



PREPARING THE FORCE FOR DATA-CENTRIC WARFIGHTING

A SUMMARY OF THE RESEARCH

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About This Report

Rapidly and efficiently sharing information across networks, platforms, systems, and security classifications and with mission partners is vital for enabling all-domain awareness and executing nonkinetic and kinetic warfighting operations. This information-sharing is especially important in the European theater, where the United States must operate from the sovereign territory of multiple allies to orchestrate coordinated defense. Accelerating change toward a digital backbone by which information is seamlessly shared is limited not just by technology but also by nonmateriel issues, such as culture and policy. These impediments to progress are preventing the Department of the Air Force from realizing Joint All-Domain Command and Control (JADC2)/Advanced Battle Management System (ABMS) and sensing grid goals. Technical solutions and capabilities are only one piece of a very complex equation. This report highlights information-sharing challenges and potential near-term and nonmateriel courses of action that the U.S. Air Force could take to prepare the force for information-sharing at speed and at scale in the European theater.

The research reported here was commissioned by U.S. Air Forces in Europe and conducted within the Force Modernization and Employment Program of RAND Project AIR FORCE as part of a fiscal year 2023 project, “Data-Centric Warfighting—Sharing at Speed and at Scale.” This summary will be of interest to representatives from such organizations as U.S. European Command, NATO Allied Air Command, the ABMS program office, Air Combat Command, and (possibly) Pacific Air Forces.

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intelligence community issues and provided critical perspectives regarding the unique challenges of operating in the European theater. Monika Cooper provided us with valuable feedback, and Sydne Newberry provided critical expertise to better distill and clarify our communication of the research. While we thank our colleagues for their assistance, we are responsible for all errors, omissions, findings, and recommendations (especially those with which the reader may disagree).

Summary

This summary report highlights information-sharing challenges and explores *near-term* and *nonmateriel* courses of action that the U.S. Air Force could take to better prepare the force for information-sharing at speed and at scale in the European theater. Given that the rules governing information-sharing—what we term the *information-sharing terrain*—will change quickly before and during a transition to war, we examined how U.S. Air Forces in Europe (USAFE) can rapidly adapt to such changes. Through a review of doctrine and policy, site visits, and discussions with subject-matter experts, we find that, if the United States and its allies do not prepare the force to anticipate changes to the information-sharing terrain, it is unlikely that change can be implemented rapidly enough to effectively conduct integrated air and missile defense of the European theater, where delays in information-sharing of even ten seconds can mean the difference between life and death. In particular, USAFE is not organized to apply a satisfactory understanding of the information-sharing terrain to best advantage in planning and operations. Training for proficiency in navigating the current information-sharing terrain is insufficient to ensure success in future war fights, when terrain likely will have shifted. Additionally, USAFE has failed to leverage combined exercises to improve its understanding of ways to shape the information-sharing terrain to best advantage in future war fights. We present recommendations that address improving the visibility and navigability of the information-sharing terrain in the near- and longer-term, organizing and training for both proficiency and adaptability in information-sharing, and engaging with allies to shape the future information-sharing terrain.

Contents

About This Report	iii
Summary	vii
Preparing the Force for Data-Centric Warfighting: A Summary of the Research	1
Research Questions and Methodology	2
An Overarching Need: Managing Information-Sharing During the Transition to War	3
Improving the Visibility and Navigability of the Information-Sharing Terrain	5
Organizing for Adaptability in Information-Sharing	7
Training for Proficiency and Adaptability in Information-Sharing	9
Engaging with Allies to Shape the Future Information-Sharing Terrain	11
Key Findings and Recommendations	13
Abbreviations	17
References	19

Preparing the Force for Data-Centric Warfighting: A Summary of the Research

Rapidly and efficiently sharing information across networks, platforms, systems, and security classifications and with mission partners is vital for enabling all-domain awareness and executing nonkinetic and kinetic warfighting operations. Accelerating change toward a digital backbone that allows for seamless information-sharing is limited not just by technology but also by nonmateriel issues, such as culture and policy. These impediments to progress are preventing the Department of the Air Force (DAF) from realizing Joint All-Domain Command and Control (JADC2)/Advanced Battle Management System (ABMS) and sensing-grid goals. Technical solutions and capabilities are only one piece of a very complex equation. This summary report highlights information-sharing challenges to explore *near-term* and *nonmateriel* courses of action (COAs) that the U.S. Air Force could take to better prepare the force for information-sharing at speed and at scale in the European theater.

As we will detail in this summary report, information-sharing with allies is challenging but crucial to coordinated cruise missile defense of the European theater. Incoming missiles are likely to overfly, be visible from, or be defended against using both U.S. and allied assets based in multiple allied sovereign territories. Prior to the invocation of Article 5 of the North Atlantic Treaty Organization (NATO), this coordinated air and missile defense will be orchestrated by a coalition of the willing. A similar coalition is sharing data in support of the defense of Ukraine, providing real-world lessons that informed the research reported here.

The focus of our research is to generate near-term and nonmateriel COAs that the DAF could take to improve information-sharing in the European theater. By *near-term*, we mean that this research provides COAs that the DAF can take now, even with today's less than ideal technology. The nonmateriel factors at the heart of this report include a focus on nontechnical barriers to information-sharing. Specifically, we address elements of doc-

trine, organization, training, and policy (DOT-P). This report starts from the position that U.S. Air Forces in Europe (USAFE) cannot afford to sit back and wait for technological changes (some of which could take years to implement) to resolve present-day challenges. Additionally, technological changes alone rarely solve the bigger challenges facing an organization. Nonmateriel factors are critical in both the near- and long-term to enable new tools or technologies to be implemented successfully. By focusing on nonmateriel factors, we provide COAs that can help the DAF avoid potential limitations that can stem from a technologically deterministic approach to dealing with information-sharing barriers, such as waiting for the implementation of a new technology before making proactive changes to DOT-P.¹

Research Questions and Methodology

The research reported here is part of a broader fiscal year 2023 effort sponsored by USAFE in which multiple federally funded research and development centers (FFRDCs) examined information-sharing challenges in the European theater. Whereas other FFRDCs focused on mapping and understanding digital engineering gaps and technology gaps, our focus is on the nontechnical issues that inform information-sharing, particularly with NATO and U.S. allies and partners but also within USAFE and U.S. European Command (EUCOM).

To shape our research, we addressed four research questions regarding information-sharing in the European theater:

- What are the issues related to culture; organization; data ownership; tactics, techniques, and procedures; policy; guidance; and laws that impede information-sharing?
- How do these nontechnical issues interact with the technical means of information-sharing (and vice versa) to create barriers, and how do such barriers affect the mission?

¹ “Technological determinism is the belief that the introduction of certain types of technologies . . . directly causes certain kinds of outcomes, such as the centralization of an organization’s decision making for the widening of its span of control” (Rice and Leonardi, 2014, p. 425).

- What are alternative COAs that could be taken to remove or mitigate the effects of those barriers?
- How can the United States and its allies organize, train, and equip to enable rapid adaptation to changes in the information-sharing terrain?

To answer these questions, we reviewed doctrine and policy, conducted site visits, observed operations and exercises, sat in on multiple discussions regarding information-sharing technical issues to gather vignette data about the interactions with nontechnical issues, and held targeted discussions with subject-matter experts. We then synthesized what we learned about those interactions to recommend COAs that USAFE might take to improve information-sharing and illustrated the impact that those COAs might have on operational results using a simulation of a cruise missile attack on a coalition airbase in the European theater.

An Overarching Need: Managing Information-Sharing During the Transition to War

Permissions to share information with allies—and the authorities related to what can be done with that information—change quite rapidly when hostile conditions are encountered. However, the primary finding from our research is that this change is not likely to be “rapid enough” to effectively implement integrated air and missile defense (IAMD) in the European theater if the United States and its allies do not prepare the force to anticipate those changes. At the initial outbreak of war in Europe, defensive action will likely be needed well before NATO forces can be brought to bear under Article 5.

Information-sharing is inhibited by many factors beyond just security classification, disclosure, and release rules. If history is any guide, authorities to access information and to make command and control (C2) decisions based on that information will be pushed down (delegated) as the pace of operations increases and will be pulled back when that pace decreases. Coalitions will expand and shrink according to the threat, and each nation will bring its own set of information-sharing constraints. Although most of our recommendations concern ways to prepare for such changes so that

information-sharing can be executed rapidly, we also recommend that technical requirements be levied on the system-of-systems that comprise JADC2/ABMS to facilitate “rapid enough” change. Without knowledge of the rules governing information-sharing and the use of that information, as well as ways to quickly access and securely change those rules, the United States and its allies will never be able to execute information-sharing at speed and at scale. With these considerations in mind, we recommend the following requirements be levied on JADC2/ABMS implementations:²

- Include a readily accessible and modifiable repository containing authoritative, machine readable, and machine enforceable information-sharing rules. At minimum, this repository should contain the rules for sharing situational awareness regarding the location, combat identity, and classification of objects in the battlespace.
- Make explicit all assumptions regarding who will have what authorities at what phase of warfare and design for expected variations in the degree of centralization versus distribution of C2 authority. At minimum, this requirement should include the authority to make combat identification, authority to engage, and authority to connect sensors to shooters.
- Provide ways to securely change the rules governing information-sharing permissions and authorities at speed and at scale.³

This report addresses nontechnical issues that influence data-sharing across networks, platforms, systems, and security classifications and with U.S. allies to enable all-domain awareness and execute nonkinetic and kinetic warfighting operations.

We discuss recommendations related to four key areas:

² Acquisition officials set system requirements in response to operational needs. USAFE should vigorously articulate its need for flexibility in information-sharing in its interactions with the acquisition community and advocate for these implementation requirements.

³ Some technology-focused recommendations may take relatively longer to implement. Such recommendations do not preclude USAFE from also implementing other, near-term recommendations.

- improving the visibility and navigability of the information-sharing terrain
- organizing for adaptability in information-sharing
- training for proficiency and adaptability in information-sharing
- engaging with allies to shape the future information-sharing terrain.

Improving the Visibility and Navigability of the Information-Sharing Terrain

We examined how U.S. doctrine and policy might inhibit or enhance USAFE's ability to adjust to changes in the information-sharing terrain and provide specific recommendations for actions that USAFE could take to improve its readiness to adapt, should conflict spread further in the European theater.

In our review of existing policy regarding information disclosure, we found such policy to be fully supportive of the need to produce analytic products that will “expedite sanitization, disclosure, and release decisions” in accordance with U.S. national security and foreign policy objectives (Office of the Director of National Intelligence, 2017, p. 1). Furthermore, guidance regarding how the production of useful analytic products is to be accomplished mirrors many of our recommendations.

Our primary recommendation is that USAFE should focus on mapping the information-sharing terrain, building roads, and adding signposts so it is easier to navigate.⁴ Although we found IC guidance on the production of analytic products needed for situational awareness to be supportive of this recommendation, there are additional actions USAFE could take to ensure intelligence information-sharing processes are better coordinated and more responsive. While actual change requires action by the larger IC and the

⁴ An excellent example of what we mean by “adding signposts” can be found in the intelligence community’s (IC’s) instructions on the use of tearlines to make it easy to distinguish what information has been authorized for dissemination at different security levels (Office of the Director of National Intelligence, 2012; Office of the Director of National Intelligence, 2017).

U.S. Department of Defense (DoD), USAFE can become a vocal and persuasive advocate for change in three areas:

- Advocate for the stipulation in IC policy guidance for “Criteria and Conditions for Emergency Foreign Disclosure and Release” to be the rule rather than the exception when USAFE is actively supporting a foreign partner, such as Ukraine, in an ongoing conflict (Office of the Director of National Intelligence, 2014).
- Advocate for IC elements, such as the National Security Agency, to develop relationships and information-sharing processes outside the Five Eyes community.
- Advocate for a change in DoD-wide policy to require a review of security classification guides prior to systems receiving their authority to operate. The purpose of the review is to ensure that decisions made to protect information during development and to deny adversaries an advantage will not adversely affect training and readiness to fight.⁵

Actions that USAFE should take now to make the information-sharing terrain more visible and (safely) navigable are based on our understanding of existing information dissemination guidance and processes. Ideally, these actions should be implemented by USAFE staff who fill enterprise data architecture roles defined in DoD’s data strategy. Recommended actions include the following:

- Continue to pursue bilateral agreements for information-sharing with willing nations.
- Develop a centralized index, log, or repository as a one-stop shop where planners can access the current and authoritative status of bilateral and multilateral agreements governing information-sharing and the authorities for using information.
- Make existing repositories of previously disclosed and released information more visible and more accessible. Develop and publicize use cases that show how the repositories are intended to be used.

⁵ This review would be similar to efforts underway in the U.S. Space Force and, therefore, could become DAF policy. Ideally, it would become DoD-wide policy.

- Develop guidelines for how USAFE will manage changes to the information-sharing terrain. Such guidelines may include developing standards for validating the user modifiable information dissemination rules for existing tools.
- Develop guidance regarding the use of sanitizing techniques.
- Define levels of and metrics for sanitizing information.

Organizing for Adaptability in Information-Sharing

The finding that change may not happen rapidly enough during a potential transition to war and the recommendation that USAFE must better understand its information-sharing terrain have organizational implications for USAFE. Our data collection pointed to organizational barriers that, if addressed, can improve information-sharing in the near term.⁶

As of this writing, there is no documented model of how information-sharing occurs within the theater that includes both technical and organizational flows of information and no clear map of how USAFE organizations connect to each other and to allies. These areas of ambiguity affect personnel in terms of how service personnel think about how information-sharing works. We found distinctly different perspectives that, ideally, should be in alignment, regarding

- how information-sharing is supposed to work (i.e., what is recorded in doctrine)
- how it works in practice
- how personnel *think* information-sharing works across the enterprise.

⁶ For our use of the term *organization*, we worked from both the DOTMLPF (doctrine, organization, training, materiel, leadership and education, personnel, and facilities) definition (“how we organize to fight”) and definitions from organizational design literature that describe key elements of an organization, including structure, processes, personnel, and leadership. An organization such as USAFE can achieve its strategic goals only if its structure and processes are aligned to support desired outcomes (Daft, 2016; Burton, Obel, and DeSanctis, 2011).

Our observations also point to a need to prioritize ownership of the data process, including collection, curation, configuration, and management. The lack of a designated organizational structure (or dedicated personnel in existing organizations) with responsibility for collecting, curating, and managing information to be shared makes information-sharing more haphazard than it should be. For example, we observed that U.S. planners in a combined exercise did not make use of much-needed allied assets *as would have been allowed by a bilateral agreement* because they did not know the agreement existed.

Currently, data-centric skill sets are not central to many USAFE billets. Given the importance of information-sharing to defense of the European theater, a culture shift that positions data and information at the center of the enterprise could be useful. With more than 30 nations, the information-sharing terrain in the European theater will always be complex. Reserve and civilian personnel, who do not change positions as frequently as active-duty personnel, can play a critical role in sustaining expertise and institutional memory regarding the terrain and how best to navigate it. We assess that the current five-year limit for employing civilians outside the continental United States is negatively affecting USAFE's ability to sustain institutional knowledge with regard to the information-sharing terrain.

In light of the above observations, we provide the following recommendations:

- USAFE should continue to prioritize the development of a documented, comprehensive, and shared understanding of the information-sharing terrain. This understanding must include how organizations connect to central nodes, such as the Air Operations Center, and how information flows within USAFE and with allies and partners.
- USAFE should place a greater emphasis on understanding how and why divergences (i.e., workarounds) from information-sharing policy, guidance, and rules occur. Studying divergences will provide real-world data that can be used in redesigning these processes.
- USAFE leadership should continue to provide sustained attention to information-sharing issues, including
 - prioritizing the recruitment or development of data-aware airmen by requiring data analytic skill sets for personnel

- creating billets for positions related to data curation and architecture
- assigning select existing personnel to take on information-sharing tasks and/or developing a dedicated organization within USAFE for information-sharing
- proactively creating a pipeline of foreign disclosure representatives to aid USAFE’s foreign disclosure officers, should the operations tempo increase
- ensuring that information-sharing terrain realism and objectives are incorporated into existing exercises.

Training for Proficiency and Adaptability in Information-Sharing

USAFE’s ability to share information at speed and at scale with U.S. allies will depend on a workforce who not only are proficient in using available repositories and tools to curate and share information but also understand the pedigree of that information and the rules governing how it is shared. Perhaps more importantly, it will depend on that workforce’s ability to rapidly adapt to changes in the rules governing who can see what information under which circumstances. Personnel must be trained for both proficiency and adaptability in the face of an ambiguous future. But we recognize that training is always a balancing act: Fully developing all potential skills and preparing for all possible scenarios would leave very little time for actual job accomplishment. Training must be objective focused.

The need to share information at the speed and scale that will be needed to defend the European theater is not (today) part of the basic skills of technical training that are foundational to U.S. Air Force qualification training. One way to accomplish this training is through exercises that mimic the conditions of crisis and conflict. However, we find the following:

- Current exercises in USAFE (and the DAF more generally) do not focus on practicing for information-sharing and often ignore the impacts of inadequate information-sharing.

- While exercises are the best environment in which to train for adaptability in information-sharing, current exercises provide too little deliberate practice (e.g., they incorporate white cards, precurated information, and predetermined targets or sensor/shooter pairings) and too little guided feedback.
- Guided feedback requires the input and participation of subject-matter experts to provide relevant and appropriate feedback. This is not a trivial undertaking and may require adjusting the personnel mix or task assignments in future exercises.
- Given the rotation of military and civilian personnel and the fluidity of coalitions, it is difficult to sustain the group skills needed for information-sharing at speed and scale in the European theater.
- USAFE and EUCOM lack exercises focused on the transition to war, including operations before, during, and after an invocation of Article 5 of the NATO Treaty.
- USAFE (and the DAF more generally) lacks a synthetic training environment that would allow it to adequately train airmen to adapt to a variety of possible information-sharing terrains.

In light of the above findings, we provide the following recommendations:

- USAFE should develop training and orientation materials regarding the unique aspects of the information-sharing terrain of the European theater and use those theater-specific materials to train foreign disclosure officers and representatives and to quickly orient command leadership.
- USAFE, in conjunction with EUCOM and NATO, should incorporate information-sharing objectives into the overall objectives of exercises, such as Ramstein Legacy, Astral Knight, Neptune Eagle, and Austere Challenge. For these exercises,
 - training objectives should include teaching staff how to find and apply information within the constraints of the current information-sharing terrain.
 - *finding issues* should be used as the success criteria for these information-sharing objectives, not performance to a specific kill-chain timeline.

- training should emphasize mastery (e.g., “understand the test content so you can apply it appropriately in other situations”) rather than getting to a correct answer (e.g., “ace the test”).
- USAFE should become a vocal advocate for DoD investments to develop a shared repository and methods for imposing synthetic imagery over real-world operations for use in exercises.

Engaging with Allies to Shape the Future Information-Sharing Terrain

This report addresses the range of nontechnical issues that affect information-sharing (with a focus on DOT-P), how nontechnical issues interact with technical means of information-sharing to create barriers, and recommendations that USAFE can pursue to mitigate barriers and improve information-sharing. The potential transition to wartime would shift the information-sharing terrain in ways that could affect the readiness of the United States and its NATO allies to defend the European theater. Given the urgency and importance of information-sharing, our recommendations emphasize what USAFE can do (or advocate for) today to better prepare the force and enable rapid adaptation to changes in the future information-sharing terrain. This section summarizes three overarching themes that inform the findings and recommendations in this report: Europe as a theater of conflict, intertemporal aspects of conflict (including onset), and the need for adaptation of information security requirements.

- As a possible theater of war, Europe has unique characteristics that make information-sharing difficult.
 - The theater is primarily a land-based environment with numerous sovereign nations, each with varying levels of involvement in NATO and differing relationships with DoD and the U.S. IC.
 - USAFE’s challenge is to navigate a complex network of relationships and related policies and authorities that comprise the information-sharing terrain and, in periods of crisis, adapt to changes in that terrain quickly so that information can be shared at speed and at scale to respond to immediate threats.

- While USAFE's current information-sharing agreements have increased shared situational awareness of an attack, less progress has been made in coordinating the authorities needed to implement a layered defense prior to invocation of Article 5.
 - During a period between the onset of hostilities (or even a pre-hostility period in which an adversary were rapidly moving forces) and the invocation of Article 5, capability shortfalls could result in substantial territorial, personnel, or equipment losses that would increase the likelihood that an adversary would achieve its operational objectives.
- A one-size-fits-all approach to information-sharing with allies in the European theater is not feasible.
 - Although allies share some of the information they collect, they may not share all for a variety of reasons.
 - Some members of a coalition will be more forward-leaning than others.
 - While nations have some shared interests, their individual interests are not always aligned with those of every other nation in the theater. Encouraging open dialogue among nations can be valuable for developing an understanding of nuances.
 - It is imperative to elicit an understanding *now* of the conditions under which nations are (or are not) willing to provide access to their information networks and territories prior to the invocation of Article 5 and the steps the United States and other NATO nations could take to address their concerns.

Although we held discussions with individuals from various nations as we participated in exercise and site visits, those discussions are no substitute for a robust and rigorous survey of the current—and potential future—information-sharing terrain. Nor did we find the current combined exercises to be sufficient to fully flesh out how uncertainties regarding that terrain affect readiness. Combined exercises, even those with an emphasis on C2, often do not include time-sensitive targeting and take place within a precoordinated information-sharing environment. Prior to doing more exercises, we recommend that USAFE prioritize a more rigorous elicitation to discover the conditions under which nations are (or are not) will-

ing to provide access to their information networks and territories prior to the invocation of Article 5. The outcome of this process is a documented description of the range of possible future information-sharing terrains in which operations might occur.

The process should begin with structured discussions and wargames to gain an understanding of the reasons why nations may be unlikely (or unable) to provide access to their information networks and territories. These structured discussions should also be used to elicit the conditions needed to most effectively facilitate access, including memorandums of understanding, training, system selection, and personnel assignments. Exercises could be used to illustrate the benefits of increased access to information from and by specific nations (for example, allies on the eastern flank) and NATO writ large. These could include relatively inexpensive tabletop exercises using simulations, as well as more complex combined exercises. By taking these types of actions, USAFE will be better positioned to shape the information-sharing terrain with its European partners.

Key Findings and Recommendations

Findings

- The rules governing information-sharing—what we term the *information-sharing terrain*—will change rapidly before and during a transition to war.
- If the United States and its allies do not prepare the force to anticipate those changes, it is unlikely that change will be implemented rapidly enough to effectively implement IAMD of the European theater, where delays of even ten seconds can mean the difference between life and death.
- USAFE is not organized to apply an understanding of the information-sharing terrain to best advantage in planning and operations.
- Training for proficiency in navigating the current information-sharing terrain is not sufficient to ensure success in future war fights, when terrain likely will have shifted.

- USAFE has failed to leverage combined exercises to improve its understanding of ways to shape the information-sharing terrain to best advantage in future war fights.

Recommendations

Improve the Visibility and Navigability of the Information-Sharing Terrain

- Near term (USAFE): Map the terrain (i.e., know your audiences or customers), build roads (i.e., tools) so the terrain is easier to traverse, and add signposts and guardrails (i.e., produce analytic products) so it is easier to navigate.
- Longer term (Air Force Futures [HAF/A5]): Require that JADC2/ABMS implementations
 - include a readily accessible and modifiable repository containing authoritative, machine-readable, and machine-enforceable rules for sharing information regarding the location, combat identity, and classification of objects in the battlespace
 - make explicit all assumptions regarding who will have what authorities at what phase of warfare and design for expected variations in the degree of centralization versus distribution of C2 authorities
 - provide ways to securely change the rules governing information-sharing permissions and authorities at speed and at scale.
- Longer term (USAFE): Become a vocal and persuasive advocate for change in three areas: (1) a priori definition of conditions for emergency disclosure of specific information, (2) creation of new security community designators (e.g., all nations with F-35s), and (3) mandatory review of security classification guides.

Organize for Adaptability in Information-Sharing (USAFE)

- Promote an understanding of the information-sharing terrain among key personnel, including organizational connections within USAFE and with allies and partners.
- Provide sustained leadership attention to information-sharing issues to facilitate the implementation of improvements to information-sharing processes.

- Create billets for data stewards and custodians charged with curating and maintaining access to authoritative source data that describe the current information-sharing terrain.

Train for Proficiency and Adaptability in Information-Sharing (USAFE)

- Develop training and orientation materials with regard to the unique aspects of the information-sharing terrain of the European theater.
- Work with EUCOM and NATO to incorporate specific information-sharing objectives for Neptune Eagle, Austere Challenge, and Ramstein Legacy. Discovering information-sharing issues should be the success criteria for these exercises, not performance to a specific kill-chain timeline.
- Become a vocal advocate for DoD investments to develop a shared repository and methods for imposing synthetic imagery over real-world operations for use in exercises.

Engage with Allies to Shape the Future Information-Sharing Terrain (USAFE)

- Beginning with structured discussions, wargames, and simulations, design a series of initiatives to better elicit allied views on the current information-sharing terrain and how to shape future terrain to the best advantage in future wars in the European theater.

Abbreviations

ABMS	Advanced Battle Management System
C2	command and control
COA	course of action
DAF	Department of the Air Force
DoD	U.S. Department of Defense
DOT-P	doctrine, organization, training, and policy
EUCOM	U.S. European Command
IAMD	integrated air and missile defense
IC	intelligence community
JADC2	Joint All-Domain Command and Control
NATO	North Atlantic Treaty Organization
USAFE	U.S. Air Forces in Europe

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Rapidly and efficiently sharing information across networks, platforms, systems, and security classifications and with mission partners is vital to enabling all-domain awareness and executing nonkinetic and kinetic warfighting operations. Accelerating change toward a digital backbone that allows for seamless information-sharing is limited not just by technology but also by nonmateriel issues, such as culture and policy. These impediments to progress are preventing the Department of the Air Force from realizing Joint All-Domain Command and Control/Advanced Battle Management System and sensing-grid goals. Technical solutions and capabilities are only one piece of a very complex equation.

In this summary report, the authors highlight information-sharing challenges and explore near-term and nonmateriel courses of action that the U.S. Air Force could take to better prepare the force for information-sharing at speed and at scale in the European theater. Given that the rules governing information-sharing will change quickly before and during a transition to war, the authors examined how U.S. Air Forces in Europe can rapidly adapt to such changes.

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