



ACQUISITION INNOVATION
RESEARCH CENTER

Mission-Aware Integrated Digital Transformation for Operational Advantage

EXECUTIVE SUMMARY

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This comprehensive report presents valuable insights drawn from in-depth conversations with Department of Defense (DoD) stakeholders, focusing on critical aspects of digital modeling, data utilization, and data-driven decision-making for ground vehicles. The report addresses challenges and opportunities in these domains and offers strategic considerations for optimizing the DoD's operational advantage.

The U.S. Army recognizes the potential of digital modeling to advance ground vehicle capabilities. However, practical challenges emerge in acquiring comprehensive digital data for various vehicle platforms. For instance, older platforms often lack up-to-date digital data, necessitating reverse engineering to create accurate digital replicas. This process faces challenges as it may overlook subtle characteristics and manufacturing discrepancies in the digital models. Furthermore, the lack of standardized digital data practice (e.g., data repositories) complicates the establishment of a cohesive digital modeling infrastructure.

Digital modeling is pivotal in understanding ground vehicle performance, especially in demanding environments. The synergy between non-destructive testing (NDT) and digital modeling is crucial, as NDT provides real-world insights while digital modeling excels in analyzing, simulating, and predicting performance under diverse conditions. Digital models enable simulations for decision-making, optimizing vehicle configurations, and operational strategies, including exploring innovative scenarios to customize vehicles for specific operational demands in challenging environments.

The establishment of the 11th Airborne Division in Alaska underscores the importance of ground vehicles suited for Arctic conditions. Army regulations and documents establish criteria for ground vehicle operations in cold climates, focusing on temperature-related considerations that significantly influence vehicle design attributes and performance benchmarks. The changing Joint Light Tactical Vehicles (JLTVs) supplier may impact access to Original Equipment Manufacturer (OEM) data, posing challenges to data-driven decision-making.

Data-driven decision-making involves considering various factors, including mobility, tire selection, powertrain specifications, and more. Different vehicle types and platforms require varying levels of data detail. Access to OEM data is crucial for data-driven decision-making. Discussions also explore the complexities of data ownership and access agreements.

The report introduces the Intelligent Front-End (IFE) framework, which optimizes data management, integration, and utilization. The IFE serves as a bridge between existing systems and modern data needs, enhancing user interactions with data. Implementing IFE involves phases such as learning, dual deployment, and full deployment, capturing user interactions to contribute to institutional memory and decision-making.

Digital modeling, simulations, and data-driven decision-making offer significant potential for enhancing the DoD's operational advantage, particularly in challenging environments like the Arctic. Accurate digital twins of vehicles are essential for simulating and optimizing performance under various conditions. Addressing data challenges, including access and ownership, can be achieved through mission-aware digital integration. Integrated digital transformation streamlines logistics, maintenance, and mission-specific simulations, ultimately improving mission readiness and resource optimization.

In future research endeavors, the aim is to develop a versatile decision/reasoning tool framework tailored to various cases, providing high-level guidance to sponsors based on crucial decision-making factors. This framework will enable prioritizing modeling efforts to address specific decision needs. Collaborations with DoD units are planned to gain insights into their decision-making processes, potentially focusing on airframes and sea platforms. The overarching goal is continually refining the approach, leveraging digital modeling and data-driven decision-making to meet evolving sponsor requirements and enhance the DoD's operational advantage.

In conclusion, this report underscores the importance of embracing digital technologies, optimizing data utilization, and addressing data challenges to bolster the DoD's operational readiness and effectiveness. The DoD is poised to excel in an ever-evolving landscape by ensuring adaptability, efficiency, and strategic agility.

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