.S. ground forces' mounting demand for tactical ground vehicle modernization.[15] Such a path forward requires a two-pronged approach to overcome both the political and procedural roadblocks to hybrid-electrification. Involving simple but impactful steps, these approaches aim to improve—and to some extent, buck—traditional methods through which the DOD currently acquires its tactical vehicles.

First, on the political front, DOD leaders must better prioritize internal R&D efforts and unequivocally communicate (up to Congress and down to the joint force) the non-climate impetus for hybrid-electrification. On the procedural front, the DOD requires a more comprehensive and modern HE TWV acquisition strategy. To enable such, acquisition leaders can integrate commercial development and hardware acquisitions as two new Adaptive Acquisition Framework pathways. To protect future funding and technology obsolescence for these vulnerable ground vehicle programs, leaders must also demand a modular open system approach (MOSA), in accordance with 10 U.S.C. § 4401(a), in future development contracts.

By maneuvering past political gridlock and creatively utilizing defense acquisitions procedures to better leverage industry innovation—and perhaps to prioritize greater DOD-internal innovation—to acquire HED capabilities for its tactical vehicles, DOD leaders can "future-proof" U.S. ground forces so they can fight and win the wars of tomorrow. It's time to get moving.

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Honorable Mention: Bridging the Gap and the Path to Real-time Intelligence: Advancing A-ISR Through Acquisition and Innovation

By the following author:

Eric Braun

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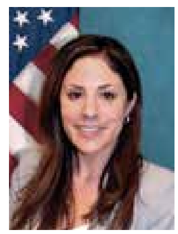

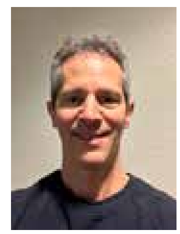

Susan Tyndall **Lauren Scicchitano** **Michael Amabile**

Project Director Sensors Aerial Intelligence (PD SAI), is a prominent fixture in the Army acquisition community, partnering with other organizations such as Project Manager Fixed Wing (PM FW), as materiel developers to field Army Aerial Intelligence, Surveillance and Reconnaissance (A-ISR) collection systems used by Headquarters, Department of the Army (HQDA) G2, United States Army Intelligence and Security Command (INSCOM) and other community stakeholders for decades. As the needs of the Army have evolved, so has PD SAI and its efforts to provide the most capable A-ISR materiel/sensing solutions to gather data to provide to senior leaders and warfighters across the globe.

Outdated Fleet

In 2018, the priorities outlined in the 2018 National Security Strategy, recognized the need for advancement of intelligence vehicles that could surpass the current limitations of turboprop powered fixed wing aircraft within the Army's acquisition community. Within the National Security Strategy, the White House stated "Our diplomatic, intelligence, military, and economic agencies have not kept pace with the changes in the character of competition. America's military must be prepared to operate across a full spectrum of conflict, across multiple domains at once," (Trump, 2017). Systems such as the Beechcraft RC-12 Guardrail Common Sensor (GRCS) and Enhanced Medium Altitude Reconnaissance and Surveillance System (EMARSS) required a technical refresh to adapt to new threats and technologies.

Acquisition Methodology

While the need was recognized and idea conceptualized, the cumbersome nature of the Army acquisition process required a newer, quicker, more agile acquisition pathway. PM FW leadership as the Office of Primary Responsibility (OPR) proposed the use of Federal Systems Integration and Management Center (FEDSIM) service contracts. This acquisition methodology would allow for rapid fielding, taking only one year from award of contracts to fielding. To test the theory of using business jets for aerial platforms and learning the limitations and advantages of sensing from them before developing the eventual High Accuracy Detection and Exploitation System (HADES) official program of record, PD SAI and PM FW decided to utilize contractor owned and operated (COCO) jets as technical demonstrator/prototype aircraft. These jets would serve not only as test vehicles for sensor integration and testing for the future HADES program but serve active roles in critical operational missions across almost every continent.

Technical Demonstrators

With a contract strategy in place, the assistant secretary of the Army (Acquisition, Logistics, and Technology) (ASA(ALT)) decided to pursue a "bridging" option that incorporated quick reaction COCO aircraft into the field. These aircraft, a placeholder for the HADES program of record, filled the needs of the Global Force Management Allocation Plan (GFMAP). Modified Challenger 650 jets could operate at higher altitudes using new and improved sensor systems, providing real time and drastically improved support to combatant commanders. Specifically, the Aerial Reconnaissance and Targeting Exploitation Multi-Mission Intelligence System (ARTEMIS), Airborne Reconnaissance and Electronic Warfare Systems (ARES), and Army Theater-Level High Altitude Expeditionary Next-AISR (ATHENA) platforms can fly higher, faster, and longer, to provide a modern and safe platform for PD SAI's sensors and the Army flight crews operating them. The updated platform also changed the available options and capabilities of the sensors integrated within. With ARTEMIS, ARES and the ATHENA's designed for higher altitudes and drastically improved payload capabilities, it expanded sensor suite capabilities well into the future without the eventual need for upgrading airframes. Each of the bridging programs utilized different payloads to test the maximum performance of each design while working out technical issues such as sensor integration, software updates, sensor repair, sensor replacement and repair/replacement/upgrade of aircraft components in various platforms both CONUS and OCONUS. ARES and ARTEMIS, as of December 2023, have logged nearly one thousand sorties combined throughout Europe and the Pacific per a 2023 Defense News article (Hudson, 2023). Sensors included on the platforms have relayed many hours of communications intelligence (COMINT), and electronic intelligence (ELINT), back to leaders and warfighters in ongoing operations throughout the world providing proof of concept. In addition to Department of Defense (DOD) and contractor owned sensors used on the platforms, several other outside agencies have also shown interest in incorporating their sensors, or obtaining intelligence products, and have worked with PD SAI and PM FW on integration efforts. The change to jet powered platforms provides the opportunity for PD SAI to incorporate deep sensing capabilities among other useful tools for the modern leader and warfighter, like programs and capabilities already in use by the United States Air Force. The ATHENA platforms begin active service at the end of 2024. The A-ISR community is optimistic that they will indeed continue to bridge the gap in service while the development and testing of HADES is underway, paving the way for the future of A-ISR.

The Future Is Here

While the platforms have improved and their capabilities increased, PD SAI wants to get intelligence to the warfighter quicker. This requires a new data flow architecture from aircraft to warfighter. The first data flow for this new architecture was operationally verified during Project Convergence 24, a military exercise where intelligence data from an ARTEMIS platform was sent to the Integrated Broadcast System (IBS) for simultaneous release to multiple analysts and tactical units across the world. A component termed the IBS Dissemination Manager (IDM) served as the adapter to the IBS network, and its use was a major success illustrating benefits of a collaborative, rapid acquisition process. Originally developed 10 years ago by Special Operations Command (SOCOM), IDM was modified by the Army's TROJAN program in 2019 and certified by the Joint Interoperability Test

Command (JITC) for use in that timeframe for a limited set of messages. PD SAI partnered with TROJAN to enhance the IDM to enable both COMINT and ELINT reports and to obtain re-certification by JITC—thereby creating a single component that could be employed across multiple Army programs, significantly reducing future sustainment costs. JITC approval for the upgraded IDM was received in August 2024, and the new end-to-end data flow went live in September. This is a historic leap in sensor to Soldier intelligence. What used to take hours (or days) is now reduced to minutes. With this innovation and the commitment of the PD SAI team, the goal of real-time sensor to Soldier intelligence is growing closer to reality.

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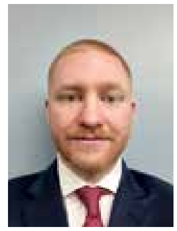
Category: Lessons Learned

WINNER

Enhancing Army Acquisition Through Collaborative Communication



By the following author:
Mark Rashford, Jr.

The views expressed in this publication are those of the author and do not necessarily reflect the official policy of the Department of Defense, Department of the Army, U.S. Army Medical Department, or the U.S. Government.

The Army acquisition community faces challenges in communicating in real-time and overall collaboration for ongoing planning, executing and establishing lessons-learned in a manner that is meaningful to the Soldiers both on ground executing these acquisitions, and the policymakers working to provide the means necessary to guide success. Information silos and a lack of effective platforms for real-time interaction impede the ability to quickly resolve issues and share innovative ideas. These barriers can delay the delivery of critical capabilities to our joint warfighters, directly affecting mission readiness and success.

Proposed Solution: Dedicated Teams Channel

What began as a miscellaneous Teams channel for Steven and his team has proven to be an invaluable tool. By enabling moderated yet open communication, this platform allows personnel at all levels to engage in meaningful discussions, provide insights and collaboratively solve problems. Key features include:

- Controlled Access: The Teams channel is CAC-enabled, ensuring secure access, and preventing anonymous posts.
- Open Forum: Members can freely ask questions, share experiences, and challenge assumptions, fostering a culture of continuous learning, improvement and innovation.
- Real-time Interaction: Issues could be addressed promptly with input from diverse perspectives, enhancing the quality and speed of problem resolution.

Implementation Strategy

To implement a similar solution within the Army acquisition community, the following steps are recommended:

1. Secure Leadership Buy-in: Without someone toward the top of the Army acquisition community to champion the Team, the Team cannot succeed. One of the most valuable ideals with creating this open forum, is that after it develops its foundation with the efforts of senior leaders, it will continue to grow into the autonomous product it was meant to become.

2. Establish Guidelines: Develop clear guidelines for participation, emphasizing professionalism and constructive engagement. This is imperative for fostering an environment that contributes to overall mission success.

3. Promote Adoption: Encourage widespread adoption through targeted communications and training sessions to highlight the platform's value. Without the unique perspectives and personal experiences of the varying members within the community, the platform will not operate at its full potential.

4. Regulate and Adapt: Ensuring that conversations stay on topic and remain professional is essential for overall success. Being mindful not to over-regulate conversation and adapting to the changing landscape of the members and topics will allow for the desired end state of organized free thought, directed at resolving the issues of the acquisition community at all levels, from policy creation to executing acquisition strategies.

Benefits To The Acquisition Process For The Soldier

Enhanced communication and collaboration. One of the most recognized barriers to success throughout the Department of Defense and beyond, is the challenge of relaying and receiving clear communication. By providing a centralized platform for real-time interaction, personnel can quickly share information, seek advice and address issues. This enhanced communication can lead to faster problem resolution and better-informed decision-making, ultimately speeding up overall acquisition processes.

Innovation and continuous improvement. The open forum nature of the Teams channel encourages innovation and continuous improvement. Personnel from different backgrounds and levels of experience can contribute their insights, challenge existing assumptions and propose new ideas. This collaborative environment fosters creativity, constructive engagement and development of innovative solutions to complex challenges.

A practical example from the Navy involved a policy to action issue where a policy was implemented that restricted electronic fingerprint submissions to specific machines causing confusion and challenging already constrictive timelines. Through the Teams channel, personnel from all around the globe collaboratively developed a streamlined resolution, facilitating a way forward and maintaining the integrity of the overall process.

Addressing misconceptions and sharing best practices. One of the key benefits of the Teams channel is the ability to correct misconceptions and share best practices publicly. When someone posts an incorrect or outdated idea, others can provide corrections and explanations, ensuring that accurate information is disseminated. With everything being in an open-forum, high standards can be expected, as well as the prevention of misinformation. With information coming from various authoritative sources, there is often confusion and a risk of misinformation, which is why this can be the most valuable aspect within the acquisition community.

Sharing best practices within the channel also allows a searchable repository of information that can be developed upon, managed and formatted into educational or developmental material. This can create waves of success as less experienced acquisition professionals seek and continue to develop.

Networking and professional development. The Teams channel also serves as a valuable networking and professional development tool. By facilitating interactions among personnel from different units and specialties, it helps build a more cohesive and knowledgeable acquisition community overall. Participants can choose how active to be within the community and can learn from each other's experiences, gain new perspectives and develop professionally.

In the Navy, the Teams channel provided opportunities to connect with subject matter experts and gain insights that would have been difficult to obtain otherwise. These insights would go on to alleviate concerns that would stem from policies at the highest echelons of decision-making, making it easier to gain support from the people that the policies impacted the most. Implementing a similar platform in the Army acquisition community can enhance professional growth and create a more connected and capable workforce.

Lessons Learned

Several lessons can be drawn from the Navy's experience with the Teams channel:

- **Effective communication is key:** Open forums facilitate the free flow of information, enabling quicker problem resolution and fostering innovation.
- **Collaborative problem-solving:** Diverse perspectives contribute to more robust solutions, as individuals can challenge and refine ideas in a public setting.
- **Leadership support is crucial:** The success of such platforms depends heavily on active support and participation from leadership. If leaders from within the acquisition community don't support the concept to its fullest intent, chances of the forum being successful diminishes significantly.

Implementation And Maintenance

Implementing and maintaining the Teams channel is relatively straightforward and cost-effective. The key steps include:

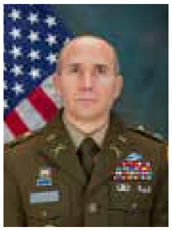
- **Initial Setup:** Configure the Teams channel with CAC-enabled access, ensuring that only authorized personnel can join. Establish clear guidelines for participation and content sharing.
- **Promotion and Awareness:** Promote the platform through internal communications and provide training sessions to familiarize personnel with its features and benefits.
- **Ongoing Support:** Monitor the platform's usage and gather feedback to make necessary adjustments. Provide ongoing support to address any technical issues and ensure smooth operation.

Conclusion

Implementing an unofficial Teams channel within the Army acquisition community can bridge communication gaps, enhance collaboration and drive innovation. By leveraging lessons learned from the Navy, we can create an open forum that empowers all members to contribute to our shared mission of delivering capabilities to our warfighters efficiently and effectively. This approach not only addresses current challenges but also prepares the Army's acquisition community for future operations, ensuring readiness and success.

Honorable Mention: Rethinking the Role of C2 in Army Acquisition: Lessons from FCS and DCGS-A

By the following author:



Col. Matthew Paul

A program manager's decision about the government's command and control (C2) structure in the development and integration of a new weapon system can be daunting. The wrong decision can lead to cost and schedule overruns, integration challenges, reliability challenges and program failure. Unfortunately, the decision about which entity exercises the lion's share of control over complex programs—government or industry—is often viewed as binary. This decision is not binary. It requires a nuanced analysis based on a sound and logical decision-making process.

Industry C2: FCS Case Study

I joined the Army Acquisition Corps in 2009. My first assignment was as a test officer for the Future Combat Systems (FCS) program, arguably, the largest major defense acquisition program (MDAP) in Army acquisition history. The program included 18 systems that required integration via robust network and data-centric technologies.

The government decided to cede almost total C2 over development, integration and testing to a single industry lead system integrator (LSI). The government structured FCS' LSI contract as a large, complex, tightly coupled project, limiting competition to only one or two industry partners with the requisite size, skills and resources.

As the test officer for the program manager, it didn't take me long to conclude that the LSI built many of the 18 systems right, but in totality, they didn't build the right thing for the Army.

Given the integration complexity and the tactical network technology limitations at the time, the LSI failed to integrate all 18 systems. Consequently, Soldiers in the field could not employ FCS effectively in realistic, combat-simulated scenarios. By 2011, the Army completely divested FCS. Billions in taxpayer dollars were spent with no tangible return on investment.

Government C2: DCGS-A Case Study

The fallout from FCS' demise lasted about a decade. The government overcorrected, and "LSI" was declared a dirty word, never to be spoken aloud again.

The Army's trust in industry waned. What happened next? Government program management offices (PMOs) began exercising full C2 and leading the development, integration and testing, with industry merely serving in limited support roles as needed.

During the post-FCS fallout period, I served as a product manager in the Army's Distributed Common Ground System-Army (DCGS-A), a large and complicated MDAP program comprised of a dozen intelligence information systems tied together via a tactical network and data-centric technologies. The government PMO team led day-to-day development, integration and testing activities. Industry provided niche capabilities across several domains, with each industry team serving under the Army's C2.

By 2015, it was evident that DCGS-A was failing to meet expectations in the field. Lackluster integration across individual systems limited scalability and adversely affected ease of use. Additionally, the original DCGS-A concept was arguably ahead of the technology because some technologies hadn't yet been invented when the Army approved the requirements. Industry eventually outpaced the DCGS-A program, and Army decision-makers no longer viewed the DCGS-A capability as a viable return on investment. As a result, the Army significantly restructured the program beginning in 2018.

The High Cost Of Rigid Requirements

Industry provided C2 dominance over FCS, and the government did the same on DCGS-A. Why did both fail? The programs had two things in common: technology maturity and integration complexity.

The C2 structure was not the proximate, underlying cause of the FCS or DCGS-A failures. However, both programs' C2 structures were not aligned to their unique characteristics, allowing issues pertaining to technology maturity and integration complexity to flourish.

FCS and DCGS-A possessed thousands of detailed and meticulously planned requirements. The Army set requirements in stone during the FCS and DCGS-A eras, forcing Army leaders to be honor bound to achieve them regardless of cost, technology limitations or integration complexity. Consequently, both programs spent many dollars and years developing capability that could not scale or be used by Soldiers in the field.

Both programs had poor planning assumptions and did not revisit them as conditions evolved. Those assumptions undergirded flawed requirements, acquisition strategies, contracts and test plans. Additionally, systemic and cultural pressures on program managers often led to a paradigm of waiting until the end to reveal bad assumptions—typically when a new weapon system reached the field for the first time.

Army leaders and Congress often viewed discovery and changes to the original plan early during program execution as a failure, and failure was something to be avoided at all costs. Furthermore, the Army did not possess Agile methods to enable an acquisition leader to de-scope or change requirements as program realities unfolded during development, integration and testing.

C2: Not The Culprit, But A Crucial Factor

The FCS and DCGS-A case studies suggest that C2 may not be the causal, determining factor of a program's success or failure. Nevertheless, selecting the right C2 structure is an important consideration when planning a new acquisition program.

Leaders should base C2 structures on several considerations, including technology maturity and integration complexity. The side that owns the risk and makes decisions affects an acquisition program's direction and outcome.

The C2 structure must align to the program's specific characteristics because a suboptimized C2 structure produces suboptimized results. Most importantly, the C2 structure must allow for early discovery and resolution of potential challenges while they are still in their infancy. For example, the ideal C2 structure can effectively address technology and integration issues by shifting resources, innovating or de-scoping requirements before discovery leads to program failure.

Army acquisition leaders may be pre-disposed to believe that industry is better suited than the government to C2 complex acquisition programs. The government's decision-making is often clouded by cognitive biases, forged by personal experiences—both good and bad. Over the years, I have learned that options in the acquisition business are neither good nor bad. Rather, they are nuanced and deserve detailed and continuous analysis.

Asking The Right Questions: A C2 Survival Guide

Program managers must ask the right questions early and often and never stop asking questions about their C2 approach. Key questions include:

- What are my critical technologies? Does my government PMO team have experience in these areas?
- What is the competitive landscape? Does industry have a history of delivering the critical technologies in similar operational conditions?
- How many external dependencies on other programs do I have? Does industry have a history of integrating similar capabilities at the scale and complexity of my program?
- Does my government PMO team possess the right skills necessary to C2 the program?
- Are my industry partners incentivized to meet the program's technical performance expectations? Who owns the risk?
- What does my test data or Soldier feedback suggest about the program's trajectory? Are we building it right? Are we building the right thing?

MDMP: A Framework For Mitigating Biases In C2 Decisions

The Army's Military Decision-Making Process (MDMP) is designed to mitigate an acquisition leader's cognitive biases. The MDMP framework helps leaders solve complex problems without clear right or wrong answers. Army acquisition programs are inherently complex and deserve the same level of rigor as planning a tactical operation in the field. Therefore, C2 selection should be part of a holistic decision-making process mirroring MDMP. In MDMP, C2 structure is one of the last decisions a commander makes during a course of action (COA) approval process, not one of the first.

A PMO should begin by identifying relevant facts and assumptions about its weapon system. Assumptions must become facts during execution, or the program may encounter insurmountable risks or issues. Holistic market research should inform facts and assumptions about the state of the technology and industry's predisposition to meet the government's requirements.

PMOs should perform market research early enough to inform requirements prior to approval. If industry cannot

FIGURE 1

MDMP: THE SECRET SAUCE TO SUCCESSFUL ACQUISITIONS

Graphic created by Javonte Useda Pearson, Strategic Communications, IPPS-A demonstrate its ability to meet challenging requirements, the Army should not approve those requirements. Alternatively, requirements owners could tailor requirements in a way that provides program managers with sufficient trade space during program execution.

PMOs must also engage in detailed and candid discussions with industry about costs and cost drivers relative to the government's requirements. Market research informs facts, assumptions and risks that shape the next phase: COA development.

PMOs must develop multiple COAs for program execution. COAs center around the major characteristics of the program and weapon system. COA considerations may include C2 structure, contract type, testing strategy and acquisition pathway. COAs must be distinguishable, realistic, affordable and complete.

PMOs then analyze or "wargame" each COA, stress testing each one's characteristics—including C2 structures—against the realities to be encountered during program execution. Next, PMOs must compare each COA against a common set of decision criteria. The PMO must forge decision criteria at the start of the MDMP to eliminate cognitive bias later, when program managers or Decision Authorities select a COA for implementation. Lastly, PMOs generate program documentation, Acquisition Program Baselines and receive Decision-Authority approval to proceed to execution. See Figure 1.

A program's characteristics should determine optimum C2 structures. The government PMO team should assume full C2 in situations where the government's requirements are inflexible, the technology is uncertain or immature, integration is easy, and industry is not well postured for the program—such as industry is not (1) ready, (2) incentivized to compete or (3) incentivized to control costs if they do compete. Conversely, industry should assume full C2 when requirements are flexible, the technology is mature, integration is easy, and the industry landscape is thriving with competition. See Figure 2.

C2 selection is not a binary decision. PMOs can and should find middle ground when nuanced characteristics exist. Government depots and industry partners often work together to complement each other's strengths during sustainment. Consequently, PMOs should consider mixed roles and responsibilities and shared C2 functions earlier, during development. Successful development outcomes often depend on industry's technical expertise and a government PMO's domain knowledge and influence when integration challenges are prevalent.

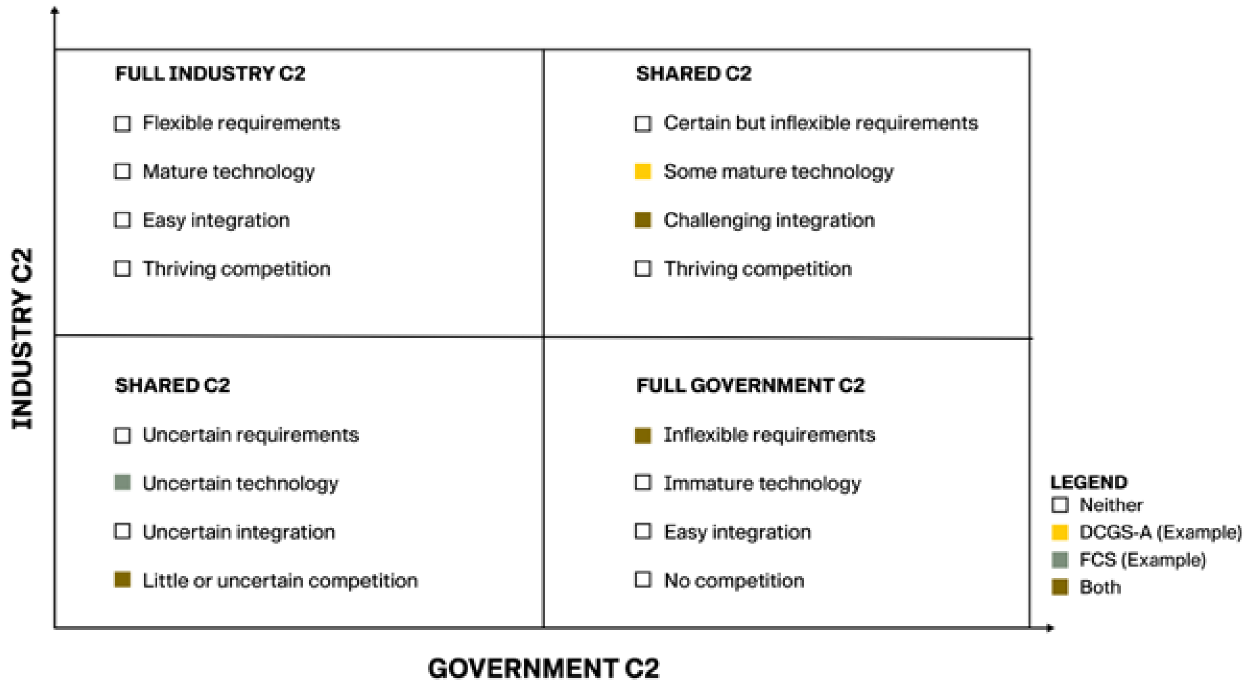
Conclusion

The FCS and DCGS-A programs demonstrated that effective C2 structures in Army acquisition are not always a straightforward, binary choice between government or industry dominance. FCS and DCGS-A each had special characteristics that should have resulted in shared government-industry C2 structures (per Figure 2). However, both programs chose extreme positions within the C2 spectrum, perhaps contributing to their demise. The success of such programs hinges on a nuanced understanding of each program's unique requirements, industry posture, technological maturity and integration challenges.

An optimal C2 decision should be part of a broader MDMP process. By adopting a flexible and informed approach, acquisition leaders can tailor C2 structures to better address specific program complexities and mitigate risks. Ultimately, integrating both government and industry strengths through mixed roles and shared responsibilities can offer a more balanced and effective strategy, improving the likelihood of delivering successful weapon systems to the field.

FIGURE 2

BEYOND BINARY: THE C2 SPECTRUM



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