Col. James Stultz, commander of 2nd Brigade Combat Team, 101st Airborne Division (Air Assault) (2-101), conducts operations during the unit's Joint Readiness Training Center rotation on 22 August 2024 at Fort Johnson, Louisiana. As the first unit in the Army to execute the chief of staff of the Army's experimental modernization concept, called "transformation in contact," 2-101 is now operating with significantly modernized network and command-and-control capabilities designed to counter evolving threats. (Photo by Staff Sgt. Joshua Joyner, U.S. Army)

# Achieving Decision Dominance

## The Arduous Pursuit of Operationalized Data

Capt. Alexander K. Adkins, U.S. Army

Senior Army leaders established and iterated data-centric policy from as far back as 2021 for the Army to move directly toward rapidly enabling commander decisions with live data to achieve overmatch of our adversaries on future battlefields. The concept of decision dominance rose to prominence in the Army after 16 March 2021, as then Chief of Staff of the Army Gen. James McConville framed the phrase as "a desired state in which commanders sense, understand, decide, act and assess faster and more effectively than their adversaries."[1] In her 8 February 2022 letter to the force, Secretary of the Army Christine Wormuth outlined her priorities to address the most pressing challenges for the U.S. Army, the second of which was for the Army to become more data-centric to win future conflicts in complex environments.[2] The *Army Data Plan*, originating from the Office of the Chief Information Officer at Headquarters, Department of the Army (HQDA), set the secretary of the Army's policies into motion for the Army of 2030 concept, placing "operationalized data-driven decisions that support multidomain operations at echelon" as the top strategic objective.[3] With the appointment of the current Chief of Staff of the Army Gen. Randy George, the imperative to further transform the Army to enable warfighting struck home the message that all efforts of the data enterprise must directly enable the warfighter.[4] The problem facing Army leaders now is how the Army delineates roles and responsibilities for achieving decision dominance with data to empower commanders at echelon.

## Decision Dominance Gaps

To comprehend the senior leadership's objectives, it is essential to first grasp the intended outcome in tangible terms. Army Futures Command (AFC) defines decision dominance as a way for Army forces to make and disseminate better and faster decisions than an adversary, thereby gaining, maintaining, and exploiting the operational initiative.[5] To affect that outcome, the Army must begin from its existing doctrine describing decision support of commander decision-making through the military decision-making process (MDMP) provided by staff inputs from every warfighting function.[6] By its design, the MDMP assumes access to finite data, but the ubiquitous presence of data on the modern battlefield risks inundating a staff executing the MDMP, possibly leading to "paralysis by analysis."[7] Current doctrine fails to prevent data inundation, but the emerging discipline of decision optimization offers a possible solution. This new discipline is an approach to gaining advantage in readiness and warfighting through data science, artificial intelligence (AI), and machine learning (ML).[8] However, even this further distillation of decision support lacks enough specificity to be actionable at the operational and tactical levels.

An optimized decision requires operationalized data, that is data analyzed and presented in a way to be immediately actionable by those who consume it. Operationalized data is made available to data consumers through the common operational picture (COP) and fighting products. The Army has long used analog fighting products such as operations order shells filled out by hand in the field environment. Within the last quarter century, these analog fighting products evolved into digital fighting products consisting of Excel documents, PowerPoint presentations, and SharePoint pages to collate and share information more rapidly. The bleeding edge of current Army efforts to achieve data centricity is the effort to produce automated fighting products (AFP). As shown in figure 1, an AFP

- consists of commonly accessible staff or leader data visualization tools,

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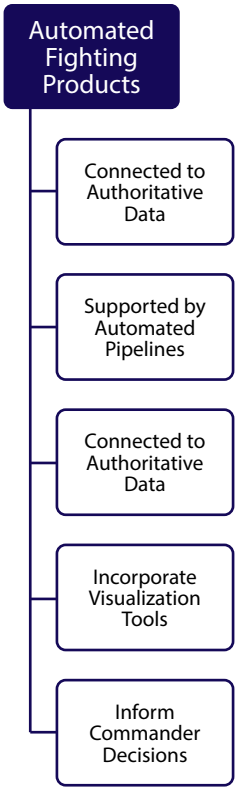



(Figure by author)

**Figure 1. Characteristics of Automated Fighting Products**

- is supported by an automated data pipeline,
- is connected to live, authoritative data sources,
- reduces the time required to produce staff running estimates, and
- informs commanders' decision-making.

The most notable examples of AFPs from the force today are the automated Power BI and Army Vantage dashboards used to reduce staff burden to produce and brief routine update reports to commanders. The concept of AFPs is agnostic of a unit's choice of data platform, with the only requirement that the data platform is readily accessible, connects a visual display to live data, and produces efficiencies for the unit's associated staff. With this detailed end product in mind, the issue the Army faces is to define what organization is responsible for producing and maintaining AFPs at echelon, which personnel will man those organizations, what training should be in place to enable those organizations, and what doctrine will support those activities.

## The Decision Optimization Team at Echelon

Over the past few years, units across the Army at multiple echelons sought to solve this problem internally by developing ad hoc teams, the most prominent of which are innovation cells. Although many of these teams produced myriad material and procedural solutions to tactical problems, the formations lacked a formal structure at echelon to support, resource, and synchronize their activities. To systematically solve this problem set and provide flexible decision optimization capability to commanders, a formal decision optimization team (DOT) must exist at every echelon from division to HQDA. This DOT would likely report directly to the chief of staff for their echelon as part of the special staff. The DOT would be responsible to rapidly provide operationalized data through the integration, analysis, and visualization of live, authoritative data required to enable a commander's decision. To provide this capability the DOT's key tasks would span the disciplines of data engineering, data science, and decision science by leveraging existing and emerging technology such as command-and-control information systems, AI, and ML. This effectively makes DOTs the operational arm of the Army's *Unified Data Reference Architecture* responsible for achieving data mesh by implementing the *Unified Data Reference Architecture* principles, service activities, and data domain processes.[9] Regardless of the operational environment—whether a garrison, operational, or combat environment—the DOT is responsible for the creation, maintenance, and transition of AFPs for their unit. The DOT provides data integration, assessment, war gaming, simulation support, and process improvement support during the planning and preparation phases of the operations process. During the execution phase, the DOT provides tracking and assessment of upcoming commander decision cycles. Throughout the operations process, the DOT conducts assessments on unit performance for rapid learning and adaptation. The only variance between DOTs at each echelon will be their roles and responsibilities.

Field Manual (FM) 3-0, *Operations*, details the Army's concept to fight large-scale combat operations and the responsibilities and time horizons for each echelon. The table shows time horizon responsibilities for echelons from brigade to theater or field army level.[10]

## Table. Unit Time Responsibilities by Echelon

| Formation | Close Fight Time | Deep Fight Time |
|---|---|---|
| Brigade | 12–24 hours | 24–48 hours |
| Division | 24–48 hours | 48–120 hours |
| Corps | 48–120 hours | 72–216 hours |
| Theater Army | 72–216 hours | > 216 hours |

(Table by author; data analysis based on content from Field Manual 3-0, *Operations* [2022], 6-11)

For an AFP to be useful to inform a commander's decision, a DOT must deploy its AFP during the first two steps of the MDMP so that the rest of the staff can leverage the tool during their analysis and planning. Using the deep-fight time horizons for each echelon, the FM 5-0 (*Planning and Orders Production*) MDMP planning factors, and the one-third/two-thirds rule for development, a division DOT would only have between 2:22 and 7:45 (hours and minutes) to develop and deploy AFPs while in contact.[11] This time horizon would only be reasonable for developing minor tools that adjust from existing AFPs. Division combat training center "division in the dirt" rotations emphasized that divisions must rapidly deliver relevant information to the tactical edge to ensure its relevance to the tactical commander.[12] Further, as the unit of action transitions to the division, a division and its subordinate brigades must be consumers rather than creators of AFPs because their cognitive bandwidth will be divided between executing combat operations and conducting survivability moves. Division-level DOTs must be responsible for producing minor, formation-specific addendums to AFPs prior to deployment and during the planning phase of the operations process. Division DOTs implement validated AI and ML tools for operational use, testing, and assessment. Each of these division-level responsibilities hinges on a close relationship with the DOT at their corps headquarters.

As the corps serves as the bridge between the operational and tactical levels, the significance of the DOT at the corps level cannot be understated.[13] Corps DOTs must be responsible for developing and deploying AFPs tailored to meet the mission sets and capabilities of their formation prior to execution. To reduce the cognitive burden on their subordinate units in combat, corps DOTs must produce theater agnostic AFP suites that scale down to the company level focused on sensor to shooter data requirements. Although a garrison and combat AFP suite will be different in form and function, the importance of their production and the management of the transition between them to meet operational requirements is persistent. An effective corps AFP incorporates validated AI and ML tools to gain efficiencies in staff decision support activities that a subordinate division or brigade can readily access and use in combat. As the corps level possesses more development time resources, the corps level is the first in a triage of reach-back capability for brigades and divisions to leverage to solve complex decision optimization problems.[14] Significant additions to or revisions of the corps AFP suite, in response to changes in mission variables by the corps DOT, take place in a headquarters further removed from the enemy threat. As corps are the highest echelon headquarters that deploy into a theater in support of large-scale combat operations, their interaction with an Army Service component command (ASCC) DOT will not be habitual and will require a high degree of design thinking at both headquarters to foster flexibility to interoperate.

ASCCs remain oriented on their theater of operations by their nature and are therefore optimally postured to produce a readily accessible, theater-specific COP platform. Coalition partners and allies integrate with U.S. Army forces at the ASCC level, further reinforcing the requirements for an ASCC to develop, deploy, and maintain a COP on the relevant networks to enable combined, joint combat power synchronization. Having a combined, joint COP for an incoming corps to fall in on in theater reduces the cognitive load on the corps staff, thereby reducing the time required

to commit the corps to combat. The development time horizon for ASCC DOTs enables them to provide reach-back capability to assigned corps for longer lead time AFP, COP, AI, and ML tools during operational and combat environments. The high volume of live data flowing into and through an ASCC headquarters serves as an optimal echelon for the training and validating of AI and ML models and tools. The U.S. Army Pacific Command and the U.S. Central Command developed and employed the Pangea and Maven Smart System platforms respectively to provide their theater specific information requirements in a cloud-based, readily accessible COP. To enable an ASCC to develop a combined, joint COP, they require infrastructure, resourcing, synchronization, and governance provided by the HQDA.

At the HQDA level, the DOT and associated staff inherit the roles and responsibilities of the lower-echelon DOTs while assuming the additional responsibility to synchronize decision optimization efforts within HQDA's operations and resourcing cycles. The HQDA DOT coordinates with the HQDA-level staff directorates to ensure that the network infrastructure, programs of records, and systems of record provide the capabilities required by operational and tactical units to complete their decision optimization support activities. The HQDA DOT provides the governance for the reach-back system down the DOT chain and serves as the gateway to strategic development resources. By providing this oversight, the HQDA DOT ensures that finite strategic development resources are prioritized and delivered to the point of greatest need and ensures that long-term projects are synchronized with operations and resourcing cycles. As AFC develops AI and ML models and tools, the HQDA DOT verifies that those products meet decision optimization requirements and assigns the validation of those products to the appropriate ASCC DOT. Further analysis is required to define the relationship among the HQDA DOT, AFC, and other strategic development assets. Without a DOT at every echelon above division, the decision optimization discipline will struggle to achieve a total Army revolution in decision dominance on future battlefields.

## The Available and Future Decision Optimization Workforce

Now with the DOT concept in mind, the next issue to address is who will man the DOTs at echelon. Currently within the Army, three branches already bear the responsibility for the key tasks that a DOT must execute: functional area (FA) 26B—information network engineer, FA 49—operations research/systems analysis (ORSA), and FA 57—simulations operations.

- FA 26B officers possess much of the knowledge, skills, and attributes required to execute the data engineering requirements of the DOT at echelon as the branch already provides innovative, flexible, and resilient mission command networks backed by operationally useful databases.[15]
- The ORSA community performs all three DOT key tasks out of necessity as they provide the capability to rapidly deliver optimization, data analytics, and data visualization through emerging technologies.[16]
- Simulation officers, despite lacking extensive technical backgrounds, contribute substantially to commander decision-making by providing knowledge-management-process-analysis expertise, simulation support, and an aptitude for harnessing new technologies to construct a comprehensive COP.[17]

Breaking up these DOT tasks into different roles and responsibilities allows deep expertise, more efficient workflows, higher quality work, and innovation. Traditional tasks for these FA officers like information systems management, special data project analysis, and knowledge management program implementation respectively would need reevaluation under the DOT concept. The XVIII Airborne Corps Office of Data Transformation piloted the combination of the FA 26B, FA 49, and FA 57 efforts within their headquarters in a targeted effort to improve the data literacy of the corps, division, and direct reporting unit staffs to great effect, implementing novel data literacy and advanced command-and-control information systems training courses.

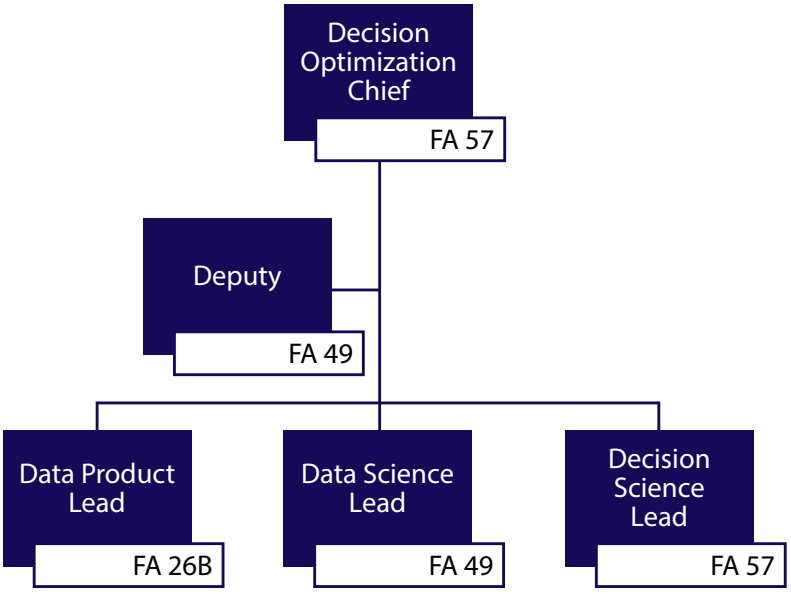
The prevalence of personnel from these three branches appears sufficient to meet requirements if properly organized at the ASCC, corps, and division levels. This capability is nonexistent at the HQDA level. For Category A ASCCs, corps, and division headquarters, four to five FA 26Bs, one to two FA 49s, and three to six FA 57s serve across eight different staff sections based on current modified table of organization and equipment.[18] At the HQDA level,


Within thirty days of standing up the Division Innovation Lab in 2022, 82nd Airborne Division soldiers developed over twelve different projects for further test and evaluation. Since its establishment, other recommendations have continued apace. This kind of collaboration on force modernization demonstrates the great potential of ground-level soldier-driven initiatives to upgrade all dimensions of the Army's organization, field operations, doctrine, and equipment. Permanent addition of a decision optimization team to the division structure would build upon the concept, formalizing and helping to instill recognition of the need for such a process as part of future Army culture. (Photo courtesy of the U.S. Army)

the personnel from the three branches required for the DOT are dispersed thinly across the deputy chief of staff G-6, the deputy chief of staff G-8, and the deputy chief of staff G-3/5/7.[19] The new HQDA directorate and associated staff billets could be made available through a bottom-up review of existing billets made obsolete from current technologies and automation. A reorganized DOT at echelon on modified table of organization and equipment would consist of a decision optimization chief, deputy, data product section, data science section, and decision science section (see figure 2). Additional table of distribution and allowances support from Department of the Army civilians, reservists, or contractors may be required to augment the capabilities of the DOT at higher echelons. Some of the personnel assigned to a DOT at the ASCC and HQDA levels require AI-related additional skill identifiers (ASI) or personnel development skill identifiers to possess the skills required for their AI and ML verification and validation mission. By reorganizing the existing force structure of the FA 26B, FA 49, and FA 57 personnel within the division, corps, and ASCC headquarters, the Army can readily implement a pilot decision optimization program.

## Training the Decision Optimization Team

Each of the three functional areas involved in the decision optimization discipline require varying levels of adjustment to their existing professional military




(Figure by author)

**Figure 2. A Potential Decision Optimization Team**

education (PME) pipeline to meet the future requirements of the DOT concept at echelon. To enable FA 26Bs to assume their data engineering role within the DOT, PME must enable them to serve as an architect, engineer, operator, and maintainer for a data domain's mesh services, responsible for building infrastructure, enhancing data analysis, managing curated data products, and supporting domain expertise with tactical data management. By fiscal year 2025, the U.S. Army Signal School will train 26-series personnel in these disciplines through their PME revisions.[20] Existing FA 49 PME proves sufficient to train ORSAs in business intelligence, data integration, data science, and data literacy training capability, enabling them to serve as transformation leaders within their formations. FA 57 PME requires the most adjustment to meet the requirement to provide decision science support to the DOT, despite recent revisions to course curricula. The Army modeling and simulations office must incorporate a broader technical foundation for additional learning—spanning systems engineering, human factors engineering, decision science, data science, computer science, and project management in addition to existing knowledge management instruction. With limited expansion and refocusing of the PME for the three DOT branches to provide a new capability, the Army could deliver trained DOT personnel as early as fiscal year 2025 to man the reorganized DOTs at the division and corps levels.

Once formed, the Army requires a systematic training and validation strategy for the DOTs at echelon. The integrated weapons training strategy or the military intelligence training strategy serves as appropriate training models for the DOT at echelon by making use of the commonly understood gunnery tables.[21] This gunnery program must aim to deliver algorithmic warfare capability ranging from executing individual tasks through whole-of-staff collective training tasks.[22] The individual training gate must train and validate individual members of the DOT in the execution of their assigned tasks within the team by employing validated algorithm-based tools as if they were an assigned weapon system. As part of the validation process for an AI and ML tool, a six-table gunnery progression must accompany the deployment of the tool to the force. Gate two of the gunnery table must cover the six-tables to progress the individuals of the DOT into a validated team to provide their decision optimization capability. Gates three and four could nest within the existing mission command digital master gunnery tables that model the training and validation of staff collective training.[23] By using the integrated weapons training strategy or military intelligence training strategy methodology as a model, this approach would emplace decision optimization as a discipline to train, certify, and employ algorithmic warfare at echelon.

A gunnery program requires an institutionally trained master gunner to certify soldiers on the tools used to optimize decisions, advise commanders on the effective employment of those tools, and develop unit training plans for DOTs.[24] No course provides this capability, but the decision optimization proponent could develop and implement such a course. Development and appointment of a decision optimization proponent requires further research and analysis. An algorithmic warfare master gunner course would aim to produce leaders to drive decision optimization operations by leveraging existing and emerging technology to develop AFPs that enable effective commander

decision-making at the speed of combat. A generation of detailed terminal learning objectives, enabling learning objectives, and program of instruction for the algorithmic warfare master gunner course requires further analysis. Using a five-week construct and a crawl-walk-run methodology, students of the course would build a technical foundation and progressively test their ability to leverage technology during practical exercises of increasing complexity. Weeks one and two provide the foundation of unit training management, the military decision-making process, data integration, data analysis, computer science, decision science, human factors design, and project management. The third week provides students with a survey of available decision optimization tools with use-cases for their employment. During week four, instructors guide students through building AFPs to meet information requirements using the tools surveyed during the previous week. The final week consists of practical exercises requiring students to form DOT-augmented staffs, develop their own AFPs, conduct the military decision-making process, and execute a simulated mission using their own AFPs. By the end of this course, newly minted algorithmic warfare master gunners receive an ASI and return to their units fully prepared to execute decision optimization.

## Decision Optimization Doctrine

Current doctrine outlines the staff's role in decision support activities through the military decision-making process and the rapid decision-making and synchronization process but does not codify the decision optimization concept.[25] The decision support proponent must develop an Army doctrinal publication (ADP) and a series of Army techniques publications (ATP) that comprehensively detail decision optimization activities and methods to effectively employ decision optimization techniques. A decision optimization ADP must codify the purpose, structure, and key tasks of the DOT as well as their roles and responsibilities at echelon. Most importantly, the ADP must cover the triaging of complex decision optimization tasks to ensure DOTs at echelon possess the appropriate authorities to prioritize and allocate resources. The nature of decision optimization activities most readily aligns to the three or six-series of publications. Once published, the decision optimization ADP must be integrated into FM 3-0, FM 5-0, and FM 6-0, *Commander and Staff Organization and Operations*, to ensure decision optimization activities synchronize with existing decision support doctrine. Writers must give special attention to detail the interactions among the commander, the DOT, and each section of the staff to break existing decision support cycles to realize the full capability of decision optimization activities.

FA 57s utilize ATP 6-01.1, *Knowledge Management*, to inform their current role in staff decision support activities through systems science, but this publication alone is insufficient to institutionalize decision science as one of their competencies.[26] Decision science requires an additional ATP within the six-series of publications to establish the framework for the deliberate analysis and enhancement of decision-making through data product orchestration within a military context with accompanying methods for implementation.[27] Further detail on the discipline of decision science requires further study and analysis. With a FA 57 adjustment to their competencies from providing decision support through knowledge management to providing decision science, the simulations branch would be the optimal proponent for decision science for the Army.

Finally, to formally train and validate members of DOTs at echelon, the Army requires a training circular (TC) establishing algorithmic warfare gunnery program in doctrine. This TC is most appropriate for the six-series of publications and should detail how to train the decision optimization discipline. Every gate and table must provide a systemic approach to train from the individual through team level using existing automation, AI, and ML tools to develop and implement AFPs, enabling decision optimization activities. A unit algorithmic warfare master gunner program within the TC must provide the duties, responsibilities, and training methodology to train DOTs on their complex tasks. What constitutes a qualification event at each gate is beyond the scope of this article and requires further analysis.

## Recommended Way Ahead

To implement the above outlined plan, a four-phase approach over a five-year time horizon provides the decision optimization capability to the Army via a sustainable model. The office of primary

responsibility for this multiyear effort should be the Mission Command Center of Excellence as that organization pioneered the concept of decision optimization. Supporting offices of coordinating responsibility include the FA 26B proponent, FA 49 proponent, FA 57 proponent, the knowledge management proponent, the Signal School, Army chief information officer, and Army chief data and analytics officer. At end state, the Army possesses a cadre of decision optimization professionals at echelon, provided by a robust institutional and operational training pipeline, that enables Army formations to adapt to their operational environment faster than the enemy, achieving decision dominance on the battlefield.

The first phase of the plan consists of reorganization and execution of a pilot program. This phase begins with the current disposition and organization of the data workforce. Key tasks for this phase are the designation and reorganization of pilot DOTs within the XVIII Airborne Corps and an Army National Guard division, appointment of a pilot assessment team, assessment of DOT lessons and best practices, and the generation of an assessment report for the pilot program. This phase ends with a completed assessment plan of the pilot program one fiscal year from program inception.

Phase two consists of revision of decision optimization training paths and doctrinal publications. This phase begins following the publication of the pilot program assessment report. Key tasks for this phase are the development of new doctrine based on the assessment report, revision of existing doctrine to integrate the new doctrinal publications, the revision of associated branch PME, the development of new institutional PME program of instruction for the algorithmic warfare master gunner course, and the submission of the program objective memorandum for out-year resourcing. At the end of this phase, institutional training is resourced and supported by doctrine.

Phase three consists of the expansion of the DOT program at echelon. This phase begins as resources and doctrine become available for the decision optimization concept. Key tasks for this phase are the implementation of institutional PME for the DOT, revision for the expanded DOT modified table of organization and equipment at the ASCC and HQDA level, and to man the DOT from division through ASCC in accordance with Army manning guidance. This phase ends as DOTs across the Army, from division through ASCC receive decision optimization-trained FA 26B, FA 49, and FA 57 personnel.

The final phase consists of a validation of the decision optimization concept. This phase begins when DOTs from division through ASCC are manned with institutionally trained personnel. Key tasks for this phase are the assessment of decision optimization training pipelines, assessment of the ASCC and HQDA DOTs, validation of the decision optimization team at echelon through a Warfighter exercise, a "dirt CTC rotation," and the generation of a program assessment report. This phase ends upon reaching the program's end state.

## Cost of Inaction

Recent events taught the Army the value of operationalizing data through AFPs hard-won while fighting through the chaotic conditions of COVID-19 tracking, the Hamid Karzai International Airport noncombatant evacuation, tracking military aid shipments to Ukraine, and ongoing conflicts around the world. The speed and precision required to execute these operations spawned multiyear efforts to produce COP tools, AFPs, and innovation cells just coming into broader Army use today. Without a programmatic approach to achieving decision dominance, tactical commanders will continue the current asynchronous approach to innovate methods to achieve local decision dominance. That approach during large-scale combat operations will levy unrealistic expectations on tactical units while in combat as strategic resources will be underutilized at the point of need. Leaders unwilling to change would do well to remember Gen. Eric Shinseki's statement that "if you dislike change, you're going to dislike irrelevance even more."[28] Being irrelevant on future battlefields in this regard could be the difference between victory and defeat. If the Army wants to break out of the current decision cycles that place it at parity with peers and near-peers, it must invest in the decision optimization discipline. ■

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