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Research Report

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Operationalizing U.S. Air Force Information Warfare

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About This Report

This report describes a study that was conducted to develop recommendations for how the U.S. Air Force (USAF) organizes, trains, and equips information warfare (IW) capabilities for peer and near-peer competition amid existing resource constraints. The study's findings and recommendations are pertinent to the work's sponsoring organization, Air Combat Command (ACC); Sixteenth Air Force (16 AF); the USAF IW community and the service more broadly; and those IW organizations throughout the joint force that are currently navigating their own efforts to mature IW communities of practice.

The research reported here was commissioned by the Plans, Programs, and Requirements Division of Headquarters Air Combat Command (ACC/A5/8/9) and conducted within the Strategy and Doctrine Program of RAND Project AIR FORCE as part of a fiscal year 2022 project, "Implementing Air Force Information Warfare (IW)."

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At RAND, many hands contributed to the research presented in this report beyond those individuals listed on the cover. We thank our colleagues Miriam Matthews, Kirsten Keller, and Paul Emslie for their meaningful contributions, as well as Laura Poole for her help in bringing the report to fruition. We also thank Raphael Cohen and Bryan Frederick for their sage guidance and support throughout the process.

Summary

Issue

Information warfare (IW) and analogous terms of art are not new to the U.S. military's vocabulary writ large or that of the U.S. Air Force (USAF) specifically. Yet even with the now-decades-old recognition by senior USAF leadership that IW is fundamental to all aspects of air operations, the USAF's approach to conducting IW remains relatively nascent. Established in 2019, the Sixteenth Air Force (16 AF) lies at the center of the USAF's approach to contemporary IW. Now, several years later, the USAF continues to wrestle with its operationalization of IW. It is against this backdrop that this study was commissioned and we were tasked with identifying actionable recommendations for how the USAF should organize, train, and equip for IW.

Approach

First, we characterized the current state of USAF IW and compared it with the approaches taken by other relevant service and joint force organizations. In doing so, we aimed to understand how the other services and the joint force have operationalized IW, identify the ways in which their approaches differ from the USAF's approach, and discern whether these alternative approaches offer relative advantages or disadvantages. Next, we identified the gaps that exist between policy, expectations, and reality regarding the roles, tasks, and missions the USAF IW community is expected to support. To address these gaps, we developed alternative constructs for the USAF's presentation of IW forces, describing both strengths and challenges of these constructs. Lastly, the team teased out the organize, train, and equip requirements associated with these constructs. This report describes the research and presents key findings and recommendations that emerged. Methods used throughout the project include a literature review, semi-structured interviews with more than 100 individuals, manual and computer-assisted content analyses of USAF leader discourse, and a semi-structured construct development workshop.

Key Findings and Recommendations

Although the USAF IW community has had several recent wins—particularly in the form of signed guidance and policy at the senior-most levels—the desired ends and means laid out in the strategic documents are, thus far, largely aspirational. As of this writing, USAF IW professionals are waiting on concrete requirements for IW, clearly delineated roles and responsibilities, a scoped USAF IW identity, formalized processes, and demonstrations of concrete investment in IW as a service mission. In the absence of such developments, our research indicates that USAF IW may continue to be conducted on an ad hoc basis such that it is not scalable. Table S.1 lays out the key findings of our

study, notably the areas in which the Air Force continues to struggle in its operationalization of IW, and Table S.2 details the recommendations, which are informed by the findings.

Table S.1. Key Findings

Category	Finding(s)
Doctrine, guidance, policy, and lexicon	• There is a widespread perception that USAF leadership does not prioritize IW. • The absence of explicit, formal requirements was consistently mentioned as one of the most significant barriers to USAF IW operationalization.
Organization and force presentation	• USAF IW remains highly stovepiped along organizational and disciplinary lines. • A crowded field of IW organizations, combined with undefined roles and responsibilities, engenders confusion and frustration.
Training and force development	• All airmen need to think about IW some of the time; some airmen need to think about IW all of the time. • Airmen in IW disciplines are expected to operate as IW forces despite having received little to no IW-specific training.
Workforce and personnel	• IW personnel are highly motivated and passionate about the mission such that they devote their own time to its advancement, but they recognize that doing so offers little career progression.
Equipping and resourcing	• Ambitious IW personnel at 16 AF are undertaking innovative IW campaigns on their own time, using existing personnel and resources, but cannot scale them with existing resourcing.
Authorities and permissions	• Some see authorities as constraints, but nearly all personnel see risk aversion and tightly held permissions as core challenges to IW execution.
Leadership and institutional culture	• The USAF IW community is not led by a single, senior leader focused exclusively on IW who is endowed with the requisite authority to advocate for resources.
Processes, procedures, and joint integration	• Few formal processes exist for IW in the USAF, resulting in intraservice, interservice, and USAF-joint frictions.

Table S.2. Summary of Recommendations, Responsible Offices, and Estimated Feasibility

Recommendation	Office of Primary Responsibility	Office of Corollary Responsibility	Estimated Feasibility
Publish actionable guidance and ensure that IW is included in USAF processes that lead to the development of concrete requirements.	CSAF and IW DCS in concert with senior USAF leaders	AF/A5, AF/2/A6	Low resistance
Expend political capital and service leader time to demonstrate the prioritization of IW and to familiarize the USAF and the joint force with IW.	CSAF and IW DCS in concert with senior USAF leaders	AF/A5, AF/2/A6	Low resistance

Recommendation	Office of Primary Responsibility	Office of Corollary Responsibility	Estimated Feasibility
Restructure IW force presentation with an eye toward addressing identified procedural, cultural, and structural challenges.	ACC	16 AF	Significant resistance
Clearly delineate and formalize the roles and responsibilities of all USAF IW organizations.	IW DCS	ACC	Moderate resistance
Develop curricula based on IW-specific requirements and cultural identity, with tiers tailored to required IW proficiency (i.e., all airmen versus IW professionals).	AETC	ACC, 16 AF	Moderate resistance
Leverage others' lessons learned to develop a framework to measure the effectiveness of IW.	AF/A9	16 AF, USAFE, PACAF	Moderate resistance
Build realistic IW capabilities and missions into USAF-wide exercises and wargames, and allow participants to struggle, even if doing so results in "mission failure."	AF/A5	ACC, AETC	Significant resistance
Establish formal funding mechanisms that USAF personnel can use to apply for and advocate for more-robust and more-stable resourcing.	CSAF, AF/A8, AF/A1	ACC	Moderate resistance
Conduct a holistic review of USAF budgets to identify obsolete programs and cost savings that could be applied to IW.	AF/A9, AF/A1	ACC	Significant resistance
Systematically catalog the IW authorities and permissions needed for the full spectrum of IW missions, from competition through conflict.	AF/A3	ACC, 16 AF	Low resistance
Demonstrate the utility of IW to all airmen through roadshows, leader rhetoric, and other highly visible activities.	CSAF, IW DCS, Commander 16 AF	USAFE commander, USAF Public Affairs Agency	Low resistance
Designate a service lead for IW who possesses authority, seniority, and cachet to advocate for IW personnel and resources.	CSAF	IW DCS, ACC	Low resistance
Consider establishing a holistic career path for all USAF IW personnel that would preserve disciplinary specialization while building a cadre of USAF IW professionals. To do so, the USAF could do the following:	AF/A1	AETC	Moderate resistance
• Grow the 14F workforce, provide 14Fs with a home base, rebrand them as "influence operations officers," and advertise their utility across the USAF and the joint force. • Establish a formal IW qualification that is open to all IW disciplines and tied to promotion criteria and career progression, and establish one or more IW general officer positions.	AF/A1, AETC	ACC, 16 AF	

Recommendation	Office of Primary Responsibility	Office of Corollary Responsibility	Estimated Feasibility
Design new internal USAF processes and paradigms that are IW-specific rather than adapting those designed for kinetic missions.	IW DCS	AF/A3, AF/A2/6, ACC	Moderate resistance
Establish and routinize IW processes in the USAF such that USAF IW personnel can integrate into established joint structures and processes.	IW DCS in concert with USAF and joint entities	AF/A3	Moderate resistance

NOTE: ACC = Air Combat Command; AETC = Air Education and Training Command; CSAF = chief of staff of the Air Force; DCS = deputy chief of staff; PACAF = Pacific Air Forces; USAFE = U.S. Air Forces Europe. *Estimated feasibility* concerns the institutional, political, bureaucratic, and/or cultural barriers that could impede each proposed recommendation's adoption by the USAF and its constituent organizations and/or leaders. Cells shaded green represent recommendations that we estimate will face little resistance in their adoption. Cells shaded yellow represent recommendations that we estimate could face moderate resistance and may require some measure of political capital, institutional reorganization, or resource allocation to implement. Cells shaded red represent recommendations that we estimate could face significant resistance and may require substantial political capital, institutional reorganization, or resource allocation to implement.

In 2019, the USAF merged the 24th and 25th Air Forces—the cyber and intelligence, surveillance, and reconnaissance numbered air forces (NAFs), respectively—to establish 16 AF, the service's dedicated cyber and IW NAF. However, rather than undertake a wholesale restructuring of the two NAFs, the USAF organized 16 AF so that it still represents the antecedent organizations' individual mission sets—an institutional dynamic that we found has had significant implications for the USAF IW mission and community. USAF IW remains highly stovepiped along disciplinary and platform lines in ways that do not allow the constituent pieces of the community to come together to conduct integrated IW when necessary. As a result, the USAF IW landscape that has emerged is a patchwork of formal and informal venues for IW analysis, planning, product development, and so on. Without explicitly circumscribing roles and responsibilities, USAF IW entities (and the other actors in this field) risk duplication of effort, missed messaging opportunities, or, worse yet, fratricide. Additionally, we found that, in the absence of formal training, resources, and institutional support, highly passionate AF IW personnel reported staying after business hours to work on the advancement of IW but recognized that these sacrifices would reap few career benefits. The population of AF personnel who are explicitly trained in IW—the organization's relatively new cadre of information operations officers, or 14Fs—remains small and underutilized and has little representation in the service's senior ranks.

Most fundamental to a comprehensive USAF approach to IW is a coherent, concrete identity. Our research indicates that the USAF IW community currently lacks a unifying identity, which is a fundamental challenge that is inexorably linked to many of the obstacles impeding IW operationalization. USAF IW professionals are unclear about leaders' expectations for USAF IW, about the future of the IW mission and its place among the service's other priorities, about the service's and their own roles and responsibilities in the broader IW arena, and about their career trajectories and prospects for future assignments in IW.

Therefore, before the USAF can be successful in operationalizing IW, our research indicates that the service needs to consider, and then clearly communicate, what IW means for the USAF. In

practice, this means that senior leaders will need to untangle some core questions: For example, what are the USAF's unique contributions to IW, and will they be largely technical in nature or will they also encompass the cognitive aspects of the field? How can the service leverage IW to enable its existing missions, and, conversely, how can its traditional missions be used to influence? Before embarking on other institutional changes, leaders from across the service need to engage in a sober dialogue about the future of USAF IW. Leadership will need to decide whether the USAF is prepared to adopt IW as a core competency and devote the requisite resources to its operationalization, even if doing so results in relatively fewer resources for traditional service priorities.

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Chapter 1

Introduction

Information warfare (IW) and analogous terms of art are not new to the U.S. military's vocabulary writ large or to that of the U.S. Air Force (USAF) specifically. A June 1996 *Air Force Magazine* article titled "The New World of Information Warfare" declared that IW "is rapidly assuming a central place in modern military thinking and planning. It involves much that is new as well as much that is familiar."[1] Yet even with the now-decades-old recognition by senior USAF leadership that IW "is fundamental to all aspects of the mission" and should be "mainstreamed rather than captured by some expert group," the USAF's approach to conducting IW remains relatively nascent.[2]

The USAF's renewed focus on IW is unfolding amid a U.S. Department of Defense (DoD)–wide reevaluation of DoD's nonkinetic instruments, including those with inherent informational characteristics. Spurred by Russia's incursions into Ukraine in 2014, the Kremlin's interference in U.S. and European elections in 2015 and 2016, and other demonstrations of the sophistication of U.S. rivals' informational instruments, DoD began to reexamine its approach to information. A cascade of policy and guidance decisions followed. In 2016, DoD published its *Strategy for Operations in the Information Environment*.[3] The following year, the chairman of the Joint Chiefs of Staff designated information as a new, seventh joint function.[4] Only months later, the 2018 National Defense Strategy described adversaries' use of IW as a chief threat facing the United States. That same year, the Joint Staff published its *Joint Concept for Operating in the Information Environment*.[5]

This cascade of strategic-level guidance has stimulated several developments in the services and joint force. In the absence of explicit guidance detailing how the services should go about establishing (or, in some cases, reinvigorating) IW capabilities, motivated IW professionals have embarked on grassroots efforts to operationalize IW and carve out their own institutional roles in the information

[1] John A. Tirpak, "The New World of Information Warfare," *Air Force Magazine*, Vol. 79, No. 6, June 1996, p. 32.

[2] Tirpak, 1996, p. 32.

[3] DoD, *Strategy for Operations in the Information Environment*, June 2016.

[4] Secretary of Defense, "Information as a Joint Function," memorandum, U.S. Department of Defense, September 15, 2017.

[5] DoD, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, 2018; Joint Chiefs of Staff, *Joint Concept for Operating in the Information Environment (JCOIE)*, July 25, 2018b.

environment.[6] As a result, the joint force and the services are now home to a mosaic of IW organizations with varying levels of maturity and interconnectivity.[7]

For its part, the newly established Sixteenth Air Force (16 AF), known as both *Air Forces Cyber* and the *USAF Information Warfare Numbered Air Force* (NAF), lies at the center of the USAF's approach to contemporary IW. Activated in October 2019 as a component NAF, 16 AF is mandated to support U.S. Cyber Command (CYBERCOM), U.S. European Command (EUCOM), U.S. Space Command (SPACECOM), and U.S. Strategic Command (STRATCOM) and is organizationally aligned under Air Combat Command (ACC). 16 AF is an amalgam of the now-disbanded 24th and 25th Air Forces, which were responsible for cyber and intelligence, surveillance, and reconnaissance (ISR), respectively. By merging these organizations' personnel under one roof and one commander, USAF senior leadership hoped that 16 AF would exceed the sum of its parts. Then–chief of staff of the Air Force (CSAF) Gen David L. Goldfein spoke to this vision, noting, "starting today, 16th Air Force will be the thought leaders for operations in the information domain. It will generate unmatched capabilities for air component commanders and joint task force commanders at a speed and scale like you've never seen before."[8]

Several years after 16 AF's inception, the USAF continues to wrestle with its operationalization of IW. With the aim of moving beyond discussions devoted to conceptualizing IW, the service is working to determine how this vision of integrated IW should be realized. It is against this backdrop that this study was commissioned and we were tasked with identifying actionable recommendations for how the USAF should organize, train, and equip for IW.

Lexical and Terminological Developments and Acknowledgments

For the purposes of this study, we use the USAF's term, *information warfare*, along with its newly sanctioned definition. As defined in Air Force Doctrine Publication (AFDP) 3-99, IW is "the employment of military capabilities in and through the information environment to deliberately affect adversary human and system behavior and preserve friendly freedom of action during cooperation, competition, and conflict."[9]

By adopting this term of art and its corresponding definition, the USAF has diverged from most of its sister services and the joint force, which have opted to pursue alternative doctrinal information-related nomenclature. After much debate and a brief dalliance with *IW*, the U.S. Army appears to be

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[6] Each of the services has historically had capabilities that, while not under the banner of "information warfare" specifically, operated in the information environment. Examples include psychological operations (PSYOP), electronic warfare (EW), and military deception (MILDEC). Each of the services has invested in various informational capabilities at different points throughout its history, but most of these capabilities have fallen in and out of favor over time. The U.S. Army has traditionally played a more significant role in the cognitive aspects of IW compared with the other services, though their capabilities have waxed and waned over time. For a history of Army information warfare, see Conrad Crane, *A Return to Information Warfare*, U.S. Army Heritage and Education Center, Historical Services Division, U.S. Army War College, undated.

[7] Joseph W. Kirschbaum, "Information Environment: DOD Operations Need Enhanced Leadership and Integration of Capabilities," testimony before the Subcommittee on Cyber, Innovative Technologies, and Information Systems, Committee on Armed Services, U.S. House of Representatives, U.S. Government Accountability Office, GAO-21-525T, April 30, 2021.

[8] Rachel S. Cohen, "16th Air Force Launches Information Ops for the Digital Age," *Air Force Magazine*, December 1, 2019.

[9] AFDP 3-99, *The Department of the Air Force Role in Joint All-Domain Operations*, U.S. Air Force and U.S. Space Force, November 19, 2021, p. 10.

converging on the term *information advantage activities*.[10] For its part, the U.S. Marine Corps has explicitly disavowed *IW* in favor of *operations in the information environment* (OIE). According to a 2020 memorandum penned by the then–deputy commandants for information and combat development and integration, the Marine Corps has chosen to forgo *IW* because it "does not adequately address all seven functions of OIE" that the Marine Corps has designated.[11] The most recent installment of joint doctrine devoted to this topic—JP 3-04, *Information in Joint Operations*—has also opted for *OIE* in lieu of *IW*. "Joint doctrine," it says, "recognizes only two types of warfare—traditional warfare and irregular warfare"—the implication being that IW cannot exist as a distinct form of warfare.[12]

Despite the differences in nomenclature, the definitions of the terms of art used by the joint force, USAF, Marine Corps, and Army share important conceptual threads. Broadly speaking, each of these interpretations includes a defensive element in the form of protecting U.S. commander decisionmaking and an offensive element in the form of influencing adversary decisionmaking such that the adversary's actions are favorable to U.S. interests, whether via attacks on networks and systems or via influence campaigns.

Curiously, the opposite holds true for the U.S. Navy's chosen lexicon and related definitions. Although the Navy has adopted the term *IW* like the USAF, its conception is narrower than that of the USAF or the other services. Navy IW priorities are battlespace awareness, assured command and control (C2), integrated fires, and cyber. Although some in the defense community have acknowledged that "the Navy has arguably generated the most mature Information Warfare capability among the services," it overwhelmingly focuses on the physical aspects of the information environment, as opposed to the psychological ones.[13]

In addition to examining lexical similarities and divergences, the research team compared the USAF's approach to IW operationalization with the approaches of its sister services and the joint force. Appendix D of this report offers a detailed discussion of these alternative approaches to IW and discusses recent developments across the services. The purpose of this comparison is twofold. First, we aimed to understand how the other services and the joint force have operationalized IW, identify the ways in which their approaches differ from the USAF's approach, and discern whether these

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[10] Robert J. Ross, "Information Advantage Activities: A Concept for the Application of Capabilities and Operational Art During Multi-Domain Operations," *Cyber Defense Review*, Vol. 6, No. 4, Fall 2021.

[11] Deputy Commandant, Combat Development and Integration, and Deputy Commandant for Information, "Definitions for Information Related Terms," joint memorandum, Headquarters United States Marine Corps, Department of the Navy, January 22, 2020, p. 2. These functions are as follows:

> (1) Assure enterprise C2 and critical systems
> (2) Provide information environment battlespace awareness
> (3) Attack and exploit networks, systems, and information
> (4) Inform domestic and international audiences
> (5) Influence foreign target audiences
> (6) Deceive foreign target audiences
> (7) Control OIE capabilities, resources, and activities. (Deputy Commandant, Combat Development and Integration, and Deputy Commandant for Information, 2020, p. 1)

[12] JP 3-04, *Information in Joint Operations*, Joint Chiefs of Staff, 2021, p. III-26.

[13] John R. Hoehn and Nishawn S. Smagh, *Intelligence, Surveillance, and Reconnaissance Design for Great Power Competition*, Congressional Research Service, R46389, June 4, 2020, p. 25.

alternative paths offer relative advantages or disadvantages compared with the USAF's approach. Second, we focused on the ways in which the other services and the joint force present their IW forces and examined the challenges and opportunities offered by each approach. Although we acknowledge that the Army, Marine Corps, and joint force have adopted their own unique terms of art, we use *IW* throughout the report for clarity and consistency.

Objective and Research Questions

The objective of the study was to make recommendations for how the USAF organizes, trains, and equips IW capabilities for peer and near-peer competition amid existing resource constraints.[14] This objective is predicated on the assumption that the service's vision of integrated USAF IW, if invested in and realized, will benefit both the USAF and the joint force. By this logic, the USAF's failure to fully embrace IW will hamstring the service's ability to execute kinetic and nonkinetic missions successfully. This assumption—that a USAF that invests in IW is ultimately superior to one that does not—echoes the position that senior USAF guidance has adopted. In the July 2022 signed *COMACC Intent for Information Warfare* document, ACC Commander Gen Mark D. Kelly acknowledges that "IW underpins USAF airpower operations by creating and leveraging information advantages in the operational environment. Therefore, it is an imperative that this command recognize that gaining advantage in the [information environment] is a precondition for airpower."[15] But how can this be achieved?

Strategic USAF guidance has struggled to demonstrate IW's utility to the service in practical terms. One person who was interviewed for this study offered their perspective on the challenges facing the USAF should it choose not to invest in IW. The interviewee noted that current and future USAF and joint force weapons and platforms "are all digital and operate in the information environment. F-35s won't get off the ground if we first lose in the [information environment]."[16] The interviewee explained that, in the event of a conflict, EW and cyberattacks could render USAF aircraft inoperable while disinformation campaigns mimicking U.S. C2 systems and structures could target airmen to relay false orders to stand down.[17]

Meanwhile, *COMACC Intent for Information Warfare* notes that IW offers the USAF an instrument it can use now, to compete with and deter adversaries below the threshold of armed conflict.[18] Interviewees at EUCOM, Special Operations Command Europe (SOCEUR), and U.S. Air Forces Europe (USAFE) commented on a new enthusiasm for IW that they have observed since February 2022, when Russia began its major offensive in Ukraine. Interviewees voiced the suspicion that this increased demand for IW is based on a recognition by USAF and joint force leaders that IW

[14] Because of both resource constraints and the nascent state of U.S. Space Force (USSF) organizations, our research focused almost exclusively on IW in the USAF and the implications of IW for airmen (rather than the USSF and guardians).

[15] ACC, *COMACC Intent for Information Warfare*, U.S. Air Force, July 2, 2022, p. 3.

[16] USAF IW ISR Personnel 4, in-person interview with the research team, Fort Meade, Md., May 4, 2022.

[17] USAF IW ISR Personnel 4, in-person interview with the research team, Fort Meade, Md., May 4, 2022.

[18] ACC, 2022.

is one of the few tools at U.S. forces' disposal in scenarios in which they are not immediately involved in kinetic operations.[19] In other words, IW offers U.S. forces flexible response options.[20]

While the study did not explicitly test whether this assumption—that the service's investment in IW will result in better outcomes than the service's deprioritization of IW—is true, it did identify trade-offs through the data collection and analysis.[21]

Several related research questions guided the study's research design and approach. First, we aimed to survey and characterize the current state of USAF IW and compare it with the approaches taken by other relevant service and joint force organizations. Next, we asked whether the USAF's approach to IW is sufficient to meet current USAF and joint missions and requirements and, if not, what gaps exist between policy, expectations, and reality regarding the roles, tasks, and missions the USAF IW community is expected to support. In addition, the study was designed to elucidate some of the more practical implications of the USAF's operationalization of IW. In this vein, the research team asked the following question: What are potential alternative constructs for the USAF's presentation of IW forces to USAF and joint units and entities, and what strengths and challenges are associated with each construct? Lastly, the team teased out the organize, train, and equip requirements associated with the constructs, findings, and recommendations of the research.

Methods and Research Approach

To interrogate the questions outlined above, the research team decided to employ a mixed-methods approach composed of a literature review, a series of semi-structured stakeholder interviews, a content analysis of USAF leadership discourse (including a manual content analysis and computer-assisted analysis), and a semi-structured construct development workshop. The research team decided to pursue several overlapping lines of inquiry to examine these questions because of the paucity of existing research on the subject and the consequent need to validate or invalidate the findings of our literature review and semi-structured interviews.

During the overwhelming majority of the interviews, the research team asked stakeholders about IW policies, processes, authorities, and other descriptive issues. That said, the interview protocols tailored to airmen in IW careers specifically included a small subset of questions about subjects' perceptions of the USAF leadership's prioritization of IW relative to other service priorities.

As the literature on semi-structured interview design indicates, interview responses can be biased if subjects have a personal or professional stake in the appraisal of, for example, a program or an

[19] EUCOM Personnel 6, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022; Service Component Personnel 1, in-person interview with the research team, Ramstein Air Base, Germany, June 8, 2022.

[20] EUCOM Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

[21] There are several reasons behind the decision not to explicitly test the assumption that the investment in IW will result in better outcomes. First, we were charged with specifically identifying organize, train, and equip implications of the service's recent efforts to operationalize its IW force and associated capabilities rather than with assessing whether USAF missions and the joint force would be more capable with or without IW. In addition, as we note elsewhere in the report, IW is still nascent for the USAF and other services, and all have struggled with measuring their own effectiveness in IW. As a result, data on IW successes are relatively limited. That said, testing this assumption could be a fruitful avenue for future research.

organization, particularly when resources are on the line.[22] Given the potential for such biases to be introduced with USAF stakeholder interviews, the research team considered alternative methods to explore the aspects of the study that may be more susceptible to stakeholder bias. These methods included the content analysis and the survey. The intent behind these two lines of inquiry was to understand whether the results from the content analysis and survey supported or refuted the outcomes of the literature review and interviews.

In the following sections, we briefly outline the study's research approach and methods. For comprehensive discussions of each of the methods used to investigate the research questions, see Appendixes A through D.

Period of Analysis

As a fiscal year study, the research officially commenced on October 1, 2021, and concluded on September 30, 2022. The first several months of the effort were devoted to research design, framing, and Department of the Air Force (DAF) second-level review.[23] All data involved were collected between December 2021 and July 2022. Given that the USAF's operationalization of IW has evolved throughout the course of our data collection (and likely since), it is possible that, despite our best efforts to consider the latest developments in USAF IW, some details of our research could be obsolete by the time this research is published. Specifics about the periods of analysis for each method employed can be found in Appendixes A through D.

Review of Primary and Secondary Literature

The research team examined both the primary and secondary literature associated with the key issues explored in this research, notably IW and adjacent subjects, such as PSYOP and MILDEC. However, because the USAF's renewed interest in IW is so recent, the literature devoted to examining IW through a USAF-specific lens is sparse. Aside from the few recent thought pieces published by USAF leaders and defense analysts, the secondary literature on this subject is virtually nonexistent.[24]

In addition to reviewing the small catalog of recent sources on the subject, we parsed the growing roster of primary sources being generated by the organizations and individuals responsible for operationalizing USAF IW. This body of work included both classified and unclassified and both signed and draft policy documents, guidance and strategy documents, communications, briefings, and after-action reports. Given that most of these documents are unavailable to the public, either because they are pre-decisional or because of their sensitive nature, the research team obtained them from

[22] Carolyn Boyce and Palena Neale, *Conducting In-Depth Interviews: A Guide for Designing and Conducting In-Depth Interviews for Evaluation Input*, Pathfinder International, May 2006, p. 3.

[23] For studies, such as our survey, that involve interactions with human subjects, the DAF requires that the RAND Corporation submit an application to the Air Force Human Subjects Protection Office outlining the research approach, potential risks to participants, and mitigation efforts. This process is referred to as *second-level review*.

[24] Timothy D. Haugh, Nicholas J. Hall, and Eugene H. Fan, "16th Air Force and Convergence for the Information War," *Cyber Defense Review*, Vol. 5, No. 2, Summer 2020.

stakeholders. As a result, the primary literature devoted to USAF IW might not have been exhaustive given that the team had access to only those documents that stakeholders identified and provided.

Semi-Structured Interviews

In the absence of a dedicated, robust body of secondary literature, and because the subject was evolving in real time, the research team decided that semi-structured stakeholder interviews were fundamental to data collection. The discussions, consisting of 80 interviews with 115 personnel hailing from various organizations across the USAF and joint force IW communities, were guided by a series of tailored protocols. After the data were collected, the artifacts produced by the interviews (i.e., the transcribed notes) were coded by team members who had not participated in the discussions, to mitigate against potential researcher biases. Appendix B details the sampling method, protocol development, and coding approach employed.

Survey of U.S. Air Force Personnel

To tease out USAF leadership perceptions and prioritization of IW, the research team designed and fielded a survey targeting senior enlisted personnel (noncommissioned officers [NCOs] and senior NCOs [SNCOs]) and mid-grade and senior officers (majors, lieutenant colonels, colonels, and general officers) hailing from all career fields. The survey asked respondents about their basic demographics, their understanding of the USAF's IW lexicon and definition, coordination mechanisms with other service and joint IW entities, IW authorities and permissions, and the USAF's prioritization of IW compared with other service priority areas. For a robust discussion of the survey design choices, development, execution, and data analysis, as well as a full copy of the instrument, see Appendix A.

Content Analysis

The aim of this line of inquiry was to understand whether the written communications of current USAF leadership (and the incumbent generation of USAF leadership) support or refute the observations reported by IW personnel: that those in decisionmaking positions in the USAF do not prioritize IW. The research team created a corpus of all *Air & Space Power Journal* (*ASPJ*) and *Strategic Studies Quarterly* (*SSQ*) articles from spring 2016 through winter 2021 and identified and labeled those that examined IW or its constituent disciplines.[25] The team then conducted two analyses, a human-driven analysis and a computer-assisted analysis, to identify themes. This period of analysis—from spring 2016 through winter 2021—is driven by DoD's renewed focus on IW following Russia's growing use of IW, including in the prelude to Russia's annexation of Crimea and incursions into the Donbas.

[25] Because the goal of our analysis was to characterize the issues prioritized by senior USAF leaders, we chose to focus on *SSQ* and *ASPJ*, both of which are DAF publications.

Semi-Structured Construct Development Workshop

Once the team had concluded the literature review and interview portions of data collection, it convened for a two-day in-person workshop to develop alternative constructs for USAF IW force presentation that could address some of the challenges identified with the USAF's existing approach to IW. Members of the research team—which included experts who are intimately familiar with the USAF, Army, Navy, Marine Corps, and joint approaches to IW and how each of the services organizes and presents its IW forces—opened the workshop by presenting these existing constructs to serve as a baseline. Each team member was asked to come prepared with responses to a set of preordained questions for their assigned service or organization.

Using the other existing service and joint approaches as a starting point, the study's two leads facilitated a whiteboarding session aimed at sketching out alternative ways in which relevant USAF IW forces could be structured.[26] This practice was also guided by a set of predetermined questions. Once each member selected the top three constructs they judged to be most fitting for the USAF given the IW missions and requirements identified in our data collection (discussed in subsequent chapters), the group considered the organize, train, and equip requirements associated with each construct, as well as the cultural and institutional implications of adopting each of the proposed structures.

Additional Caveats and Limitations

As with any research, the data collection undertaken by the research team and findings produced by this work were constrained by several factors that bear acknowledgment. First, the team was tasked with examining the operationalization of USAF IW as it was evolving in real time. For this reason, the team worked iteratively, conducting its literature review on a rolling basis and continuously updating the frame of reference from which it was operating. However, this means that the analysis does not include developments that have transpired since the team concluded its data collection. Second, many of the challenges that the research identified, which are presented in Chapter 3, are nested or interconnected. To provide as holistic a portrait as possible, the research team chose to address each finding separately, while noting dependencies, at the risk of repetitiveness.

Furthermore, as we noted previously, the study specifically focused on USAF IW in the context of competition, not conflict. Thus, during the time we spent examining combatant command IW requirements and past experiences with USAF IW forces, we chose to focus on EUCOM and U.S. Indo-Pacific Command (INDOPACOM). Of the combatant commands, these two are the most immediately focused on competition with U.S. peers and near peers. But, in making this decision, we were unable to devote considerable time to the examination of IW lessons learned over the past 20-plus years by U.S. forces engaged in combat in U.S. Central Command. Given that these lessons were derived from IW employed in a combat environment—which possesses unique properties, such as the

[26] These alternative approaches included Navy, Army, Marine Corps, and joint force constructs but did not include allied approaches to IW. We acknowledge that allied approaches offer an additional avenue to probe for valuable lessons that the USAF could draw from. That said, the team did not have the time to examine these with the level of detail required.

broad allocation of authority—some of these lessons may not be immediately relevant. That said, others could be valuable to the USAF and may be fruitful avenues for future research.

Lastly, the research team chose to focus exclusively on IW operationalization as it pertains to the USAF, not the USSF. This decision was motivated by several factors. First, the USSF is a new organization that is focused on establishing its own cultural identity and ironing out its approach to personnel and talent management.[27] Discussions with guardians revealed that—although the USSF acknowledges that it needs to have a hand in IW—IW does not fall within the service leadership's current list of priorities, which are principally focused on the people-centric aspects of standing up a new service. Therefore, we felt that, given the available resources, the DAF would be better served by a deep dive into USAF IW operationalization rather than a shallower look at both USAF and USSF IW. That said, IW operationalization as it pertains to the USSF, once the service is more mature, is an area ripe for future research.

Report Structure

This report first outlines the existing status of USAF IW operationalization, described in Chapter 2. The chapter includes a discussion of recent developments in policy, guidance, lexicon, force structures, and other issues relevant to USAF IW. Next, in Chapter 3, we turn to a discussion of the opportunities and challenges that the USAF faces given its current approach to operationalizing IW. These opportunities and challenges have been informed by and derived from the team's analysis of the various streams of collected data. The findings presented in Chapter 3 informed our development of several alternative frameworks, discussed in detail in Chapter 4, that are designed to leverage existing opportunities and overcome challenges. In Chapter 5, we provide an enumeration of the recommendations revealed by our research and analysis. The report concludes with a series of appendixes that detail the methods employed in our research and dive deeper into the findings.

[27] "CSO Unveils Guardian Ideal, Space Force Values at AFA," U.S. Space Force News, September 21, 2021; Joshua M. Faustman, *Establishing a Space Force Culture: Lessons on Artifacts and Organizational Identity*, Wright Flyer Paper No. 83, Air University Press, September 2021.

Chapter 2

Current State of U.S. Air Force Information Warfare

The latest iteration of and renewed focus on IW in the USAF can be traced back to the creation of the 14F (information operations [IO]) Air Force Specialty Code (AFSC) in 2016 and the subsequent merger of the 24th and 25th Air Forces into 16 AF in 2019.[28] As mentioned in the previous chapter, this "new" organization was an amalgam of two antecedent organizations and was charged with meeting previously defined cyber and ISR mission sets while also leading USAF efforts to converge effects in the information environment. Since that merger, many working groups, task forces, and steering groups have been convened, from the headquarters level to the major command and wing levels, with the aim of tackling the challenge of defining and implementing IW. In this chapter, we briefly describe how those efforts have matured the concept of IW through policy, organization, and workforce development. We note that this snapshot is current as of the writing of this report in August 2022; as a result, it may not reflect more-recent developments.

Current Doctrine, Lexicon, and Policy

No formal doctrine dedicated to IW exists in the USAF or the joint force. The most-recent information-focused doctrine in the USAF—AFDP 3-13, *Information Operations*—was published in 2016 and does not address more-recent joint or USAF thinking on the subject. Moreover, it uses outdated constructs that are not aligned with current USAF priorities and efforts.[29]

Although formal doctrine is lagging, the USAF has been actively advancing its conceptual thinking on information since 2016, as reflected by several newly signed and published documents on IW. The timeline in Figure 2.1 highlights the major policy developments related to IW in the service. From 2016 to 2018, USAF personnel contributed to the development of related joint policy, including by having a hand in the creation of DoD's *Strategy for Operations in the Information Environment* and *Joint Concept for Operating in the Information Environment* and the elevation of "Information" to the list of other joint functions.[30] In 2020, USAF-specific documents on IW and OIE began to appear in

[28] For a comprehensive discussion of the history of information warfare in the USAF, see "ACC Announces 24th and 25th NAF Merger," U.S. Air Force News, April 5, 2019; "AF Officials Announce Creation of Info Ops Tech School," U.S. Air Force News, March 5, 2018; and Sixteenth Air Force History Office, *Sixteenth Air Force (Air Forces Cyber) Legacy 2021*, Department of the Air Force, 2021.

[29] AFDP 3-13, *Information Operations*, Department of the Air Force, April 28, 2016.

[30] DoD, 2016; Joint Chiefs of Staff, 2018b, p. iii; Secretary of Defense, 2017.

earnest, incorporating the findings from working groups and other efforts that examined how to adapt joint policy to USAF needs.

Figure 2.1. Recent Developments in U.S. Air Force Information Warfare

2016: USAF establishes the Information Operations (14F) career field
2017: The Secretary of Defense and Joint Staff designate Information as the seventh Joint Warfighting Function
2018: Airmen assigned to the Cyber Mission Force take a leading role in securing the 2018 and 2020 elections
2019: The Air Force establishes 16th Air Force (16 AF), the IW Numbered Air Force
2020: AF A5/7 and A2/6 stand up the IW Cross-Functional Team
2020: ACC, USAFE, PACAF, and 16 AF host an inaugural IW TTX
2021: AF A2/6, AF A3, and AF A5/7 stand up the IW General Officer Steering Group (IW GOSG) to accelerate USAF IW initiatives
2021: HAF aligns Electro-Magnetic Spectrum Operations (EMSO) under A2/6 to link Cyber, EMSO, and ISR capabilities
2021: The Air Force launches "digital literacy" foundational competency
2022: CSAF signs OIE Strategic Plan, IW Concept of Operations, and IW Strategy

SOURCE: Adapted from USAF Information Warfare, "Community of Practice Note to the Field," March 2022.
NOTE: HAF = Headquarters Air Force; PACAF = Pacific Air Forces; TTX = tabletop exercise.

Before diving into the specifics of the recent USAF policy developments, we highlight some key terms. Unless we indicate otherwise, the following definitions are used throughout the remainder of the report.

OIE deliberately and specifically leverage the **inherent informational aspects of military activities** to affect behavior and meet the joint force commander's intent. Beyond written or spoken words and broadcast imagery, **all** activities have informational aspects that may deliver a message or communicate intent. OIE are described as "the sequence of activities that use this information to affect behavior by informing audiences; influencing external relevant actors; and affecting information, information networks, and information systems."[31]

IW, as noted above, is defined as "the employment of **military capabilities in and through the information environment** to deliberately affect adversary human and system behavior and preserve friendly freedom of action during cooperation, competition, and conflict."[32] IW leverages specific USAF **information capabilities** to achieve and preserve **information advantage** and **decision advantage**.[33] Put another way, "the employment of IW is the art and science of deliberately integrating and layering information capabilities to consistently and persistently target the adversary's human and system behavior and decision-making," according to the *United States Air Force*

[31] Headquarters, U.S. Air Force, *Headquarters Air Force Operations in the Information Environment Strategic Plan 2021–2026*, 2022, p. 5.

[32] AFDP 3-99, 2021, p. 10. Emphasis added.

[33] AFDP 3-13, *Information in Air Force Operations*, Department of the Air Force, February 1, 2023, p. 4.

Information Warfare Strategy, published in 2022.[34] These definitions raise the following questions: What are the information capabilities that both documents refer to, how are they intended to operate independently, and how are they integrated in service of IW?

The USAF has specified "six principal AF IW capabilities": cyberspace operations (CO); electromagnetic spectrum operations (EMSO); IO; public affairs (PA); ISR; and weather.[35] Other documents, such as the *United States Air Force Operating Concept for Information Warfare*, identify international affairs, operations research, and data science as adjacent informational capabilities that can also contribute to IW.[36] Each of the six principal AF IW capabilities predates the USAF's recent focus on IW and the service's accompanying slate of strategic IW guidance documents. What is more, each exists as its own USAF discipline that contributes to the broader USAF missions apart from IW. Before delving into the utility generated by their convergence, it is useful to enumerate each discipline's functions independently.

CO are formally defined in joint doctrine as "the employment of cyberspace capabilities where the primary purpose is to achieve objectives or effects in or through cyberspace," *cyberspace* being "the interdependent networks of information technology infrastructures . . . including the Internet, telecommunications networks, computer systems, and embedded processors and controllers."[37] CO include cyberspace-based activities aimed at protecting and enabling the uninterrupted functioning of USAF and DoD systems and networks (known as *DoD information network operations*), activities in cyberspace intended to safeguard U.S. cyberspace from external threats (*defensive CO*), and actions undertaken in cyberspace to project power (*offensive CO*).[38] Russia's 2022 invasion of Ukraine illustrates the significance of offensive CO in the context of a conventional conflict. During the conflict, Ukrainian networks and systems, including government websites, suffered "fast, dirty, and relentless" cyberattacks,[39] although attacks against the United States have not materialized.[40]

Like CO, *EMSO* are employed in service of both defensive and offensive missions—that is, to protect and manage the friendly aspects of the electromagnetic spectrum and exploit and attack the adversarial aspects.[41] Joint doctrine defines the *electromagnetic spectrum* as "a maneuver space," like the traditional warfighting domains and cyberspace, "consisting of all frequencies of [electromagnetic] radiation (oscillating electric and magnetic fields characterized by frequency and wavelength)."[42] The electromagnetic spectrum includes both naturally occurring and man-made "radio waves, microwaves, infrared (IR) radiation, visible light, ultraviolet radiation, x-rays, and gamma rays."[43] The electromagnetic spectrum, and its manipulation, has critically important implications for the military.

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[34] DAF, *United States Air Force Information Warfare Strategy*, July 2022b, p. 11.

[35] DAF, 2022b, p. 11.

[36] DAF, *United States Air Force Operating Concept for Information Warfare*, March 30, 2022a, p. 3.

[37] JP 3-12, *Cyberspace Operations*, Joint Chiefs of Staff, June 8, 2018, pp. I-1, GL-4.

[38] JP 3-12, 2018, pp. x–xi.

[39] Andy Greenberg, "Russia's New Cyberwarfare in Ukraine Is Fast, Dirty, and Relentless," *WIRED*, November 10, 2022.

[40] Colin Demarest, "Feared Russian Cyberattacks Against US Have Yet to Materialize," C4ISRNET, April 29, 2022.

[41] AFDP 3-51, *Electromagnetic Warfare and Electromagnetic Spectrum Operations*, Department of the Air Force, July 30, 2019, p. 10.

[42] JP 3-85, *Joint Electromagnetic Spectrum Operations*, Joint Chiefs of Staff, May 22, 2020, p. I-2.

[43] JP 3-85, 2020, p. I-2.

Many of today's military capabilities are reliant on the electromagnetic spectrum or operate within it—a reality that U.S. adversaries recognize and exploit.[44] Authors Matthew J. Florenzen, Kurt M. Shulkitas, and Kyle P. Bair illustrate the practical implications of EMSO:

> Imagine you are a combatant commander (CCDR) equipped with the latest capabilities today's military has to offer. Your troops are armed with fifth-generation aircraft, precision-strike capabilities, advanced naval forces, and fully networked combat arms and land forces. From your command center you can precisely observe your forces on the battlefield, and your surveillance equipment allows unmitigated access to their actions and communications in real time. However, when you take this state-of-the-art force into combat against a near-peer competitor, nothing seems to work. Communications are at best intermittent and at worst nonexistent . . . and your combat arms are relegated to utilizing line-of-sight communications to control the battle. . . . In this scenario, one potential issue complicating your operations might be an enemy exploiting your force's reliance on the electromagnetic spectrum.[45]

In this scenario, U.S. forces have failed to conduct electromagnetic protection and have fallen prey to adversary electromagnetic attack.

Whereas CO and EMSO represent the more technical disciplines associated with USAF IW, *IO* and *PA* serve as the human and cognitive aspects of the service's influence efforts. Although *IO* has long existed in the USAF vernacular as a staff-planning, coordination, and integration function, in late 2016 the service decided to establish a new dedicated IO officer career field, AFSC, and schoolhouse.[46] Today's IO airmen are charged with employing various disciplines to "influence, disrupt, corrupt or usurp the decision making of selected audiences to create desired effects."[47] Prior to this development, airmen hailing from a number of AFSCs "served in IO positions as career-broadening experiences for a limited period," a practice that hampered the cultivation and maintenance of IO institutional memory and the refinement of IO-specific tactics, techniques, and procedures.[48] Referred to as *14Fs*, the officers in this relatively new career field receive training in military information support operations (MISO), operations security (OPSEC), and MILDEC, as well as in joint planning and targeting.[49] In this sense, the USAF's conception of IO is different from those of its sister services, which either have phased out the term altogether (Marine Corps) or continue to use it to refer specifically to the planning, coordination, and integration function (Army).[50] Given the centrality of

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[44] DoD, *Electromagnetic Spectrum Superiority Strategy*, October 2020, p. 1.

[45] Matthew J. Florenzen, Kurt M. Shulkitas, and Kyle P. Bair, "Unmasking the Spectrum with Artificial Intelligence," National Defense University Press, November 18, 2019.

[46] "AF Officials Announce Creation of Info Ops Tech School," 2018; Christopher Paul, "Is It Time to Abandon the Term Information Operations?" *Strategy Bridge*, March 13, 2019.

[47] Stephen Losey, "Information Operations Officers Get Their Own School," *Defense News*, March 13, 2018.

[48] Trevor Tiernan, "First Class of Information Operations Airmen Completes 14F Initial Skills Training Course," Nellis Air Force Base News, December 17, 2020.

[49] Tiernan, 2020.

[50] Deputy Commandant, Combat Development and Integration, and Deputy Commandant for Information, 2020.

social media and other web-based platforms as principal instruments for communication, many of the USAF IO activities leverage the service's cyber capabilities.[51]

Relatedly, the use of communication to shape perceptions is foundational to PA. Yet there is a critical distinction between it and IO. Notably, PA professionals are responsible for propagating accurate information, whereas IO personnel can, in some cases, disseminate deliberately deceptive messaging. This divergence is one that all USAF PA professionals emphasized in our discussions and one that is highlighted prominently in USAF doctrine, which lists "tell the truth" as the first of the discipline's core tenets.[52] PA contributions specific to OIE are characterized as "putting joint operations in context [and] facilitating informed perceptions about military operations" in order to undermine "adversarial propaganda, disinformation, misinformation and other forms of malign influence" in USAF doctrine.[53]

Unlike the previous specified IW capabilities, which can themselves serve in active operational roles, USAF *weather operations* and *ISR* both involve the collection and analysis of data to enable USAF and joint force missions. *Weather*—defined in USAF doctrine as "the physical conditions of the terrestrial and space environment"—is a key variable in most military operations, including USAF operations.[54] As articulated in USAF doctrine,

> Weather has a profound effect on flight operations. Even on a clear day, the impact of something as simple as the speed and direction of the wind can significantly affect operations. Severe weather such as large hail, high winds, and heavy rains can halt flying operations and damage unprotected aircraft on the ground. Communication within the air domain is also susceptible to space weather effects such as ionosphere scintillation. This phenomenon affects the air operator's ability to effectively communicate with other airborne assets, ground forces, and can alter the effect of other services such as position, navigation, and timing.[55]

Outside the IW realm, weather "support to air operations focuses on three broad areas: protecting air assets, personnel, and base infrastructure from hazardous weather; maximizing aircraft performance and the effectiveness of the aircraft's weapons systems; and assisting during mission planning and execution."[56]

In addition to collection and analysis, USAF weather personnel are responsible for predicting weather and the future conditions of the operational environment. It is this aspect of weather operations that is particularly relevant and useful in the context of USAF IW. The same high-powered computing capabilities employed in predictive weather modeling can be applied to target audience analyses, sentiment analyses, or other relevant facets of IW. In the words of then–Commander of 16 AF Lt Gen Timothy Haugh, the USAF's weather forces are "capable [of] handling

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[51] Joshua A. Sipper, "It's Not Just About Cyber Anymore: Multidisciplinary Cyber Education and Training Under the New Information Warfare Paradigm," *Joint Force Quarterly*, Vol. 100, 1st Quarter 2021, p. 55.

[52] AFDP 3-61, *Public Affairs*, U.S. Air Force, September 10, 2020, pp. 2–3.

[53] AFDP 3-61, 2020, p. 2.

[54] AFDP 3-59, *Weather Operations*, U.S. Air Force, October 28, 2020, p. 1.

[55] AFDP 3-59, 2020, p. 4.

[56] AFDP 3-59, 2020, p. 4.

a lot of big data and then being able to make sense of it [and understanding] how weather is impacting adversary decision-making."[57]

Like weather operations, USAF *ISR* is tasked with providing the service and the joint force with battlespace awareness, which includes a detailed understanding of the operating environment itself and developments within it, as well as a window into adversary decisionmaking.[58] To execute this mission, the USAF has developed a robust ISR enterprise composed of a constellation of platforms, personnel, and networks tasked with sensing, collecting, analyzing, and integrating data with the end goal of "deliver[ing] intelligence to the right person at the right time, anywhere on the globe."[59] USAF ISR doctrine explains how the constituent pieces of globally integrated ISR are amalgamated in practice:

> A global integrated Predator mission includes the aircraft, a [continental United States] CONUS-based or forward-deployed pilot and sensor operator team, the datalinks that allow it to be flown remotely from a location outside of theater, and all of the networks that allow its data to be streamed in near-real time to many locations around the world.[60]

Although the individual scopes of the disciplines (or *pillars*, as they are sometimes referred to) described above extend beyond IW, each discipline provides essential ways and means that directly contribute to USAF missions. To this end, the *United States Air Force Information Warfare Strategy* acknowledges that the IW-related disciplines "provide value in their own right."[61] However, it also specifies that "the combination of IW capabilities—the convergence of effects—underpins the success of USAF operations in the future."[62] To achieve the USAF's desired end state for IW as articulated in the *United States Air Force Information Warfare Strategy*, IW "capabilities [must be] seamlessly integrated into strategic, operational, and tactical planning and execution to deliver converged, cross-domain effects."[63] The *United States Air Force Operating Concept for Information Warfare* echoes this point: IW capabilities "that are deliberately integrated in time and space can more effectively shape relevant actors' decision-making, freedom of action, and warfighting capacity."[64]

Yet these and other USAF guidance documents offer little detail on why or how IW disciplines should be integrated in practice. Where guidance falls short, articles penned by senior USAF leaders help fill in the gaps. In his 2020 piece titled "Achieving Convergence in the Information Environment," Brig Gen George M. Reynolds, vice commander of the USAF Warfare Center, explains how convergence can be achieved and why it is significant for IW. As he notes,

> Convergence occurs during integrated planning and execution in support of combatant commands and their service components, but it also occurs before IW

[57] Mark Pomerleau, "How Weather Is Playing a Role in Information Warfare," C4ISRNET, December 21, 2021d.

[58] AFDP 2-0, *Globally Integrated ISR*, Department of the Air Force, January 29, 2015.

[59] AFDP 2-0, 2015, p. 3.

[60] AFDP 2-0, 2015, p. 3.

[61] DAF, 2022b, p. 4.

[62] DAF, 2022b, p. 4.

[63] DAF, 2022b, p. 2.

[64] DAF, 2022a, p. 2.

> forces are presented. Examples include bringing IW forces together during exercises and training events resulting in new tactics, techniques and procedures (TTP); integrating development operations (DevOps) initiatives creating new, interoperable capabilities; mission rehearsals improving operational integration; implementing data strategies ensuring better access; and experimenting with new and evolving IW concepts leading to improved innovation.[65]

Relatedly, General Haugh and his coauthors outline an important use case from recent operational experience:

> U.S. Africa Command (USAFRICOM) took this initiative on May 26, 2020, when it publicly released unclassified imagery of Russian MiG-29 and Su-24 aircraft deployed to Libya. In a statement amplified by CNN, USAFRICOM disclosed that 'Moscow recently deployed military fighter aircraft to Libya in support of Russian state-sponsored private miliary contractors operating on the ground there.' The aircraft had also been painted to remove national markings. The USAFRICOM exposure of Russian malign action is an IW outcome the 16th Air Force should regularly enable by generating the initial insights into the adversary activity and shaping the information environment to counter adversary actions.[66]

Reading this description, one can imagine that this effort leveraged joint force ISR, MISO/IO, and CO in concert with mechanisms offered by other U.S. government actors.

We offer a second theoretical example of convergence in practice. Weather operations could be married with IO, CO, and ISR in support of USAF and joint force missions. Armed with high-powered computing capabilities, USAF weather personnel possess the ability to predict the onset of a significant weather event, such as an ice storm. USAF ISR personnel could determine that adversary forces positioned in the path of the storm are unprepared to operate under these conditions with existing forces and equipment. USAF IO forces could then leverage this combined information to devise a messaging campaign (deployed via channels controlled by USAF cyber forces) that could advertise adversary vulnerabilities in an effort to prevent adversary forces from achieving their objectives.

Ideally, USAF IW disciplines should both integrate with one another in service of USAF missions and merge into joint force structures with the goal of achieving the desired ends identified by joint force guidance and leadership. One critical end identified by JP 3-04, *Information in Joint Operations*, is information advantage.[67] As defined in this doctrine, *information advantage* is "the operational advantage gained through the joint force's use of information for decision making and its ability to leverage information to create effects in the [information environment]."[68] Although this definition is somewhat vague, JP 3-04 offers an example of how information advantage could work in practice:

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[65] George M. Reynolds, "Achieving Convergence in the Information Environment: Revising the Air Component Structure," *Air & Space Power Journal*, Vol. 34, No. 4, Winter 2020, p. 8.

[66] Haugh, Hall, and Fan, 2020, p. 34.

[67] JP 3-04, 2021, p. ix.

[68] JP 3-04, 2021, p. II-2.

> Disabling an opponent's space-based assets might provide the joint force with the operational advantage of being able to communicate securely over long distances without interruption and of being able to move without being detected. The joint force could then exploit that advantage through an operation to destroy an enemy ground force. Likewise, gaining and maintaining sufficient goodwill among a local population provides the operational advantage of joint forces being able to move freely in the vicinity of the populace without the locals alerting insurgents to friendly force activities.[69]

As discussed throughout this report, terms and definitions matter, particularly when new communities (such as the USAF IW community) are attempting to gain acceptance, status, and support within established organizations with long-standing histories and strong institutional cultures, as is the case with the USAF. Understandably, the constellation of terms listed above and their nuanced definitions have contributed to confusion among airmen about what IW is and how it can be achieved, as we discuss in Chapter 3.

Recent Policy Developments

At the Headquarters Air Force level, much of the work to create IW policy and bring information to the forefront of USAF operations was led by groups in AF/A2/6, AF/A3, and USAF Futures (AF/A5). The work led by Headquarters Air Force/A3 has focused on C2 (specifically, planning, execution, and assessment at the operational level) of OIE.[70] This work has laid a foundation for the USAF strategy for information and has begun to carve out the USAF's unique contribution to OIE. AF/A3 made the case that, to properly leverage the inherent informational power of military operations, the USAF needs to place information at the forefront of all its activities. In spring 2021, AF/A3 published a more detailed paper describing how to create campaigns and operations directly focused on shaping perceptions and behaviors of relevant actors and target audiences of interest.[71] It also provided techniques and practical considerations to help elevate information in operational-level planning, execution, and assessments.

Building on this foundation, the USAF has since published additional policy documents, refining the concepts put forth in the framework for C2 of OIE. The *United States Air Force Operating Concept for Information Warfare* was released in March 2022 by AF/A5.[72] Signed by the CSAF, this future-focused document was authored by the Air Force Futures and Concepts (AF/A5/7SC) group and the AF/A5/7DD IW cross-functional team. It is intended to create an imperative to organize, train, and equip forces that can conduct IW in alignment with Joint All-Domain C2 through three lines of

[69] JP 3-04, 2021, p. II-2.

[70] Sandeep S. Mulgund, and Mark D. Kelly, "Command and Control of Operations in the Information Environment: Leading with Information in Operational Planning, Execution, and Assessment," *Air & Space Power Journal*, Vol. 34, No. 4, Winter 2020.

[71] DAF, *Command and Control of Operations in the Information Environment: Leading with Information in Operational Planning, Execution, and Assessment*, March 9, 2021, Not available to the general public.

[72] DAF, 2022a.

effort: people, capabilities, and external integration. It also defines critical terms and attempts to align lexicon for the USAF.

For its part, the *United States Air Force Information Warfare Strategy*, which was authored by AF/A2/6 and signed by the CSAF in summer 2022, adds clarification on what IW capabilities are needed in the nearer term (2022–2029), as well as how to acquire and organize them.[73] It describes how IW professionals must have certain core competencies: They must be technically proficient, adaptable, collaborative, and communicative. It also lays out three objectives: (1) "Organize the Force," (2) "Develop the Force," and (3) "Equip the Force." It goes on to outline a phased approach to achieving these objectives over the near term (Phase 1: 2022–2025) and the longer term (Phase 2: 2025–2029).[74]

At the major command level, *COMACC Intent for Information Warfare*, published in July 2022, outlines the problem of leveraging information and how to converge multiple capability areas to support the Air Force's efforts to compete with adversaries for influence today while preparing for possible future conflict.[75] It describes General Kelly's desired outcomes and two lines of effort to achieve his stated desired end state: to "normalize, operationalize and develop IW-minded leaders throughout the [Combat Air Force]."[76] These lines of effort are (1) develop IW airmen and individual IW capabilities and (2) assign IW airmen to support Air Forces Cyber.

Collectively, these documents represent the most-recent developments in USAF IW policy. Chapter 3 describes the extent to which these higher-level policy documents have been adopted by the rest of the USAF. As we explain in detail in Chapter 3, our research indicates that these documents, although necessary, are insufficient.

Current Organization

As mentioned previously, changes in policy have been reflected in organizational changes in an attempt to better align forces and mature IW. 16 AF, which is the IW NAF, is the primary organization through which the USAF currently presents IW forces and capabilities to combatant commanders. However, rather than a wholesale restructuring of the two NAFs from which it was formed, 16 AF is still organized to represent the antecedent organizations' individual mission sets. The commander of 16 AF sits atop an organization that is more than 32,000 personnel strong. These airmen, including personnel aligned from the USAF guard and reserve components, are based at 128 locations throughout the world.[77] Each of the nine component wings subsumed under 16 AF's chain of command is aligned to a single capability (e.g., cyber, ISR, weather) rather than organized to have cross-functional units of action to conduct IW. Table 2.1 illustrates 16 AF's overall structure and size. Approximately 17,700 personnel in the ISR and Reconnaissance wings are devoted to the ISR

[73] DAF, 2022b.

[74] DAF, 2022b, p. 7.

[75] ACC, 2022, p. 3.

[76] ACC, 2022, p. 5.

[77] Timothy D. Haugh, "16th Air Force Mission Briefing," 2021.

mission set, 6,700 to ISR and EW missions with the 55th Wing, 4,900 to the cyber mission set, and 1,300 to weather.

Table 2.1. Sixteenth Air Force Organization, by Assigned Personnel

Unit	Civilian	Enlisted	Officer
16 AF staff	299	260	228
616th Operations Center (616 OC)	34	242	50
616th Air Support Squadron	20	10	1
70th ISR Wing	215	4,375	518
363rd ISR Wing	213	1,413	183
480th ISR Wing	195	4,620	332
9th Reconnaissance Wing	459	2,236	371
319th Reconnaissance Wing	297	1,969	336
67th Cyberspace Wing	442	1,443	530
688th Cyberspace Wing	529	1,732	191
557th Weather Wing	254	927	136
55th Wing	929	4,671	1,135
Air Force Technical Applications Center	477	450	141
Total	4,363	24,348	4,152

SOURCE: Defense Manpower Data Center, dataset, August 2022.

As discussed further in the next chapter, despite 16 AF being named the leading USAF organization for IW, its focus since its inception has overwhelmingly been on planning and conducting ISR activities and cyber operations rather than on synchronizing all USAF IW efforts. IW integration is essentially left to the 16 AF staff, and most of their time is focused on fulfilling the 16 AF commander's assigned responsibilities, including

- serving as the service cryptologic component to the National Security Agency (NSA)
- serving as a defense intelligence component to the Office of the Under Secretary of Defense for Intelligence and Security
- building, extending, operating, securing, and defending the USAF portion of the DoD information network
- serving as the Commander of Air Force Forces for presenting USAF cyber forces to other cyber components as directed
- performing operational planning and execution of offensive and defensive CO for CYBERCOM, EUCOM, SPACECOM, and STRATCOM

- organizing, training, and equipping assigned forces for ACC and the air components.[78]

While 16 AF is the largest organization dedicated to IW, it is not the only one. USAFE and Pacific Air Forces (PACAF) have both found use for IW capabilities against adversaries, creating working groups and other teams dedicated to planning IW activities. Air Force Special Operations Command (AFSOC) also has dedicated personnel for planning IW associated with their unique mission sets.

Current Workforce and Training

When asked who does IW, most USAF personnel will point to 16 AF and airmen in the 14F (IO officer) career field. These trained IW professionals are highly valued and sought after by those familiar with their capabilities, and we heard in our interviews that the overall number of trained 14Fs is insufficient to meet existing demand. Only approximately 200 14Fs existed across the entire USAF as of our last discussions with IW airmen, and the highest-ranked was an O-6. As of August 2022, 16 AF had only 39 14Fs, as shown in Table 2.2. Of the remainder, who are scattered throughout the USAF, many are employed in day-to-day jobs that do not leverage their specialized training. For example, although they have been trained to craft IO packages and coordinate these packages for execution, many 14Fs at the National Air and Space Intelligence Center (NASIC) or in intelligence squadrons report being employed more as intelligence officers (14Ns). Units in which their unique skills do appear to be leveraged include 16 AF staff positions, the 67th Operations Support Squadron, and the 616 OC. Other units in which 14Fs may be more valuable and able to perform their specialized function include air operations centers and joint assignments, such as within theater special operations commands (TSOCs). For instance, an interviewee noted that the 14F assigned to SOCEUR was particularly helpful.[79]

Table 2.2. 14F Units and Grades in Sixteenth Air Force

Unit			O-1	O-2	O-3	O-4	O-5
16 AF staff			1	1	9	2	1
363rd ISR Wing	363rd ISR Group	Staff			1		
		17th Intel Squadron	1	2	1		
		36th Intel Squadron	1	2			
67th Cyberspace Wing	318th Cyber Operations Group	39th IO Squadron			5		
	67th Operations Support Squadron		4	5	2		

SOURCE: Defense Manpower Data Center, dataset, August 2022.

[78] Sixteenth Air Force (Air Forces Cyber), "Sixteenth Air Force (Air Forces Cyber)," webpage, undated.

[79] SOCEUR Personnel 1, in-person interview with the research team, Patch Barracks, Germany, June 7, 2022.

From a training perspective, most IW-related training is conducted by the 39th IO Squadron (IOS) at Hurlburt Air Force Base.[80] This squadron trains airmen for both IO and cyber operations in both advanced offensive and advanced defensive skills. It also provides classes in signature management, MILDEC, and OPSEC. The 39th IOS plans to expand its courses in 2023 to include PSYOP and IW fundamentals and planning.[81] These courses are intended to train students in how to integrate information effects into existing planning, targeting, and operational processes. Before the courses existed at the 39th IOS, almost all PSYOP training was conducted at the U.S. Army John F. Kennedy Special Warfare Center and School at Fort Liberty, North Carolina. This training is still highly valued by IW professionals for its in-depth and comprehensive coursework, as well as for providing a more joint perspective.

The USAF is making some, albeit slow, headway to train airmen in IW. It is taking some steps to build the courses and facilities to do so. Yet, as described further in Chapter 3, challenges with access to those courses and the ability to be assigned to units that leverage that training persist. Furthermore, the stovepiped nature of individual disciplines is hindering the ability to train effectively. A revised training task list designed to be inclusive of IW and to incorporate multiple capability areas will be required to create true IW, not just IO or cyber, professionals.

Current Force Presentation

The main unit by which the USAF presents forces forward to combatant commanders to meet their objectives is the *unit type code* (UTC). A UTC is a standardized force package that deploys as a single unit, together with all associated personnel and equipment (if required). Each UTC is associated with a mission capability statement (MISCAP), which briefly summarizes the basic capabilities, functional areas, and response capabilities and any other details necessary to characterize the package for deployment. The USAF uses UTCs for joint force planning through a system called *Deliberate and Crisis Action Planning and Execution Segments* (DCAPES), which in turn feeds into the Joint Operation Planning and Execution System (JOPES). In DCAPES, the Manpower and Equipment Force Packaging (MEFPAK) list details the number of personnel included, responsible major command, pilot unit, and associated movement or airlift requirements for deployment. This information is kept up to date by functional area managers, specialists in each career area in the USAF.[82]

The current UTC list for the USAF has more than 3,000 separate entries, but only one specifies an integrated IW capability. Established by ACC/A326K, this UTC is called the *IO Information Warfare Cell*. According to the Air Force's UTC list, an IW Cell

> provides both functionally and geographically focused air components with global information warfare subject matter expertise in order to plan, coordinate, de-conflict,

[80] George I. Seffers, "Air Force Expanding Information Operations Classes," AFCEA International, April 1, 2022.

[81] Seffers, 2022.

[82] Don Snyder and Patrick Mills, *A Methodology for Determining Air Force Deployment Requirements*, RAND Corporation, MG-176-AF, 2004, p. xv.

> synchronize, integrate, and assess employment of ISR, cyber, EW, and IO capabilities. [It] expands air component linkage with the USAF's IW NAF enterprise.[83]

This UTC requires 17 personnel—a mix of officers and enlisted personnel—who have air operations center initial qualification training and IO integration course training. It also notes that one year of air operations center or IO experience is suitable as a substitute for the formal training. It has no associated equipment and is intended to be an augmentation to already deployed forces.

Other UTCs in the database provide specific IW-related capabilities, such as IO, offensive and defensive cyber operations, weather support, and a variety of ISR and EW packages, along with associated air operations center and intelligence support. While it stands to reason that each of these disciplines would have distinct UTCs to operate independently, it should be noted that one does not currently exist for an integrated IW body. Without this formal mechanism for integration, the USAF is limited in its ability to present IW forces that can achieve the desired convergence of effects. The new IW UTC is a step in the right direction but may be too generic to meet specific combatant commander objectives.

[83] USAF, August 2022 summary, Unit Type Code List, database, August 2022.

Chapter 3

Opportunities and Challenges in Operationalizing U.S. Air Force Information Warfare

Rather than present the study's findings in a concluding chapter, we chose to devote a significant portion of the report's main body to unpacking the findings in detail and calling out their interconnectivities and dependencies. This chapter presents each of the core findings derived from the study's multiple streams of research. We have organized the findings (which are in bold) according to broader themes: doctrine, guidance, policy, and lexicon; organization and force presentation; equipping and resourcing; authorities and permissions; leadership and institutional culture; processes, procedures, and joint integration; and personnel and workforce. Each finding is accompanied by a discussion of the issue itself, the evidence and analysis substantiating the team's conclusion, and an examination of the ways in which it ties to the chapter's other conclusions and the USAF's broader IW operationalization effort.

Overall, several points emerged from the study's findings that bear mention. First, the USAF IW community has had several recent wins, particularly in the form of signed guidance and policy at the senior-most levels. Moreover, some parts of the USAF that are responsible for pieces of IW operationalization, such as IW-specific training, are in the early stages of sketching out their constituent contributions. Nevertheless, the desired ends and means laid out in the strategic documents are, thus far, largely aspirational. As of this writing, USAF IW professionals are waiting on concrete requirements for IW, clearly delineated roles and responsibilities, a scoped USAF IW identity, formalized processes, and demonstrations of concrete investment in IW as a service mission. In the absence of such developments, our research indicates that USAF IW may continue to be conducted on an ad hoc basis such that it is not scalable.

Doctrine, Guidance, Policy, and Lexicon

Recently unveiled high-level guidance is immature and often too ambiguous to leverage for resourcing or planning. Since our research commenced, the USAF has taken several significant steps in its operationalization of IW. Chief among these is the CSAF's signature of and subsequent publication of the *United States Air Force Operating Concept for Information Warfare* and the *United States Air Force Information Warfare Strategy*. The airmen we interviewed overwhelmingly cited the

need for formal guidance on IW as a core barrier to the operationalization of IW.[84] What is more, interviewees pointed to the absence of high-level IW policy and guidance as evidence that USAF leadership did not endorse IW.[85] Fifteen of the airmen we interviewed—hailing from a wide array of organizations, including USAFE, PACAF, 16 AF, and USAF PA entities—expressed this perception. Although this number does not represent a majority of the interviews, it indicates that a diversity of airmen felt this way. (The nuances of these perspectives will be discussed in greater detail in the finding devoted to leader prioritization of IW.)

USAF IW personnel are not alone in the perception that USAF leadership does not prioritize IW. The data generated by our survey, which included airmen outside USAF IW disciplines, reinforce this perspective. On a list of seven options—(1) reorganization of USAF IW forces, (2) publication of IW doctrine, (3) establishment of formal coordination mechanisms, (4) allocation of new authorities, (5) development of IW training, (6) greater resource allocation, and (7) formalization of IW policy/guidance—respondents ranked the last one, formalization of policy/guidance, as the top means by which the USAF could better prioritize the operationalization of IW. (For additional details on the survey, see Appendix A.)

By this logic, the formal acknowledgment in the *United States Air Force Information Warfare Strategy* that "the information environment is an integral part of the operational environment" and the fact that "IW is foundational to U.S. airpower" may signal to airmen that senior service leadership recognizes the virtues of IW.[86] Yet, as might be expected with strategic-level guidance, while the *Information Warfare Strategy* and *Operating Concept* strike an important aspirational tone in laying out the objectives guiding USAF IW development between 2022 and 2035, they provide few operational-level details about the practicable path toward achieving these ends. For these objectives to be realized, they need to be translated into more-detailed tactics, techniques, and procedures and formal requirements.

As we detail below, the disconnect between strategy and practice has far-reaching resourcing, staffing, training, and other implications for the active-duty force, as well as for Air Force Reserve Command personnel. Further complicating matters, concrete guidance on IW, notably the communication of geographic combatant command (GCC) requirements, is wholly absent at the joint level, where even foundational IW doctrine has languished for years.[87]

Lastly, although the publication of the *Information Warfare Strategy* and the *Operating Concept* is a necessary step in operationalizing IW, these documents are insufficient in routinizing IW concepts throughout the broader USAF. While those airmen in IW disciplines whom we interviewed were intimately aware of developments in IW guidance and policy, evidence suggests that airmen outside the IW community may not be. Discussions of either document are notably absent from CSAF's social media–based announcements and his office's web presence. If, as the *Information Warfare Strategy* and the *Operating Concept* assert, the USAF is committed to "grow[ing] an information-centered cultural mindset among all Airmen," thereby developing a force of "information aware

[84] USAF Personnel 3, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[85] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[86] DAF, 2022b, p. 3.

[87] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

Airmen," the service needs to meaningfully familiarize all USAF communities with guidance documents.[88]

The absence of explicit, formal requirements was consistently cited as one of the most significant barriers to USAF IW operationalization. Airmen in IW roles overwhelmingly cited the absence of unambiguous, formal requirements—particularly those specified by ACC—as one of the most significant barriers to USAF IW operationalization. In the words of one interviewee, "Lots of airmen are believers in IW but are waiting on requirements and guidance."[89] Interestingly, both the *Information Warfare Strategy* and the *Operating Concept* echo interviewee observations on this issue, explicitly acknowledging the need for formal requirements as a critical next step in the evolution of USAF IW. The *Information Warfare Strategy*, which focuses on the near term of USAF IW operationalization (2022–2029), calls out the need to "identify requirements" as the third line of effort of objective 1, "Organize the Force." It mandates that the USAF "gather air component requirements for tailorable IW planning and execution on the [Headquarters Air Force] staff or like organization; [and] evaluate and update USAF corporate process to prioritize and fund IW capabilities and integration."[90] In other words, the document indicates awareness of the absence of requirements and reinforces the need to specify them going forward. For its part, the *Operating Concept*, which approaches IW through a longer-term lens (2030–2035), is framed as an "articulat[ion of] high-level requirements for delivering USAF Information Warfare capabilities and outcomes," but not specific ones.[91] Here, too, the need for "subsequent force design efforts [to] identify specific requirements for Information Warfare employment and organizational structures across warfighting echelons" is called out.[92]

Those requirements that do exist are typically pillar- or platform-specific, according to some of the airmen interviewed. That is, formal requirements are often classified as, for example, "cyber requirements" or "F-16 requirements" rather than cross-disciplinary IW requirements.[93]

Requirements, or the lack thereof, have an important budgetary component. When allocating resources, services seek to meet validated requirements through programs or systems. That is, the services typically resist spending precious budgetary resources on new items (or more of existing items) if those items are not tied to documented requirements.[94] Because requirements are used to drive budget submissions and justify resourcing requests, a lack of requirements stymies IW's prospects of competing for funding. Furthermore, the programming and budgeting process is biased toward the procurement of platforms and systems rather than toward commercial off-the-shelf technology, investments in training for specialized personnel, or additional components or modules to

[88] DAF, 2022a, p. 7; DAF, 2022b, p. 7.

[89] USAF Personnel 3, Headquarters Air Force, in-person interview with the research team, Pentagon, Va., April 6, 2022.

[90] DAF, 2022b, p. 7.

[91] DAF, 2022a, p. 2.

[92] DAF, 2022a, p. 2.

[93] USAF Personnel 3, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[94] For a full discussion of the defense acquisition process, see Jonathan P. Wong, Obaid Younossi, Christine Kistler LaCoste, Philip S. Anton, Alan J. Vick, Guy Weichenberg, and Thomas C. Whitmore, *Improving Defense Acquisition: Insights from Three Decades of RAND Research*, RAND Corporation, RR-A1670-1, 2022.

attach to existing platforms.[95] Because IW requirements, even if fully documented, are unlikely to be met by a single, specialized new platform (notably aircraft), IW is unlikely to fit well with the sorts of things the USAF is focused on buying or the sorts of requirements those acquisitions typically satisfy. Taken together, the absence of requirements makes it more difficult to plan or budget for IW as a singular capability.

Despite broader adoption of the term *information warfare* in the USAF, differing interpretations and definitions continue to pose challenges. The DAF's November 2021 iteration of AFDP 3-99, *The Department of the Air Force Role in Joint All-Domain Operations*, includes a brief chapter devoted to information that includes a formal, sanctioned definition of IW, which we cite above. Likewise, recently unveiled guidance documents, such as the CSAF-signed *United States Air Force Operating Concept for Information Warfare* and *United States Air Force Information Warfare Strategy*, echo the definition presented in AFDP 3-99.[96] While this terminological consistency at the policy level signifies an important development in the operationalization of USAF IW, our interviews and survey responses suggest that airmen continue to struggle with the conceptualization of IW.

Of those USAF IW stakeholders whom we interviewed, including those at 16 AF, most acknowledged the existence of a sanctioned USAF doctrinal definition of IW but overwhelmingly reported continued confusion related to the meaning of the concept in practice. In the words of two stakeholders, "IW has not been adequately articulated as a construct," meaning, "a definition only goes so far in the absence of a vision and direction."[97] As a result, stakeholders observed the circulation of dueling IW conceptions: (1) the definition specified in official documents cited above and (2) references to the IW personnel developmental category.[98]

The responses of the mid-grade officers, general officers, and senior enlisted personnel (hailing from across the service) who completed our survey also reflect this trend. When asked in an open-ended question to characterize IW, respondents offered a broad array of interpretations, varying from "I have no idea" to "utilizing information against you" to "the continual protection of information of the U.S. military" to a verbatim reiteration of the doctrinal definition, to name a few. Similarly, when asked to identify the USAF disciplines associated with IW, respondents were largely divided between selecting all USAF disciplines, selecting the six disciplines that the USAF has formally classified as tied to IW, and selecting pared-down subsets that are cyber- and ISR-heavy.

Relatedly, interviewees cited confusion around the term *convergence*, which has colloquially emerged as shorthand for *IW*. The genesis of the term in relation to USAF IW is a 2020 article penned by then–Commander of 16 AF General Haugh, Lt Col Nicholas J. Hall, and Maj Eugene H.

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[95] See the discussion of the platform-centric nature of the USAF (p. 50) and the discussion of the lack of funding for training IW professionals (p. 37).

[96] DAF, 2022a; DAF, 2022b.

[97] USAF Personnel 1, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021; USAF Personnel at Headquarters Air Force 1, in-person interview with the research team, Pentagon City, Va., April 4, 2022.

[98] Air Force Personnel at Headquarters Air Force 1, in-person interview with the research team, Pentagon City, Va., April 4, 2022. According to a RAND report, "competitive categories are groups of officers who compete against each other for promotion. . . . The Air Force currently uses the term *developmental category* in its internal references to competitive categories" (Albert A. Robbert, John S. Crown, Agnes Gereben Schaefer, Matthew Walsh, Diana Y. Myers, Anthony Lawrence, and Ignacio A. Lara, *Emerging Options for Field-Grade Officer Promotions in the U.S. Air Force*, RAND Corporation, RR-A989-1, 2023, p. 1).

Fan.[99] Titled "16th Air Force and Convergence for the Information War," the article defines convergence as "the integration of capabilities that leverage access to data across separate functions in a way that both improves the effectiveness of each functional capability and creates new information warfare outcomes" that are ideally "greater than each individual capability can create on its own."[100] As a highly visible thought piece published by the then–commander of 16 AF at a time when IW was not defined in doctrine, this article has been treated by the airmen we interviewed as *the* authoritative articulation of the service's vision for IW. Yet, although the *United States Air Force Operating Concept for Information Warfare* cites Haugh, Hall, and Fan's definition of convergence, the term is notably absent from the USAF's official articulation of IW.[101] Moreover, the term is not defined in USAF doctrine. This lack of a formal definition appears to have created considerable confusion over the service's official expectations of airmen when it comes to operationalizing the convergence of IW disciplines.

Although seemingly innocuous, these terminological inconsistencies and challenges have important real-world implications. If service leadership is committed to operationalizing IW, airmen must first understand what it is they are intended to actualize. Airmen cited a sense of paralysis related to this issue, noting, "without a [socialized] definition of IW, everyone in the USAF IW community is unsure of how to proceed, what it means, and what is expected of them."[102]

In this vein, our observations suggest that anointing a doctrinal definition of IW is insufficient. As we detail in Chapter 5, the USAF needs to go a step further to familiarize the service with its definition of IW and explain how IW is conducted in practice—i.e., what successful IW looks like. One airmen's comments vividly illustrate how terminological issues can affect the service's operationalization of IW. "It is very demoralizing," the airman noted, "when you have been given a mission which is unclear, for a concept that does not have a clear definition."[103] This sentiment was expressed widely.

What is more, USAF-wide adoption of analogous terms and definitions is only half the battle. The decision to proceed with *IW* as the service's anointed term of art will mean that USAF lexicon will not align with other service or expected joint terminology. In joint parlance, the abbreviation *IW* is most commonly associated with the term *irregular warfare*, not *information warfare*. Many of the USAF IW interviewees who were serving in joint settings highlighted this incongruity as a source of friction and frustration. Several interviewees in the USAF and the joint force noted that the USAF should be using joint terminology.

There is a widespread perception across the USAF IW community that USAF leadership does not prioritize IW. Above all else, our discussions with airmen revealed a deeply held and widespread perception among USAF IW professionals that, as an institution, the USAF does not prioritize IW. Although several interviewees acknowledged the demonstrations of support they had seen some USAF leaders display in public and private settings, they found these to be insufficient for

[99] Haugh, Hall, and Fan, 2020.

[100] Haugh, Hall, and Fan, 2020, pp. 29, 33.

[101] DAF, 2022a, p. 4.

[102] USAF Personnel 1, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[103] USAF Personnel 3, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

the successful operationalization of IW. Some characterized leaders' verbal endorsements of IW in the form of public remarks, written communications, and oral backing as largely symbolic in the absence of more-tangible expressions of support, such as dedicated funding. As articulated by one airman, "If it's not POMed or classified as a program of record, it doesn't exist."[104]

Other interviewees cited the Secretary of the Air Force's recent removal of cyber from the USAF's official mission statement as evidence of the USAF's prioritization of kinetic capabilities over nonkinetic instruments, including IW.[105] In April 2021, the service unveiled its new mission statement, which changed from "fly, fight, and win . . . in air, space, and cyberspace" to "fly, fight, and win . . . airpower anytime, anywhere."[106] The corresponding press release cited the fact that "the Air Force [could] now focus solely on Airpower and maintain a sustained focus on core air domain missions" as justification for the change.[107] On the face of it, this statement is likely a nod to the establishment of a separate USSF in late 2019. That said, it is understandable why some airmen outside air domain missions perceived the subtext of this message as a lack of support for non-pilots.

Still others relayed personal anecdotes as evidence of the perceived lack of IW prioritization, focusing on funding provided to IW requirements. One airman observed that designating intelligence requests as "IO requirements" ensures that the requests are "dropped to the bottom of the pile." This interviewee learned to "get creative" and "write [requests] up as force protection instead," which, in their experience, addressed the deprioritization issue.[108] Past RAND research has found that this phenomenon is not exclusive to the USAF. Broadly speaking, intelligence support to IW (and IO) is generally deprioritized across the joint force.[109]

Given the prevalence of this perception and the significance of its implications, the team chose to test the assertion to better understand whether it is supported by additional data. As is mentioned above and outlined in detail in Appendixes A and C, the team fielded a survey of mid-grade USAF officers, general officers, NCOs, and SNCOs across career fields and conducted manual and computer-assisted content analyses. The data produced by all three lines of inquiry generally substantiated interviewee perceptions of USAF institutional funding priorities.

For instance, when asked to identify the top areas that USAF leadership prioritizes from a list of 2021 POM panels, the overall group of survey respondents overwhelmingly ranked air superiority as a clear first, and global precision strike and C2 were ranked as second and third most prioritized, respectively (see Figure 3.1). Respondents were allowed to choose multiple answers and were encouraged to choose three. Because IW does not have a devoted panel, we did not include it as an option that respondents could select. USAF personnel indicated that cyber is funded through the

[104] EUCOM Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022. *POM* stands for *Program Objective Memorandum*.

[105] USAF Personnel 5, in-person interview with the research team, Langley Air Force Base, Va., February 9, 2021.

[106] Oriana Pawlyk, "Air Force Drops 'Space,' 'Cyber' from Mission Statement as Space Force Gains Momentum," Military.com, April 8, 2021b.

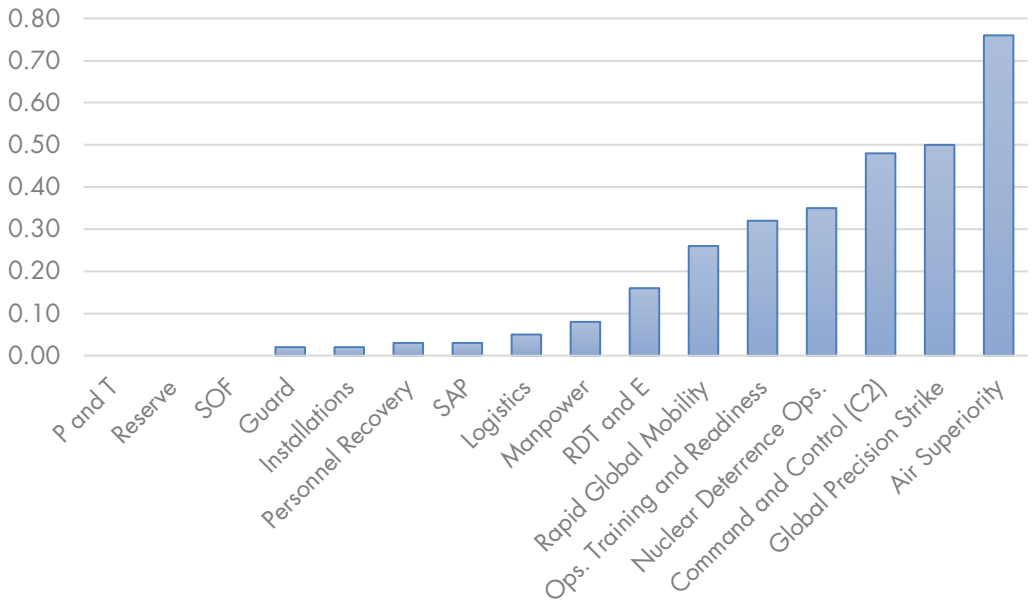
[107] Pawlyk, 2021b.

[108] EUCOM Personnel 8, in-person interview with the research team, Panzer Kaserne, Germany, June 10, 2022.

[109] Michael Schwille, Anthony Atler, Jonathan Welch, Christopher Paul, and Richard C. Baffa, *Intelligence Support for Operations in the Information Environment: Dividing Roles and Responsibilities Between Intelligence and Information Professionals*, RAND Corporation, RR-3161-EUCOM, 2020.

cyber panel, while ISR, weather, EMSO, and C2 are all funded through the C2 or ISR panels.[110] As a result, respondents did not have the opportunity to select IW specifically as a priority issue. However, our findings indicate that most of IW is funded under panels that do not rank as the first or the second priority for leadership. Interviewees further noted that they felt that IW and IW integration, which would cross multiple panels, were often at the bottom of the priority list for the panels they were sent to. So, even if IW were submitted under C2, which was ranked as the third most prioritized panel, it is likely that IW would be low on that list for funding, competing with proposals from other areas.[111] In addition, an interviewee noted that when an integrated IW POM was submitted, it was divided up and parceled out to the stovepiped panels, which "owned" each of its component parts, further diminishing the likelihood of it being funded as a whole.[112] The list of issue areas that the USAF has chosen to organize its corporate budgeting structure around—and those areas that it has chosen to exclude—serves as an indicator of USAF priorities at the corporate level.

Figure 3.1. U.S. Air Force Leadership Priorities



NOTE: Ops. = operations; P and T = personnel and training; RDT&E = research, development, test, and evaluation; SAP = special access programs; SOF = special operations forces. Number of respondents for this question = 62. Respondents were allowed to choose multiple answers and were encouraged to choose three.

[110] ACC Personnel 1, email to the authors, November 23, 2022.

[111] We chose to use the established POM panels as potential survey response options for USAF priorities, despite the exclusion of IW, because they represent an established set of corporate structures that are likely reflective of institutional priorities. Further information on which POM panel IW falls into came from USAF Public Affairs Personnel 3, phone interview with the research team, March 7, 2022.

[112] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

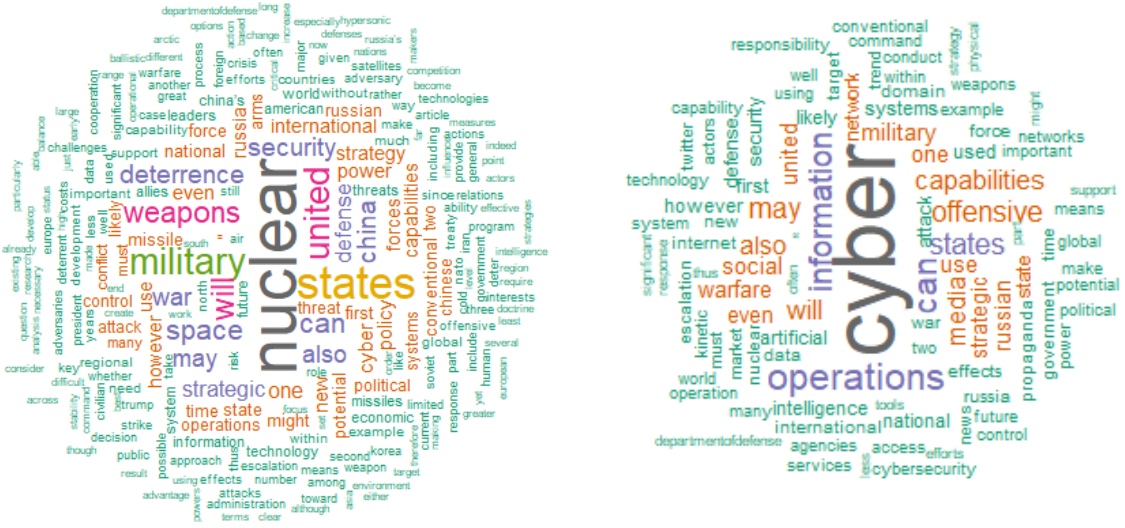
Relatedly, the two content analyses that we undertook—a manual approach and a computer-assisted text-as-data approach—yielded similar findings. Of the 189 articles and commentaries published in *ASPJ* between spring 2016 and winter 2021, only 16.4 percent dealt with at least one pillar of IW. Moreover, 63.3 percent of the articles (19 of the 30) that touched on at least one aspect of IW focused exclusively on cyber operations. Therefore, among the IW-affiliated pillars, discussions on CO dominated *ASPJ* articles from 2016 until the publication of the special winter 2020 edition, when a more general discussion of operations in and through the information environment took precedence. This latter shift is unsurprising given that 16 AF was officially stood up in October 2019, merging the 24th and 25th Air Forces. The same can be said for *SSQ* in the same period, wherein all but one of the articles touching on IW themes discussed CO exclusively.

Press briefings, news articles, and other public statements provide another useful qualitative measure of USAF institutional priorities. As noted previously, articles and press releases published before the reestablishment of 16 AF overwhelmingly, but not exclusively, focus on CO-related issues. For additional details on this analysis, see Appendix C.

Lastly, the computer-assisted text-as-data analysis echoed the outcomes of the interviews and manual content analysis. We first asked the algorithm to conduct a word count to understand the most and least prevalent words in *SSQ* between 2016 and 2021. The word clouds in Figure 3.2 serve as visual representations of the most–frequently occurring words in the full corpus of all *SSQ* articles and commentaries (left) and the corpus of articles and commentaries coded as IW-specific (right). The relative sizes of the words indicate their frequency of occurrence within the corpus; larger words occur more frequently.[113]

[113] The full-corpus word cloud was constructed to omit words that are used fewer than 350 times in the corpus and to plot the 500 most frequently occurring words. The IW-specific word cloud was programmed to omit words that do not appear more than 50 times and to plot the 1,000 most frequently occurring words.

Figure 3.2. Word Clouds for Full Corpus (Left) and Information Warfare–Specific Corpus (Right) of *Strategic Studies Quarterly* Between 2016 and 2021



SOURCE: RAND analysis of articles from *SSQ* issues published between spring 2016 and winter 2021.

These word clouds illustrate some relevant overall trends. First, there is a strong prevalence of *nuclear* and nuclear-related words, such as *deterrence*, in the full corpus of *SSQ* articles and commentaries.[114] This prevalence suggests that USAF contributions to the nuclear triad and nuclear deterrence were topics of interest in both the military and academic circles that contributed to *SSQ* issues, as well as to the editors of *SSQ*, between 2016 and 2021. Likewise, the relative prevalence of such words as *space*, *deterrence*, *war*, and *strategic* seems to reinforce the journal's stated focus on topics related to strategy and warfighting, whereas the relative prevalence of *China* and *Russia* appears to echo the DAF and DoD's pivot to focus on near-peer rivals in this period. *Information* is present (bottom left), but its size illustrates its relative scarcity. Turning to the word cloud for the IW-specific corpus, we observe the prominence of *cyber* at the center, which speaks to the relative prevalence of that word in the articles and commentaries identified as IW-specific in our manual analysis. In this respect, *cyber* overshadows *information*, and *IW* is notably absent from the word cloud.

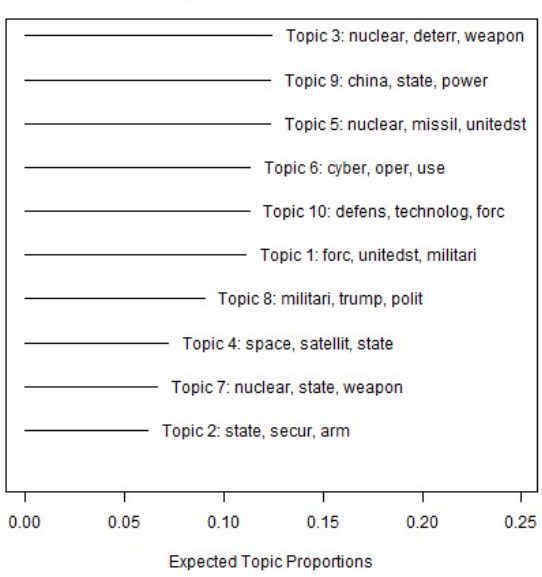
In addition to producing the word clouds, we analyzed the full *SSQ* corpus and the IW-specific *SSQ* corpus using a structural topic model approach. As we discuss in detail in Appendix C, topic models are a form of unsupervised machine learning that relies on words and their co-occurrences to identify and measure the underlying themes in a large corpus of text. It is unlikely that such an analysis would identify a single mention of a word in an article that is otherwise about a different issue as a distinct topic. Functionally, topic models rely on the logic that when words occur together, they convey concepts, and, over a large enough string of words, they form themes, or topics, based on where

[114] The analysis from which the word clouds are derived represents the frequency with which the words occur in each of the corpuses. The word clouds represent all instances of the words in the respective corpuses. We did not control for incidental occurrences of the terms shown (e.g., for the use of the word *nuclear* in the colloquial phrase *going nuclear*) or for mentions of USAF capabilities in contexts in which the authors are not making arguments in reference to USAF priorities specifically.

they occur together. Topic models use a process through which latent topics or themes are revealed through how words are strung together throughout the corpus.

Figure 3.3 shows the results of one illustrative topic model generated by our analysis. If we consider the words listed for each of the topics that the analysis identified, we can see some distinct trends that resonate with the outputs of the word clouds, the manual content analysis, and the interviews. Topic 3, represented by the terms *nuclear*, *deterr* (the beginning of the words *deterring* or *deterrence*, to account for both permutations), and *weapon*, is the most prevalent in the full *SSQ* corpus. The clustering of these words indicates that the most frequently discussed topic in *SSQ* between 2016 and 2021 relates to nuclear weapons, nuclear deterrence, and the nuclear triad. What is more, Topics 5 and 7 also focus on nuclear issues.[115] It should be noted that this trend is not unique to this specific model; rather, Topic 3 remains the most prevalent topic across all iterations of the model produced using the full corpus.[116] In the context of this specific finding, this analysis supports interviewee observations that the USAF is not focused on IW and suggests that the service's attention is instead on nuclear issues.

Figure 3.3. Plot of Expected Topic Proportions for Ten Topics for Full Corpus



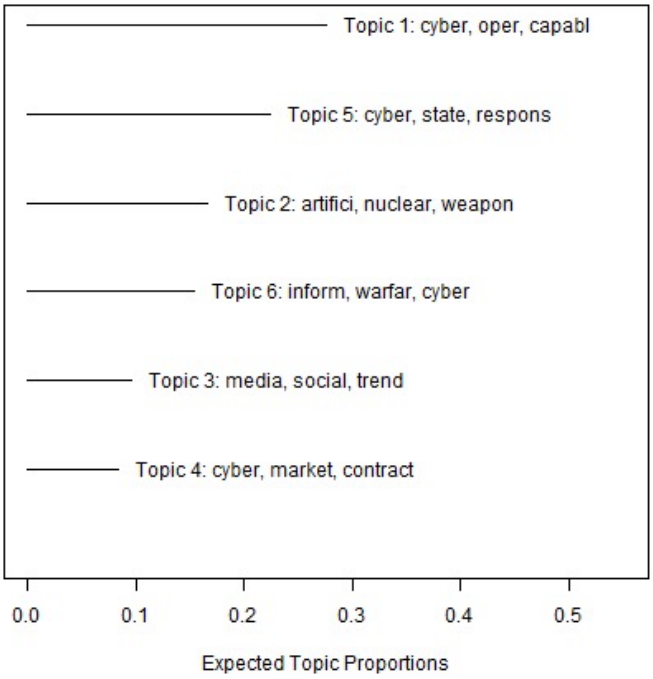
As is the case with our other lines of inquiry on the prioritization of DAF leadership, the analysis visualized in Figure 3.3 supports airmen's observations that, of the IW pillars, the USAF is most acutely focused on cyber. Topic 6, represented by the terms *cyber*, *oper*, and *use*, is prevalent in the full

[115] When we dive deeper into the words and documents that make up those topics, we find that there are different topics under the broad umbrella of *nuclear*. Topic 5 focuses on nuclear missiles or platforms through which weapons, including nuclear weapons, can be deployed, while Topic 3 contains discussion of nuclear deterrence and Topic 7 focuses on state and possibly nonstate proliferation.

[116] *Nuclear* and *deterr* or *nuclear* and *weapon* appear in the top topic summaries across models that contain between eight and 15 topics. The model defined by *cyber*, *oper* (Topic 6) outranks a nuclear-related topic in this measure of estimated topic proportions. However, in the seven-topic model, a nuclear-related topic is rated second highest.

corpus. This trend becomes even more pronounced in the analysis we conducted on the IW-specific corpus. Topics 1, 5, and 6 in Figure 3.4 all cluster around cyber. Even so, the IW-specific focus does include two topics (Topics 6 and 3) whose full lists of affiliated words—*inform*, *warfar*, *cyber*, *can*, *attack*, *use*, and *oper* and *media*, *social*, *trend*, *network*, *propaganda*, *use*, and *Russian*—focus on some non-cyber IW issues, including foreign social media–based disinformation campaigns.

Figure 3.4. Plot of Expected Topic Proportions for Six Topics for Information Warfare–Specific Corpus



In sum, our analysis shows that the airmen we interviewed across the USAF IW community resoundingly perceived that the USAF does not prioritize IW. Our analyses of USAF journal articles and commentaries, Corona Commanders' Conference agendas, press releases, and other public remarks reinforce the notion that current USAF leadership and service thought leaders are not focused on IW—a trend that might in turn reinforce IW airmen's perceptions of service priorities.[117]

Interviewees mentioned several factors that could plausibly be contributing to the perceived lack of support for IW. First, interviewees pointed to the intangible nature of IW and inherent difficulties involved in measuring and demonstrating IW successes for leaders (see the finding on measuring the effectiveness of IW). Others argued that USAF processes, structures, and norms inherently favor capabilities and disciplines that are designated as core missions—a group that IW does not belong to. Still others explained that IW is not well understood in the broader USAF and its utility needs to be made known (see the finding on the need to familiarize the USAF and the joint force with IW).

[117] Corona Commanders' Conferences, or "Coronas," are convenings of senior Air Force leadership. For additional background on Corona conferences, see Phil Tucker, "Brief History of the Corona (Commanders) Conferences," U.S. Department of Defense, September 2005.

Lastly, some airmen cited the USAF's cultural proclivity toward technology and technical disciplines as a reason for the service's perceived hesitancy to embrace the more enigmatic cognitive elements of IW.[118]

Organization and Force Presentation

USAF IW remains highly stovepiped along organizational and disciplinary lines. Numerous scholars and practitioners who have examined the cultural and institutional dynamics of the USAF over time have observed and commented on the service's fractionalized nature along disciplinary, platform, and organizational lines. Carl H. Builder, in his seminal 1989 treatise on the "personalities" of the U.S. military services, *The Masks of War*, asserted that pilots stood at the top of the hierarchy of USAF disciplines. At the time of his research, they increasingly composed the bulk of USAF leadership.[119] Relatedly, Builder found that USAF pilots identified as pilots first and airmen second, and they tied their identities to their specific aircraft models (e.g., the F-15 Strike Eagle, the F-16 Fighting Falcon) rather than to the service itself.[120] Therefore, Builder observed, rather than possessing a single, overarching service identity, the USAF could be characterized as an institution with siloed loyalties to career paths and platforms within its relatively strict hierarchy.[121] According to Builder, these cultural traits existed because, above all else, the USAF was about aircraft or, in his words, "toys."[122]

Builder is not alone in his observations. Numerous analyses conducted in the decades since the publication of *The Masks of War* in 1989 substantiate these findings. Scholar James M. Smith quotes a finding from an analysis of two 1996 surveys conducted by Air University, noting,

> 'the responses indicate that officers value unit cohesion, identify with technical specialties and do not persuasively articulate airpower doctrine.' This observation seems to indicate that in the absence of a shared vision or sense of mission, Air Force officers turn to their occupations and the immediate units built around those occupations for their primary identification.[123]

Natasha Lander's 2019 conceptualization of the USAF as an organization that remains partitioned along occupational fiefdoms echoes these earlier studies.[124] What is more, USAF processes and structures, which are often segmented by platform or occupation, reinforce existing cultural cleavages.

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[118] See our discussion of USAF cultural norms and historic priorities in Appendix C.

[119] Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis*, Johns Hopkins University Press, 1989.

[120] Builder, 1989, p. 23.

[121] See also James M. Smith, "Air Force Culture and Cohesion: Building an Air and Space Force for the Twenty-First Century," *Airpower Journal*, Vol. 12, No. 3, Fall 1998b, pp. 40–53.

[122] Builder, 1989, pp. 22–23.

[123] James M. Smith, *USAF Culture and Cohesion: Building an Air and Space Force for the 21st Century*, Institute for National Security Studies, U.S. Air Force Academy, INSS Occasional Paper 19, June 1998a, p. 46, quoting Lieutenant Colonel McCoy, "Talking Paper on Analysis of Basic Course Surveys," Air University, December 12, 1996.

[124] Natasha Lander, "The Air Force," in S. Rebecca Zimmerman, Kimberly Jackson, Natasha Lander, Colin Roberts, Dan Madden, and Rebeca Orrie, *Movement and Maneuver: Culture and the Competition for Influence Among the U.S. Military Services*, RAND Corporation, RR-2270-OSD, 2019.

This fractured approach has important implications beyond the service's cultural cohesion, particularly for IW. Although Haugh, Hall, and Fan acknowledge the pitfalls associated with factionalism in their 2020 piece on IW, they assert that "16th Air Force is *problem-centric* and has moved away from a platform or sensor-based approach to one that leverages access to many data sources, regardless of origin."[125] Yet our research suggests that the USAF—including the IW community—remains highly stovepiped along disciplinary and platform lines in ways that do not allow the constituent pieces of the community to come together to conduct integrated IW when necessary.[126] One airman described the current state of USAF IW as "piecemeal capabilities that are not synchronized."[127] Interviewees reported that USAF IW disciplines remain siloed, often by platform. For instance, EMSO capabilities associated with F-16s are "owned" by a different organization from those that "own" EMSO capabilities associated with F-35s, which inhibits the USAF's ability to plan and execute integrated campaigns across platforms using one discipline, let alone multiple disciplines.

The *United States Air Force Operating Concept for Information Warfare* explicitly acknowledges the issue of fractionalization as a fundamental roadblock to IW operationalization, stating that the service's

> limited and fragmented approach to Information Warfare leaves [the service] unable to holistically integrate key information capabilities into global operations and preserve friendly freedom of action. Consequently, the USAF risks ceding decision advantage and losing its ability to generate and project airpower for the Joint Force.[128]

For IW, which is predicated on the cohesive integration or convergence of multiple IW disciplines across existing communities, as we discuss in Chapter 2, this kind of tribalism has the potential to undermine its operationalization. By mandating that the USAF operationalize IW, service leadership has directed communities that have long possessed their own identities, C2 structures, processes, and norms to integrate without providing guidance on the seismic cultural, budgetary, procedural, and other changes that will need to accompany these developments.

Resourcing and equipping processes illustrate this point well. Currently, budgets for the constituent pieces of IW are assigned to different POM panels. As a result, there is no central venue where leadership in the IW community can fight for IW resources.[129] Even when ACC deliberately drafted a single IW POM request several years ago, the IW budget request was ultimately parceled out to individual panels, according to interviewees. IW's absence from the list of core USAF missions was cited by one interviewee as the justification.[130]

Relatedly, because 16 AF is subsumed under ACC, ACC is responsible for equipping all IW forces. However, as one USAF official noted, there is a "fundamental mismatch" given that ACC has

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[125] Haugh, Hall, and Fan, 2020, p. 38. Emphasis in original.

[126] USAF Personnel 1, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021; 16 AF Official 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[127] USAF Personnel 2, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[128] DAF, 2022a, p. 6.

[129] 16 AF Official 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[130] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

historically organized around platforms, whereas IW has few platforms to speak of.[131] On the personnel side, this mismatch is further complicated by the absence of an IW program element code, "which identifies what program pays the salary bill for personnel that fall under it."[132] With respect to fractured budgetary practices, a number of interviewees cited the need for distinct IW mechanisms, such as the establishment of a separate IW POM panel.

A crowded field of IW organizations, combined with undefined roles and responsibilities, engenders confusion and frustration. Because USAF leadership has directed the service to operationalize USAF IW before designating IW-specific doctrine, guidance, requirements, and so on, communities across the USAF have begun to organize and mobilize their own grassroots IW efforts. The landscape that has emerged is a patchwork of formal and informal venues for IW analysis, planning, product development, and more. Similarly, the broader IW community beyond the USAF is becoming increasingly crowded with legacy and newly minted service, joint, interagency, and partner and ally organizations devoted to IW. While these developments are positive in some respects, without explicitly circumscribing roles and responsibilities, USAF IW entities (and the other actors in this field) risk duplication of effort, missed messaging opportunities, or, worse yet, fratricide.

Interviewees reported frustration and tensions arising from overlapping portfolios, uncertainties regarding taskings, and deconfliction challenges.[133] These same airmen called for USAF leadership to formalize roles and responsibilities in the IW arena, including by officially designating a service lead for IW, whether Headquarters Air Force A3, Headquarters Air Force A2/6, or ACC, the three current contenders.[134] In the words of one airman whom we interviewed, "Who owns IW? It needs a home."[135] The airman is not alone in this observation; the *United States Air Force Information Warfare Strategy* identifies designating the deputy chief of staff (DCS) for IW as the top priority for Phase 1 of IW operationalization going forward.[136]

Confusion regarding the USAF's role in IW is particularly acute in joint settings, in which the cast of characters is more diverse but roles are equally murky, according to interviewees.[137] Airmen raised concerns over the ways in which USAF IW entities might be expected to plug into joint structures, processes, and operations. This point parallels findings from a series of U.S. Government Accountability Office studies on DoD's progress on its OIE. Specifically, the research recommended "that DOD clearly define roles and responsibilities" in the information environment, including "between geographic combatant commands and U.S. Cyber Command. Such action would enable DOD to more effectively plan and execute operations across boundaries and below the level of

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[131] USAF Official 1, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[132] 16 AF Official 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[133] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021; USAF Personnel 5, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021; 16 AF Personnel 5, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022; 16 AF Official 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022; NASIC IW Working Group, in-person meeting, Wright-Patterson Air Force Base, Ohio, April 19–21, 2022.

[134] USAF Personnel Headquarters Air Force 1, in-person interview with the research team, RAND office, Arlington, Va., April 4, 2022.

[135] 16 AF Official 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[136] DAF, 2022b, p. 6.

[137] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

conflict."[138] We recognize that these kinds of changes are the responsibility of the joint force, not the USAF. However, from a service perspective, whichever entity is designated as the lead for IW could assign roles and responsibilities within the USAF while working with joint counterparts to carve out USAF-specific missions and functions.

Training and Force Development

"All airmen need to think about IW some of the time; some airmen need to think about IW all of the time."[139] Throughout our research, we observed a consistent refrain from airmen in positions across the USAF that all airmen need to know a little about IW. This maxim was not only observed by interviewees; it is also articulated in the CSAF-signed *United States Air Force Operating Concept for Information Warfare*, which explicitly acknowledges that "the USAF recognizes that it needs *all* Airmen to think about information *some of the time (Information Aware Airmen)* and *some* Airmen to think about information *all of the time (Information Professional Airmen)*."[140]

USAF IW professionals underscored that "information is an aspect of everything," and, as a result, "everyone needs training in [IW]."[141] Several reasons, both defensive and offensive, were given. Notably, in an information environment in which malign actors regularly target the military, it is key for every member of the force to have a baseline level of media literacy and inoculation against misinformation. Therefore, USAF IW professionals argued that *all* airmen—from pilots to cooks to mechanics—need to appreciate the types of threats they face in the information environment and understand how to protect themselves, undergird OPSEC, and safeguard USAF data and capabilities. On the offensive side, the *Operating Concept* argues that all airmen need to appreciate the utility of information in warfare.

Specifically, interviewees cited the need for a broad-based and mandatory information awareness course that outlines known misinformation and disinformation threats targeting USAF personnel.[142] Survey respondents echoed this theme; nearly one-third (29 percent) selected "all" when asked which disciplines fall under the IW disciplines.[143] This sentiment is consistent with the *Information Warfare Strategy*, which calls on the USAF to

> grow an information-centered cultural mindset among all Airmen through modifications to professional military education while establishing a formal program to train IW professionals on the synchronization, integration, and convergence of IW capabilities. Second, the USAF will grow its analytical tradecraft through the development of psychosocial and socioculturally aware airmen that focus on the cognitive aspects of decision-making and technical analysis to target human and systems behavior. Third, the USAF will develop resilient USAF personnel and

[138] Kirschbaum, 2021, p. 21.

[139] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[140] DAF, 2022a, p. 7.

[141] 16 AF Official 3, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[142] Quotes from the survey data and multiple interviews, including USAF Communications Enterprise Personnel 1, video call with the authors, March 10, 2022.

[143] See Appendix A.

> service IW forces that can defend against misinformation and disinformation and support integrated deterrence and campaigning objectives.[144]

What are the risks to USAF and joint missions and personnel if the service does not invest in developing information-aware airmen? Recent operational examples may serve as cautionary tales. For instance, U.S. and other North Atlantic Treaty Organization (NATO) forces stationed in Poland and the Baltic states have reportedly been targets of Russian IW efforts. In 2017, U.S. forces reported having contacts erased from their personal smartphones and experiencing breaches of personal communications. In one instance, "a U.S. soldier standing in line for a sports event" in Latvia described being "approached by a person who casually dropped details of the soldier's life, including information about family members."[145] Although potentially innocuous in this setting, such campaigns could be used in a conflict scenario to identify compromising personal or operational information that adversaries could leverage to degrade airmen's will to fight. These efforts could also be used to locate and intercept U.S. forces. Alternatively, if sophisticated enough, such tactics could be used to sow additional confusion amid the fog of war by breaching U.S. systems that are used to convey orders (formally or informally) and issuing false orders. In light of these threats, several countries (including Russia itself) have taken precautionary measures in the form of information awareness trainings and bans on personal devices (though these bans are not always successful, as can be seen in reporting that links Ukrainian successes to leaked data generated by Russian soldiers' personal cell phones).[146]

Fortunately, some communities in the USAF and the joint force are aware of the need to develop information-aware airmen—and the vulnerability that not doing so represents—and are working to address it. The Air Education and Training Command (AETC) is reportedly developing an annual "information awareness basics" course to serve as an analogue to the existing cyber awareness course (called the *Cyber Awareness Challenge*) that all airmen are required to take. The training will reportedly consist of an introduction to the definition of *information*, a section devoted to increasing personnel awareness that airmen are targets of foreign malign actors, and an overview of best practices for vetting information.[147] Related efforts at the joint level are more mature. For instance, the Joint Information Operations Warfare Center (JIOWC) recently produced a computer-based influence awareness training that aims to "inoculate [military personnel] from misinformation and disinformation."[148] Although it is available to the entire joint force, it is not required as of this writing. Nevertheless, this training could inform AETC's analogous efforts, or the USAF could mandate that all airmen take the course.

The *United States Air Force Information Warfare Strategy* and the *United States Air Force Operating Concept for Information Warfare* also represent important steps in this respect. Both set forth guidelines for airmen to increase their information awareness and represent a promise to further

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[144] DAF, 2022b, p. 5.

[145] Thomas Grove, Julian E. Barnes, and Drew Hinshaw, "Russia Targets NATO Soldier Smartphones, Western Officials Say," *Wall Street Journal*, October 4, 2017.

[146] Jeff Schogol, "Russian Troops Are Proving That Cell Phones in War Zones Are a Very Bad Idea," Task & Purpose, May 13, 2022.

[147] NASIC IW Working Group, in-person interview with the research team, Wright-Patterson Air Force Base, Ohio, April 19–21, 2022.

[148] 16 AF Personnel 8, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

define which skills are associated with being an information-aware airman. That said, this development remains short of what some interviewees recommend, which would require information awareness courses tailored to specific career fields. One example mentioned was training tailored to supply personnel that is focused on the ways in which cyberattacks could lead gauges to show incorrect information for fuel readings.[149]

Several interviewees also mentioned that USAF operational planners and general officers outside IW-specific organizations require an awareness of IW and its operational utility, an understanding of the ways in which IW could support USAF missions (and vice versa), and an appreciation for the various IW disciplines and their unique contributions. The reason is that, as the *United States Air Force Operating Concept for Information Warfare* explicitly mandates, "USAF Information Warfare capabilities should not be planned or employed in isolation."[150] It stands to reason that those planners and general officers who are armed with a more nuanced grasp of IW and the advantages it affords in an operational setting may be more inclined to build IW into operations from their inception rather than opting to "laminate" them onto existing plans, in the words of then–Chairman of the Joint Chiefs of Staff Gen Joseph Dunford, Jr.[151] IO professionals, for example, argued that IO needs to be "a part of junior leader training,"[152] and multiple IW professionals whom we interviewed had encountered mid-level leaders who did not understand how to use their skills.[153] In particular, interviewees pushed for training that provides an awareness of integration of IW effects, noting that, even if officer understanding existed, it was often segregated by discipline.[154]

Some USAF IW professionals were hopeful: They believed that as younger generations of officers ascend through the ranks, more will have a working understanding of IW.[155] It is important to note that challenges with senior leader awareness could overlap with other concerns, particularly with respect to prioritization of and resourcing for IW. Some interviewees speculated, for instance, that a lack of senior leader understanding of IW is tied to challenges IW professionals face in garnering support for funding. As one interviewee recounted, during the POM process, they heard, "What is IW? Show me where this fits into the formal requirements and missions."[156] The challenge here, as we detail earlier in the chapter, is that IW is not officially tied to USAF requirements and missions, at least as of this writing.

Airmen in IW disciplines are expected to operate as IW forces despite having received little to no IW-specific training. For airmen in IW disciplines, several stakeholders reported the lack of formal USAF IW professional training or sufficient IW training. Multiple IW professionals at 16 AF

[149] USAF Communications Enterprise Personnel 1, video call with the authors, March 10, 2022.

[150] DAF, 2022a, p. 8.

[151] Joseph F. Dunford, Jr., "From the Chairman: The Pace of Change," *Joint Force Quarterly*, Vol. 84, 1st Quarter 2017.

[152] EUCOM Personnel 4, EUCOM Personnel Roundtable, Patch Barracks, Germany, June 9, 2022.

[153] This was discussed in multiple interviews, including EUCOM Personnel 4, EUCOM Personnel Roundtable, Patch Barracks, Germany, June 9, 2022; USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 7, 2022; and AFSOC Personnel 1, phone call with the authors, August 3, 2022.

[154] Air Force Reserve Command Personnel, video call with the authors, January 1, 2022.

[155] EUCOM Personnel 4, EUCOM Personnel Roundtable, in-person interview with the research team, Patch Barracks, Germany, June 9, 2022.

[156] USAF Personnel 4, video call with the authors, December 9, 2022.

reported that they had received no formal IW training before assuming their IW-focused positions.[157] In lieu of required training, interviewees reported "hav[ing] to do [their] own research," whereas others relied on their own personal experiences.[158] Interviewees characterized the training they did receive as "massively deficient."[159] This lack of training was also mentioned by IW professionals outside 16 AF.[160] Interviewees flagged the lack of cultural awareness training and training on cross-functional area actions or convergence of different forms of IW as particularly acute issues.[161]

The *United States Air Force Information Warfare Strategy* shows the USAF's cognizance of this gap and devotes one of its lines of effort under objective 2 ("Develop the Force") to addressing it. Specifically, it sets forth as a stated objective the "develo[pment of] information professionals who have a broad and nuanced understanding of a competitor and adversary's behavior, organization, force posture, systems and networks, language, regional concerns, culture, history, sense of value, and worldview."[162] Although the official recognition of this gap is significant unto itself, the USAF will need to devote time and resources toward meeting this standard.

As for the status of IW training in this arena, it appears to be in a state of flux. According to interviewees, several formalized and ad hoc efforts exist. Training sometimes exists but is usually specific to a given discipline. In other cases, training falls short of what IW professionals believe is necessary to conduct integrated IW effectively. Stakeholders from 16 AF's A39 noted that they had undertaken an effort to develop a weeklong IW training pilot program to serve as a primer to introduce airmen to IO concepts—notably, MISO, MILDEC, and IW battle damage assessment—and their employment.[163] However, because of resource constraints, 16 AF had to pare down the pilot training to a two-day remote iteration of the program, which ultimately had only 45 to 50 participants.[164]

Thus, although a new, ad hoc curriculum is being developed, many personnel still feel that there are few opportunities to attend such training. As one interviewee mentioned, "I've been sent to one training, so I've been trained for nothing."[165] This same individual said that training dollars for IW have been reduced from the previous year, which raises the question, how important is IW if the only classes that can be taken are online and free?[166]

USAF PA officers also reported struggling with training. During our discussions, PA personnel indicated that only a single nine-week introductory qualification course exists. Although additional

[157] 16 AF Personnel 6, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[158] 16 AF Personnel 7, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022; 16 AF Personnel 8, in-person interview with the research team, Joint Base San Antonio-Lackland, Tex., March 1, 2022.

[159] 16 AF Personnel 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[160] AFSOC Personnel 1, phone call with the authors, August 3, 2022.

[161] 16 AF Personnel 8, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022; USAF Personnel Headquarters Air Force 1, video call with the authors, April 4, 2022. The interviewees also noted, however, that without agreement about what exactly was included in *convergence*, it was impossible to create courses to address it. This was also noted by USAF Public Affairs Personnel 1 and 2, video call with the authors, February 2, 2022.

[162] DAF, 2022b, p. 7.

[163] 16 AF Personnel 8, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[164] 16 AF Personnel 8, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[165] 16 AF Personnel 6, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[166] 16 AF Personnel 6, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

intermediate- and senior-level training is available through a joint schoolhouse, it is not required. Several PA personnel also noted that despite recently receiving support from the Office of the Administrative Assistant to the Secretary of the Air Force (SAF/AA) to POM for funding to develop an intermediate-level course, these efforts to develop the course were ultimately unsuccessful.[167] ISR personnel noted that, although they had both an introductory and an intermediate course, they often did not have sufficient resources for personnel to take the higher-level course.[168]

For their part, 14F personnel do receive training, but interviewees who had attended the course characterized it as preliminary and rudimentary, despite the fact that it had been billed as training to develop deployment-ready 14F personnel. 14F personnel have requested a 200-level intermediate course to serve as a primer in more-practical IW skills. 14F personnel did note that the new iteration of their basic training was markedly better; with the previous training, it would take an entire rotation to achieve a level of readiness appropriate to the deployment.[169]

Throughout the interviews, airmen frequently compared their IW training (or the lack thereof) with Army training, specifically Army PSYOP training. (The Army has several PSYOP and civil affairs [CA] courses that are available through the John F. Kennedy Special Warfare Center and School.) This comparison is unsurprising, as many 14F personnel whom we interviewed had attended the Army PSYOP training. There was a diversity of opinions regarding the utility of this training for airmen. Those who expressed positive opinions about the training noted that the Army "currently owns" PSYOP and that completing this course built useful credibility for 14F personnel with Army PSYOP personnel and the broader joint force, especially in joint positions.[170] However, 14F personnel who went into USAF positions said that the course was largely mismatched with the requirements of their roles.[171]

Other services and organizations may also offer a model for USAF IW coursework. For example, the Navy has introduced an eight-week IW Basic course to build the professionalism and shared knowledge base of its IW force. This course includes a variety of IW disciplines, such as electromagnetic warfare, tactical cryptology, and signals intelligence.[172] After the course, graduates are considered patch-wearing IW officers.[173] The Defense Information School has courses targeted at PA officers but has also started to incorporate IW-related content and exercises into some of its courses. The Marine Corps runs an information wargame twice a year that seeks participation from other services.

In sum, discipline-specific courses are available in some pockets of the USAF IW community, and more training is available at the joint level or from other services; however, the community lacks a

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[167] USAF Public Affairs Personnel 1–2, video call with the authors, February 2, 2022; USAF Public Affairs Personnel 3, in-person interview with the research team, Ramstein Air Force Base, Germany, June 13, 2022.

[168] Air Force Reserve Command Personnel, video call with the authors, January 1, 2022.

[169] AFSOC Personnel 1, video call, August 3, 2022.

[170] SOCEUR Personnel 2, in-person interview with the research team, Patch Barracks, Germany, June 8, 2022.

[171] USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 7, 2022.

[172] U.S. Navy, "Information Warfare: Attacking and Exploiting Communications Networks," information warfare officer job recruiting brochure, 2018.

[173] U.S. Naval Academy, "Special Duty—Information Warfare (DESIG 1810)," information warfare community info sheet, undated.

unifying training curriculum that addresses the convergence aspects of IW. Moreover, the community needs courses that address the cultural and linguistic requirements of IW. That said, the USAF must first characterize its intended IW cultural identity and determine what the USAF's unique contributions to IW will be before it designs and resources a new IW curriculum; otherwise, it risks spending resources on training that might not align well with future conceptions of USAF IW.

All USAF IW organizations recognize the importance of measuring effectiveness but struggle with how to do so in practice. IW organizations in the USAF recognize the significance of measuring the effectiveness of their efforts but struggle with demonstrating that effectiveness, at least in part because of the nature of IW work. Interviewees discussed how challenging it was to communicate the importance of their work with their leadership without having defined measures of effectiveness and resources to assess effectiveness.[174] Stakeholders mentioned the challenge of measuring the effectiveness of IW actions that might take months or years of investment to reap measurable rewards.[175] In addition, stakeholders argued that many of their successes exist at a classification level that is too high to widely circulate them as proof of their effectiveness.[176] Measurement requires baseline assessments, clear objectives, and better metrics of evaluation, much of which simply does not exist for USAF efforts in the information environment. Other joint actors may be able to help bridge this gap; actors in the IW arena are already making resource-intensive efforts to measure changes in the information environment. However, operationalizing efforts to measure effectiveness of IW campaigns would require coordination that is not always in place.[177] The lack of measures of effectiveness feeds into other issues, such as prioritization of IW, because it is difficult to prove the importance of investing further resources in IW without strong evidence of its effectiveness.

The USAF's persistent practice of "white-carding" IW in exercises affects the readiness of USAF IW forces and creates unrealistic expectations about IW utility. Although the employment of IW can produce serious, tangible effects, many IW capabilities are inherently difficult to visualize, simulate, and demonstrate the effects of in a training environment.[178] As a result, all the services have struggled with realistically integrating IW into exercises and wargames.[179] Accordingly, the USAF overwhelmingly white-cards IW in exercises and wargames, according to a majority of the airmen we interviewed, instead of incorporating actual IW injects into gameplay and allowing IW effects to meaningfully affect the operational outcomes. In this setting, *white-carding* refers to the use of physical note cards with pre-scripted scenario developments to simulate IW activities or effects.[180] There are various reasons IW might be white-carded in these settings. First, in USAF exercises and wargames that are not exclusively focused on IW or effects in the information environment, it is unlikely that IW is a training priority for the force. In this respect, white-carding could be a reflection of the

[174] USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 7, 2022.

[175] SOCEUR Personnel 2, in-person interview with the research team, Patch Barracks, Germany, June 8, 2022.

[176] 16 AF Personnel 2, in-person interview with the research team, Hickam Air Force Base, Hawaii, February 28, 2022.

[177] One such example referenced by stakeholders in our discussions is EUCOM's assessment efforts.

[178] Justin Lynch, "Why Note Cards Can't Simulate a Cyberattack," C4ISRNET, January 28, 2019.

[179] For a discussion of some of the challenges of integrating IW in exercises and some solutions recommended in a Marine Corps context, see Christopher Paul, Yuna Huh Wong, and Elizabeth M. Bartels, *Opportunities for Including the Information Environment in U.S. Marine Corps Wargames*, RAND Corporation, RR-2997-USMC, 2020.

[180] Jennifer McArdle, "Gaming to Victory: Synthetic Training for Future Combat," *War on the Rocks*, November 15, 2017.

service's prioritization of pilots and platforms. Second, IW effects can be challenging to build into wargames and exercises; they often run on a different timeline and at a different scale from traditional kinetic activities. For example, these effects could occur at levels that are not usually included in games, such as at the level of public opinion or an individual soldier. This does not mean that games never include IW, but it does mean that it is less common for games to include IW, and IW actions are often included at the margins.

Our research indicates that this approach to training for IW has several deleterious effects. In the absence of tangible experience with IW, airmen outside the IW disciplines reportedly fail to develop an appreciation for its utility or its limitations, or both.[181] As we discuss above, airmen are provided with little IW guidance, doctrine, or operational experience. Therefore, exercises and wargames serve as particularly important opportunities for airmen outside IW disciplines to develop an understanding of (1) how their activities and behaviors affect the information environment, (2) how adversary and third-party IW can influence their missions, and (3) how to leverage IW in service of their objectives and missions. Yet the USAF's reliance on white-carding in these settings stymies such learning experiences. In the words of one airman, "because IW is always white-carded in exercise environments, no one gets to iron out the mechanics of real-world IW, and operators never get the opportunity to understand the full implications of their activities in the [information environment]."[182]

According to several airmen we interviewed, the absence of realistic IW experiences in training environments contributes to two pernicious schools of thought: one that questions the validity of IW as a legitimate instrument of warfare and competition and one that assumes that IW (particularly cyber) should be able to function as a silver bullet that can be used on demand to enhance pilots' missions. Several IW practitioners (often 14Fs) relayed having nearly identical experiences when they were assigned to mid-level non-IW commanders. When the IW airmen were introduced to non-IW commanders, the commanders reportedly told them, "We are pilots, we're going to bomb things; go sit in the corner and shut up." Another reportedly claimed, "IO is made up and I don't believe in it; you'll be in charge of my travel."[183] Interviewees cited unrealistic training for IW as a contributor to these dynamics. One airman noted,

> During exercises, commanders want to get mentions [be acknowledged, or get kudos], so they white-card IW, but this is inherently setting up false expectations for commanders about what IW is capable of. Then, when those same commanders request these capabilities and are told they cannot get them, or that their requests are infeasible, they become frustrated.[184]

In other words, interviewees underscored the need for realistic expectation management for IW. Both the USAF and the joint force seek to "train as they fight." Because commanders cannot do so in training exercises in which IW is white-carded, they cannot build a correct intuition of how effective

[181] USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 8, 2022; GCC Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

[182] USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 8, 2022.

[183] USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 8, 2022; GCC Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

[184] EUCOM Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

IW activities can be, what processes and timelines need to be followed to generate IW effects, and what realistic probabilities of success are for IW missions (or probabilities of approval for IW-related requests). This problem leaves commanders with either an over- or an under-expectation of the ease and performance of IW, neither of which enables effective engagement with IW staff. Worse, high expectations from commanders that are dashed in practice can lead to low confidence in IW and mistrust of IW forces.

Lastly, some of the USAF's wargames and exercises, such as the "AF Future Games" series, serve as mechanisms through which the service can develop and validate requirements. By omitting IW from the training environment entirely or neutering its role through white-carding, the USAF excludes the IW community from another opportunity to contribute to the development of USAF requirements or the validation of existing requirements. Therefore, the practice of white-carding only reinforces the lack of formal requirements guiding IW operationalization.

Personnel and Workforce

IW personnel are highly passionate about the mission such that they devote their own time to its advancement, but they recognize that doing so offers little career progression. This is part of a larger issue related to retention of IW personnel. USAF IW personnel appear to be broadly passionate about the mission such that they reported staying after business hours to work on and train themselves in IW. Even so, these personnel overwhelmingly expressed frustrations about their perceived lack of resourcing prioritization. Worse yet, many said that they chose to pursue careers in IW and related disciplines despite knowing that they might face stunted career progression as a result of this decision.[185] Moreover, several interviewees noted that they are often utilized in ways that go beyond their specific career fields.[186] As stated earlier in the chapter, IW professionals mentioned that personnel in IW disciplines face a glass ceiling beyond which there are few, if any, opportunities to progress. One interviewee related their own experience of leaving active duty and moving to the reserves because there were no career progression options for 14Fs compared with 17Ds (cyber officers).[187]

Beyond concerns about IW not being well represented at the leadership level, retention of IW airmen might be difficult because of job satisfaction and the skills they possess. One airman captured this frustration, asking, "Why would I stay here? There is more job satisfaction and less bureaucracy outside of this."[188] The lack of job satisfaction and the attractiveness of IW airmen's skills to the private sector make retention especially challenging, as the ability to conduct IW requires personnel with skills that are highly attractive to the private sector, including cyber and technology skills, linguistic and cultural skills, and behavioral science skills. In interviews, the USAF was characterized as "bleeding talent," and IW professionals described coworkers drifting away to Google, Amazon, and

[185] EUCOM Personnel 8, in-person interview with the research team, Panzer Kaserne, Germany, June 8, 2022.

[186] See discussion on p. 44 of the prioritization and resourcing of IW; EUCOM Personnel 8, in-person interview with the research team, Patch Barracks, Germany, June 8, 2022; and AFSOC Personnel 1, phone call with the authors, August 3, 2022.

[187] INDOPACOM Personnel 1–6, in-person interviews with the authors, Camp H. M. Smith, Hawaii, June 7, 2022.

[188] EUCOM Personnel 8, in-person interview with the research team, Patch Barracks, Germany, June 8, 2022.

other private-sector actors.[189] That said, these departures, some noted, were not exclusively financially motivated. Rather, several airmen observed that colleagues who chose to separate cited frustrations over feeling overlooked, underappreciated, and underutilized, as well as dissatisfaction with not being able to contribute to the mission, as motivating factors.[190]

14Fs need a home base. Those interviewees who worked with 14F personnel uniformly found them very useful, but there were several suggestions for further improving their utility.[191] Several interviewees suggested that the 14F career field needed a central hub or reachback center beyond the schoolhouse.[192] They argued that this would minimize wasteful use of limited 14F personnel and improve their retention.[193] A home base could also offer more set pathways for requesting support and capabilities, which 14F personnel indicated can be difficult outside of "bro-comms," a colloquialism for communications through their personal networks.[194]

Rotation issues create additional challenges: "You get spun up, then you have to leave." While several of the personnel issues discussed above are unique to the IW workforce, the IW workforce is still vulnerable to broader personnel issues that affect the USAF and the joint force. Short deployments, or even lengthy deployments, which require a broad depth of institutional or expertise-based knowledge to complete successfully, are difficult with the rhythm of the manning cycle. Because of the highly skilled nature of some of the IW subfields and the need for cultural or regional expertise in several IW positions, careers in USAF IW are especially prone to this challenge. Interviewees complained that, especially with gaps in training, personnel would be ready to do their jobs the moment it was time for them to leave their posts.[195]

Joint stakeholders who have interacted with 14Fs in an operational setting are convinced of their utility but were previously unaware of their existence. Interviewees who have interacted with 14Fs conveyed a clear demand signal for 14F personnel. That said, there are few 14Fs, so the number of leadership stakeholders with experience interacting with 14Fs is limited. In one instance, a TSOC commander shared their plan to reclassify existing joint billets that they "owned" to specifically target and try to pull in more 14F personnel.[196] By contrast, joint stakeholders (and even some USAF stakeholders[197]) who have not previously worked with 14F personnel displayed a broad lack of understanding of the skills 14Fs possess, where they are posted, and the mechanisms by which to request one.[198] The USAF needs to familiarize both joint and internal stakeholders with the fact that

[189] EUCOM Personnel 8, in-person interview with the research team, Patch Barracks, Germany, June 8, 2022.

[190] EUCOM Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 8, 2022.

[191] SOCEUR Personnel 1, in-person interview with the research team, Patch Barracks, Germany, June 7, 2022; USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 7, 2022; among others.

[192] AFSOC Personnel 1, phone call with the authors, August 3, 2022.

[193] SOCEUR Personnel 2, in-person interview with the research team, Patch Barracks, Germany, June 7, 2022; 16 AF Personnel 9, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022; AFSOC Personnel 1, phone call with the authors, August 3, 2022.

[194] PACAF Personnel 1–4, in-person interviews with the authors, Hickam Air Force Base, Hawaii, June 8, 2022.

[195] AFSOC Personnel 1, phone call with the authors, August 3, 2022.

[196] SOCEUR Personnel 2, in-person interview with the research team, Patch Barracks, Germany, June 7, 2022.

[197] USAFE Personnel 2, in-person interview with the research team, Ramstein Air Force Base, Germany, June 13, 2022.

[198] EUCOM Personnel 6, in-person interview with the research team, Patch Barracks, Germany, June 9, 2022.

14F personnel are not IO officer equivalents but rather have been to Army PSYOP training and understand operational planning. Ideally, this communication would better convey to joint and USAF stakeholders how the skills of 14F personnel can be maximized.

Equipping and Resourcing

Ambitious IW personnel at 16 AF are undertaking innovative IW campaigns on their own time, using existing personnel and resources, but cannot scale them with existing resourcing. Throughout the interviews, the research team was struck by the dedication and enthusiasm that many of the USAF IW professionals displayed for the IW mission and its promise if invested in and realized as envisioned in guidance documents. All exhibited a deep sense of investment in the operationalization of integrated IW and communicated its centrality to USAF operations. In this sense, we observed an interesting dynamic among working-level USAF IW personnel, so to speak: the simultaneous existence of excitement for the possibility afforded by IW and frustration with the service's continued reticence to invest in it.

Motivated by their eagerness to be involved in operationalizing USAF IW on the one hand and their recognition that USAF IW personnel need to demonstrate the utility of IW in order to advocate for resources on the other, these airmen have devised innovative IW campaigns that are intended to serve as proofs of concept for IW.[199]

This latter objective—that is, demonstrating the utility of IW by way of successful campaigns—requires training, authorities, and resources. Yet the USAF has thus far not invested in these exigencies for IW. Without further investment, USAF IW campaigns have largely been devised and executed using current resources, within the bounds of existing authorities, and often on airmen's own time, according to USAF IW practitioners. One airman at 16 AF noted that "resourcing is a *major* issue. The IW 'wins' that 16 AF has achieved to date are on the backs of airmen." In other words, these operations were not deliberately resourced as IW efforts but rather were "taken out of hide"; that is, they used existing personnel and resources.[200]

Following Russia's 2022 invasion of Ukraine and DoD's recognition that nonkinetic instruments, including IW, are the only military tools that the United States has chosen to exercise in the war, appetite for IW has grown considerably.[201] 16 AF has attempted to seize this opportunity to position itself as a partner for GCC- and TSOC-led IW missions, which has led to successful partnership in at least two cases we heard of.[202] However, 16 AF does not possess the capacity to scale these types of IW efforts within its current organizational structure, budgetary mechanisms, and mandates, according to 16 AF senior leadership.[203] Although 16 AF is a substantial organization with relatively deep pockets, its personnel and funds are organized to conduct discipline-specific missions rather than

[199] Specifics on these campaigns are available in classified documentation. That said, the details of the campaigns do not affect the broader phenomenon described in the finding above.

[200] 16 AF Personnel 2, in-person interview with the research team, Hickam Air Force Base, Hawaii, February 28, 2022.

[201] 16 AF Official 8, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[202] SOCEUR Personnel 1, in-person interview with the research team, Patch Barracks, Germany, May 25, 2022; SOCEUR Personnel 3, in-person interview with the research team, Patch Barracks, Germany, May 27, 2022.

[203] 16 AF Official 1, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

integrated IW. Likewise, our survey results revealed that some airmen outside 16 AF also recognize the need for greater IW resourcing. When asked how the USAF might better prioritize the operationalization of IW, respondents ranked the need for greater resource allocation second, behind policy and guidance.

Lastly, the practice of airmen training and planning for IW on their own time has important implications for personnel retention. According to some interviewees, USAF IW professionals' passion for IW and willingness to devote their own time to the cause cannot be relied on in perpetuity.[204] Several interviewees described feeling demoralized or witnessing widespread demoralization among the ranks of USAF IW practitioners, which could be contributing to the field's retention issues.[205]

Authorities and Permissions

Perceptions on authorities as constraints are mixed, whereas nearly all personnel cited risk aversion and tightly held permissions as core challenges to IW execution. Broadly speaking, interviewee responses were mixed on the question of whether their organizations possessed sufficient authorities to conduct IW campaigns. That said, nearly all USAF, other service, and joint IW professionals whom we interviewed bemoaned the difficulties they experienced gaining permission to execute IW.[206] Citing escalation risks, commanders in the European theater have generally been risk averse and slow to grant permissions for IW, according to interviewees, particularly in the context of recent events in Ukraine. Although personnel acknowledged the escalation risks involved, they underscored the importance of experimentation, particularly with new capabilities. Proclivities to deny permission or to require approvals at the senior-most levels, including the commander of EUCOM and the National Security Council, may be tied to this report's finding that airmen struggle to demonstrate IW effectiveness and, in turn, senior leaders struggle to see the utility and benefits of IW and are therefore unwilling to take on risk.

DoD's paradigmatic shift from counterterrorism to near-peer competition has implications for USAF IW and for those airmen who came of age in the Global War on Terror (GWOT) era. Several of the interviewees with whom we spoke at GCCs observed frictions between commander and operator expectations about IW authorities and permissions and between institutional and geopolitical realities. The United States' decades-long role in the GWOT has reportedly shaped commander and operator perceptions regarding the scope within which they can operate and the ease of obtaining authorities and permissions for IW campaigns. Those IW personnel who came of age in the GWOT era were reportedly endowed with a broad mandate within which to operate given that their efforts were part of declared military operations and areas of active hostilities. This is not the case in the EUCOM and INDOPACOM theaters today, where escalation risks involving nuclear rivals are much higher. Two interviewees from different organizations in EUCOM described this trend with uncanny similarity. As one of these EUCOM interviewees noted,

[204] EUCOM Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

[205] USAF Personnel 3, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

[206] EUCOM Personnel 6, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

> [The] cultural shift from GWOT has been a rude awakening for operators who are used to having a ton of latitude against [violent extremist organizations]. This will be a difficult shift from a combat environment to a heavily diplomatic environment.[207]

The other noted,

> A lot of the commanders and operators have only had operational experience in GWOT. This means they are used to having all the authorities necessary and having a lot of latitude. Now they are feeling muzzled when [stationed] at a competition-heavy theater with high political risks. This is creating issues in EUCOM.[208]

Other interviewees highlighted two related but distinct challenges for IW forces who came of age in the era in which counterterrorism efforts were DoD's principal focus. First, because of technological barriers, IW forces typically relied on leaflet drops instead of social media–based campaigns to disseminate messages in Afghanistan, Iraq, and Syria, according to some interviewees. However, since arriving at EUCOM, these personnel have had to pivot their tactics, techniques, and procedures and campaign planning.[209]

Second, in discussions with USAF ISR professionals, these airmen asserted that the paradigmatic shift from counterterrorism to competition has had important implications for ISR processes and the service's expectations for intelligence. In Afghanistan, they noted, the information environment was largely uncontested. In practice, this meant that the USAF collected more raw intelligence data than it had the resources to analyze, which engendered the perception that "a lot of data was left on the cutting room floor," so to speak.[210] Now that DoD has shifted its focus to the EUCOM and INDOPACOM theaters, both of which are highly contested information environments with sophisticated actors, raw intelligence data are harder to come by. Yet operators and commanders reportedly continue to operate under the assumption that the intelligence community still has access to a vast pool of untapped raw intelligence that could be probed.

Leadership and Institutional Culture

The USAF IW community is not led by a single, senior leader focused exclusively on IW who is endowed with the requisite authority to advocate for resources. JP 1, *Doctrine for the Armed Forces of the United States*, opens its chapter devoted to joint command organizations with a quote by General Dwight D. Eisenhower that reads, "success rests in the vision, the leadership, the skill and the judgment of the professionals making up command and staff groups . . . ."[211] For its part, USAF doctrine states that "leadership is fundamental to the US Air Force," as "leaders are inextricably linked to mission effectiveness."[212] Both quotes are germane to the USAF IW community, which lacks a

[207] EUCOM Personnel 5, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

[208] EUCOM Personnel 8, in-person, interview with the research team Patch Barracks, Germany, June 10, 2022.

[209] EUCOM Personnel 6, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022.

[210] USAF ISR Personnel 2, in-person interview with the research team, Fort Meade, Md., May 4, 2022.

[211] JP 1, *Doctrine for the Armed Forces of the United States*, Joint Chiefs of Staff, March 25, 2013, change 1, July 12, 2017, p. IV-1.

[212] USAF, *Air Force Doctrine*, Vol. II: *Leadership*, 2015, p. 45.

strong, central advocate for IW. The commander of 16 AF (now Lt Gen Kevin Kennedy; formerly General Haugh) appears to be the closest that USAF IW has to a clear advocate. It is unsurprising that this role is seen as the primary figure in USAF IW. General Haugh was mentioned in more than 20 of the interviews we conducted and appears to have had a lasting influence on definitions,[213] but his current role at CYBERCOM means that there is an even clearer gap for a leader who is focused solely on IW. Interviewees characterized General Haugh as both being key to the IW enterprise as a whole and having an outsized influence in shaping the direction of USAF IW because of his recent roles. He has already been influential at both an organizational level (through his leadership of 16 AF) and a lexical level (through his role in elevating the importance of the concept of convergence). That said, as we explained in Chapter 2, the commander of 16 AF is required to don six hats simultaneously, balancing and prioritizing these various roles.[214]

Because a significant portion of 16 AF's funding is provided by CYBERCOM, the focus of the commander's staff is, understandably, on 16 AF's Joint Force Headquarters–Cyber role.[215] Having a singular advocate endowed with the requisite authority and cachet whose primary loyalty is to the USAF IW enterprise would send important signals. It would highlight IW as having an important supporter and champion who is in the position to jockey for IW resources, and it would allow IW to be handled more strategically and holistically. Without a designated administrative or operational leader and advocate, the widespread perception that USAF senior leadership does not prioritize IW will persist. Therefore, although designating a DCS for IW is a large hurdle, doing so is critical to establishing IW as a priority, and it is good that the new strategy has designated this as the first step of Phase 1 (2022–2025).[216]

Other actors in the joint force have also recognized the need for an IW leader. In 2017, the Marine Corps established a deputy commandant for information,[217] a role first occupied by Lt Gen Daniel O'Donohue, who was succeeded by Lt Gen Loretta Reynolds and then Maj Gen. Matthew Glavy.[218] In this role, General Reynolds said she thought that at least part of her role was "to get organized to think about this stuff holistically" and how doing so could add significant value.[219] The Navy has both a commander of naval information forces (Vice Admiral Kelly Aeschbach) and a deputy chief of naval operations for information warfare and director of naval intelligence (Vice Admiral Jeffrey Trussler). Admiral Aeschbach has addressed several of the issues faced by USAF IW, including the need for practical drills on IW and, again, the need to build a more holistic and unified strategy for IW.[220]

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[213] General Haugh was discussed or mentioned in interviews with personnel from 16 AF, Headquarters Air Force, USAFE, NASIC, ISR, ACC, and Air Force Reserve Command, among others.

[214] Timothy D. Haugh, "Air Force Cyber Mission Force Readiness Statement of Lieutenant General Timothy D. Haugh," testimony before the Subcommittee on Cyber Security, Committee on Armed Services, U.S. Senate, April 5, 2022, p. 2.

[215] 16 AF Personnel 3, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[216] DAF, 2022b, p. 6.

[217] Mark Pomerleau, "Why the Marine Corps Needed a New Deputy Commandant," C4ISRNET, December 5, 2017d.

[218] Mark Pomerleau, "Marine Corps Names New Top Information Officer," C4ISRNET, June 11, 2021c.

[219] Mark Pomerleau, "5 Questions with the Marine Corps' Deputy Commandant for Information," C4ISRNET, April 3, 2020.

[220] Megan Eckstein, "Navy Doesn't Want to Keep Guessing Whether Its Information Warfare Systems Work," *Defense News*, February 18, 2022.

USAF cultural identity and norms affect the operationalization of IW. Historically, USAF cultural identity has typically been characterized as heavily pilot- and platform-centric—an observation that is unsurprising but has several important practical implications for IW. The prominence of pilots in USAF culture has been described by interviewees and in the literature as sometimes coming at the expense of other career fields. A 2020 RAND report describing service identities and norms and the USAF's approach to grooming senior leadership states that the USAF has long prioritized platforms and pilots over other career fields and areas of investment:

> Bombers reigned supreme at the service's inception, but they were soon surpassed by fighter pilots, who remain the most prominent personnel and symbols of the Air Force today. This pilot-centric culture aligns with the Air Force's organizational mission. It is the fighter pilots being at the center of the service, as reflected in the composition of today's Air Force [general officer] pool, that is notable. Indeed, the service has never had a nonpilot chief of staff. However, the Air Force has cyber, space, nuclear, and other mission areas that are not always directly connected to its primary—and storied—flying missions. Within the Air Force, this diversity of missions prevents the service from espousing one unified culture. Even so, the dominance of pilots throughout the service's senior leadership positions is culturally defining across the service's mission areas.[221]

In practice, the prioritization of pilots and platforms means that "pilots are frequently tapped to fill positions whose duties many other non-pilots could theoretically perform."[222] However, the converse trend—non-pilots being chosen over pilots to fill positions—rarely transpires.[223] According to an interviewee quoted in a 2019 RAND report, "There is a school of thought in the Air Force that pilots are in the best position to run the service because their situational awareness and multitasking skills translate to leadership, but it's not clear if they do."[224] This division between pilots and non-pilots is so well known that the external stakeholders whom we interviewed commented on it, noting how it may have influenced the service's approach and lack of respect for USAF IW professionals.[225] This perceived lack of respect is reflected in other findings explored in this chapter: low resourcing, low prioritization, and lack of representation of IW personnel at higher levels of leadership.

Likewise, our interviews reflected another cultural trend that the literature on the subject has identified: the USAF's overwhelming veneration of platforms, particularly aircraft. One interviewee referred to this trend as "boys and their toys."[226] As the content analysis revealed, those mid-career and senior leaders who do think about IW view IW capabilities—perhaps with the exception of CO and, to a lesser extent, ISR—as serving an auxiliary role. Only recently has IW become an increasingly visible area for some USAF communities. This focus on platforms leaves many IW professionals, who

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[221] Kimberly Jackson, Katherine L. Kidder, Sean Mann, William H. Waggy II, Natasha Lander, and S. Rebecca Zimmerman, *Raising the Flag: Implications of U.S. Military Approaches to General and Flag Officer Development*, RAND Corporation, RR-4347-OSD, 2020, p. 117.

[222] Jackson et al., 2020, p. 117.

[223] Jackson et al., 2020.

[224] Lander, 2019, p. 83.

[225] Navy Expert 4, phone interview with the research team, May 5, 2022.

[226] USAF Personnel Headquarters Air Force 1, phone interview with the research team, April 4, 2022.

are not identified with particular aircraft platforms, feeling excluded, including from such processes as POM funding cycles. This exclusion feeds into the siloing in IW and gaps between IW and the broader force. In addition, the centrality of platforms further privileges kinetics over nonkinetics. Interviewees commented on platforms being easier than IW to understand, plan for, and budget for, which likely reinforces the existent culture built around platforms.[227] IW professionals recognize that "iron is warfare," but they want their superiors to recognize that warfare also has informational aspects.[228]

USAF IW is dominated by the cyber mission. One of the core themes that emerged from our research is that USAF IW is overwhelmingly identified with cyber, often to the detriment of the other pillars of USAF IW.[229] This perception is held by airmen and other service personnel. In the eyes of IW professionals at 16 AF, the preponderance of staff time, funding, and senior leader focus is devoted to cyber. One airman characterized the breakdown among the USAF IW pillars as "90-percent cyber and intelligence in support of cyber, 3-percent ISR, 2-percent IO, and the [remaining] 5 percent is everything else."[230] This was borne out in interviews with 16 AF "customers" at GCCs and TSOCs, who overwhelmingly linked both 16 AF and USAF IW more broadly with cyber capabilities exclusively.[231] Some interviewees were unaware that 16 AF possessed other capabilities. This trend was echoed in the other research streams the team undertook, including the content analysis.[232]

Figure 3.5 shows survey respondents' answers to the question, "What USAF disciplines fall under information warfare (IW)?" As shown in the figure, survey respondents most heavily associated IW with cyber; 45 percent of all respondents indicated that cyber was a USAF IW discipline, and several respondents indicated *only* cyber. The combination of the focus on cyber during interviews with joint force customer organizations, the content analysis findings, and the survey findings points to USAF IW being widely associated with cyber or even perceived as synonymous with cyber in the eyes of some interview or survey respondents.

[227] USAF Personnel Headquarters Air Force 1, phone interview with the research team, April 4, 2022.

[228] USAF Personnel Headquarters Air Force 4, video call with the authors, April 14, 2022.

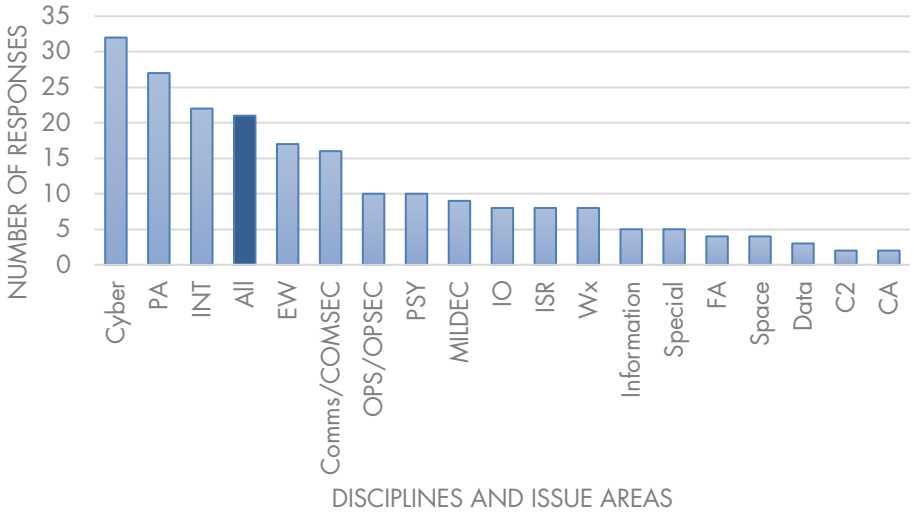
[229] Air Force ISR Personnel 2, in-person interview with the research team, Fort Meade, Md., May 4, 2022.

[230] 16 AF Personnel 11, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 2, 2022.

[231] By *customers* we mean the personnel at GCCs and TSOCs who have the authority to task 16 AF personnel. E.g., EUCOM Personnel 6, in-person interview with the research team, Patch Barracks, Germany, June 10, 2022; EUCOM Personnel 9, in-person interview with the research team, June 10, 2022; NASIC Working Group, interview with the research team, Wright-Patterson Air Force Base, April 16–22, 2022; and AF Personnel 5, in-person interview with the research team, Langley Air Force Base, December 9, 2021.

[232] See Appendix C for further information.

Figure 3.5. Responses to "What USAF Disciplines Fall Under Information Warfare (IW)?"



NOTE: COMSEC = communications security; comms = communications; FA = foreign area; INT = intelligence; OPS = operations, PSY = psychological operations; Wx = weather. Number of respondents for this question = 72. (Respondents were allowed to choose multiple disciplines.) "All" indicates that respondents felt that all of the USAF disciplines fell under IW. Disciplines that were mentioned by only one respondent are not included in the figure.

There are several reasons USAF IW may be so closely linked to the USAF's cyber mission. First, 16 AF is still predominantly cyber focused, making it easier for 16 AF to understand, resource, and conduct cyber actions.[233] Cyber authorities and permissions are comparatively well established, and 16 AF's strong relationship with CYBERCOM makes cyber activities comparatively less costly.[234] Therefore, both resource limitations and path entrenchment may contribute to this focus on cyber.

IW personnel observed significant biases against IW by USAF and other service commanders. In addition to describing the distinction made between pilots and nonpilots, several IW professionals shared their perception that IW is not a respected field in the USAF. This perception does not appear to be limited to the USAF; some of the Army IW personnel we interviewed reported observing similar institutional biases. One Army IW officer recalled that the when they decided to pursue a "functional field" (such as IW disciplines) over the Army's "bread and butter" (vocations strictly tied to conventional ground combat), they recognized that this decision meant that they would never be promoted to general officer.[235] Even at lower echelons, interviewees pointed to the practice of having Green Berets lead CA and PSYOP units as an indicator of institutional bias. They were told that if they were motivated, they would have gone into a field with more career progression.[236]

[233] See discussion above about 16 AF's relationship with CO (in the section about establishing a formal leader of IW in the USAF, starting on p. 48).

[234] This point was noted especially by customer stakeholders in the GCCs and TSOCs, including in EUCOM Personnel Roundtable 1, in-person meeting, Panzer Kaserne, Germany, June 10, 2022.

[235] EUCOM Personnel 8, in-person interview with the research team, Panzer Kaserne, Germany, June 10, 2022.

[236] EUCOM Personnel 8 (stakeholder A), in-person interview with the research team, Panzer Kaserne, Germany, June 10, 2022.

In the USAF IW community, several interviewees relayed stories of being sidelined by commanders who treated IW as useless.[237] While leaders who had interacted with successful IW officers (14Fs) saw the value of IW to their teams, many leaders lacked understanding of how IW could benefit them in their pursuits. Such views are likely reinforced by insufficient investment in IW. IW professionals reported struggling to prove their effectiveness because they did not have the resources to do so.[238] For instance, one Army IW officer explained the dynamics of this pernicious cycle as follows: "We bleed good talent; the bad talent sticks around, which disincentivizes maneuver guys to employ us. So, [the remaining] soldiers are dissatisfied, leave, and then we suck even more."[239] Similarly, a USAF IW professional described being told that if they were motivated, they would have gone into a field with more career progression, a discouraging attitude to face for those who are passionate about their profession.[240] Overall, these biases that personnel face in their interactions with their superiors have likely fed into many of the other issues discussed in this chapter, including demoralization, retention problems, and barriers to adequately resourcing IW.

Processes, Procedures, and Joint Integration

Terminological and doctrinal incongruities create unnecessary friction in implementation, especially in working with joint customers. As mentioned previously, the USAF's decision to adopt the term *information warfare* means that the service's chosen term of art will not align with those adopted by the Army and the Marine Corps or with the lexicon that joint doctrine is expected to adopt. As articulated by an airman in a joint IW position at EUCOM, "No one at EUCOM or SOCEUR uses the term *IW*. Those that do mean *irregular warfare*."[241] In the absence of a formal joint lexicon, we observed interviewees using the terms *information operations*, *operations in the information environment*, *PSYOP*, and *PSYWAR*, among others.

In discussions, airmen and other service personnel serving in joint positions spoke about the practical implications of these lexical incongruities. Several interviewees reported spending months learning joint IW "speak" and translating USAF IW lexicon into a language that their colleagues understood. One 14F whom we interviewed illustrated this tension by relaying a personal anecdote. The term *IO* has a broader conception in the USAF—where it includes OPSEC, MISO, and MILDEC—than it does in the Army. USAF 14Fs (IO officers) are trained in each of these disciplines. For the Army, *IO* represents a narrower integration staff function.[242] As a result, it took some time after the 14F introduced themselves as an IO officer to gain credibility with their joint colleagues as an operational IW expert.[243]

[237] EUCOM Personnel Roundtable 1, in-person meeting, Ramstein Air Force Base, Germany, June 7, 2022.

[238] EUCOM Personnel Roundtable 1, in-person meeting, Ramstein Air Force Base, Germany, June 7, 2022.

[239] EUCOM Personnel 8, in-person interview with the research team, Panzer Kaserne, Germany, June 10, 2022.

[240] EUCOM Personnel 8 (stakeholder B), in-person interview with the research team, Panzer Kaserne, Germany, June 8, 2022.

[241] EUCOM Personnel 8, in-person interview with the research team, Panzer Kaserne, Germany, June 10, 2022.

[242] Paul, 2019.

[243] SOCEUR Personnel 3, in-person interview with the research team, Patch Barracks, Germany, June 7, 2022.

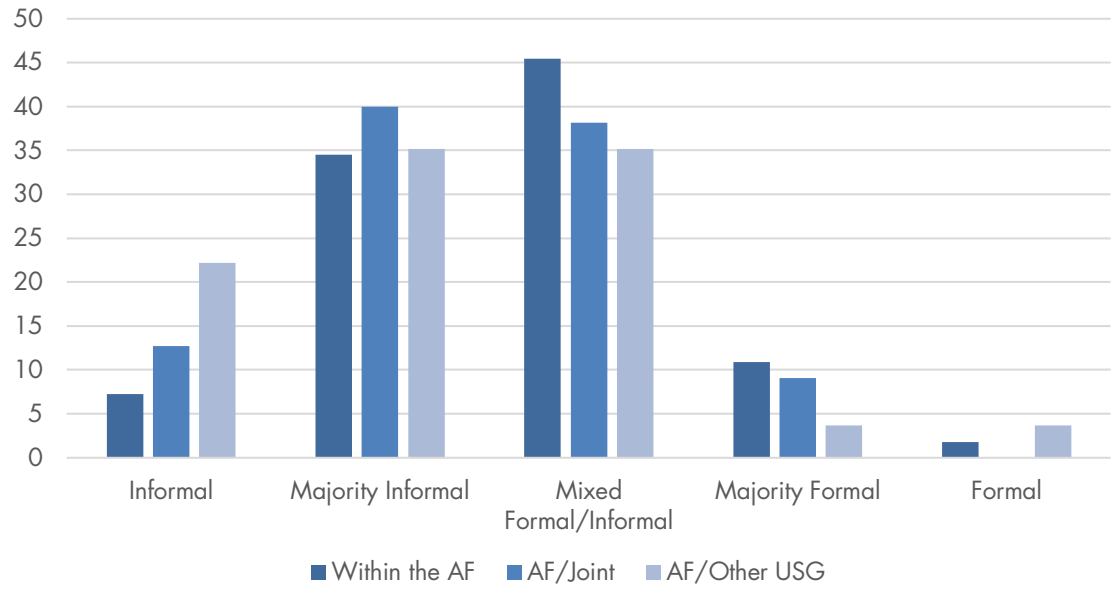
Ultimately, these terminological frictions are one small, albeit significant, hurdle that airmen will need to overcome if the USAF is to realize its aims of operationalizing IW and positioning its IW forces as indispensable to joint customers, such as GCCs and TSOCs.

Few formal processes exist for IW in the USAF, resulting in intraservice, interservice, and USAF-joint frictions. According to most of the interviewees, whether from the USAF IW community, other services, or the joint force, few formalized processes and procedures exist to govern everything from coordination and deconfliction to planning, execution, and budgeting. This absence of formalized processes includes the relationship between 16 AF and ACC. In the words of one interviewee at ACC, "There is nothing formal, no charter governing the relationship between ACC and 16 AF. A couple of working groups exist, an IW exercise planning [integrated planning team], but otherwise, it's all from bottom up."[244] The one exception that interviewees raised consisted of the processes and procedures governing the relationship between 16 AF and CYBERCOM; the interviewees described these processes and procedures as robust and effective. That said, these processes pertained strictly to CO rather than to integrated IW. In the absence of formal processes, motivated IW personnel and their counterparts in the joint force have established their own informal procedures in the form of working group discussions, cultivation of personal relationships, exchanges of favors, and informal communications. It should be noted that several interviewees at organizations outside 16 AF reported that once an initial relationship between 16 AF and the organization had been established, it was relatively easy to cultivate and maintain.

As is evident from the data presented in Figure 3.6, survey responses reinforce the dynamics reported by interviewees. When asked how *formal* (defined as the presence of established lines of communication, meetings, points of contact, or established relevant organizations) IW coordination is within the USAF, between the USAF and the joint force, and between the joint force and the interagency, the majority of respondents selected "informal," "majority informal," and "mixed formal/informal."

[244] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

Figure 3.6. Responses to "How Formal Is Coordination?"



NOTE: AF = Air Force; USG = U.S. government. Number of respondents for this question = 59.

Conclusion

The USAF has laid out a bold vision for IW, notably in its recently published guidance documents. This chapter notes many of the challenges that stand in the way of successful operationalization of that vision. Broadly speaking, these can be organized into the following overarching themes.

Lexical, Cultural, and Other Ambiguities Surrounding Information Warfare

Although *IW* now has a formal definition and the USAF has published strategic-level guidance, ambiguity about the term and the concept it embodies persists. Further complicating matters, IW professionals are navigating their role in the service's operationalization of USAF IW without clear requirements, amid confusion over authorities and permissions, murky roles and responsibilities, and an unclear conception of the unique contributions of the USAF to joint missions (its IW identity).

In the absence of concrete requirements, the training and assessments of IW efforts—which should be tailored to requirements—are being created in a more ad hoc way or neglected entirely. In many cases, airmen are taking on the task of contributing to the operationalization of IW without having received formal IW-specific training. The sporadic and often unrealistic inclusion of IW in training and exercises can leave commanders and staff with misperceptions about the ease and effectiveness of IW. Additionally, without the establishment of standardized processes, efforts to measure the effectiveness of IW activities either do not occur or occur in a less systematic and reliable way.

Perceived (and Real) Lack of Prioritization

One challenge related to the widely held perception among USAF IW personnel that the USAF is not investing in IW is its impact on several areas of IW operationalization. Whether or not it reflects reality, this perception engenders demoralization among the USAF IW ranks, according to many interviewees. This perception is reinforced when USAF IW personnel encounter limits to their career progression and challenges related to gaps in IW-specific funding.

Integration and Organizational Challenges

Interviewees reported experiencing stovepiped processes, fragmentation between disciplines and missions, fractured authorities and permissions, and other structural issues. These include challenges integrating across disciplines and organizations in the USAF and in the joint force.

Fortunately, each of these challenges also presents an opportunity. In Chapter 4, we describe two possible structures for the future organization and presentation of USAF IW forces that speak directly to several of the challenges we have presented in this chapter. Chapter 5 presents a broad slate of recommendations informed by the findings of this research for the USAF.

Chapter 4

New Structures for Presenting U.S. Air Force Information Warfare Forces

Our research indicates that 16 AF's current organization and force presentation structure may be contributing to several of the challenges identified and discussed in Chapter 3, such as the fractionation of IW disciplines and related issues with integration across them. Also, as currently structured, 16 AF is not organizationally aligned to address USAF and GCC requirements for IW forces. We therefore decided to include an analysis of alternative constructs that the USAF could use to reorganize its IW forces. While the full set of constructs we explored and our methods for doing so are discussed in detail in Appendix D, this chapter lays out the constructs that address the largest number of existing challenges within existing resourcing and institutional realities. We explore two sets of proposed changes, the first within the air staff at different echelons and the second a restructured organization within 16 AF. To be effective, both organizational changes will require additional investments in training and equipping. Moreover, associated doctrinal, policy, and cultural challenges will need to be overcome to bolster the utility of these proposed changes. We describe the implications and additional requirements after introducing each organizational change.

Designating Responsibility for Information Warfare to the Air Staff

To realize the vision laid out in the USAF's IW guidance and policy documents, the USAF will need to adapt a command staff structure to incorporate information into all aspects of air operations. Our research revealed that the command staff structure is currently predicated on the concept that the IW-associated disciplines serve a predominantly supporting function. As a result, the existing structures diffuse planning and execution responsibilities across multiple air staff directorates. This means that a unifying lead for information and a clear champion for the implementation of IW—which are critical to operationalization, as we discuss in Chapter 3—do not exist in this structure. We considered several alternative constructs with an eye toward addressing this challenge. In particular, the command staff structure should ensure that information is perceived as an equal to traditional warfighting functions (i.e., C2, fires, maneuver, protection, sustainment, and intelligence).

We considered several factors when determining which staff position would be the most effective to lead the operational implementation of IW. Even though each of the air staff directors has equal influence on the commander's decision process in concept, the operations directorate (A3) tends to have more influence in practice and is likely the best postured to integrate information into air operations. On most staffs, the A3 has the most influence on how C2, fires, maneuver, protection, sustainment, intelligence, and information support meeting the commander's objectives. Furthermore, it is likely that the A3 will be best positioned to align the command staff structure with developments

in joint and other service doctrine regarding OIE. Because putting the A3 in charge of IW would add an additional responsibility to an already heavily burdened A3 staff, we concluded that the best spot on a command staff to integrate information and ensure a convergence of effects is the deputy of the operations directorate (deputy A3).

The recommendation to designate the deputy A3 as the point person responsible for IW would not require a realignment of staff billets and air staff directorate functions. Under this structure, the intelligence directorate (A2) would still be the lead for intelligence and report to the commander. The communications directorate (A6) would still be responsible for communications, DoD information network operations, and cyberspace security. And the IO division (A39), when it exists, would still be responsible for the integration of information-related capabilities. Other IW-related billets, such as those devoted to PA positions, would also remain unchanged. The main thrust of this new responsibility would be to formally designate the deputy A3 as responsible for ensuring that the commander is informed about how the information environment could affect operations, and vice versa. The role will also help translate commander's guidance and intent into specific operations to achieve convergence of effects in the information environment.

Another benefit of designating the deputy A3 as the lead for IW is to provide a career path for the relatively nascent 14F career field. If this position can be filled by a 14F-designated officer, it will provide command opportunities, as well as additional operational experience, at several echelons: select squadrons, wings, NAFs, and major commands. The 14F-designated deputy A3 will have the expertise to ensure that information is part of all operations, will understand how to leverage the IW aspects of the other directorates, and can utilize 16 AF for support and reachback capabilities.

Designating the deputy A3 as the lead for IW is an important step on the road to implementing IW. Having this billet filled by the 14F community provides career progression to what has been described by stakeholders as a much-needed career field. However, success also relies on the ability to conduct IW from the strategic level to the operational level to the tactical level. Having designated air staff billets with significant commander's decision influence from the operational level to the tactical level enables the strategic elements at the combatant commands to leverage the USAF operational and tactical units to shape the information environment to meet national information strategies.

To organize, train, and equip personnel for this role, 14Fs would have to possess a baseline understanding of all IW-related disciplines but would also need to have a working knowledge of air operations. Their role will be to inform the commander not only how to achieve operational and tactical objectives but also how the methods of achieving those objectives have an impact on the greater information environment and align to strategic and national objectives and narratives.

Operationalizing this construct will require the USAF, with significant input from the IW community, to prioritize understanding and assessing how air operations affect the information environment. It will require the joint community, specifically the combatant commands, to prioritize and develop requirements in the information environment.

Creating a command structure that enables the prioritization of IW and the seamless integration of information activities is crucial to the success of the USAF in future conflicts with adversaries that are adept at leveraging the information environment for their own needs. From a USAF-centric perspective, the service needs to protect air operations from attempts by adversaries to manipulate the information environment to their own advantage, as described in previous chapters. Offensively, the

USAF should take advantage of every capability at its disposal to improve operational effectiveness and efficiency. Leaving IW to other services would mean that USAF priorities and needs might not be met and would negatively affect the USAF's ability to deliver global airpower effects to the joint force commander during competition and conflict, as explained in recent USAF guidance.[245] By designating the deputy A3 as the lead for IW, the USAF would demonstrate the importance of IW, as well as the USAF's willingness to dedicate resources to IW, which would have important ramifications for the morale of the USAF IW workforce. Instituting this framework would also establish an IW lead role that is postured to have situational awareness of and can influence all command activities.

As with any major change, there are risks and challenges associated with designating the deputy A3 as the lead for IW. The first big risk is that operations directorates are busy and usually require the deputy to be very involved in all required tasks across the directorate. A reframing of the deputy's responsibilities to include IW will likely detract from, or at least require the reprioritization of, current responsibilities. The staff will need to rebalance staffing functions to ensure that the inclusion of IW is additive and does not hinder capacity. The second big risk is that the 14F community will likely not be as informed (as other officers hailing from more-traditional combat roles) on the staffing functions and execution of air operations. The person who fills the role of deputy A3 will need an expert understanding of not only IW but also the Air Force's core air combat missions (e.g., suppression of enemy air defenses, defensive counter-air, offensive counter-air) and enabling missions (e.g., logistics, C2, protection).

Establishing a Dedicated Information Warfare Unit in Sixteenth Air Force

We now turn to new force presentation structures that would better meet combatant commander requirements. The wing is the main force presentation structure used by the USAF. A typical USAF wing is commanded by an O-6 (a colonel); has between 500 and 1,000 personnel; has all staff sections (A1, A2, A3, and so on); and includes multiple squadrons, detachments, and/or flights. Multiple wings fall under a NAF. We explore two related structures that could be assigned to 16 AF and sourced from existing 16 AF units. These structures are intended to provide tailored support to USAF service component commands in service of GCC requirements and to implement the *United States Air Force Operating Concept for Information Warfare*, providing people, capabilities, and the ability to integrate with external organizations.[246]

Both of the proposed structures that we present below are predicated on redesigns of an existing organization within 16 AF: the 616 OC. At its inception in March 2020, the 616 OC was conceived of as an organization tasked with conducting "daily intelligence-gathering, offensive and defensive missions in the air, on cyber networks, and across the electromagnetic spectrum."[247] Within it, an IW cell would be responsible for "pull[ing] together the assets needed as the 'integration point' for a particular response," which could include "'naming and shaming' an entity for bad behavior through

[245] DAF, 2022b.

[246] DAF, 2022a.

[247] Rachel S. Cohen, "Air Force Builds Up Information Warfare Ops," *Air Force Magazine*, March 2, 2020.

public affairs, supplying a combatant commander with helpful intelligence data, or reacting in the cyber and electronic spheres."[248]

In practice, however, our research indicates that, as of this writing, the 616 OC functions almost exclusively as a cyber operations center.[249] Its operations include offensive and defensive cyber operations, as well as network operations.[250] These include monitoring and maintaining the Air Force Information Network. In a presentation to ACC Commander General Kelly in 2021, one of the 616 OC's chiefs characterized the organization's mission as overseeing two functions: cyber and ISR.[251] The chief said of the 616 OC, "Just as there are Air Operations Centers focused on air operations, we are the Operations Centers that focus on cyber operations."[252] As is the case with other constituent parts of 16 AF, the 616 OC is responsible for satisfying CYBERCOM taskings—a reality that could contribute to the organization's predominantly cyber focus.

Our interviews substantiated this observation. According to one interviewee responsible for leading a team within the center, 60 to 70 percent of the center's workload is focused on very near-term cyber issues (i.e., a one-week outlook), 20 to 30 percent is focused on mid-term issues (i.e., a week to several-month outlook), and whatever time remains is focused on longer-term operational planning and execution.[253] Additionally, we found that the organization's staffing speaks to its overwhelmingly cyber focus. For instance, at the time of our interviews in March 2022, there were no 14F positions (or 14F personnel working) in the 616 OC.[254]

As it currently stands, the 616 OC does not appear to realize the vision of IW as articulated in the *United States Air Force Information Warfare Strategy*—that is, the "integrati[on] and layering [of] information capabilities to consistently and persistently target the adversary's human and system behavior and decision-making."[255] Therefore, both of the proposed structures outlined below were designed with an eye toward narrowing the gap between where the 616 OC currently stands and the conception of IW presented by higher-level guidance.

Variation 1: Information Warfare Wing with Forward-Deployed and Reachback Squadrons

Description

The first structure we consider would establish a new IW Wing under 16 AF and rebrand the 616 OC. Both of the proposed organizations would be created from billets harvested from existing 16

[248] Cohen, 2020.

[249] 16 AF Personnel 11, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022; 16 AF Personnel 9, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[250] Sharon Singleton, "616th Operations Center Demonstrates Cyber Capabilities to ACC Leaders," Joint Base San Antonio News, March 9, 2021.

[251] Singleton, 2021.

[252] Singleton, 2021.

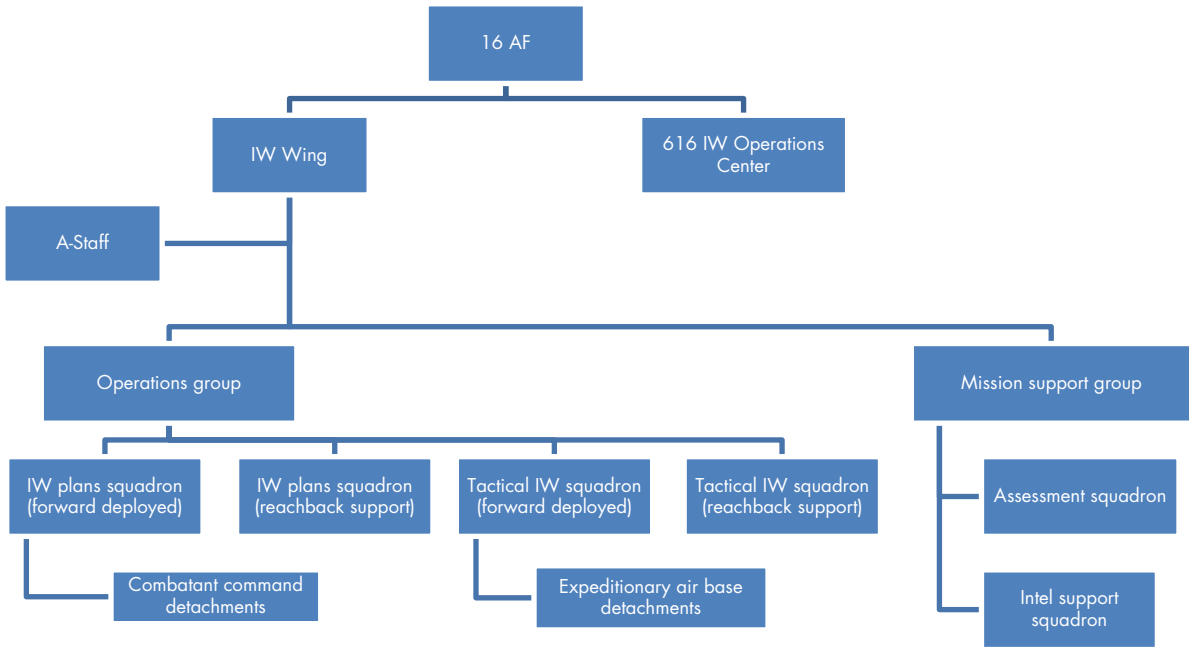
[253] 16 AF Personnel 11, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[254] 16 AF Personnel 11, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022.

[255] DAF, 2022b, p. 11.

AF squadrons and staff. The IW Wing would have a full command staff (A1, A2, A3, A4, A6, etc.), an IW operations group, and an IW mission support group. The operations group would have four squadrons to carry out IW activities, divided into two types. Akin to how the Army organizes its IW forces, one type of squadron would be deployed forward and the other would provide reachback support from a home station. Within each type (forward-deployed and reachback), there would be a planning squadron and a tactically focused squadron. The intent would be to have one unit deployed or actively providing support to forward-stationed units while the other squadron acts as reachback support. Supporting detachments for both the planner and tactical IW squadrons would be regionally aligned to provide support to USAF service component commands and expeditionary air bases. Figure 4.1 depicts this structure.

Figure 4.1. Information Warfare Wing with Forward-Deployed and Reachback Squadrons



The IW Wing A-Staff, IW Operations Center, operations group, and mission support group would all be colocated and would not be deployable through a UTC. The wing and group commanders and their staff would be responsible for the "care and feeding" of their assigned forces, ensuring that they are appropriately trained and equipped. To provide forces to combatant commanders and the air components, deployable UTCs would be filled through the planner and tactical IW detachments and the assessment and intelligence squadrons. Elements that are not deployed forward would report through the IW Wing. IW planner teams that are deployed forward would fall under the USAF service component command and could report to the A39 or through the air operations center, depending on the structure to which they are assigned. The tactical IW teams that deploy would be focused on conducting IW activities and would need to be attached to an air expeditionary task force as part of the Air Force Forces within a joint task force (JTF).

Implications, Requirements, and Advantages

This structure borrows heavily from the forward/home-station force rotation used by the Army's 1st IO Command and provides many of the same benefits in terms of on-the-job training. More-junior personnel would initially be assigned to the tactical IW detachments so that they could learn how to bring together multiple IW capabilities to achieve effects in the information environment. Once personnel had deployed several times with one of the tactical IW detachments, they would be more experienced and senior in rank. This would typically happen at the O-3 or O-4 level. These personnel could then transfer to one of the planning detachments, where they would work with USAF service component commands to help plan IW campaigns and synchronize USAF IW effects with the joint force. Training for these personnel would typically take place in the planning and tactical IW squadrons. The intent would be to have one detachment deployed while another detachment is going through training for its upcoming deployment. During this training period, the detachment would act as operational reachback support for the deployed team. Through this reachback support, the forward team could receive dedicated support while also helping keep the next team abreast of mission requirements and processes. Detachments that are in the home-station period of the cycle could attend USAF and other service courses that are applicable for their job, such as those described in Chapter 3.

Specialized equipment for IW personnel could be assigned to the various squadrons in the operations group. Most "equipment" would be special software packages that provide analytic, targeting, and intelligence functions. Additional software that focuses on the ability to conduct analysis of publicly available information might be needed. This type of software can help with collecting, sorting, and making sense of large amounts of data and can help display trends and show connections between online and real-world actors. Such capabilities are a critical part of OPSEC, counterintelligence, and force protection and would be of particular use to the detachments supporting expeditionary air bases.

As discussed in Chapters 2 and 3, the *United States Air Force Operating Concept for Information Warfare* and the *United States Air Force Information Warfare Strategy* serve as important first steps that describe the USAF's trajectory for IW at a strategic level. However, they are not doctrine and do not provide the specific direction needed to implement the structure described above. The Marine Corps has published Marine Corps Doctrinal Publication 8, *Information*, which paves the way for the use of information in support of Marine Corps operations.[256] The Army, for its part, published Army Doctrine Publication 3-13, *Information*, in late 2023.[257] USAF doctrine can and should build on these other doctrinal publications to flesh out the IW Wing organizational structure.

Implementing this structure will require a cultural change from the USAF at large, as well as within 16 AF. With 16 AF predominantly focused on ISR activities and cyber operations because of its legacy from the missions of the 24th and 25th Air Forces, IW missions and requirements are difficult for the existing 16 AF wings to understand and resource. As long as cyber operations and ISR activities remain the top day-to-day priorities, the creation of a dedicated IW wing will require a

[256] Marine Corps Doctrinal Publication 8, *Information*, Headquarters U.S. Marine Corps, Department of the Navy, June 21, 2022.

[257] Army Doctrine Publication 3-13, *Information*, Department of the Army, November 2023.

widening of the operational aperture for most personnel within 16 AF. Concurrently, the larger USAF, which tends to prioritize platforms and pilots for conflict, will also have to adapt to IW occasionally becoming the main effort in competition instead of focusing on sortie generation and the delivery of lethal effects onto targets.

This structure affords multiple advantages that address some of the challenges highlighted in Chapter 3. The IW Wing would provide a dedicated "home" for 14Fs and offer them a place to grow throughout their careers. As the USAF continues to train more 14Fs, those personnel will need an organization where they can collectively train, share lessons learned, and gain experience. This wing could also serve a similar purpose for other IW-related AFSCs. By having multiple squadrons of planners and of tactically focused personnel, an IW officer could spend the bulk of their career in this wing or deployed forward from this wing. When deployed, teams and detachments would have dedicated reachback support from the IW Wing. This would allow personnel who have just returned from a deployment to stay on top of operational changes and requirements, while also helping keep them focused on their specific regional issues. While deployed, teams could leverage multiple IW AFSCs to achieve mission objectives. The true strength of these teams would be the diverse skill sets (and accompanying authorities) that these AFSCs could contribute.

Another benefit of this structure is its balance between "doers" and "planners" of IW. Junior officers and enlisted personnel assigned to the tactical wing would focus on learning their jobs and understanding how their jobs integrate with other AFSCs. For example, a junior 14F could provide target audience analysis and then synchronize that analysis with PA personnel at USAFE or EUCOM to create targeted messaging packages. They could also work with associated air operations centers to plan specific shows of force for deterrence or assurance purposes. These effects could then be amplified with social media messaging or PA news releases. Supporting these types of operations would give valuable insight into how these types of operations are conducted—expertise and knowledge that cannot be gained without doing it. The planning element would consist of more-senior officers (captains and majors) and enlisted personnel who had completed one or two deployments on a tactical team. These planners would be suited to help shape more-complicated operations that leverage other joint force capabilities. Integration of capability areas across both types of squadrons would also help integrate AFSCs that have been habitually stovepiped and that have traditionally not worked closely.

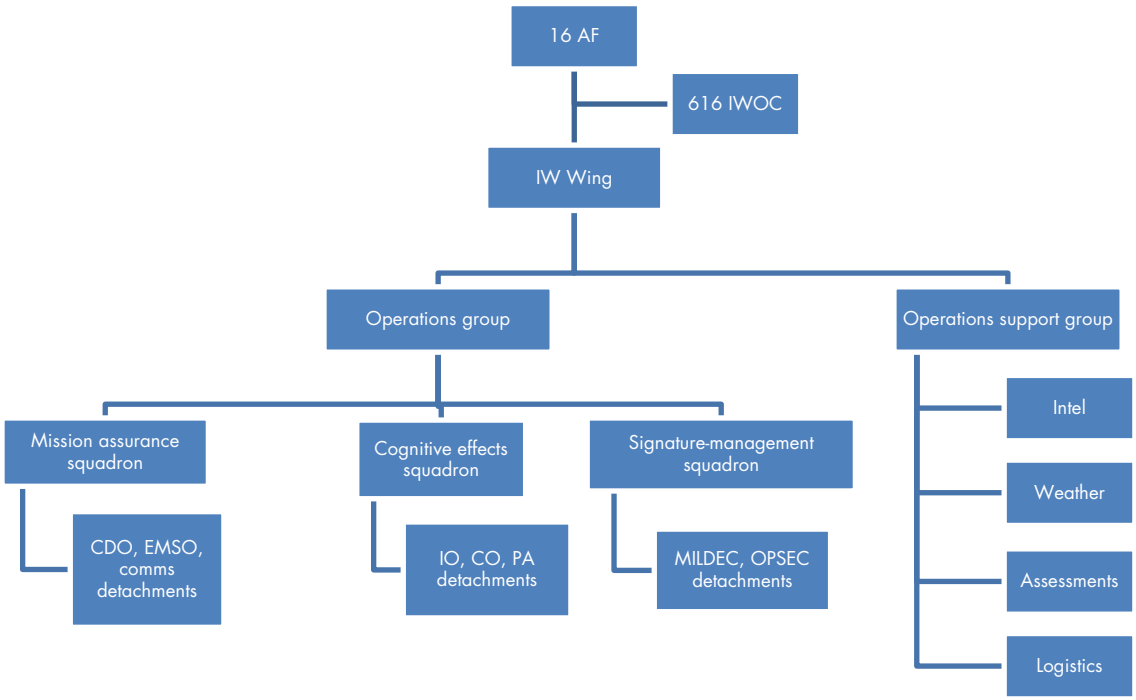
Finally, an IW Wing would give the USAF an organization like the Marine Corps Information Operations Center, marine expeditionary force (MEF) information group, or 1st IO Command. That is, it would be an operational command that would train together to achieve effects greater than the sum of their individual parts, serve as a home for IW capability areas, and help build the USAF IW knowledge base.

Variation 2: Geographically Aligned Information Warfare Wing with Mission-Focused Squadrons

Description

Like the IW Wing described above, the second organizational structure we explored modifies the existing 616 OC to turn it into an IW Operations Center. This structure proposes at least one geographically aligned IW Wing. The intent is to have an initial prototype IW Wing aligned to USAFE and EUCOM, and a second wing could be aligned to PACAF and INDOPACOM. Others could be stood up as needed. Each wing would be physically located in its respective theater of operation but would still be administratively controlled by 16 AF for organize, train, and equip requirements. Within each wing would be an operations group and an operations support group, similar to how most USAF fighter wings are structured. The main difference would be in the operations group, which would have squadrons organized around IW *missions* or *effects*, such as mission assurance, cognitive effects, and signature management. Aligned under each of these squadrons could be multiple detachments, which could be used to fulfill unique mission-specific UTCs based on GCC and USAF service component command requirements. The operations support group would have multiple squadrons as well, each supporting the IW missions conducted by the squadrons in the operations group in different areas: intelligence, weather, assessments, and logistics. Figure 4.2 depicts this structure.

Figure 4.2. Information Warfare Wing with Mission-Focused Squadrons



NOTE: CDO = Chief Data Officer; IWOC = IW Operations Center.

Administratively, the wing would still fall under 16 AF. That way, 16 AF would manage the careers of assigned personnel, serve as an organizational "home," help solidify training, build IW-focused teams, and change USAF culture, all while building an esprit de corps in the USAF IW community. The close connection to other IW-focused capabilities within 16 AF would also help build more-repetitive processes and strengthen networks that are currently ad hoc. UTCs would then be built from the squadrons and detachments to fulfill USAF service component command requirements. When deployed, these UTCs would be tactical control to an air component command, air operations center, air expeditionary task force, or other forward-deployed wing or squadron.

In the cognitive domain, having a deep understanding of adversary cultures is a prerequisite for effective influence campaigns. To assist in this effort, dedicated intelligence and assessment squadrons in the operations support group could help make sense of the information environment and understand the impact of a given campaign. Making sense of the information environment and measuring effects in it require time, complex logic models, and deep linguistic and cultural expertise. Detachments in each squadron could help contribute to this understanding and would help build a deeper bench for "bespoke" or "niche" capability areas. This would include having dedicated weather and logistics squadrons with personnel who understand IW missions and requirements.

Implications, Requirements, and Advantages

Many of the implications and requirements applicable to the first construct would also be applicable with this alternative structure. The wing would require billets, funding, training, and equipment, most of which could be harvested from existing 16 AF wings. One of the main differences under this construct, compared with the first construct, is a larger diversification of the seniority of the officers. Each of the squadrons in the operations group would require both junior officers (O1–O3) and more-senior graded officers (O4–O5). Deployable UTCs would pull airmen from a squadron or a combination of squadrons, depending on the mission and the required capabilities. These mission-tailored UTCs could be created from across a diverse set of capability areas. As with the previous construct, functional area managers would need to accurately reflect these new converged IW capabilities in appropriately sized UTCs in DCAPES and JOPES so that joint operational planners know what to request. Unlike the previous construct, however, this option does not provide a single element or unit within the wing that could be responsible for IW planning.

Because this construct specifically addresses the need for a signature-management squadron, we note that the USAF would need updated doctrine and policy for MILDEC and OPSEC. At a minimum, this squadron would be responsible for employing decoys and helping manage signatures for forward operational bases. Such operations might require working with personnel and systems for other services. As an example, consider how Navy EW specialists were assigned to Army formations throughout Iraq and Afghanistan to provide dedicated EW support. In much the same way, other USAF-specific capabilities could be leveraged for joint missions.

This structure has several benefits, including the ability to provide various forms of robust support and multiple ways to experiment with new capabilities. To help fulfill GCC requirements, dedicated support would be regionally aligned but adaptable to mission needs. This structure can also consolidate training for the many disparate IW capability areas. In time, consolidated training would

address the challenge that multiple capability areas and ASFCs either are in stovepiped wings or are specialties without a true home.

The ability to experiment and test out new formations and forces is also built into this construct. 16 AF could dedicate the resources for whatever geographic area is deemed to be the priority effort. It could then experiment with the prototype IW Wing and identify what works before it commits to standing up other regionally aligned wings. In the same vein, the squadrons and individual detachments could also be tested and adapted to see how capability areas can be integrated.

Potential Challenges

Both force presentation structures have similar challenges. Creating a new IW Wing in 16 AF, even if it does not require new resources but is harvested from existing ones, would be a significant effort for any NAF. One of the most pressing challenges may be finding the requisite resources to operationalize this structural change. Operationalizing either structure as envisioned would likely require between 500 and 1,000 personnel. Billets to create the new wing would have to come from other units within 16 AF. Most of these billets would come from billets currently classified as positions devoted to single IW disciplines (e.g., cyber or ISR). These would be reclassified as IW billets in the new wing. The organizations from which these billets are harvested will then need to rely on the new wing to fulfill the tasks that their former personnel performed. This will create challenges during the transition period, as organizations losing billets adapt to maintaining missions with fewer personnel and as the larger organization adapts to shifting the demand for IW capabilities from many different organizations to the new centralized wing. However, once the transition is complete, the demand for IW capabilities will be more efficiently met by the new wing, and the units that sourced the billets will be better able to focus on the non-IW mission set.

Personnel assigned to the IW Wing would require additional IW training, some of which does not currently exist. New AETC courses would need to be created. The personnel initially assigned to the wing could help create training for subsequent personnel—a train-the-trainer model. Without predeveloped doctrine and tactics, techniques, and procedures, this could be quite difficult for the initial members of the wing.

Lastly, related to the findings highlighted in the previous chapter, the lack of a cohesive understanding of IW—in both the USAF and the joint community—will present a challenge for the effective employment of an IW Wing. Without that understanding, demonstrating what an IW Wing could do for USAF service component commands and GCCs will likely be a large hurdle to overcome.

Conclusion

This chapter outlines two different constructs that 16 AF could consider adopting to better position itself to conduct IW and to present IW forces to combatant commanders. Table 4.1 summarizes the relevant attributes of each construct. The two wing constructs offer slightly different advantages, but both streamline the presentation of IW forces and make it easier for combatant commanders and air components to ask for and receive IW capabilities where they are needed in support of objectives. The proposed air staff construct is not an alternative to creating an IW Wing;

rather, it is intended to help with the challenge of promoting and integrating IW into operations throughout the entire USAF. By designating the deputy A3 at multiple echelons *and* by establishing an IW Wing within 16 AF, the USAF will be better positioned to "fly, fight, and win" in the information environment.

Table 4.1. Attributes of Each Information Warfare Construct

		Wing Construct	
Attribute	**Air Staff Construct**	**Variation 1**	**Variation 2**
Tactical element		X	
Planning element	X	X	
Cognitive effects			X
Operational reachback support	X	X	X
Intelligence support			X
Home station and career progression	X	X	X
Direct C2		X	X

Chapter 5

Recommendations and Concluding Observations

This concluding chapter is devoted to an in-depth discussion of the proposed steps the USAF could take to address the challenges and opportunities enumerated in Chapters 2 and 3 of this report. In developing these recommendations, the research team aimed to provide actionable measures that, in its estimation, could advance the operationalization of USAF IW, thereby bringing it closer to the objectives laid out in IW guidance documents. This is not to say that the adoption of these measures will be uncomplicated. Rather, as discussed throughout the report, USAF IW is being operationalized within the bounds of existing institutional dynamics, cultural norms, budgetary pressures, and other constraints. Therefore, the research team aimed to consider these dynamics when developing its recommendations.

The chapter presents the recommendations according to the broader category that they fall under: doctrine, guidance, policy, and lexicon; organization and force presentation; training and force development; personnel and workforce; equipping and resourcing; authorities and permissions; leadership and institutional culture; and processes, procedures, and joint integration. We close the chapter and the report with a summation of the recommendations; the likely offices of primary responsibility (OPRs) and offices of corollary responsibility (OCRs) tied to each recommendation; and the expected level of political, bureaucratic, or institutional resistance the implementor of each recommendation could face.

Before delving in, we should note that although each of the following recommendations is significant in its own right, a comprehensive approach to IW operationalization may be more successful in yielding the USAF's desired outcome of "holistically integrated information warfare capabilities" than would a continuation of the current fragmentary course.[258] Part and parcel to a comprehensive approach is a coherent identity for USAF IW that is concrete and comprehensible.

Organizational identity, particularly in a military context, is critical to a community's success. A 2021 study examining the development of the USSF's service culture underscores the centrality of organizational identity, noting,

> A strong identity forms the foundation of an effective organization. . . . Furthermore, identity facilitates members' comprehension of organizational behavior which in turn affects their choices, directly impacting organizational outcomes. In the context of military organizations, identity motivates commitment, clarifies roles and missions,

[258] DAF, 2022a, p. 5.

> defines areas of responsibility, and articulates required resources. It delineates and differentiates organizational boundaries, directly impacting esprit de corps.[259]

Yet, as we note in Chapter 3, our research indicates that the USAF IW community currently lacks a unifying identity—a fundamental challenge that is inexorably linked to many of the obstacles we have identified that impede IW operationalization. USAF IW professionals are unclear about leader expectations for USAF IW, about the service's and their own roles and responsibilities in the broader IW arena, and about their career trajectories and prospects for future assignments in IW.

Before the USAF can be successful in operationalizing IW, it needs to consider, then clearly communicate, what IW means for the USAF. Service leadership will first need to resolve foundational yet difficult questions, such as the following:

- What are the USAF's unique contributions to IW, and how will those affect the USAF IW "brand identity"?
- Will the USAF IW community focus its efforts on the more technical aspects of IW, its cognitive aspects, or both?
- Should the USAF IW community focus on the psychological effects of airpower specifically, as some interviewees suggested, or serve the joint force in a broader capacity?
- How can IW serve the USAF's existing core missions, and how can the USAF's core capabilities serve IW?
- Is the service prepared to adopt IW as a core competency and devote the requisite resources to its operationalization if doing so translates to (relatively) smaller investments in traditional USAF priorities, such as aircraft?

These types of discussions need to take place among *all* senior USAF leadership, not only those with explicit IW equities, given that the adoption of IW as a service priority will require buy-in and investments across the service. Corona conferences could serve as a potential venue for these discussions.

Doctrine, Guidance, Policy, and Lexicon

Publish actionable guidance and ensure that IW is included in USAF processes that lead to the development of concrete requirements. Provided that USAF leadership chooses to prioritize IW and takes steps to define USAF IW's identity, the service will need to communicate its expectations for the USAF IW community through the publication of actionable guidance. The service has recently taken a significant step forward by publishing its *Information Warfare Strategy* and the *Operating Concept*. Yet little appears to have been done to familiarize either the USAF IW community or the broader USAF with this guidance. What is more, neither document specifies roles and responsibilities for the lines of effort outlined; lays out a detailed roadmap between the present reality and the documents' desired end states; or enumerates the types of cultural, personnel-related, or funding implications of pursuing the lines of effort outlined. Moreover, guidance designed with an eye toward addressing terminological and doctrinal incongruities within the USAF and between

[259] Faustman, 2021, p. 2.

airmen and their joint counterparts is crucial to lessen friction in the adoption of USAF IW, especially when working with joint customers.

Relatedly, all interviewed USAF IW personnel cited the absence of formal requirements as a core impediment to the successful operationalization of IW. To address this gap, USAF leadership should take steps to incorporate IW into all established USAF processes designed to generate requirements. From a joint perspective, USAF leadership needs to actively solicit inputs from existing and prospective joint customers of USAF IW and work with them to establish formal processes by which requirements can be amended and added. Once these requirements have been specified, ACC, in coordination with Headquarters Air Force, needs to clearly communicate them in a structured fashion. To avoid redundancies and resource misuse due to dependencies and cascading effects, it is critical that responsibilities are formalized before the USAF adopts other recommendations put forth in this chapter. For instance, requirements should be specified before resources are applied toward the development of IW-specific training to ensure that airmen are being trained in ways that meet USAF and joint needs.

Expend political capital and service leader time to demonstrate the prioritization of IW and to familiarize the USAF and the joint force with IW. As we discuss in Chapter 3, another core issue underpinning the service's operationalization of IW is the perceptions of USAF IW (and its prioritization) among all airmen, among USAF IW professionals specifically, and among joint force partners. If key USAF leaders choose to support IW operationalization, they will need to deliberately demonstrate their endorsement in ways that are meaningful in the eyes of the USAF and the joint force. For instance, the CSAF could devote time to familiarizing USAF communities with the *Information Warfare Strategy* and the *Operating Concept* or consider pushing for the adoption of IW as an official core mission. It is important to note, however, that from the perspective of USAF IW personnel whom we interviewed, public demonstrations of support like these are critical but insufficient in the absence of dedicated funding. USAF leadership could also partner with 16 AF to identify IW success stories and build a messaging campaign that highlights these wins in a way that demonstrates IW utility. This campaign should frame these successes in a way that clearly explains how IW can be used to enhance other USAF missions and capabilities.

Organization and Force Presentation

Restructure IW force presentation with an eye toward addressing identified procedural, cultural, and structural challenges. Several of the challenges raised by this research can be, at least in part, attributed to the way in which the USAF currently organizes and presents its IW forces. As it stands, the distance—in terms of physical location, chain of command, and mutual understanding—between USAF IW personnel and their customers is significant. Within the USAF, institutional barriers that exist along organizational and disciplinary lines stymie the type of convergence and collaboration required for truly integrated IW. This logic would suggest, then, that by reorganizing IW forces with an eye toward addressing these procedural, structural, and cultural changes, the USAF would be better positioned to realize its stated objective of "optimizing convergence" of IW effects.[260]

[260] DAF, 2022b, p. 3.

Informed by the findings of the research, the team designed two IW constructs and considered their organize, train, and equip implications, which are described in detail in Chapter 4. The first is focused at the Headquarters Air Force staff level and recommends that the deputy A3 be the lead in IW operationalization to help improve the unification of IW planning and execution across the staff directorates. The second is focused on 16 AF and has two possible models. We recommend that the USAF consider reshaping its IW force structure using the existing billets "owned" by 16 AF, whether the USAF chooses to adopt one of the two models outlined above or design a wholly new organizational scheme. The forward-positioned unit that we describe is intended to serve as a pilot program to test the concept before it is applied throughout 16 AF.

Clearly delineate and formalize the roles and responsibilities of all USAF IW organizations. Several personnel in the USAF IW community highlighted a lack of clear and formal guidance on the roles and responsibilities of the service's various IW organizations creating friction and deconfliction challenges within the service. To address this challenge, the USAF needs to develop a coherent policy that provides guidance to USAF IW personnel on how to properly coordinate IW planning and execution. As noted above, this includes developing and promoting guidance that specifies the roles and leadership responsibilities for each USAF IW organization, including designating and providing the appropriate authorities for those that are responsible for managing the convergence of IW capabilities. The USAF's new *Information Warfare Strategy* takes a step in this direction by identifying new key leadership positions, such as the DCS. It stands to reason that the expectation is that the future DCS will enumerate roles and responsibilities for USAF IW organizations.[261] In addition to identifying these positions, the USAF must identify IW leaders at various levels within the service who are endowed with the proper authorities to direct this policy and ensure proper coordination and deconfliction both within the USAF and with the joint force. The recent *United States Air Force Operating Concept for Information Warfare* highlights all IW disciplines and the critical role they play in executing USAF IW.[262] To supplement this, the USAF needs to provide clear direction on the ways in which IW can contribute to USAF objectives and the roles that USAF IW organizations can play in supporting these objectives.

Training and Force Development

Develop curricula based on IW-specific requirements and cultural identity, with tiers tailored to required IW proficiency (i.e., all airmen versus IW professionals). Several of the USAF IW personnel whom we interviewed argued that their community, and the USAF writ large, needs additional IW training. Broadly speaking, this training can be classified into three major types: (1) basic courses to improve media literacy and to combat disinformation for all airmen, (2) specialized introductory training tailored to IW planners and USAF leadership (with a focus on integration), and (3) specialized intermediate training for IW airmen (especially PA and 14F personnel). Importantly, participants of the subgroup at the 2022 IW Working Group hosted by NASIC who were tasked

[261] DAF, 2022b, p. 6.

[262] DAF, 2022a, pp. 3–4.

with brainstorming the types of training required for IW came to these same conclusions.[263] What is more, these very categories echo the *Information Warfare Strategy*'s goals of "grow[ing] an information-centered cultural mindset among all Airmen," "develop[ing] resilient USAF personnel and service IW forces that can defend against misinformation and disinformation," and "train[ing] IW professionals on the synchronization, integration, and convergence of IW capabilities."[264] If the USAF is committed to these objectives, it will need to make good on the *Information Warfare Strategy*'s proposed approach to training development.

First, as discussed in Chapter 3, basic courses to improve media literacy and to combat disinformation were cited as very important. We had discussions with stakeholders who had already seen worrying impacts of false or misleading information inside the force and on the perceptions of airmen.[265] Hopefully, the AETC course discussed in Chapter 3 will bridge this gap and help inoculate all airmen against misinformation and disinformation. However, the Cyber Awareness Challenge is only part of a larger effort to protect cybersecurity that includes the Air Force's publication of articles highlighting advanced spear-phishing techniques and internal penetration attempts. It seems likely that the USAF will need to develop further pragmatic tests of the inoculation of its airmen to misinformation.

We turn now to the question of a more specialized curriculum for IW planners and leadership to provide these personnel with a baseline understanding of the IW disciplines, their convergence, and the integration of IW capabilities into USAF and joint operational planning and execution. This curriculum will need to include information on the forces responsible for each IW discipline, the means by which to access them and their associated capabilities, and how to integrate these with other kinetic and nonkinetic USAF capabilities and missions. What is more, those responsible for designing a USAF IW-specific curriculum will need to consider the following questions:

- What constitutes an IW airman, and what level of knowledge does an IW airman require for their discipline and for the successful integration of IW effects?[266]
- What do the joint force and the USAF require of USAF IW forces? Specifically, what unique or important contributions to IW does the USAF wish to specialize in, if any?

If the USAF chooses to invest in baseline training for IW planners and leadership, the training would also benefit from the inclusion of a module devoted to the other services' approaches to IW, the lexicon that the other services use, and the incongruities in approaches. Several stakeholders noted friction in terminological and doctrinal incongruities between the services; this terminological and doctrinal incongruity causes unnecessary friction in implementation, especially when working with joint customers.[267]

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[263] Members of the research team attended the 2022 Information Warfare Working Group and observed the various subgroups in their sessions devoted to brainstorming IW training, policy, etc.

[264] DAF, 2022b, p. 5.

[265] USAF Communications Enterprise Personnel 1, phone interview with the research team, March 10, 2022.

[266] The DAF has made an important step in working to define what constitutes an *IW airman* with its definition in its *Operating Concept* (DAF, 2022a, p. 7), but this definition is still scoped very broadly and does not appear to be ready for use as a narrowing mechanism.

[267] For example, 16 AF Personnel 9 and 11, in-person interviews with the authors, Joint Base San Antonio–Lackland, Tex., March 1, 2022; AFSOC Personnel 1, phone call with the authors, August 3, 2022.

Second, personnel in both the PA and 14F communities expressed a need for an intermediate course to build on their initial training. They felt that the initial training was helpful but insufficient to ensure their ability to perform their jobs. The issue with building an intermediate course is not scoping down to what the USAF needs from IW broadly but rather is linked to the lack of resourcing for IW in the USAF.

Leverage others' lessons learned to develop a framework to measure the effectiveness of USAF IW. Many stakeholders in the USAF IW community recognize the importance of measuring the effectiveness of IW efforts, but the military as a whole is currently struggling to do so. Attempts have been hampered by the lack of baseline assessments; minimal resources, including personnel time to conduct evaluations; and the existence of few formal objectives or requirements to measure effectiveness against. And this is to say nothing of the inherent challenges involved with isolating the effectiveness of any single messaging campaign amid a sea of extraneous variables.

To address the thorny issue of measuring effectiveness, the USAF must either devote additional resources toward developing an assessment framework or contract this work out. The former avenue would require considerable resources but could result in a framework (and, by extension, assessments) wholly tailored to USAF needs. This option would require the USAF to first conduct baseline assessments of the information environment and USAF target audiences and would require the USAF to set formal objectives.[268] From this, the USAF would need to develop an assessment framework that IW personnel could apply to their operations, as is common practice with many other disciplines across the military. Whatever framework the USAF ultimately designs will need to be built around existing constraints, such as some entities' (e.g., the 16 AF A39's) legal limitations on monitoring social media, which will represent a challenge when much of the existing sentiment monitoring is conducted via social media.[269]

That said, because the USAF is not the first in the joint force—or in the U.S. government, for that matter—to struggle with this issue, the service could leverage existing practices from partner organizations whose approaches are more developed. For instance, EUCOM's Assessments Team, which is responsible for measuring the effectiveness of the GCC's IW efforts, has invested extensively in developing this type of framework.[270] Leveraging existing practices could reap important cost savings.

Build realistic IW capabilities and missions into USAF-wide exercises and wargames, and allow participants to struggle, even if doing so results in "mission failure." When it comes to training its forces, the USAF has historically ascribed to the adage "train as you fight." In practice, this has meant that the service goes to great lengths to provide its forces, particularly its pilots, with training environments that are designed to serve as facsimiles of the genuine article. Unfortunately, the practice of creating realistic training environments has not yet transpired for the USAF IW community, whose members expressed frustration over IW being either "sprinkled onto" exercises as an afterthought or white-carded and glossed over. This approach has had important implications for USAF IW personnel, operators, and commanders. Without opportunities to train in realistic settings,

[268] This is another area that would require the USAF to consider what it desires from its IW disciplines.

[269] USAFE Personnel 2, in-person interview with the research team, Ramstein Air Force Base, Germany, June 8, 2022.

[270] EUCOM Personnel 2, in-person interview with the research team, Patch Barracks, Germany, June 9, 2022.

USAF IW professionals have not been able to fully exercise their skills. Additionally, white-carding has contributed to overly ambitious expectations for what IW can do and the timelines it can operate on.[271] Better representation of IW in wargames would allow for better planning of IW capabilities, with more awareness of their strengths and vulnerabilities.

Although the USAF IW community has had some narrow experiences with building and executing IW-focused wargames, such as its Hack the OIE exercise, our research indicates that these experiences will need to go beyond IW airmen and integrate more non-IW personnel.[272] For this reason, realistic IW also needs to be integrated into so-called Big USAF exercises and other training fora from their inception. We therefore suggest that USAF leadership direct airmen to realistically incorporate IW capabilities and missions into the service's flagship exercises, such as Red Flag, Blue Flag, and others with high visibility. In doing so, it is critical that IW effects are simulated in a realistic manner and not obscured away via white-carding, even if this means compromising the success of the larger mission. Only then will all airmen in exercises experience the ways in which adversary IW campaigns can disrupt traditional USAF missions or witness the contributions of IW toward achieving mission success.

Personnel and Workforce

Consider establishing a holistic career path for all USAF IW personnel that would preserve disciplinary specialization while building a cadre of USAF IW professionals. To do so, the USAF could do the following.

Grow the 14F workforce, provide 14Fs with a home base, rebrand them as "influence operations officers," and advertise their utility across the USAF and the joint force. Interviewees in the USAF and the joint force who reported having firsthand experiences with 14F personnel were complimentary. Among these interviewees, demand for 14F personnel was high and growing. But these "unicorns," as several interviewees described them, are scarce, and the career field therefore struggles to meet this growing demand. For those interviewees who had not directly worked with 14Fs, we observed a lack of understanding of their purpose, utility, and training. This suggests that the 14F workforce should be grown (to meet the demand that already exists), given a home base, and socialized, both inside and outside the USAF.

Nesting all 14Fs under a single unit within 16 AF, as discussed in our force organization constructs in Chapter 4, could help cultivate a sense of community among the 14Fs and provide a permanent home for their "care and feeding." Being situated in one central home would afford other advantages. For instance, a 14F reachback center could educate those looking to request 14Fs on the capabilities they are trained to accomplish and could serve as a central hub and directory for the 14F forces. A reachback center would also give 14F personnel easier access to the capabilities and support they would need to effectively do their jobs.

For the larger issue of advertising the 14F personnel and their capabilities, we recommend a two-pronged approach. First, inside the USAF, 14F organizational leads will need to collect success stories

[271] The concept of white-carding is discussed in more depth in Chapter 3.

[272] USAF, Headquarters Air Force, *Hack the OIE Exercise Summary*, February 20, 2019, p. 1.

from customers and make these broadly known. Second, outside the USAF, we return to the difficulty of terminological differences: a lack of understanding of USAF IW and a misalignment between different conceptions of IO. We therefore suggest openly rebranding 14Fs as "influence operations officers" (or another similar name) and actively socializing their skills, both in the USAF and in the joint force, to further promote their use.

Establish a formal IW qualification that is open to all IW disciplines and tied to promotion criteria and career progression, and establish one or more IW general officer positions. A consistent issue raised by IW professionals was that they felt that there was little career progression available—an issue with implications for the retention of highly skilled IW personnel. There are multiple ways to address this issue. First, we argue that the USAF should look to its sister services for ways to formalize and allow career progression in the IW disciplines. It should consider mirroring or adapting a program like the Navy's IW officer program, which has an IW officer Personnel Qualification Standards program and an IW officer oral board.[273] Such a program could be piloted at 16 AF. This program would help set standards for IW knowledge and address waning morale by showing that IW personnel in the USAF have met certain criteria, including specialized skills. It would also provide standards on which promotion and career progression could be based. Both the Navy and the Marine Corps have IW-focused general officers. This representation of IW at a senior level of service leadership is important for increasing retention and maintaining morale. For areas in which career progression in the military cannot be offered, the USAF should consider reinforcing the force with more civilian contractors. Civilian contractors can bring skills to address IW requirements, such as highly coveted technology skills or more-niche regional or language skills. Likewise, they are generally more apt to stay in their positions for longer than active-duty personnel and can serve as custodians of institutional knowledge. It is important to note, however, that stakeholders said that they often cannot afford civilians, or they spend time investing in civilians and giving them useful skills, but the civilians then take other jobs outside the force.[274] This reality indicates that reinforcing retention and morale in other areas will remain important. This recommendation ties back to both the organizing recommendations and the force presentation we propose in this report.

Equipping and Resourcing

Establish formal funding mechanisms that USAF personnel can use to apply for and advocate for more-robust and more-stable resourcing. One of the common threads underpinning many of the discussions we had with USAF IW personnel focused on funding, or rather the lack thereof, for IW. For USAF IW personnel to operationalize IW as envisioned by recent strategy documents, the USAF will need to invest in IW adequately and actively—something it does not currently do, according to most of the airmen we spoke with.

These airmen also cautioned that although IW requires the allocation of comparatively fewer resources to operationalize and execute than do more-traditional USAF missions, these efforts are not

[273] Samuel Souvannason, "Fleet Cyber Command Officer Is First JAG to Earn IWO Pin," photograph, Defense Visual Information Distribution Service, August 10, 2018.

[274] 16 AF Personnel 2, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

without cost. Unlike with forces and capabilities that fall squarely within the USAF's service identity whose budgets are platform- and equipment-heavy, the most-significant expenses in IW are people-centered costs. These expenses include recruiting or training highly skilled linguists, data scientists, behavioral specialists, cyber experts, and others and training airmen on new web-based platforms and software. This characteristic of IW, as we identified earlier, makes it difficult for IW to compete with flashier platforms and other physical capabilities whose virtues are easier to exhibit, particularly when advocating for funding. As a result, it is even more important that USAF IW has dedicated funding mechanisms, such as a distinct POM panel. Likewise, an IW-specific POM panel would allow the USAF to budget for IW holistically rather than in a piecemeal fashion, as is currently the case.

Conduct a holistic review of USAF budgets to identify obsolete programs and cost savings that could be applied to IW. When advocating for additional resource allocation for USAF IW, airmen acknowledged that service budgets are finite, billets are scarce resources, and the reallocation of either requires institutional capital. Recognizing these realities, the airmen suggested that the service conduct a holistic review of USAF budgets to identify any obsolete programs, cost-saving measures, and billet vacancies that exist and to determine whether they could be applied to IW. This would be a significant undertaking but could benefit both the USAF IW community and others advocating for additional resources.

Authorities and Permissions

Systematically catalog the IW authorities and permissions needed for the full spectrum of IW missions, from competition through conflict. Interviewee responses were mixed on the question of whether additional permissions were needed to execute IW, in part because a number of the airmen we spoke with were unclear about the specific authorities required to conduct integrated IW missions. Likewise, this research found that processes and expectations tied to requesting permissions evolve, particularly in a crisis or conflict setting. Therefore, we recommend that the USAF systematically catalog the IW authorities and permissions needed across the full spectrum of IW missions—from competition through conflict—and publish this menu where USAF IW professionals can easily access it from CONUS and once they are deployed forward. Additionally, AETC should consider integrating this into its curriculum designed to train USAF IW practitioners.

Relatedly, personnel we spoke with in the USAF IW community and in the combatant commands highlighted the need to improve the speed by which messages are developed and disseminated. To address this challenge, some suggested that USAF IW entities work with their counterparts at combatant commands to design a menu of preauthorized narratives based on the combatant command objectives.[275] So long as IW efforts stay within the bounds of this prescribed menu, USAF IW personnel could craft messages that they know will be permitted, helping improve the speed and utility of IW packages.

[275] 16 AF Personnel 8, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., March 1, 2022; INDOPACOM Personnel 7, in-person interview with the research team, Camp H. M. Smith, Hawaii, June 8, 2022.

Leadership and Institutional Culture

Demonstrate the utility of IW to all airmen through roadshows, leader rhetoric, and other highly visible activities. A recurring theme among interviewees was the perception that there is a lack of understanding of the importance and utility of IW throughout the broader USAF community, including senior leaders, airmen outside the IW community, and those who have not had meaningful experience working with IW personnel. Consequently, IW capabilities are not properly integrated to support more-traditional USAF missions, nor are they prioritized to address key USAF objectives.

Provided that the USAF is prepared to invest in IW, the service can pursue several steps to convey its decision, as well as to demonstrate the utility of IW, starting at the senior-most levels of leadership. For instance, several interviewees suggested that the USAF undertake an effort to identify IW success stories and make them known throughout the service by planning roadshows, incorporating talking points into senior leader rhetoric, adding IW to large-scale exercises, and hosting key-leader engagements with other service and joint leaders. The data generated by the survey undergird this point. When asked to identify the most important factor in their understanding of USAF leadership priorities, a plurality of respondents (31 percent) chose leader rhetoric.

In this vein, the USAF could tailor two sets of messaging campaigns—for cleared and uncleared personnel. This kind of messaging effort could be designed by USAF IW practitioners who are experts in crafting narratives, targeting audiences, and propagating information, whether through electronic or other means.

The ongoing war between Russia and Ukraine, which includes a significant IW component, serves as a demonstrative example of the value of IW and the types of threats airmen face in the information environment.[276] The war in Ukraine could be used as a lens through which to frame the significance of IW in modern warfare.

Designate a service lead for IW who possesses authority, seniority, and cachet to advocate for IW personnel and resources. Leaders, as we underscore above, "are inextricably linked to mission effectiveness," according to USAF doctrine.[277] Although the commander of 16 AF serves as the organizational manager under which IW forces have been organized, the position's six chains of command mean that, in practice, the commander's time, attention, and political equities are divided among these portfolios. The USAF should consider following the examples set by the Navy and the Marine Corps, which have each designated three-star billets as commanders charged with overseeing all facets of IW for their respective services.

In this vein, we recommend that the USAF select a lead for IW who is endowed with the requisite authority and influence to advocate on behalf of IW personnel, IW capabilities, and associated resources. Relatedly, several interviewees highlighted the need for the USAF to designate a single lead organization on IW. One stakeholder stated that current policy "does not designate who/which organization is responsible for the convergence," leading to tension between organizations.[278] In

[276] Headquarters Air Force Personnel 2, interview with the research team, April 6, 2022, RAND office, Arlington, Va.; 16 AF Personnel 12, in-person interview with the research team, Joint Base San Antonio–Lackland, Tex., February 28, 2022.

[277] USAF, 2015, p. 49.

[278] Headquarters Air Force Personnel 1, in-person interview with the research team, Washington, D.C., April 4, 2022.

addition, some PA personnel explained how this separation leads to a lack of a cohesive voice and advocacy for the IW community in which "IW does not get a corporate enterprise–wide look."[279]

Our research is not alone in addressing this need. In fact, the USAF's new *Information Warfare Strategy* identifies the designation of a DCS for IW and the designation of a lead major command for IW as the top two near-term actions the USAF needs to take in operationalizing IW.[280] In selecting personnel for these positions, the USAF should ensure that it has considerable buy-in within the service and sufficient knowledge of or experience with multiple IW capabilities and their integration.

Processes, Procedures, and Joint Integration

Design new internal USAF processes and paradigms that are IW-specific rather than adapting those designed for kinetic missions. The battle rhythms, processes, paradigms, and expectations for traditional USAF missions have been developed, refined, and formalized over time. By contrast, given that IW is a relatively new and unique focus area, the USAF is still in the throes of developing those processes. Because existing procedures and paradigms designed for traditional USAF missions are so entrenched, stakeholders have observed that the USAF has attempted to affix these onto IW. Yet interviewees complained that, by trying to force IW actions into kinetic timelines and processes, leadership has made it impossible to execute important and effective IW, as IW has not only different timelines from kinetic actions but also different timelines between different types of IW.[281] One example cited by several airmen was the application of the 72-hour Air Tasking Order cycle paradigm to IW. Although this construct has worked well for traditional airpower missions, the timeline it operates on is both too short for IW planning and too long for IW execution, according to several airmen. This indicates a need for new internal processes, especially timelines, for IW, and for different types of IW. While it is reasonable to expect these to coordinate with kinetic timelines, they cannot be forced into the same timelines without handicapping IW professionals and their ability to execute IW actions.

Establish and routinize IW processes within the USAF such that USAF IW personnel can integrate into established joint structures and processes. There are several areas in which we recommend formalization: lexicon and guidance, training, timelines and processes, and effectiveness assessment. Currently, this formalization—and, therefore, the routinization of the processes attached to these areas—is an impossibly large and complex task. However, if the USAF narrows its IW scope, focusing on the IW areas that are unique to the USAF and important for the USAF to professionalize and invest resources into, formalizing IW processes will become much more manageable. If the USAF takes that step and is successful, it will next need to routinize and formalize the processes around that scope. We recommend that, when it does so, it considers more fully how the USAF would fit into the whole of the joint force, both socializing differences in lexicon and implementation and striving to match terminology and practice in IW whenever possible to minimize future friction.

[279] USAF Public Affairs Personnel 1 and 2, phone interview with the research team, February 22, 2022; USAF Public Affairs Personnel 3, phone interview with the research team, March 7, 2022.

[280] DAF, 2022b, p. 6.

[281] USAFE Personnel 1, in-person interview with the research team, Ramstein Air Force Base, Germany, June 8, 2022.

Summary

Given that this chapter has covered a wide breadth of topics related to the operationalization of IW, we close with a summation of the recommendations derived from our research (see Table 5.1). To tie these notional recommendations to present realities, the table identifies expected OPRs and OCRs for each recommendation and includes an estimation of the feasibility of the implementation of each recommendation based on the team's understanding of cultural, institutional, budgetary, and political dynamics within the USAF and its constraints. The team derived these estimated feasibility classifications for each of the recommendations based on the data generated by the study's lines of inquiry. This is to say that several team members drew on the data from the literature review, content analysis, and interviews to individually estimate the levels of expected resistance that the likely OPRs and OCRs might encounter. For instance, our research indicated that the USAF has historically favored investments in planes, pilots, and kinetic missions. The literature on service culture also tells us that military leaders aim to protect their own purses and portfolios, even at the cost of service-wide initiatives. With these dynamics in mind, we coded measures that our research indicates would require significant investments in resources or the reorganization of forces in ways that could arouse existing bureaucratic tensions as "significant resistance."

Table 5.1. Summary of Recommendations, Responsible Offices, and Estimated Feasibility

Recommendation	OPR	OCR	Estimated Feasibility
Publish actionable guidance and ensure that IW is included in USAF processes that lead to the development of concrete requirements.	CSAF and IW DCS in concert with senior USAF leaders	AF/A5, AF/2/A6	Low resistance
Expend political capital and service leader time to demonstrate the prioritization of IW and to familiarize the USAF and the joint force with IW.	CSAF and IW DCS in concert with senior USAF leaders	AF/A5, AF/2/A6	Low resistance
Restructure IW force presentation with an eye toward addressing identified procedural, cultural, and structural challenges.	ACC	16 AF	Significant resistance
Clearly delineate and formalize the roles and responsibilities of all USAF IW organizations.	IW DCS	ACC	Moderate resistance
Develop curricula based on IW-specific requirements and cultural identity, with tiers tailored to required IW proficiency (i.e., all airmen versus IW professionals).	AETC	ACC, 16 AF	Moderate resistance
Leverage others' lessons learned to develop a framework to measure the effectiveness of IW.	AF/A9	16 AF, USAFE, PACAF	Moderate resistance
Build realistic IW capabilities and missions into USAF-wide exercises and wargames, and allow participants to struggle, even if doing so results in "mission failure."	AF/A5	ACC, AETC	Significant resistance

Recommendation	OPR	OCR	Estimated Feasibility
Establish formal funding mechanisms that USAF personnel can use to apply for and advocate for more-robust and more-stable resourcing.	CSAF, AF/A8, AF/A1	ACC	Moderate resistance
Conduct a holistic review of USAF budgets to identify obsolete programs and cost savings that could be applied to IW.	AF/A9, AF/A1	ACC	Significant resistance
Systematically catalog the IW authorities and permissions needed for the full spectrum of IW missions, from competition through conflict.	AF/A3	ACC, 16 AF	Low resistance
Demonstrate the utility of IW to all airmen through roadshows, leader rhetoric, and other highly visible activities.	CSAF, IW DCS, Commander 16 AF	USAFE commander, USAF PA Agency	Low resistance
Designate a service lead for IW who possesses authority, seniority, and cachet to advocate for IW personnel and resources.	CSAF	IW DCS, ACC	Low resistance
Consider establishing a holistic career path for all USAF IW personnel that would preserve disciplinary specialization while building a cadre of USAF IW professionals. To do so, the USAF could do the following: • Grow the 14F workforce, provide 14Fs with a home base, rebrand them as "influence operations officers," and advertise their utility across the USAF and the joint force. • Establish a formal IW qualification that is open to all IW disciplines and tied to promotion criteria and career progression, and establish one or more IW general officer positions.	AF/A1 AF/A1, AETC	AETC ACC, 16 AF	Moderate resistance
Design new internal USAF processes and paradigms that are IW-specific rather than adapting those designed for kinetic missions.	IW DCS	AF/A3, AF/A2/6, ACC	Moderate resistance
Establish and routinize IW processes within the USAF such that USAF IW personnel can integrate into established joint structures and processes.	IW DCS in concert with USAF and joint entities	AF/A3	Moderate resistance

NOTE: *Estimated feasibility* concerns the institutional, political, bureaucratic, and/or cultural barriers that could impede each proposed recommendation's adoption by the USAF and its constituent organizations and/or leaders. Cells shaded green represent recommendations that we estimate will face little resistance in their adoption. Cells shaded yellow represent recommendations that we estimate could face moderate resistance and may require some measure of political capital, institutional reorganization, or resource allocation to implement. Cells shaded red represent recommendations that we estimate could face significant resistance and may require substantial political capital, institutional reorganization, or resource allocation to implement.

Appendix A

Survey Data Collection and Analysis Methodology

As part of our multipronged approach to collecting evidence for this report, we developed a survey to assess the perceptions of mid-grade and senior USAF officers and enlisted personnel. Specifically, because a majority of our interviews focused on personnel involved with IW, we aimed to understand how a more diverse array of USAF personnel perceived the definition, fields, resourcing, and prioritization of IW. In this appendix, we describe the survey development, instrument, population, fielding, data-analysis methods, analysis and findings, and limitations.

Survey Development

We developed an initial set of survey questions, which we based on our interview protocol so that the interview and the survey would be aligned in topic and question type. After the creation of our original survey instrument, we refined these questions in consultation with the Air Force Survey Office.

Survey Instrument

Our survey instrument included a survey control number, Human Subjects Protection Committee information and author contact information, and a consent form. The rest of the instrument is included here.

Basic Demographics

a. Area of work:
   i. Please select your Air Force Specialty Code (AFSC) from the drop-down menu below. [this will include the name of the AFSC and an option for participants to opt out if they want more anonymity: "If you do not wish to answer, please check this box."][282]
   ii. Does your current position require the skills of your AFSC? Check box: [Yes / No]
b. Rank

[282] For questions on demographics related to AFSCs, we included all of the enlisted and officer career fields listed in "2021 USAF & USSF Almanac: Specialty Codes" except 13O, Multi-Domain Officer, which the DAF had announced would be phased out (*Air Force Magazine*, "2021 USAF & USSF Almanac: Specialty Codes," June 30, 2021b; "Air Force to Phase Out 13O Career Field, Strengthen All Airmen Joint Capabilities," U.S. Air Force News, February 17, 2022).

iii. Please select your rank [drag and drop, all ranks]

Definitions

c. How do you define information warfare (IW)? [Open text box]
d. What USAF disciplines fall under information warfare (IW)? [Open text box]

[A page break was included here.]
[This text was provided: Although the study team is aware there are multiple definitions associated with these terms, the definition this survey will work from for IW is: "a. The Air Force describes IW as the employment of military capabilities in and through the information environment (IE) to deliberately affect adversary human and system behavior and to preserve friendly freedom of action during cooperation, competition, and conflict."][283]

[The USAF Information Warfare primarily consists of the following disciplines: disciplines associated with IW are: Cyberspace Operations (CO), Electromagnetic Spectrum Operations (EMSO), Information Operations (IO), Public Affairs (PA), Intelligence, Surveillance, and Reconnaissance (ISR), and Weather."]

Demographics Continued

e. Approximately how many years of career experience do you have in the principal USAF disciplines associated with IW? [Respondents were offered the choice of 0–10+ years]
f. Approximately how many years of career experience do you have in fields you consider IW adjacent? [drop-down – prompt if they chose more than 0 with 'Please write adjacent field:']
g. In your current position, do you interact with any of the USAF IW disciplines on a regular basis, including working in, coordinating with, or supporting one of the USAF IW disciplines? [If so move to the questions below, if not send participants directly to question i:]
h. Please characterize the ways in which you interact with USAF IW disciplines in your current position. Select all that apply, and click "continue" without selecting if none apply:
    iv. I currently perform work in the following USAF IW discipline(s): [List (CO, EMSO, IO, ISR, Weather, PA, N/A), with checkboxes]
    v. I directly support the following USAF IW discipline(s): [List (CO, EMSO, IO, ISR, Weather, PA, N/A), with checkboxes]
    vi. My role requires that I coordinate with the following USAF IW discipline(s): [List (CO, EMSO, IO, ISR, Weather, PA), with checkboxes]

Air Force Priorities

i. What are the top areas of the Air Force that Air Force leadership prioritizes? [Ranked list, drag and drop, offering: Air Superiority, C2, Global Precision Strike, Guard, Installations,

[283] In the survey, we reference the definition of IW included in DAF, 2022a, p. 2.

Logistics, Manpower, Nuclear Deterrence Ops, Ops Training and Readiness, P and T, Personnel Recovery, RDT and E, Rapid Global Mobility, Reserve, SAP, and SOF]

vii. [For non GOs/FOs]: What has informed your understanding of USAF leadership priorities? [Drag and drop, offering: Leadership rhetoric, Formal guidance and policy, Doctrine, Amount of resources devoted, CORONA, Air and Space Power Journal, Articles devoted to IW]

j. Does your department/group work on USAF IW either formally or in an ad-hoc manner [Yes or no]?

viii. [If selected yes] Approximately what percentage of your department's efforts, defined as its resources, personnel time, and planning, are dedicated to the IW lines of effort? [Likert Scale – 0–100 bucketed at every 10%]

k. Please rank the disciplines associated with USAF IW [CO, EMSO, IO, ISR, Weather, and PA] in the order that the USAF prioritizes them, in your estimation. [Ranked list (CO, EMSO, IO, ISR, Weather, and PA), drag and drop][284]

l. Does the USAF's conception of IW as you understand it focus on the use of informational capabilities during competition, conflict, both, or neither? Checkbox]

m. Is the USAF better poised to operationalize and conduct IW during competition, conflict, both, or neither? [Checkbox]

n. Please rank the following items on their potential ability to optimize the operationalization of IW in the USAF. [drag and drop – include greater resource allocation, reorganization, new authorities, training, policy/guidance, doctrine, formal coordination mechanism]

Personnel Staffing Issues [Following questions only offered/pertain to O-4s–O-6s that specify they are in a position affiliated with USAF IW]

o. To what extent, if any, is training capacity (training capacity meaning, the ability that organizations possess to train personnel—such as the availability of courses or necessary experience opportunities, or resources devoted to training) an issue in [area of expertise as identified in demographics] [Likert Scale ("where 1 is there are no issues training personnel for this area, 2 is minor issues training personnel for this area, 3 is some issues training personnel for this area, 4 is significant issues training personnel for this area, and 5 is that there is a severe lack of ability to train personnel for this area")]

p. To what extent, if any, is recruitment for [area of expertise] an issue? [Likert Scale ("where 1 is there are no issues finding personnel for this area, 2 is minor issues finding personnel for this area, 3 is some issues finding personnel for this area, 4 is significant issues finding personnel for this area, and 5 is that there is a severe lack of personnel for this area"]

[284] For the question asking respondents to rank the disciplines associated with USAF IW, the disciplines provided as responses are those included in DAF, 2022a, minus those capabilities listed that are not formally designated as disciplines with associated career fields (international affairs, data science, and operations research).

Authorities

q. Do USAF IW efforts currently possess the authorities they need to be effective? [Likert Scale ("where 1 is they do not have any of the authorities they need to be effective, 2 is they have only a few authorities and need many more to be effective, 3 is they have some authorities but still require more authorities to be effective, 4 is they have most of the authorities they require to be effective, and 5 is that they have every required authority they need to be effective"]
   ix. [If less than neutral [0 or 1]: What particular area(s) of USAF IW efforts need additional authorities and what additional authorities do they need? (Open text)]
   x. [If no: What issues does this lack of authorities cause?]

Coordination—[The three questions below will be a matrix, with the provided Likert scale: [1–5 Likert Scale, with definitions ("where 1 is entirely informal/ad-hoc, 2 is majority informal/ad-hoc, with a few formalized processes, 3 is some informal/ad-hoc, some formalized processes, 4 is majority formalized processes, with a few informal/ad-hoc processes, and 5 is entirely formalized, with clear, established processes"), with definitions/option to select 'I don't know']

r. How formal (defined as established lines of communication, meetings, points of contact, or established relevant organizations) is IW coordination within the USAF?
s. How formal is IW coordination between the USAF and other military services/Joint organizations?
t. How formal is IW coordination between the USAF and other agencies or organizations in the USG?
u. Is there anything else which merits discussion with respect to USAF IW definitions, prioritization, personnel/training, resourcing, authorities, or coordination that this survey has not covered, and that you wish to discuss? [Open text box.]

Survey Population

We contacted 1,000 participants to invite them to participate in our survey; originally, the research team expected this to be the upper end of what would be possible with a snowball sample, but the team later received access to data provided to RAND from the Air Force Personnel Center, including contact information for all personnel by rank. The team used random sampling procedures from Stata (on a default seed) to create a dataset of contact information for all personnel in the ranks listed below, using the sampling system discussed below.

We decided to include four subpopulations within USAF active-duty personnel: field-grade officers (O-4 through O-6), general officers (O-7 through O-10), NCOs (E-5 through E-6), and SNCOs (E-7 through E-9).[285] We wanted to capture the priorities and perceptions of priorities of

[285] Through a small error, some USSF personnel were included. We suspect that the survey link was forwarded to those outside the sample, which is why we have registered a single E-1. Because we collected information on whether participants belonged in our subpopulations, the E-1's responses were automatically excluded, and the E-1 was counted only in the total count of who was included.

senior service leadership, represented by SNCOs and general officers, as well as the priorities and perceptions of priorities of the next generation of prospective service leaders, represented by NCOs and field-grade officers. The survey population included both those leaders (officers and enlisted) in IW fields and those outside of or adjacent to IW fields, as the research team wanted a view of USAF personnel writ large and their opinions on IW and its prioritization, as well as a comparison between those two populations. For our sampling procedure, we began by creating quotas based on the representative rank population of the force. For example, E-7s make up 9 percent of the overall force, so 9 percent of 1,000 would require 90 E-7s to be chosen randomly to be in the sample.[286] We were unable to create such quotas using other demographics (such as age, race, or gender) because, out of concerns about handling sensitive personally identifiable information, we did not access or handle such information. The research team made the methodological choice to oversample officer populations (O-7 to O-10) because those populations are particularly influential despite being a smaller proportion of the overall force. Similarly, the research team chose to undersample NCO populations (E-6 and below) because these populations make up a very large proportion of the force and, if sampled proportionally, might overwhelm other rank groups.

Survey Fielding

Study participants were recruited via direct contact over email and were asked to participate in an electronic survey. Survey responses were collected in August 2022. The survey was programmed into SelectSurvey.NET software and delivered via hyperlink. Survey responses were entirely anonymous, meaning that individual respondents' names and contact information were not linked to responses. The overall response rate was 267 out of 1,000, with 76 respondents answering at least one substantive question and with 59 complete responses. Incomplete responses were retained and analyzed in non-demographic questions unless otherwise marked. In the "Survey Analysis and Findings" section of this appendix, each finding includes information on how many responses were recorded for that question.

Survey Data-Analysis Methods

Because of the small size of the sample, we consider this survey to be nonrepresentative,[287] which allows the survey to be treated only as further supporting evidence paired with the interviews, content analysis, and other data collection efforts the research team conducted. The size of the survey and the lack of representativeness mean that we do not attempt to reweight on demographic characteristics beyond our sampling procedures. Below, we explore findings from the overall population of respondents and then perform a comparison between those USAF personnel who self-identified as interacting with the IW disciplines and those who did not.

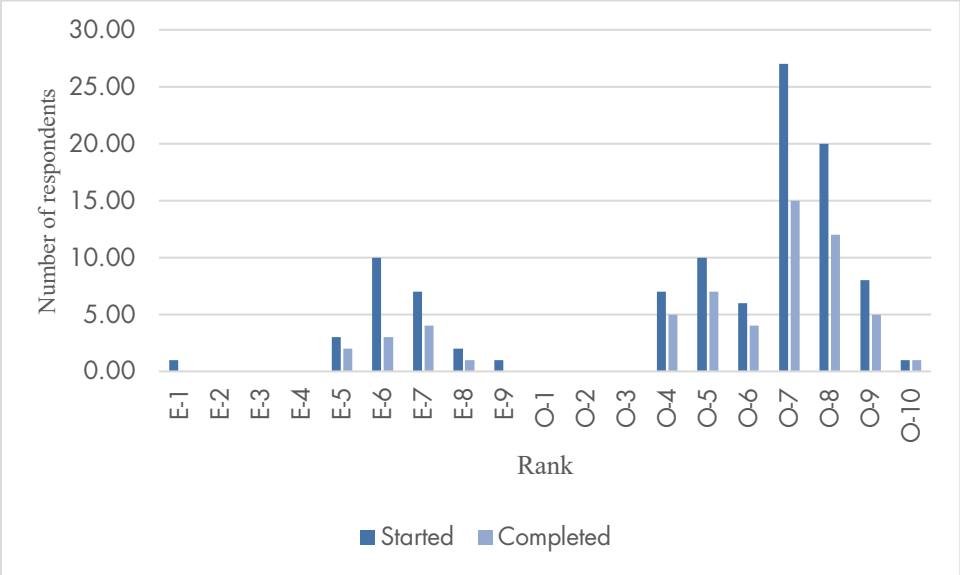
[286] The proportions of the force were drawn from *Air Force Magazine*, "2021 USAF & USSF Almanac: Personnel," June 30, 2021a.

[287] This point is discussed further in the section titled "Survey Limitations, Biases, and Caveats."

Survey Analysis and Findings

In this section, we first explore the ranks of those who responded to our survey (Figure A.1) and then compare this group against the actual proportions of the ranks that exist in the USAF (Table A.1). The survey team chose to oversample certain rarer populations, as discussed above, to capture respondents who are more likely to be influential in making decisions about IW prioritization, socialization, and resourcing.

Figure A.1. Survey Respondents, by Rank



NOTE: Number of respondents who started this question = 102. Number of respondents who completed this question = 59.

Table A.1. Respondent Rank Proportions Versus Overall U.S. Air Force Personnel Rank Proportions

Rank	Percentage in Completed Survey	Percentage in Overall Personnel
E-1	0	3
E-2	0	3
E-3	0	19
E-4	0	20
E-5	3	23
E-6	5	15
E-7	7	9
E-8	2	2
E-9	0	1
O-4[a]	8	1
O-5	12	1
O-6	7	3
O-7	25	12
O-8	20	1
O-9	8	1
O-10	2	1

SOURCE: Features data from *Air Force Magazine*, 2021a.
[a] O-1 through O-3 were excluded from our overall sample.

As shown in Figure A.1, the sampling strategy was successful. The populations of those who did and did not complete the survey were similar, but the population who completed the survey, when compared with the overall proportions of the ranks in the USAF, shows a clear skewing toward more-senior officers, especially those in the O-8–and-above range. Therefore, although not representative of the overall population of USAF personnel, the survey is likely more representative of those who would make decisions affecting the questions that the study was most concerned with pertaining to IW.[288]

Respondents were then asked to define IW and were asked what disciplines they believed fell under the umbrella of IW. There was a diversity of responses to the question about the definition of IW, and there was some clear confusion on what it included; a major theme, mentioned in a majority of responses, was control of information, especially the use of information against an adversary or an action against an adversary in the information domain. Some responses were more specific, drawing on the associated disciplines or particular effects that can be created in the information domain. Few respondents had no response at all, and there was a single "I don't know," but, on balance, most

[288] Although the research team collected information on AFSC, the data were deemed unreliable because of a design issue (in the way the data were collected and/or categorized) and are not included here.

respondents captured the general importance and definition of IW (although a few presented the definition provided in recent documentation verbatim).

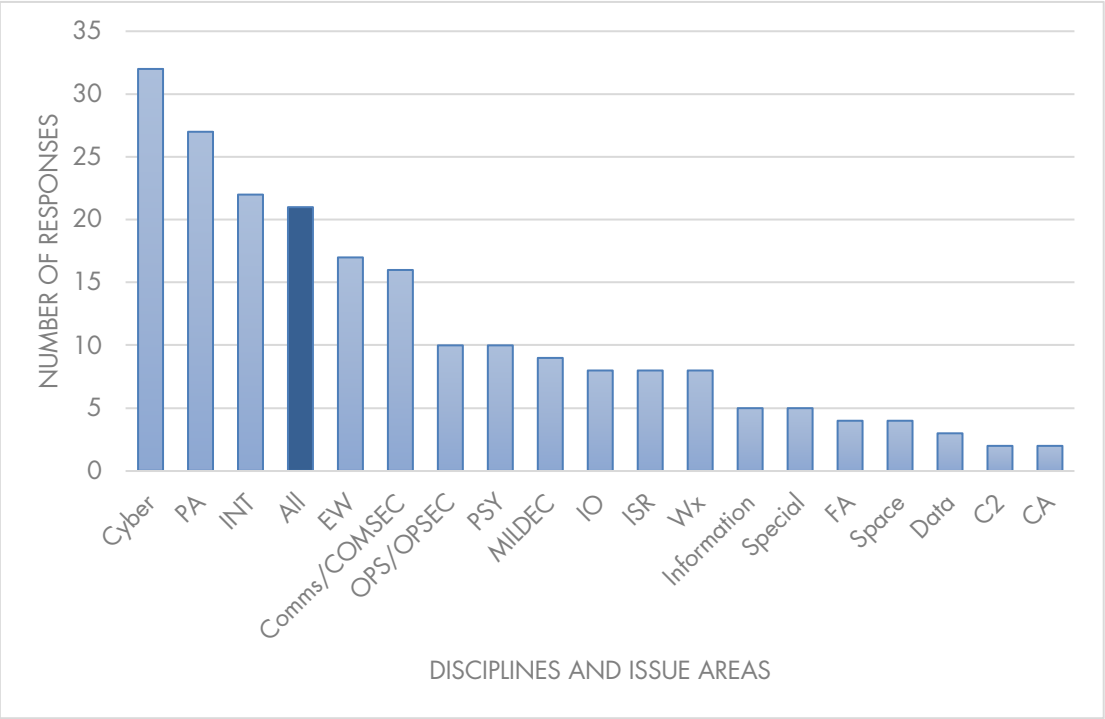
Figure A.2 provides a visual representation of respondents' open-text answers to the survey question about the definition of IW. As discussed above, *information* is key and was present in most definitions provided. Additionally, several responses mentioned the informational domain, information warfare, adversary states, and information operations. Beyond these terms, however, there is a significant diversity of responses, with little agreement around particular terms, as shown by the variety of words in the green portion of the cloud.

Figure A.2. Word Cloud of Respondent Definitions of *Information Warfare*

NOTE: This figure is a word cloud visualization of survey respondents' open-text answers to the question about the definition of IW. The word cloud was created from all complete responses. Text was made lowercase, and punctuation, white space, and English stop words were removed. (*Stop words* are small words, such as articles, that serve little informational purpose in standard English.) Size and color indicate word frequency. No preprocessing steps were taken other than those listed here.

The survey instrument then asked respondents what disciplines fall under IW (Figure A.3). This question is key for several reasons. First, it indicates a more nuanced understanding of what IW is in the USAF, but second, it also indicates awareness of where IW "lives" in the USAF—what personnel are associated with it and who can be called on to contribute to creating IW effects in the information environment.

Figure A.3. Responses to "What Disciplines Fall Under Information Warfare?"



NOTE: COMSEC = communications security; comms = communications; FA = foreign area; INT = intelligence; OPS = operations, PSY = psychological operations; Wx = weather. Number of respondents for this question = 72. (Respondents were allowed to choose multiple disciplines.) "All" indicates that respondents felt that all of the USAF disciplines fell under IW. Disciplines that were mentioned by only one respondent are not included in the figure.

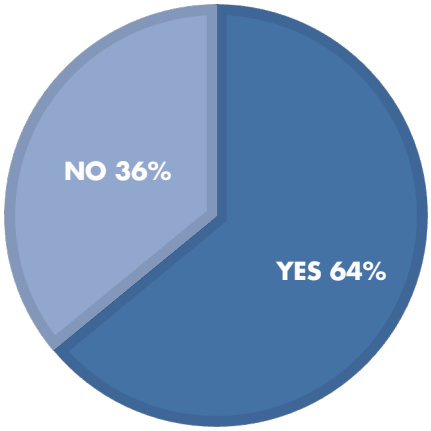
In line with the evidence from our interviews and content analysis, IW is most heavily associated with cyber; 45 percent of all respondents indicated that cyber was a USAF IW discipline. PA is also closely associated with USAF IW; 37.5 percent of all respondents named it. Only around 11 percent of respondents identified IO as a discipline in IW. These numbers may be artificially reduced, however, because 29 percent of respondents chose to answer that "all" disciplines (or "all airmen") fell under IW. This is likely in response to or in line with the statement "All airmen need to think about IW some of the time; some airmen need to think about IW all of the time,"[289] which was a consistent refrain throughout the interviews conducted for this project. While interesting, this result does seem to indicate a lack of understanding of the disciplines associated with IW, which may indicate a lack of understanding of which disciplines to reach out to in order to achieve IW effects and integration. Multiple respondents also incorrectly identified some disciplines as being part of IW when in fact they are not (e.g., foreign affairs, space, C2, CA, special tactics) or went for vague identifiers that are not associated with particular disciplines (e.g., *information*, *data*, *operations*).

The survey instrument offered the definition used in the *United States Air Force Operating Concept for Information Warfare*, as well as the associated disciplines; asked further demographic questions; and then focused on interaction with the disciplines: "In your current position, do you interact with

[289] USAF Personnel 4, in-person interview with the research team, Langley Air Force Base, Va., December 9, 2021.

any of the USAF IW disciplines on a regular basis, including working in, coordinating with, or supporting one of the USAF IW disciplines?" Sixty-four percent of all respondents said that they did (see Figure A.4).

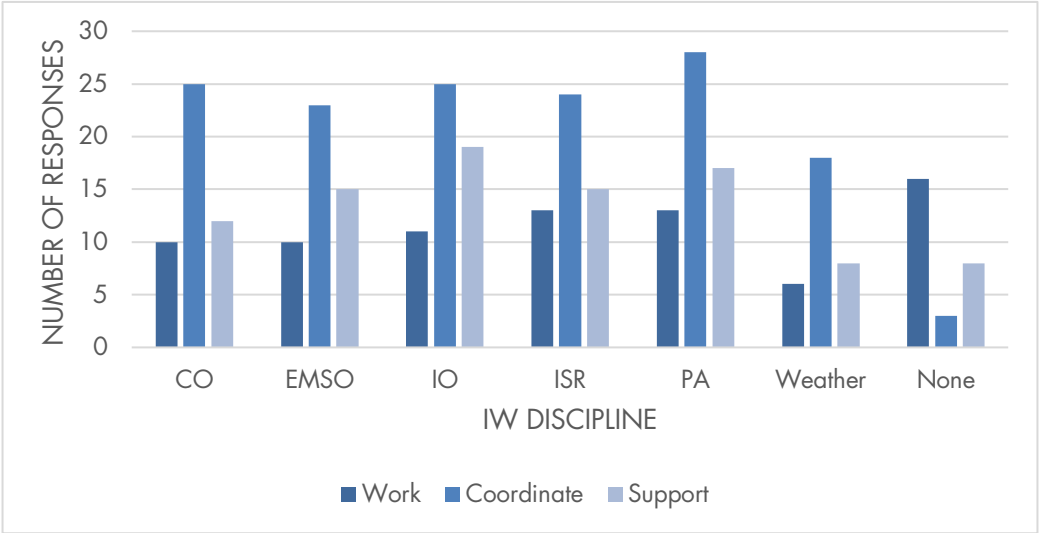
Figure A.4. Responses to "Do You Interact with Any of the USAF IW Disciplines?"



NOTE: Number of respondents for this question = 73.

From there, the survey team took a closer look at which IW disciplines were most likely to be points of interaction between those airmen who responded to the survey and IW-specific disciplines (see Figure A.5).

Figure A.5. Responses to "Please Characterize the Ways in Which You Interact with USAF IW Disciplines"

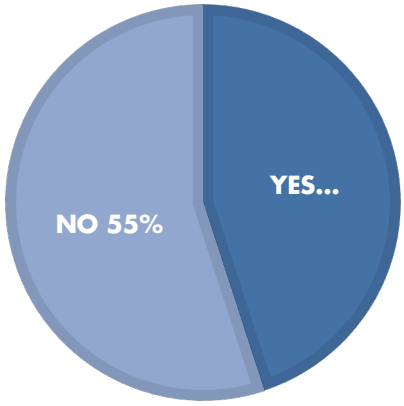


NOTE: Number of respondents for this question = 73.

As the figure shows, there was interaction broadly across a variety of IW disciplines. Coordination was the most likely type of interaction in all IW disciplines but was especially important for interaction with PA; 38 percent of respondents indicated that they had to coordinate with PA. ISR, IO, EMSO, and CO all had around 30 percent of respondents indicating that they had to coordinate with those departments. The discipline with the most respondents indicating that they supported it was IO (26 percent of respondents). The disciplines with the most respondents working in them were ISR and PA; 17.8 percent of respondents worked in both ISR and PA. Fewer worked in, coordinated with, or supported weather. Overall, however, there seemed to be significant interaction with the different IW disciplines.

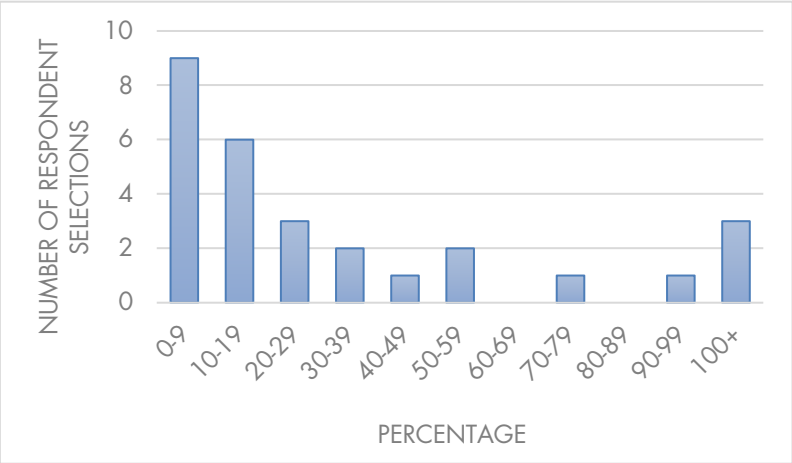
Later in the survey, we asked two linked questions: whether the respondent's overall department did any work with IW and, if so, approximately what percentage of department efforts—defined as resources, personnel time, and planning—were dedicated to IW (see Figures A.6 and A.7).

Figure A.6. Responses to "Does Your Department/Group Work on USAF IW?"



NOTE: Number of respondents for this question = 62.

Figure A.7. Responses to "What Percentage of Your Department's Efforts . . . Are Dedicated to the IW Lines of Effort?"



NOTE: Number of respondents for this question = 28. This question was asked of respondents who answered "yes" to the previous survey question: "Does your department/group work on USAF IW either formally or in an ad-hoc manner?"

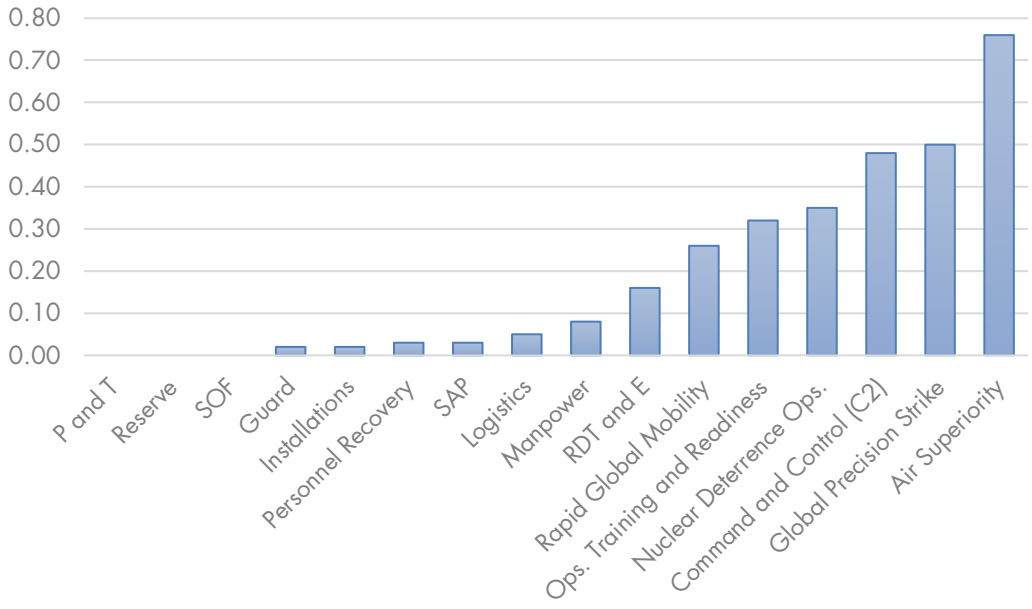
These two figures tell an interesting story; while half of all personnel responded that their departments worked on some form of IW, those who said that their departments did work on IW said that their departments often used only minimal resources on IW; 53 percent of respondents who were in organizations that worked on IW said that their organizations dedicated only 1 to 19 percent of their total resources to IW. Figure A.7 shows a bimodal distribution, though, with the majority of organizations contributing minimal resources or all or almost all of their resources to IW.

Several interviewees indicated that their awareness of 16 AF and IW capabilities came through interaction with personnel in IW disciplines. Those with more familiarity—or who work directly in IW—are likely more invested in both resourcing and prioritizing IW and likely hold opinions that are closer to those represented in the interviews conducted during this project, as the majority of the interviewees were in IW or major client organizations of IW. Thus, from here onward, we present both the pooled responses of all respondents and, separately, analysis of the responses of those who indicated that they did not interact with IW disciplines.

Next, the survey instrument shifted from collecting demographic information (e.g., ranks, years involved with IW, areas of IW in which the respondents were involved) to asking about which areas the respondents felt were prioritized by USAF leadership.

In the pooled population, the largest number of respondents (75 percent) identified air superiority as a leadership priority (Figure A.8). Respondents identified global precision strike (49 percent) and C2 (46 percent) as the issues next most prioritized by Air Force leadership. Least prioritized, according to survey respondents, were P and T, reserve, and SOF, all of which received no votes.

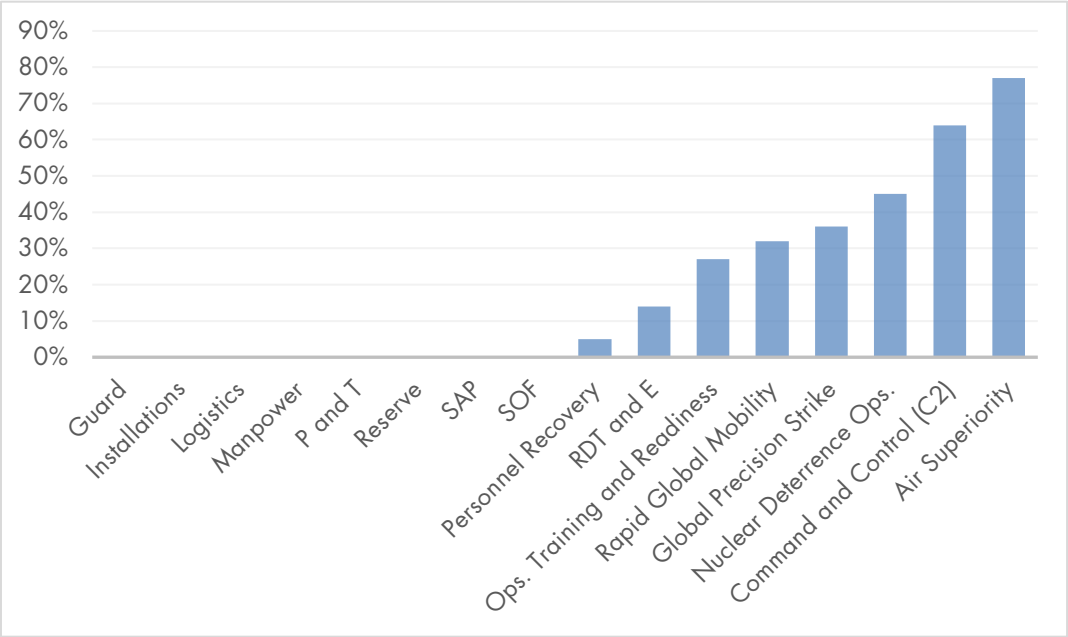
Figure A.8. U.S. Air Force Leadership Priorities, According to All Respondents



NOTE: Number of respondents for this question = 62. Respondents were allowed to choose multiple answers and were encouraged to choose three.

Of just the respondents who indicated that they did not interact with IW, the largest number of respondents (77 percent) also identified air superiority as a leadership priority (Figure A.9). Sixty-four percent selected C2 and 45 percent selected nuclear deterrence operations as important, while only 36 percent selected global precision strike. Least prioritized, according to survey respondents, again were P and T, reserve, and SOF, all of which received no votes, but these categories were joined by SAP, logistics, manpower, and installations.

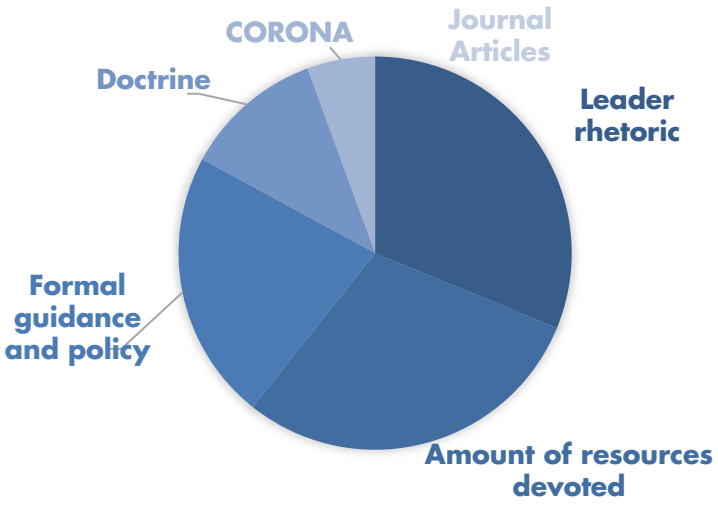
Figure A.9. U.S. Air Force Leadership Priorities, According to Respondents Who Indicated That They Do Not Interact with IW In Their Roles



NOTE: Number of respondents for this question = 22. Respondents were allowed to choose multiple answers.

Next, the survey collected information on where these opinions came from and how personnel gauged leadership priorities. Survey respondents were asked to rank which factors were most influential in the formation of their opinions on what leaders were prioritizing. The respondents ranked leadership rhetoric as the most important, followed by amount of resources devoted, then by formal guidance and policy (Figure A.10). Journal articles did not make the ranking. For those respondents who said that they did not interact with the IW disciplines, the rankings remained the same.

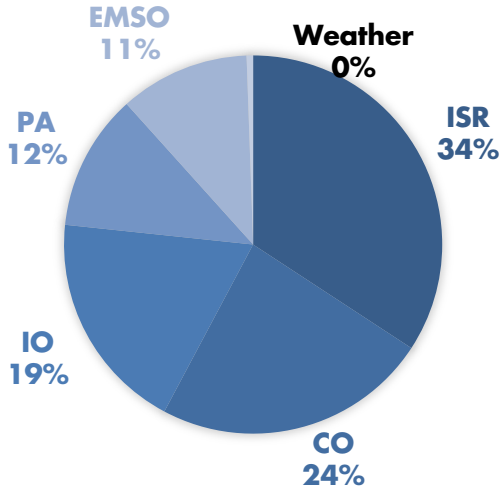
Figure A.10. Key Factors in Understanding Leadership Priorities



NOTE: Number of respondents for this question = 40. (Leadership was not asked this question.)

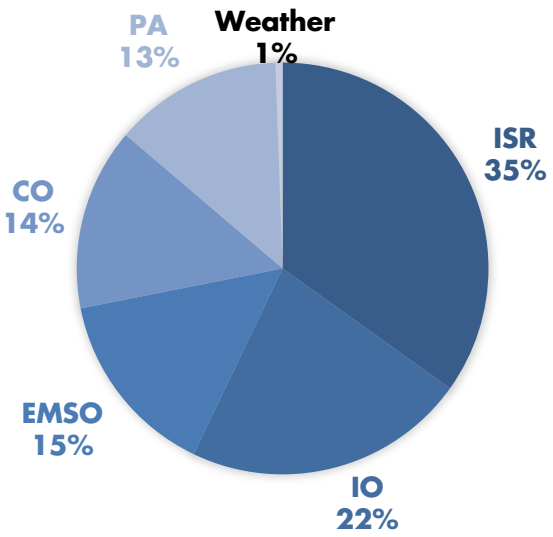
All survey respondents were asked to rank which IW disciplines the USAF prioritizes (Figure A.11). In the pooled population, ISR, CO, and IO were ranked as the top three prioritized disciplines, while weather was ranked the lowest. In comparison, for the population of only those who did not interact with IW, ISR was ranked as slightly more important, while IO and EMSO were ranked above CO. Weather, again, was ranked the lowest (Figure A.12).

Figure A.11. Information Warfare Disciplines the U.S. Air Force Prioritizes, According to All Respondents



NOTE: Number of respondents for this question = 60.

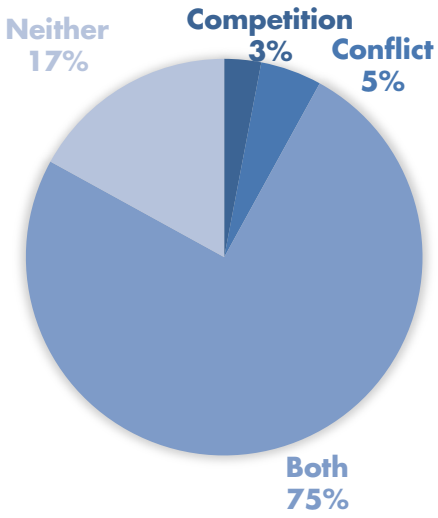
Figure A.12. Information Warfare Disciplines the U.S. Air Force Prioritizes, According to Respondents Who Indicated That They Did Not Interact with Information Warfare



NOTE: Number of respondents for this question = 60.

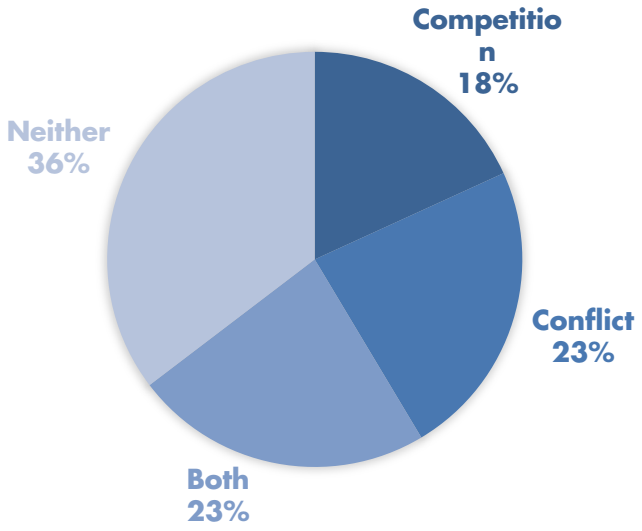
The conception of IW in both conflict and competition was one that came up in both interviews and the guiding documentation and definition that the research team was given. The research team wished to explore how the USAF conceptualizes IW in competition versus in conflict (Figure A.13), while also capturing which of these the respondents believed the USAF was better poised to address (Figure A.14).

Figure A.13. Responses to "Does the USAF's Conception of IW . . . Focus on the Use of Informational Capabilities During Competition, Conflict, Both or Neither?" (All Respondents)



NOTE: Number of respondents for this question = 60.

Figure A.14. Responses to "Is the USAF Better Poised to Operationalize and Conduct IW During Competition, Conflict, Both or Neither?" (All Respondents)



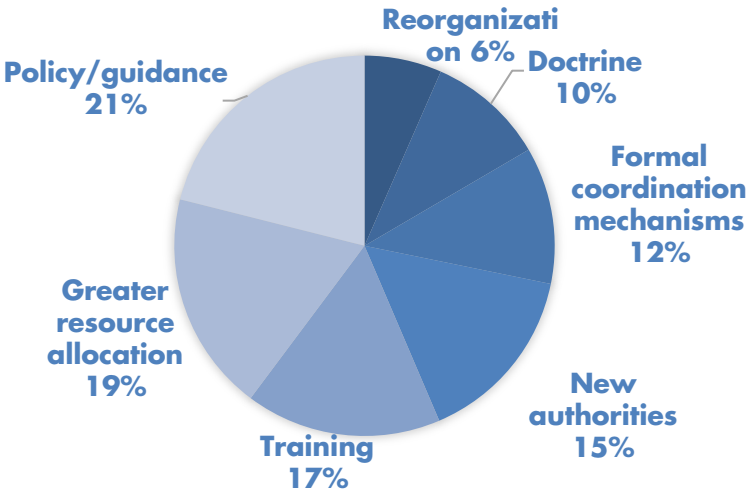
NOTE: Number of respondents for this question = 60.

Figure A.13 demonstrates that respondents broadly understood (75 percent) that USAF IW should be applicable in both situations of competition and situations of conflict. However, Figure A.14 demonstrates a lack of agreement on which of these it is better poised to address, including a large contingent of respondents (36 percent) who were skeptical of the USAF's ability to conduct IW in either competition or conflict.

Figure A.15 demonstrates that, although policy/guidance was ranked as the most important way the USAF could optimize IW, a majority of respondents did not agree on any one path forward. Despite this, respondents selected policy/guidance, greater resource allocation, and training as the top three ways the USAF could optimize its ability to pursue IW. Among the subpopulation of only those respondents who did not interact with IW, the same three items were ranked as most important, but greater resource allocation was first, then policy/guidance, followed by training.[290]

[290] The survey also included questions about personnel and recruitment. However, because we asked these questions of only those USAF IW officers of a high enough level to affect policies pertaining to personnel and recruitment, the number of responses was low enough that we chose not to include results from those questions.

Figure A.15. Respondents' Selections When Asked "How to Best Optimize Information Warfare"

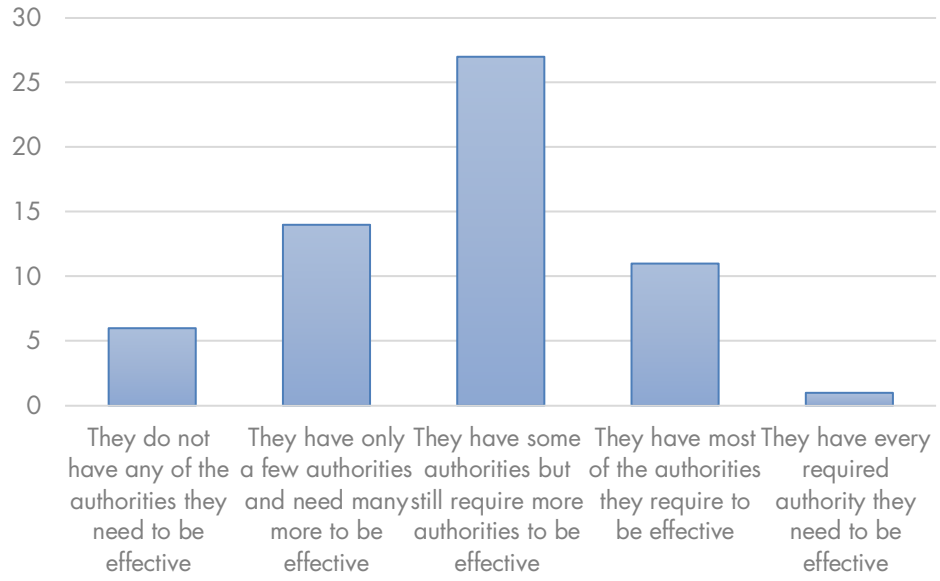


NOTE: Number of respondents for this question = 60.

While neither population ranked new authorities as one of the top three ways the USAF could optimize IW, the lack of authorities came up repeatedly as a comment in interviews.

The majority of respondents (80 percent) indicated that USAF IW disciplines lacked the authorities they needed to be effective; only one respondent (2 percent) indicated that USAF IW disciplines had all the authorities they required to be effective (Figure A.16). This result is in line with what we found in interviews; multiple interviewees said that they felt they lacked the authorities to do their job effectively. There is a caveat to this; a few interviewees mentioned that some in the IW community point to the lack of authorities as a barrier to operationalization, when in fact the lack of capabilities or resources is preventing the execution of an IW action.

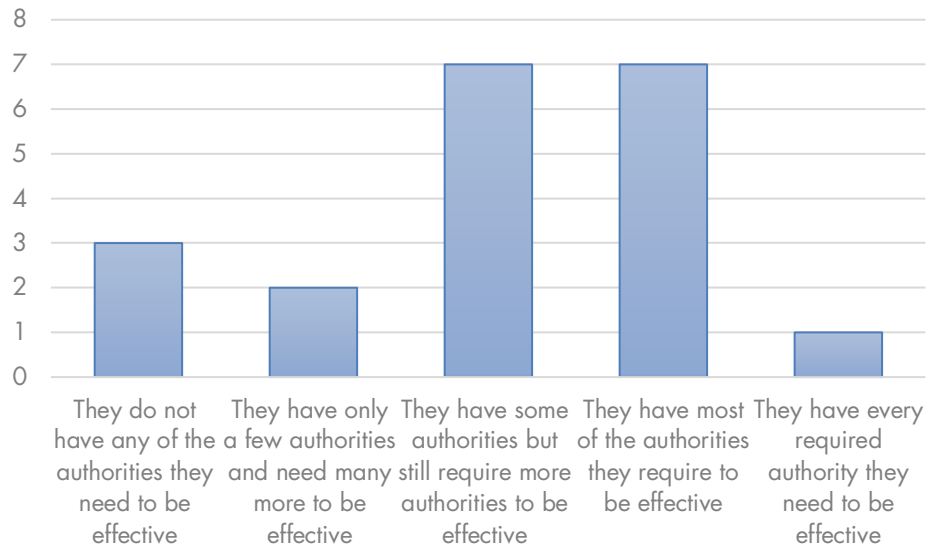
Figure A.16. Responses to "Do USAF IW Efforts Currently Possess the Authorities They Need to Be Effective?" (All Respondents)



NOTE: Number of respondents for this question = 59.

Interestingly, although a smaller population and, therefore, biased to skewing, the respondents who did not interact with IW were less likely to say that IW disciplines required more authorities (Figure A.17); 35 percent suggested that the IW disciplines have most of the authorities they require to be effective, and 5 percent (the same respondent who counted as 2 percent in Figure A.16) suggested that the IW disciplines have every authority they require to be effective. The survey also included an open text box accompanying its questions about authorities challenges. The word cloud in Figure A.18 provides a visualization of these responses; the relative size of each word corresponds to the frequency of the word's mention in the written text box responses. For instance, "cyber" is the largest word depicted, suggesting that it was the topic most frequently mentioned in the open text box responses.

Figure A.17. Responses to "Do USAF IW Efforts Currently Possess the Authorities They Need to Be Effective?" (Respondents Who Indicated That They Did Not Interact with Information Warfare)



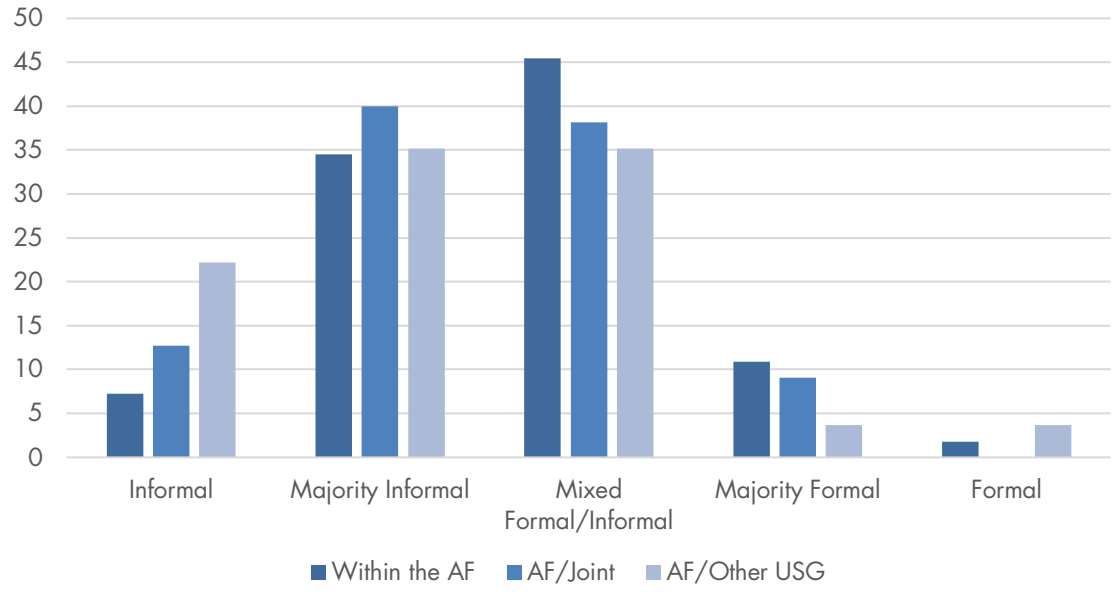
NOTE: Number of respondents for this question = 20.

Figure A.18. Visualization of Open-Text Responses to Survey Question About Needed Authorities

Finally, many interviewees noted that contact within and outside the USAF on the topic of IW is a "pick-up game," largely ad hoc and informal. Generally, respondents agreed that coordination within the USAF, between the USAF and joint organizations, and between the USAF and other U.S. government actors was a mix of formal and informal or largely informal (see Figure A.19). Very few respondents indicated that coordination was entirely formalized: 2 percent for within the USAF, 0

percent for between the USAF and joint organizations, and 4 percent for between the USAF and other U.S. government actors. This result is largely in line with what we found in interviews.

Figure A.19. Responses to "How Formal Is IW Coordination"?



NOTE: AF = Air Force; USG = U.S. government. Number of respondents for this question = 59.

Survey Limitations, Biases, and Caveats

First and foremost, the sample was not representative. We were limited in our scoping to 1,000 respondents, and, as previously discussed, our response rates were 5.9 percent of that population if we counted only complete surveys and 26.7 percent if we counted both complete and incomplete surveys. Therefore, our sample represented 1,000 possible respondents out of a total population that fluctuates but is around 285,000. Thus, although the conclusions drawn from this survey are interesting and reinforce our findings in other sections of the report, they are anecdotal and not representative. Response rate might also bias our findings; only those individuals with free time or strong feelings might be willing to respond to a survey. Additionally, although we took steps to ensure that the survey responses would remain anonymous, social desirability may mean that respondents still might have felt pressured to ask for resources, define IW in a certain way, or defend USAF IW's ability to conduct IW operations in conflict or competition.

Appendix B

Interview Analysis Details

Interviews were a critical source of information for the RAND team. Because of the emerging nature of the IW arena, as demonstrated by the fact that the USAF has only recently adopted a definition of IW, these interviews served as an integral way to examine a topic that is largely absent from the secondary literature. As a result, the sizable number of interviews generated a wealth of data that provided the RAND team with valuable context about the status of USAF IW and the challenges associated with IW operationalization and that ultimately informed the study's analyses and findings. By conducting in-depth discussions with personnel who have hands-on experience developing, implementing, and using USAF IW capabilities, the study team was able to tease out nuances related to the processes, hurdles, and complexities involved in operationalizing USAF IW.

Methodology for Data Collection

The study team chose to conduct a series of semi-structured interviews with several categories of stakeholders. The overwhelming majority of interviews were conducted with USAF active-duty and reserve personnel who have experience with, and expertise in, USAF IW operationalization by virtue of either (1) their career fields (as airmen in IW disciplines) or (2) their current assignments (at organizations tasked with USAF IW responsibilities). Additionally, we spoke with personnel at joint organizations and sister service IW entities that either (1) have worked directly with USAF IW forces in the past or (2) are likely to work with USAF IW forces in the future given their overlapping portfolios.

The interviews were voluntary and were conducted on a not-for-attribution basis. In practice, this means that each interviewee has been assigned a generic moniker (e.g., "16 AF Personnel," "Air Force HQ Personnel") to protect their identity. References to data gleaned from interviews in this report cite the interviewee's assigned moniker; we aimed to avoid referencing other distinguishing traits to preserve participants' anonymity. The interviews were held both in-person and virtually, by phone and video conference, in both classified and unclassified settings.

The interviews were guided by a series of tailored, semi-structured protocols that members of the team developed in consultation with a senior RAND expert on interview design. The protocols focused on several topics related to the ways in which the DAF does (and should) organize, train, and equip IW capabilities for peer and near-peer competition. These topics include IW operationalization, IW organization and coordination, personnel, training, authorities and permissions, cultural challenges, and resources and doctrinal issues. Although these protocols guided the interviews, the semi-structured format allowed for the discussion of relevant adjacent topics and relevant follow-on questions. In addition to being reviewed by members of the team, the interview protocols were reviewed and approved by RAND's Human Subjects Protection Committee and the

DAF's Human Research Protection Office. The team developed a total of six interview protocols that were tailored to interviewees' organizational affiliations and disciplines, including USAF component commands, 16 AF, the broader USAF community, GCCs, TSOCs, and other service and joint IW entities.

Within the populations of interest, interview subjects were identified and selected through purposive sampling. Interviewees were not selected at random but instead were intentionally chosen based on their characteristics, including prominence in the field, job title or rank, and indicated relevant experience, and/or through snowball sampling, in which someone was identified by another interviewee as having relevant experience. The RAND team conducted 80 interviews with a total of 115 individuals who have a variety of experiences and expertise from various elements within the USAF (including USAF component commands, 16 AF, and Headquarters Air Force) and personnel who coordinate with the USAF (including joint organizations, such as GCCs and TSOCs); see Table B.1 for details on interviewees' affiliations. The size of this sample was informed by the degree to which we continued to receive new information from additional interviewees, until we reached a point of saturation, as well as the responsiveness and availability of interviewees. In some cases, the team was not able to speak with prospective interviewees, either because the team had not received a response from initial contact efforts or because significant scheduling conflicts precluded the interviewee from meeting with us.

Table B.1. Numbers and Organizational Affiliations of Interview Participants

Organization and/or Specialty	Number of Interviewees
USAF major commands (ACC [11], Air Force Reserve Command [14])	25
Service component commands (PACAF [4], USAFE [12], AFSOC [6], Air Forces Southern [1])	23
GCCs (EUCOM [16], INDOPACOM [7])	23
16 AF staff and associated forces	21
Headquarters Air Force personnel	14
TSOCs (SOCEUR [4], Special Operations Command Pacific [1])	5
IW experts from other services	4
Total	115

Methodology for Data Analysis

In each of the interviews, at least two team members recorded notes from the discussion. They then cleaned the notes generated from these interviews and provided the transcripts to the rest of the team so that it could review them and begin identifying themes and prominent highlights from the interviews.

Once notes from each interview were compiled, two team members who were not included in the interview process examined the artifacts derived from the interviews (notes) and coded data based on the interview protocols used and specific questions asked in the interviews. The two coders used a standardized process to summarize answers from the notes back to the themes outlined in each set of questions. This process allowed the team to uncover additional insights from a fresh perspective, comparing the themes across interviews in a more structured way and more rigorously comparing the gaps across interviewee responses on IW from the semi-structured interview process.

Analysis and Findings

Because the main body of the report so heavily draws on the data collected and analyzed by way of our semi-structured interviews and subsequent coding, the findings presented in the report directly reflect our analytical findings for the interviews specifically. For this reason, we will not detail these findings separately here. Instead, we direct readers to Chapter 3, which discusses the findings in detail.

Limitations, Biases, and Caveats

As indicated above, interviewees were selected through purposive sampling based on their job titles, their related experience, and/or recommendation by others. Although the team sought to speak with as comprehensive of a group as possible, including individuals from several service and geographic commands, these individuals are not a fully representative population sample. Given time and resource constraints, the team prioritized speaking with personnel in the theaters that the joint force is currently the most focused on, such as EUCOM and INDOPACOM, as well as critical implementors, such as 16 AF staff. In addition, although semi-structured interviews allow for more-flexible conversations than structured interviews do, they also result in less homogeneous interviews, which can make comparison across interviews more difficult.

Appendix C

Details on Content and Lexical Analysis

While interviews provide an important means of eliciting stakeholder perspectives on the status of USAF IW, the data collected through interviews are limited to the observations and experiences of those interview subjects whom we were able to include in our sample. For this reason, we attempted to go a step further in understanding how the USAF thinks and talks about IW by examining several types of written content and discourse using qualitative and quantitative analyses. Specifically, the corpuses we built included two DAF journals—*ASPJ* and *SSQ*—and agendas from quarterly Corona conferences.[291]

Ultimately, the aims of this research stream were to determine how the discourse on IW has evolved (or has not evolved) within the USAF and the scholarly community; identify the areas of IW that are (or are not) prioritized; and explore how USAF leadership and thought leaders view IW compared with other USAF priorities. Broadly speaking, our analysis demonstrates that IW remains a secondary issue for the USAF. Of the IW-affiliated disciplines, cyber operations and, to a lesser extent, ISR appear to command the most attention of USAF leadership and thought leaders.

Methodology for Data Collection: Manual Content Analysis

To determine the degree to which USAF leadership and thought leaders discussed IW, OIE, and associated topics, we first built several corpuses; we compiled key leadership documents, peer-reviewed articles in *ASPJ* and *SSQ*, and Corona agendas for the years 2016–2021, inclusive. We deliberately selected this as the period of analysis to reflect the period following Russia's 2014 incursion into Ukraine and U.S. and European officials' determination that Russia had employed IW instruments to interfere with key elections.

We selected *ASPJ* because it is one of Air University's flagship journals and because it serves as an important forum for senior and mid-ranking leaders to voice their ideas. For mid-ranking officers in particular, *ASPJ* is a means to make their ideas known in a venue that is visible to senior leadership. As described by Air University, *ASPJ* is "the Air Force's professional peer-reviewed journal and the leading forum for airpower thought and dialogue . . . it is designed to serve as an open forum for the presentation and stimulation of innovative thinking on military doctrine, strategy, force structure, readiness, and other matters of national defense."[292] We included all 37 of the journal's issues from the spring 2016 issue through the winter 2021 issue in the corpus.

[291] For additional background on Corona conferences, see Tucker, 2005.

[292] Air University, "Air University Press," webpage, undated.

Like its sister publication *ASPJ*, *SSQ* is published by Air University Press and is directed toward senior leadership. Unlike *ASPJ*, its articles are often written by USAF-affiliated academics, although senior and mid-ranking officers publish in it as well. We included all 32 of the journal's articles from the spring 2016 issue through the winter 2021 issue in the corpus.

Finally, we built a corpus of public statements, interviews, press releases, and quotations attributed to a subset of USAF general officers serving in positions with some IW responsibilities. Here, too, we collected data for the period from spring 2016 through winter 2021. Of the approximately 285 USAF general officers, we selected 30 to include in the data collection, using the following selection criteria.[293] We included all four-star general officers, given their high visibility and ability to influence institutionwide decisionmaking. Next, we selected USAF component commanders and those combatant commanders who were in the USAF between spring 2016 and winter 2021. We also included the heads of the USAF's training and educational institutions and other organizations that shape airmen and groom future leaders (e.g., the superintendent of the U.S. Air Force Academy, the head of Air University, the head of AETC, the president of the National Defense University). Finally, we included commanders with specific IW roles, including General Haugh, then–commander of 16 AF and the DCS for ISR and cyber effects operations. We downloaded this information and developed a coded database listing name, rank, date, type of publication (e.g., press release, news article), and topic(s) within IW. Table C.1 provides a full list of the 30 general and flag officers included in the analysis.

To identify the content included in the analysis, we employed the following Boolean search strings for each of the individuals included in Table C.1: ["first name] [middle initial] [last name"] OR ["first name] [last name"] AND ["information warfare"] OR ["information operation"].

[293] Lawrence Kapp, *General and Flag Officers in the U.S. Armed Forces: Background and Considerations for Congress*, Congressional Research Service, R44389, updated February 1, 2019, p. 3.

Table C.1. General and Flag Officers Included in Manual Content Analysis

Rank	Name	Position at Time of Analysis
General	David W. Allvin	Vice CSAF
General	Charles Q. Brown, Jr.	CSAF
General	Anthony J. Cotton	Commander, USAF Global Strike Command
General	Jeffrey L. Harrigian	Commander, USAFE; Commander, U.S. Air Forces Africa; Commander, Allied Air Command
General	Mark D. Kelly	Commander, ACC
General	Michael A. Minihan	Commander, Air Mobility Command
General	John W. Raymond	Chief of Space Operations, USSF
General	David D. Thompson	Vice Chief of Space Operations, USSF
General	Jacqueline Van Ovost	Commander, U.S. Transportation Command
General	Glen D. VanHerck	Commander, NORTHCOM; Commander, NORAD
General	Kenneth S. Wilsbach	Commander, Pacific Forces; Air Component Commander, INDOPACOM
General	Tod D. Wolters	Commander, EUCOM; Supreme Allied Commander Europe
Lieutenant General	Steven L. Basham	Deputy Commander, USAFE; Deputy Commander, U.S. Air Forces Africa
Lieutenant General	Tony D. Bauernfeind	Vice Commander, U.S. Special Operations Command
Lieutenant General	Thomas A. Bussiere	Deputy Commander, STRATCOM
Lieutenant General	Richard M. Clark	Superintendent, U.S. Air Force Academy
Lieutenant General	Andrew A. Croft	Military Deputy Commander, U.S. Southern Command
Lieutenant General	Joseph T. Guastella, Jr.	DCS for Operations, Headquarters Air Force
Lieutenant General	Timothy D. Haugh	Commander, 16 AF
Lieutenant General	James B. Hecker	Commander and President, Air University, AETC
Lieutenant General	Samuel C. Hinote	DCS for Strategy, Integration, and Requirements, Headquarters Air Force
Lieutenant General	James A. Jacobson	Deputy Commander, PACAF
Lieutenant General	David A. Krumm	Commander, Alaskan Command, NORTHCOM; Commander, 11 AF, PACAF; Commander, Alaskan NORAD Region
Lieutenant General	Russell L. Mack	Deputy Commander, ACC
Lieutenant General	Charles L. Moore, Jr.	Deputy Commander, CYBERCOM
Lieutenant General	Mary F. O'Brien	DCS for ISR and Cyber Effects Operations, Headquarters Air Force
Lieutenant General	Michael T. Plehn	President, National Defense University
Lieutenant General	James C. Slife	Commander, AFSOC

Rank	Name	Position at Time of Analysis
Lieutenant General	Kirk W. Smith	Deputy Commander, U.S. Africa Command
Lieutenant General	Mark E. Weatherington	Deputy Commander, USAF Global Strike Command

NOTE: NORAD = North American Aerospace Defense Command; NORTHCOM = U.S. Northern Command.

Methodology for Data Analysis

Manual Content Analysis

For the manual content analysis, we combed through the full corpus of *ASPJ* and *SSQ* articles published between spring 2016 and winter 2021 and identified those that related to CO, ISR, IO, weather, PA, MISO/PSYOP, EMSO, IW, or OIE more generally. Next, we labeled these articles in a database, identifying author, affiliation, rank (if available), topic(s) within IW, issue date, and title. Finally, we undertook a historiographical analysis of each article in chronological order to examine discursive trends over time.

Topic-Modeling and Text-as-Data Analysis

To expand on our analysis of the *ASPJ* and *SSQ* articles selected and analyzed by members of the research team (human-driven analysis), we used machine-assisted techniques to analyze the content of the articles published between spring 2016 and winter 2021 in *SSQ*.[294] This analysis allowed us to better understand and describe the topics, coherence, and overall content of the USAF discourse over the six-year period that may or may not have been apparent to a human reader. To do this, we built a new corpus of 166 articles from the universe of articles published within our period of analysis in *SSQ*. We then employed descriptive corpus techniques and topic modeling on that corpus.[295] The journal publishes quarterly issues (spring, summer, fall, and winter). During our time frame, *SSQ* also published one extra article, a special issue,[296] which we included in our analysis, resulting in 24 traditional issues and one off-cycle special issue per journal, or 25 issues in total.[297] Each issue had a

[294] Because of time constraints, we were able to build and clean a corpus of only one journal, *SSQ*. We explore the insights we can glean from unsupervised machine learning on a small corpus. Expansion of the corpus would be feasible with more time and resources and would improve our ability to understand the prioritization and discussion within these leader-read journals.

We thank the editors of *ASPJ* and *SSQ* for their open publication of issues. While we are not reproducing the articles here, the open access to the journal contents eased our data collection process.

[295] There is one article, authored by Dallas Boyd, that appears to have been published in both the STRATCOM 2016 special issue and the spring 2016 issue of *SSQ*. The two articles carry the same name. Both are retained in the total number of articles (166) and the full corpus.

[296] *SSQ* published a ten-year anniversary special issue in our time frame, in addition to these 25 articles. However, this was a compilation of previously published articles, some of which predate our data collection, so we excluded this issue.

[297] The versions of the journal issues for the machine learning corpus were pulled directly from the two journals' archived issues webpage in summer 2022 to ensure machine-readable pdf files. Where *SSQ* published special edition articles, they appear to have replaced the traditional quarterly publications for those cycles, except for a 2016 special edition on STRATCOM and deterrence.

varying number of articles that we included in our study. To keep the texts that we analyzed as comparable as possible, we excluded some of the content that appears in the journal issues. Specifically, we excluded interview transcripts, book reviews, book essays, additional remarks, special features, editor notes, transcripts of committee testimony, in memoriam sections, and reflections on the journals themselves.

To move from pdf documents to an article-level text corpus, we used the *Text Extraction, Rendering and Converting of PDF Documents* (or pdftools) package in R. This package—specifically, the pdf_text() function—returns a vector of the text for each page of a pdf file, which we then pasted together into a vector with all the text from an issue for additional cleaning. Many of the articles in the issues of interest included figures, images, and tables, as is standard in academic articles, to communicate ideas and findings more precisely. If these features are read into the corpus like other paragraphs, sentences, or blocks of text, they do not always maintain their structure. For instance, tables are particularly powerful at communicating information because humans know to read across the axes to understand the categorization of the information included. If a computer were to read that text, it would "read" it only horizontally and without regard for the cell structure of the table. Thus, we output the issue-long vectors of text and removed the tables, figures, captions, author biographies, acknowledgments, disclaimers, and other formatted but nonuniform text from the files to preserve as much of the natural structure of the text data as possible. These cleaned text files were then read back into R and divided up by article, producing a data frame with one row for each article published in that issue.[298]

Once each issue had been broken into individual articles and other unstructured, nonuniform text had been removed by hand, the individual issues' data were merged together, and that dataframe was merged with existing data on each article, such as title, author, issue, journal, and whether or not the article includes IW topics.[299] The indicator for whether or not an article includes IW topics is a key connective piece between this machine learning approach to analyzing the article text and the manual content analysis discussed elsewhere in this report. These associated data, or metadata, provided extra content for our topic-modeling analysis. For our study, the metadata we used were limited to a dummy variable of whether or not the article was coded in the manual process as related to IW. *SSQ* published 12 articles in our period of analysis that were identified in our manual process as related to IW. This provided us with an additional (and rare, as most topic models are not run on corpuses with key topics labeled already) check on the topics produced by the model. If we were interested in how the topics changed over time, we could use the publication dates of the articles in this way as well.

Finally, before the text corpus could be analyzed, more–finely tuned cleaning of the corpus was required. First, we removed any standard disclaimer language from the headers of articles, and then we removed symbols and other Unicode features in the corpus. After that, we simplified key or common acronyms. In some cases, we replaced the spelled-out forms of terms with their abbreviated forms (e.g.,

[298] These steps are documented and can be rerun through the following R Markdown scripts: 7.26.2022_SSQnonOCR.Rmd and 7.26.2022_ASJPnonOCR.Rmd. For additional information on how this was done and how identifiers are built into the data, see those scripts.

[299] The merge to the metadata is provided in the file 8.3.2022_corpusprep.R. This includes building an article identifier with the journal, issue, and author as a unique identifier. This code also addresses typos from earlier author names across the many files to allow the merges to work.

intercontinental ballistic missile became *ICBM*). More commonly, we went in the other direction, spelling them out and then joining their component parts (e.g., *AI* became *artificial intelligence*). We also replaced such terms as *People's Republic of China* and *PRC* with *China* (we did the same with *DPRK* and *North Korea*) to help unify language around identical concepts.[300] Additionally, we replaced abbreviations that double as common words once capitalization is removed, to preserve those ideas as distinct from their common words. A good example of this is replacing "START" with the full title of the treaty, "Strategic Arms Reduction Treaty," as it is clearly and importantly distinct from the word "start."[301]

To simplify the rest of the scraping code after we finished with case-specific content, such as acronyms, we made everything in the dataset lowercase and scraped out the headers and footers that each journal includes on nearly every page. This boilerplate language includes the journal name, issue labels, article titles, and author names. After we removed standardized language, we worked to preserve text items that would not survive further standard and important preprocessing steps in the later analysis. For instance, all numbers, punctuation, stop words,[302] and stand-alone letters (i.e., single-letter words) are traditionally dropped. Consider what this means for a text corpus that often discusses aircraft, such as the F-35: Through basic preprocessing alone, "F-35" and any other platform referred to with the standard alphanumeric identifier would be dropped. To avoid this, we searched for all aircraft, missile, and radar identifiers in the data and replaced these alphanumeric identifiers with characters.[303] For instance, "F-35" became "fthirtyfive." Then, we worked to remove words that ran over one line or one page—i.e., hyphenated words at the end of a line or page. Furthermore, we paid particular attention to preserving the abbreviations associated with IW concepts and disciplines (especially the short, two-letter ones). Where the abbreviations were present, we replaced them with their text equivalents. For example, we replaced "IW" (in the cases in which it was defined as "information warfare" and not "irregular warfare") with "information warfare," and we replaced "EW" with "electronic warfare."[304] The only IW-related discipline we kept in its abbreviated form (replacing all spelled-out instances of the term with the abbreviation) was ISR.

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[300] Two members of the team combed through the "Shortened Word Forms (Abbreviations, Acronyms, and Initialisms)" list in the *DOD Dictionary of Military and Associated Terms* to pull abbreviations of interest to the core questions in the project and other abbreviations (e.g., one- to two-letter abbreviations, those with combinations of letters and numbers) that would be a challenge for the computer to parse given the known cleaning steps (DoD, *DOD Dictionary of Military and Associated Terms*, November 2021).

[301] Where necessary, we made these acronym changes at the article level. Article-specific disambiguation of acronyms was necessary for "CAP," which in one case was defined as "civilian air patrol" and in another was "combat air patrol." Similarly, "CT" was "counterterrorism" in some articles and "critical thinking" in others. We worked to address these issues as best as constraints allowed.

[302] As noted earlier, *stop words* are small words, such as articles, that serve little informational purpose in standard English.

[303] Some other similarly formatted identifiers, including some missiles, also arose from these searches, and we included them in this cleaning process. We focused our efforts on U.S. systems and paid less attention to adversary systems discussed in these ways. Future work could address these challenges in the corpus and modeling process.

[304] After much consideration of the downstream effects of preprocessing on unsupervised model results, we did not remove the spaces to make these abbreviations unigrams. Instead, we kept them as distinct words for the model to parse, in order to avoid adding bias (or a further aid for the computer to identify IW-related content) to the models. We felt that the attention paid to preserving these concepts through moving from acronyms to words struck a better balance with ensuring that the concepts would survive the preprocessing steps but not going a step further to include them as one concept.

Furthermore, these models are case-specific and are not designed to match acronyms, alternate spellings, or other very close synonyms to their alternate presentations. Following a similar logic to the F-35–type replacements, we combined words to replace limited multi-word concepts. We replaced a single "word" or token with acronym versions of key concepts with their spelled-out versions so that they remained together and are considered correctly in the analysis. For example, "United States" became "unitedstates."[305] Here, too, we worked to harmonize language across issues, authors, and perspectives. Specifically, we replaced all instances of the word "cyberspace" with "cyber." Even though DoD has moved to using the term "cyberspace," not every author has made the switch when discussing the same concept. Using "cyber" allowed us to capture discussions that use both "cyber" and "cyberspace."

We used the textProcessor function in the STM package for R to create the corpus objects we fed into the structural topic models.[306] This step removed punctuation, any remaining numbers, and extra whitespace and *stemmed* the corpus, or removed all but the roots of the words.[307] That is, "terrorism," "terrorist," "terrorists," and other words with a "terror" root were all cut down to their root word and included in the models as "terror." We paid particular attention to the preprocessing and corpus cleaning steps and order because of the known downstream impacts of changing the process (e.g., addressing necessary acronyms before removing capitalization). However, because of system and time constraints, we were unable to run the preText() tests, as advised by Denny and Spirling (2018).[308]

Computer-Assisted Analysis Findings

These standard text cleaning processes (except for word stemming, which is not done until the topic models are run) aid in producing useful document term matrices. Document term matrices include a count for each word in each document.[309] We produced one document term matrix for the full corpus of articles (n = 166) and one for those articles we labeled as IW-specific articles (n = 12). From those document term matrices, we produced the two word clouds presented in Figure C.1. The word cloud on the left side of the figure displays the most–frequently used words in the full *SSQ*

[305] This full cleaning process is included, in the order it was run, in the script 8.11.2022_corpuscleaning_preprocess.R. We also retained "departmentofdefense" and "airforce" as unigrams.

[306] This package was written by the same team that wrote the *Journal of Statistical Software* vignette cited later in the report (Margaret E. Roberts, Brandon M. Stewart, and Dustin Tingley, "stm: An R Package for Structural Topic Models," *Journal of Statistical Software*, Vol. 91, No. 2, October 2019).

[307] This process starts by bringing the corpus to lowercase, which we had already done in order to streamline the cleaning process.

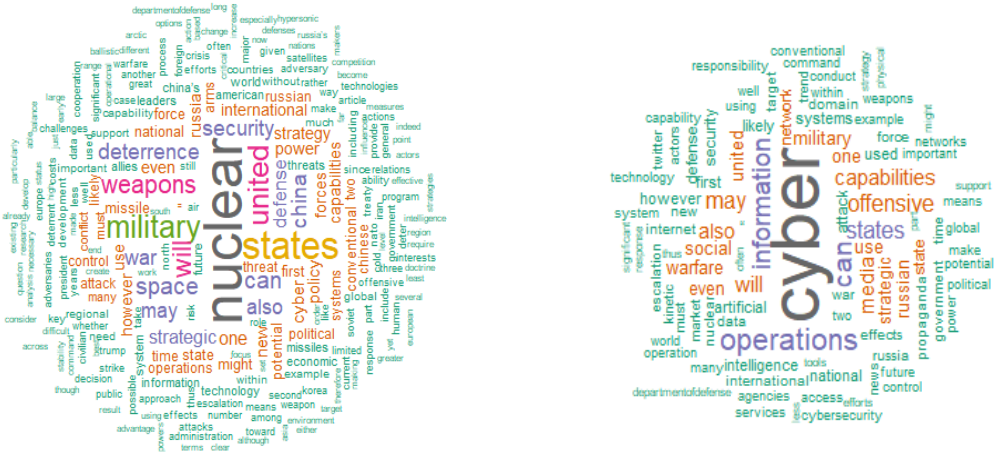
[308] Matthew J. Denny and Arthur Spirling, "Text Preprocessing for Unsupervised Learning: Why It Matters, When It Misleads, and What to Do About It," *Political Analysis*, Vol. 26, October 2018. The preText() analysis provides statistical estimations of how different the corpus is depending on the order of operations of preprocessing steps. In an attempt to provide a check of some kind to our preprocessing steps, we ran the corpus with two different specifications of the IW-related acronyms we drew from the text, as discussed above. The two corpus cleaning codes are found in the files 8.11.2022_corpuscleaning_preprocess.R and 8.21.2022_corpuscleaning_IWwithSpaces.R (respectively). These additional checks were used to check the models for IW-specific robustness; however, we paid the most attention to IW- and IW discipline–specific acronym preservation from the beginning of the process. There are certainly other cleaning steps and priorities that could be reflected in this corpus.

[309] Document term matrices are case-specific; for "The" and "the" to be counted as the same word, capitalization must be stripped from the corpus.

corpus, and the word cloud on the right shows the most–frequently used words in the articles dedicated to IW topics exclusively. The relative sizes and colors of the words indicate their frequency of occurrence in the corpus.[310]

Looking at these word clouds, we see some general trends. First, the corpus generally includes significant discussion of nuclear topics, which tracks well with the USAF's focus on its leg of the nuclear triad and the prevalence of nuclear deterrence as a topic of interest to members of the military and academics, both of whom author articles in *SSQ*. However, there are other important areas related to space, deterrence, war, and strategic issues, which, again, all seem to reinforce the focus of this journal on topics related to strategy, warfighting, and other military-related issues. If we turn to the word cloud on the right, we see *cyber* at the center, with *information* and *operations* nearby in a smaller font, highlighting the overall importance of cyber and related content to the articles identified in our manual process as related to IW. This word cloud appears to reinforce the finding from the interviews and survey results that cyber is one of the most identifiable and prioritized aspects of IW in the USAF.

Figure C.1. Word Clouds for Full Corpus (Left) and Information Warfare–Specific Corpus (Right)



To analyze the corpus, we used a structural topic model. A topic model is a form of unsupervised machine learning that relies on words and co-occurrences to measure the underlying themes within a large corpus of text. Functionally, it relies on the logic that when words occur together, they convey concepts, and, over a large enough string of words, depending on where the words occur together, these concepts form themes—or topics. Topic models use a process through which latent topics or themes are revealed based on how words are used together throughout the corpus.

[310] The full corpus word cloud was constructed to omit words that are used less than 350 times in the corpus and print the 500 most frequent words. The IW-specific word cloud was programmed to drop words that did not appear more than 50 times and plot the 1,000 most frequent words. See code in 8.22.2022_textanalysis_and_figures.R.

Latent Dirichlet Allocation (LDA) models, a form of probabilistic topic model, are rooted in the idea that one document can include content relevant to multiple topics, and, algorithmically, we can "analyze the words of the original texts to discover the themes that run through them, how those themes are connected to each other, and how they change over time."[311] Structural topic models, which we use in this report, build on LDA models but allow the inclusion of additional covariates—or other document features, such as author, time of publication, and whether the article was determined to include IW contents—in the modeling process and analysis.[312]

Where possible, in implementing the analysis for this process, we relied on the guidance and process laid out in Roberts, Stewart, and Tingley's vignette published in the *Journal of Statistical Software* in 2019. Structural topic models require the researcher to specify the number of topics in the document a priori. As is common practice in the implementation of topic models and the selection of the most accurate number of topics, we ran the same model several times with different numbers of topics specified and then compared the outputs and selected the number of topics that most efficiently and coherently captured the topics in the corpus. Overall, Roberts, Stewart, and Tingley (2019) suggest that researchers balance semantic coherence and exclusivity when selecting the number of topics to include in their analysis. Semantic coherence "is maximized when the most probable words in a given topic frequently co-occur together," and this has been shown to generally correlate well with human perception of topic quality,[313] but that can also be the result of having fewer topics with common words.[314] Roberts, Stewart, and Tingley rely on the Frequency-Exclusivity (FREX) score to measure exclusivity balanced with word frequency.[315] To balance between these two measures, the researchers include functions in the STM package to measure semantic coherence and exclusivity—measures that would be important to consider in future work but that ultimately fall beyond the bounds of our current analysis.[316]

We prioritized semantic coherence in selecting models, as we were interested in high-level description of the main themes discussed across the years covered in the journal. Below, we discuss the selection process and present the results for the models, which included between nine and 11 topics for the full corpus and six to eight topics for the IW-specific corpus. We ran these models for a wider range of topics (seven to 15 for the full corpus and five to eight for the IW-specific corpus). We note where the model outputs change drastically for these different specifications. For the models we present and the results we discuss, we reference the relative semantic coherence and exclusivity scores

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[311] David M. Blei, "Probabilistic Topic Models," *Communications of the ACM*, Vol. 55, No. 4, April 2012, pp. 77–78.

[312] Margaret E. Roberts, Brandon M. Stewart, Dustin Tingley, Christopher Lucas, Jetson Leder-Luis, Shana Kushner Gadarian, Bethany Albertson, and David G. Rand, "Structural Topic Models for Open-Ended Survey Responses," *American Journal of Political Science*, Vol. 58, No. 4, October 2014.

[313] Roberts, Stewart, and Tingley, 2019, p. 10.

[314] Roberts et al., 2014.

[315] A *FREX score* is "a univariate summary of topical content that averages performance in [two] dimensions": the frequency and exclusivity of a word (Jonathan M. Bischof and Edoardo M. Airoldi, "Summarizing Topical Content with Word Frequency and Exclusivity," *Proceedings of the 29th International Conference on Machine Learning*, 2012). That is, it is a measure of both the frequency of the occurrence of a word and its uniqueness.

[316] When we reference semantic coherence and exclusivity, we are drawing from plots of topicQuality(). We were unable to run selectModel()s for each model presented because of time constraints.

from the models to add context around the quality of the topics stemming from those particular models.

Structural topic models produce several types of results and visualizations, which we present and discuss below.[317] Furthermore, we discuss how robust our key findings are to changes in the selected number of topics. Figures C.2 through C.4 present plots of expected topic proportions within the full corpus, given the number of topics specified in the individual figures. The *x*-axes of these plots provide the expected topic proportion for the corpus, or the proportion of the whole "corpus that belongs to each topic."[318] The topic at the top of each plot is the most prevalent topic in the corpus and likely the most interpretable on its own. As we move down the plots, the topics represent smaller and smaller portions of the corpus and may not "hang together" as well as those higher up. The words listed to the right of the proportion line represent the three words that are most indicative of the topic.[319]

If we consider the words listed for each topic, we can see some distinct trends that match with what we might expect given the time frame of the corpus, the audience and authors of the articles included, and the word cloud outputs. For instance, in Figure C.2, we see a high prevalence of nuclear-focused terms listed with several of the topics. This suggests that the corpus includes several prominent discussions on nuclear deterrence and deployment of the nuclear triad. This topic retains its status as the most prevalent across all three model outputs presented here.[320] Take, for instance, Topics 3, 5, and 7 in Figure C.2: All focus on nuclear issues. When we dive deeper into the words and documents that make up those categories, we find that there are distinctly different topics under the broad umbrella of "nuclear." Topic 5 pertains to nuclear missiles and platforms through which weapons, including nuclear weapons, can be deployed, while Topic 3 contains discussion of nuclear deterrence and Topic 7 focuses on state or possibly nonstate proliferation.[321] We see similar patterns across the ten- and 11- topic models with regard to these topics.

[317] Code for the model analysis and selection is provided in the following files: 8.11.2022_textanalysis.R and 8.16.2022_check_comparemodels.R. This code also produced Figures C.2 through C.9.

[318] Roberts, Stewart, and Tingley, 2019.

[319] Roberts, Stewart, and Tingley, 2019.

[320] "Nuclear" and "deterr" or "nuclear" and "weapon" appear in the top topic summaries across models from eight to 15 topics. Only a model with seven topics, one defined by "cyber, oper, use," outranks a nuclear-related topic in this measure of estimated topic proportions. However, even in the seven-topic model, a nuclear-related topic is rated second highest.

[321] We can further inspect the contents of the topics through the labelTopics() function in the STM package or pull out individual quotes or documents. When we look deeper into the topics individually, we are using the labelTopics() function unless otherwise noted. Those outputs can be called from the model objects created in 8.11.2022_textanalysis.R and called from there or 8.16.2022_check_comparemodels.R.

Figure C.2. Plot of Expected Topic Proportions for Nine Topics for Full Corpus

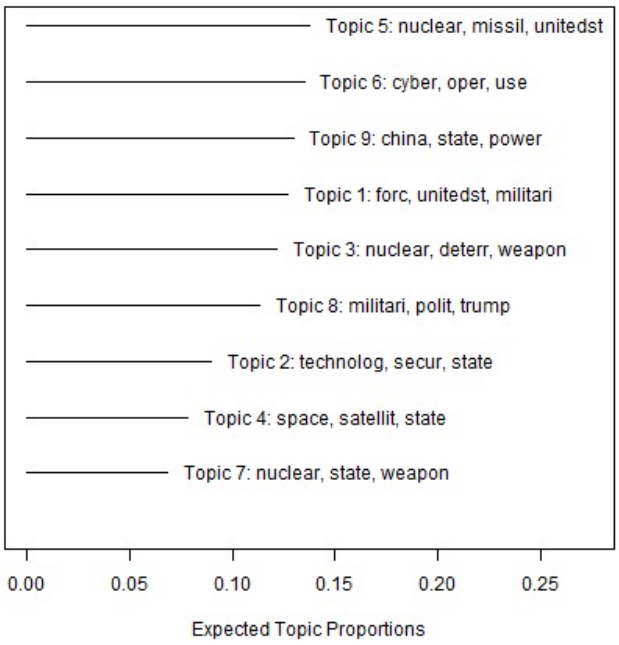


Figure C.3. Plot of Expected Topic Proportions for Ten Topics for Full Corpus

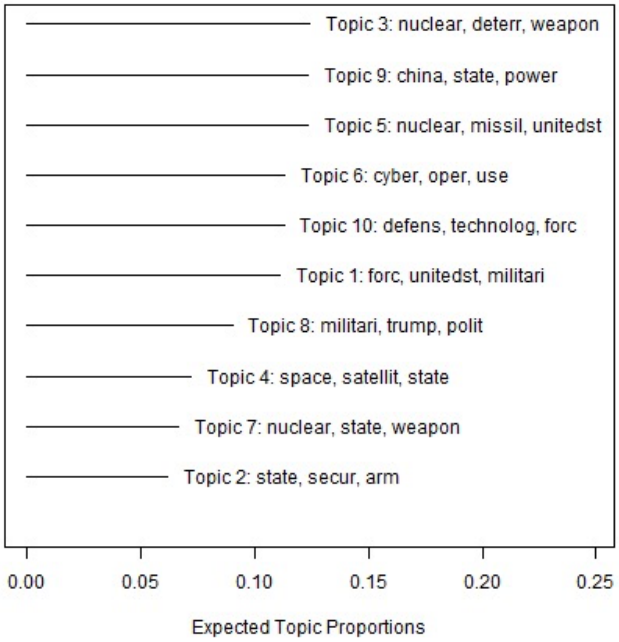
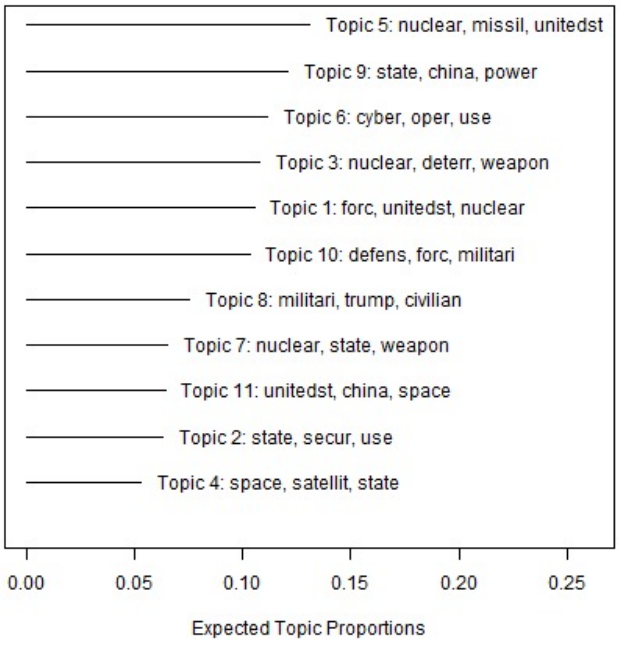


Figure C.4. Plot of Expected Topic Proportions for 11 Topics for Full Corpus



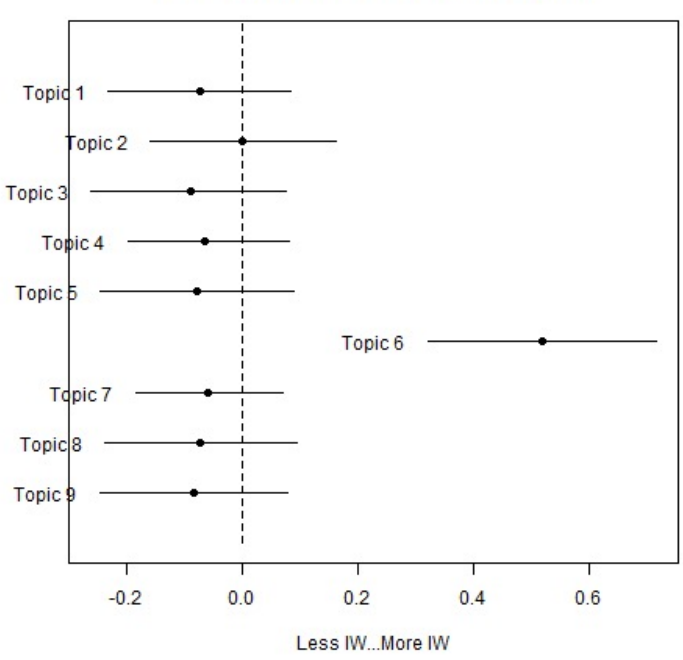
Of particular interest for this study is Topic 6. As we can see in the figures above, "cyber," "oper," and "use" are the top words that describe Topic 6, and they speak to topics important to IW. This observation is further supported when we dig deeper, as Topic 6 includes contents related to "artific," possibly relating to artificial intelligence (AI), and "network," as well as "inform" and "media."[322] Furthermore, this topic—or a similar one—appears in each model we ran with between seven and 15 topics. In the ten- and 11-topic models, Topic 6 had the lowest performing exclusivity and semantic coherence of the topics produced in those models. In the nine-topic model, this topic had relatively good semantic coherence, but the lowest exclusivity. This combination can be interpreted as having some common words driving the topic coherence and as being loosely held together—or possibly harder to describe cohesively—even though it is a topic that is durable across model specifications. We should note that only one distinctly IW topic is immediately identifiable from the estimated topic proportions for models with between seven and 15 topics.

Another way to test the relationships between topics and documents is through the document-level metadata included in the data for this analysis. Structural topic models can include covariates in the initial model, and those can be analyzed further after the topics are set. Figures C.5, C.6, and C.7 present topic prevalence contrast plots for the models shown above with nine, ten, and 11 topics (respectively). On the *x*-axis of Figure C.7, we have the expected topic proportion levels as they relate to the variable included, or the estimated proportion of the document related to that individual topic, regressed on the IW dummy label provided by the manual coding process. These plots are coefficient plots, which show the results of a linear regression; the dots represent the point estimate, and the lines

[322] These words are drawn from a list of additional FREX and highest-probability words from the nine-topic model but are mirrored in outputs from the ten- and 11-topic outputs.

extending horizontally represent the confidence interval that surrounds that point estimate.[323] The figures show that only Topic 6 clearly contains documents related to IW. We expected this because of the keywords produced, but it further confirms that the probabilistic topic models, like the team member who conducted the manual content analysis, are able to reliably detect IW as a distinct topic of discussion in this corpus. These regression results hold for the models we ran with between seven and 15 topics. Furthermore, while the point estimates are not significant and, therefore, not distinguishable from a null relationship mathematically, there are some topics that cross the zero line into the "more IW" side of the plots. This indicates that they might include more IW-related content and, therefore, that these topic areas might be interesting considerations moving forward (although these topics are not necessarily stellar performers when it comes to balancing semantic coherence and exclusivity).

Figure C.5. Plot of Topic Prevalence Contrast for Information Warfare Dummy Variable, Full Corpus, Nine Topics



[323] All of the regression models were specified with the standard "Global" level for uncertainty, which estimates uncertainty with the uncertainty of the topic proportions included in the regression estimates through the composition method (Roberts, Stewart, and Tingley, 2019).

Figure C.6. Plot of Topic Prevalence Contrast for Information Warfare Dummy Variable, Full Corpus, Ten Topics

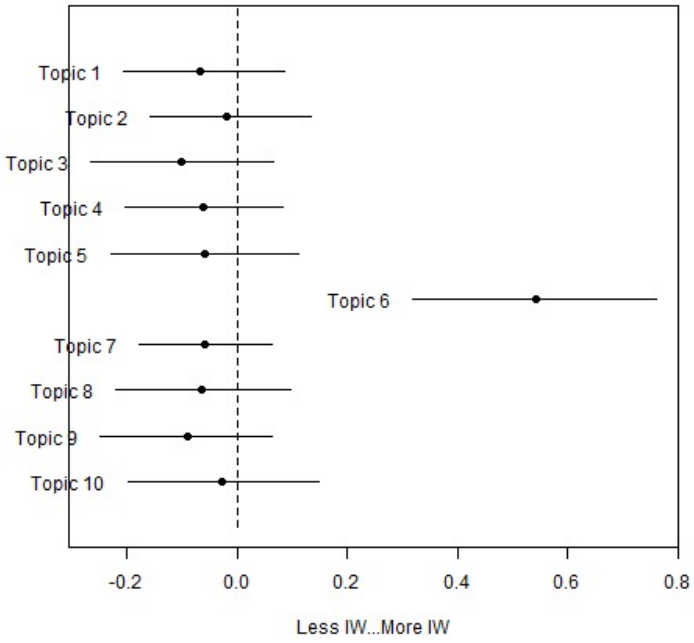
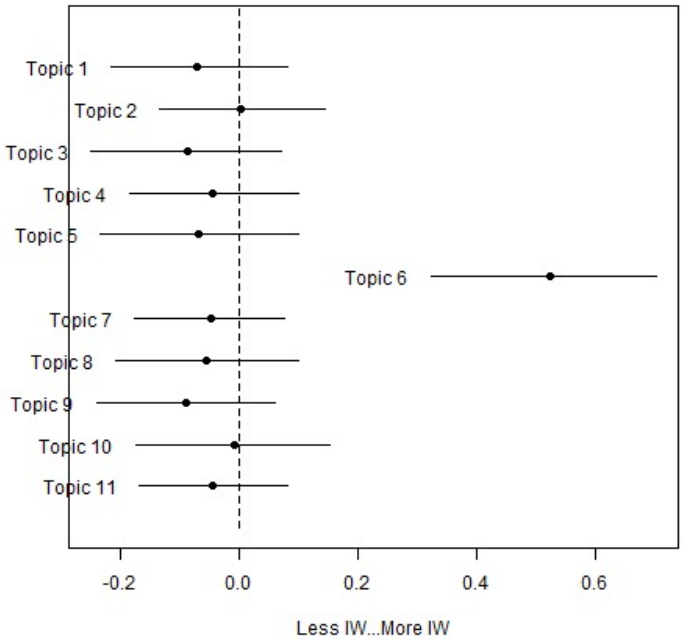


Figure C.7. Plot of Topic Prevalence Contrast for Information Warfare Dummy Variable, Full Corpus, 11 Topics



After analyzing the full corpus to understand how IW fits into the broader conversation over six years of USAF discourse, we pared down the corpus to include only those 12 IW-specific articles found through our manual content analysis process. Although this corpus is much smaller, we analyzed it the same way in terms of topic models and number of topics, though we did not perform the regression analysis on it, as we employed the dummy variable used above. To determine the number of topics that is most applicable to this set of documents, we ran models with five to eight topics specified. To explore what we can observe from within the IW-specific articles, we present the results from two topic models.

Figure C.8 presents the topic proportions for a model with six topics, and Figure C.9 presents the topic proportions for a model with five topics. Both models were run on the 12-document corpus of IW hand-labeled articles. Because of the smaller size of this corpus, we limited the number of topics to the lower end of what may be informative or generative rather than inferential, and we restrict our claims of certainty of what this analysis can tell us.[324]

Recall that the *x*-axis is a measure of how much of the corpus is represented by each topic, and the words listed on the right-hand side of that prevalence line represent the three words that best capture that topic. If we take each topic in turn, we see that Topic 1 covers the most of any topic within the IW-related discussion in the documents considered. It includes words related to "cyber," "attack," "kinet," and "capabl." These descriptive words hold across the five- and six-topic models, but this model also has the lowest levels of exclusivity in each of the models, indicating that this coherence of the topics may stem from commonly used words within the topic. While many of the highest-probability words from both of these models include the term "cyber"—which we might expect to be the case given USAF's cyber-focused approach to IW, based on other evidence we gathered—we still see different topics take shape that do not include this term.

In the five-topic model, we see that Topic 3 includes "inform, media, social, warfar, inform, [and] russia" as the highest probability; this group of words seems to be an assortment of terms related to IW and possibly disinformation on social media. (The FREX list of words includes "propaganda," "twitter," "disinform," and "bot.") Furthermore, this topic has the lowest semantic coherence of any topic in this model, meaning that it may be harder to pull a cohesive human-interpretable thread from this topic than from the others. Interestingly, when we consider the six-topic model, we see that there are two topics that relate to these areas: Topics 3 and 6. Topic 3 seems to center around mis- or disinformation on social media, while Topic 6 centers more around a general conversation regarding the uses of types of IW. Additionally, Topic 3's exclusivity increases but still suffers from a lower level of semantic coherence, while Topic 6 is in the lower third of topics in this model for exclusivity but is in the top half for semantic coherence. Once these two topics split (after the six-topic mark), they remained distinct in the outputs for the seven- or eight-topic models we also ran, demonstrating the balances struck with these models and the ability for the number of topics given to the models to reveal new, meaningful groupings of words into themes.

[324] After cleaning and before processing, this corpus has 2,414 terms and 10,801 tokens for consideration of the model.

Figure C.8. Plot of Expected Topic Proportions for Six Topics for Information Warfare–Specific Corpus

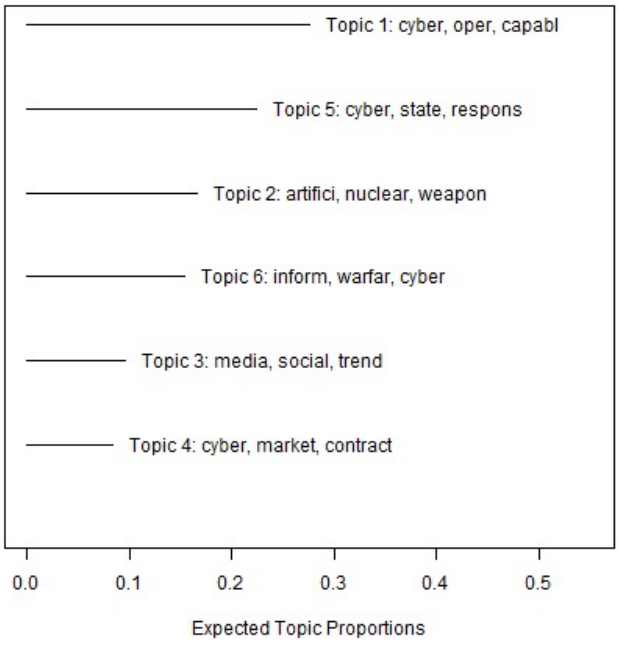
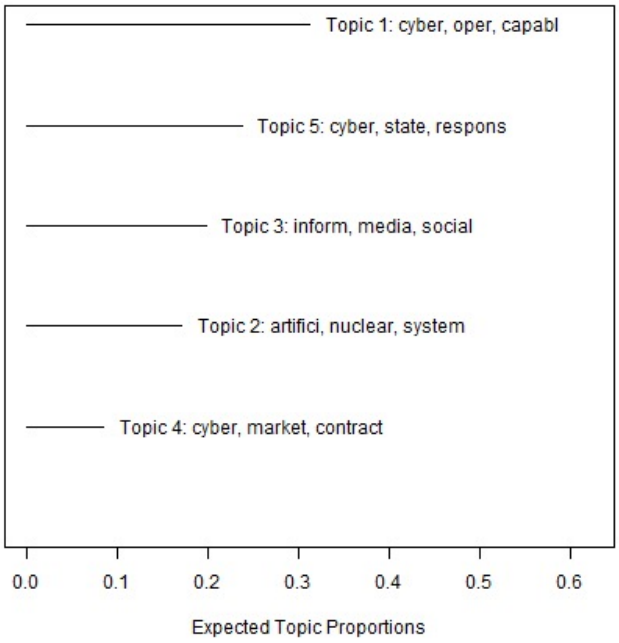


Figure C.9. Plot of Expected Topic Proportions for Five Topics for Information Warfare–Specific Corpus



Generally, within the IW corpus, it is hard to miss how prevalent cyber is within the models. Across all the models we ran, cyber comes up in the words most closely related to each topic for more

than half the topics in every model. Although cyber topics are not always the highest-quality topics in terms of semantic coherence and exclusivity, "cyber" is clearly a common enough word in the articles to appear across the board in these results.

Limitations

When dealing with any source of data, it is important to critically assess several factors, including the data that are included or excluded and the perspectives of the people who compiled the information. For quantitative data, consideration is often characterized as an inclusion or exclusion criterion and is cataloged in the coding decision rules documented in relevant codebooks. For text data, these questions can be somewhat easy to overlook, as the sources are more often the universe of articles published in a set time frame or the full archive that exists that should cover the context of the conversation. However, it is critical to consider what data are included and excluded and what motivated these decisions. In the case of the two journals that we examined, there are many reasons certain topics are covered, covered more, or missing completely.

First, there are issues of data and, relatedly, classification. Important conversations may be completely missing from this unclassified, peer-reviewed setting, and the technical details of certain areas of the USAF's mission, even around IW, appear in technical manuals rather than in academic journals. Second, the backgrounds and experiences of the authors of the texts examined are significant and can sway which topics are discussed. In the six-year span that we examined, the list of authors included USAF officers who wrote about their military disciplines and academics. That said, very few articles, if any, were written by enlisted members of the military, which certainly limits the visibility of certain viewpoints and lived experiences. This is not to say that this approach is wrong, but rather to acknowledge that it should shape the outcome of our analysis.

Additionally, editors and reviewers play a role in deciding which articles to publish and how to package journal issues. This is especially apparent in special issues—such as the U.S. Special Operations Command (SOCOM) special edition of *SSQ*—in which the journal traditionally solicits articles about a particular theme or question in order to put out a unified discussion. However, we also see some evidence of the practice of publishing like topics together in the standard, quarterly journal issues. While this is not a problem—editors play an important role in curating the conversations and discussions in the academic sphere—it does influence what is available for our analysis and, therefore, should shape how we consider the results.

Lastly, we selected and cleaned the data in this corpus, taking extra precautions to preserve the acronyms that we hypothesized were significant for this analysis. This is to say that our own biases could have influenced the analysis, despite our best efforts to put countermeasures in place.

Methods and Findings of Manual Content Analysis

In 2013, then–Lt Col Jeffrey W. Donnithorne argued that "organizational culture comprises the dominant variable in shaping a military's policy preference."[325] The U.S. military services are some of the largest organizations on earth. Each possesses a unique institutional culture that guides its priorities and decisionmaking, intraservice and interservice relationships, and dealings with Congress and the White House. The USAF is no exception. Interview subjects' perception that IW disciplines are not prioritized by leadership is unsurprising given past scholarship on the service's culture and priorities.

In *The Masks of War*, Carl Builder articulates that, at the time of his writing, the Air Force displayed two core cultural traits. The first was the prevalence of pilots (particularly fighter pilots) at the top of the service hierarchy.[326] The second was the service's proclivity toward using rigorous quantitative analysis to both improve its own operations and make its case for the latest, most-advanced technologies (usually aircraft) when appealing to Congress for funding approval.[327]

According to Builder, both cultural traits are important in understanding the lens through which senior Air Force leadership conceives of the service. At the time of his writing, pilots, especially fighter pilots, stood at the top of the hierarchy of Air Force disciplines and increasingly composed the bulk of Air Force leadership, a trend echoed in subsequent studies (discussed below). Builder's research found that Air Force pilots identified as pilots first and airmen second, and they tied their identities to their specific aircraft models (e.g., the F-15 Eagle and Strike Eagle, the F-16 Fighting Falcon) rather than to the service itself.[328] Therefore, Builder observed, rather than possessing a single, overarching service identity, the Air Force could be characterized as an institution with siloed loyalties to career paths and technologies within its relatively strict hierarchy.[329] Builder argued that these cultural traits existed because, above all else, the Air Force was about aircraft, or what he more broadly described as "toys."[330]

An implication of Builder's findings is that, at least in the 1980s, Air Force ISR was conceived of as an Air Force responsibility, but only in a support capacity to pilots' missions. Other aspects of what the USAF now conceives of as IW are not mentioned.

In a 1994 follow-on book, *The Icarus Syndrome*, Builder affirmed that this "sense of 'occupationalism' among members of the Air Force" continued to exist.[331] Jonathan Riley's 2014 paper

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[325] Jeffrey W. Donnithorne, *Culture Wars: Air Force Culture and Civil-Military Relations*, Drew Paper No. 10, Air University Press, August 2013, pp. 24–25. Donnithorne provides a composite definition of *culture* based on definitions from social psychologist Edgar Schein: "Culture is the prevailing personality of an organization, rooted in its collective history, enduring over time, and comprised of assumptions from which it forms a basis for future action" (p. 23).

[326] Builder, 1989, p. 26.

[327] Builder, 1989, pp. 104–105.

[328] Builder, 1989, p. 23.

[329] See also Smith, 1998b.

[330] Builder, 1989, pp. 22–23.

[331] S. Rebecca Zimmerman, Kimberly Jackson, Natasha Lander, Colin Roberts, Dan Madden, and Rebeca Orrie, *Movement and Maneuver: Culture and the Competition for Influence Among the U.S. Military Services*, RAND Corporation, RR-2270-OSD, 2019, p. 81, quoting Carl H. Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force*, Routledge, 1994, p. 283. Charles C. Moskos first posited this concept of *occupationalism* (Charles C. Moskos, "Institutional and Occupational Trends in the Armed Forces," in Charles C. Moskos and Frank R. Wood, eds., *The Military: More Than Just a*

on Air Force identities echoed Builder's scholarship in describing the service as being divided into so-called tribes. Riley cites Frederick Mosher's *Democracy and the Public Service* to argue that a single core group within an institution generally takes priority;[332] in the Air Force, the core group is the pilots.[333] Those who practice IW are somewhat further down the hierarchy.[334]

A 2012 study by retired brigadier general and RAND researcher Paula G. Thornhill largely supports the argument that the USAF lacks a unifying service identity that supports all airmen.[335] Thornhill determined that, historically, the Air Force had possessed five distinct cultures and had struggled to develop a singular, inclusive culture. She ultimately argues that "over, not through" best articulates the Air Force's culture, one that implicitly prioritizes the pilot and the airplane over other Air Force service members.

Recognition of the importance of IW for the USAF and its need to integrate IW into its culture and doctrine is not new. In a 1996 RAND study, Glenn Buchan argued that "dealing with this broad spectrum of 'information operations' should be the Air Force's first priority in taking advantage of the information revolution to support its combat operations. That is the basis for making everything else work."[336] Nevertheless, adoption of IW into USAF culture has progressed only incrementally since. In an Air University study from the same year, for instance, Robin K. Crumm argued that the Air Force did not even consider the PA discipline to be part of IW. Crumm noted that the Air Force's broader IW doctrine was "still in draft."[337] Martin Libicki and Jeremy Shapiro, writing in a 1999 RAND anthology edited by Zalmay M. Khalilzad and John P. White, pressed the Air Force to acknowledge, in an emerging, contested IW environment, that the service "must be prepared for the creation of [a] new constituency [cyberwarfare] in its midst, one that will seek its own identity and perhaps independence from the Air Force's pilot culture," and be prepared to eventually absorb that constituency into broader Air Force culture.[338] They relied on Builder's definition of IW as "warfare waged with information as a *primary* weapon or target."[339]

Job? Pergamon-Brassey's International Defense Publishers, 1988). For an updated version of his original thesis, see Charles C. Moskos, "Institutional/Occupational Trends in Armed Forces: An Update," *Armed Forces & Society*, Vol. 12, No. 3, Spring 1986; and Carl H. Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force*, rev. ed., Taylor and Francis, 2017, p. 283.

[332] Frederick C. Mosher, *Democracy and the Public Service*, Oxford University Press, 1982.

[333] Jonathan Riley, *At the Fulcrum of Air Force Identity: Balancing the Internal and External Pressures of Image and Culture*, Drew Paper No. 11, Air University Press, January 2014, p. 42. When we refer to "pilots" here, this does not include pilots of unmanned aerial vehicles (UAVs).

[334] See, e.g., William C. Thomas, "The Cultural Identity of the United States Air Force," Air University, undated.

[335] Paula G. Thornhill, *"Over Not Through": The Search for a Strong, Unified Culture for America's Airmen*, RAND Corporation, OP-386-AF, 2012.

[336] Glenn Buchan, *Information War and the Air Force: Wave of the Future? Current Fad?* RAND Corporation, IP-149, 1996, p. 4.

[337] Robin K. Crumm, *Information Warfare: An Air Force Policy for the Role of Public Affairs*, thesis, Air University, Air University Press, 1996, pp. v, 31.

[338] Martin Libicki and Jeremy Shapiro, "Conclusion: The Changing Role of Information in Warfare," in Zalmay M. Khalilzad and John P. White, eds., *Strategic Appraisal: The Changing Role of Information in Warfare*, RAND Corporation, MR-1016-AF, 1999, p. 450.

[339] Carl H. Builder, "The American Military Enterprise in the Information Age," in Zalmay M. Khalilzad and John P. White, eds., *Strategic Appraisal: The Changing Role of Information in Warfare*, RAND Corporation, MR-1016-AF, 1999, p. 22. Emphasis in original.

Donnithorne, in his 2013 paper, argued that the Air Force possessed a "forward-looking orientation" that prioritized new technologies.[340] However, he qualified this assertion by arguing,

> While the Air Force looks forward, its investment in high-priced systems with long development times creates a counterintuitive conservatism. The service builds its doctrine and force structure around the machines and systems in its inventory; however, when emerging technologies enable new doctrines or strategies [e.g., UAVs], they threaten the viability of the Air Force's posture. Builder explains, "In fostering technology, even for its cherished instruments, the Air Force is necessarily instigating new concepts and capabilities that challenge the form and preferences of its institution."[341]

This is to say that the establishment of 16 AF in 2019 and the related need to formalize USAF investments in IW personnel and technologies compete with the service's more traditional priorities. This reality provides additional context for a tension we observed: Even though USAF leadership acknowledges the importance of IW and expresses its desire for the USAF to be the preeminent service responsible for IW because of the service's technologically minded and forward-thinking culture, it struggles to realize this vision when it competes with the service's historic institutional priorities.

A 2019 RAND report by Rebecca Zimmerman and colleagues, which examines service culture in the 21st century, acknowledges Builder's 1989 and 1994 studies while updating and adapting their central tenets to reflect the modern information environment. Importantly, the authors note that space and cyber, alongside ISR, have become more important in Air Force doctrine: "The prevalence of fighter culture in the Air Force," the authors argue, remains "a point of contention among the service's other specializations, such as nuclear, space, and cyber, which have sought to increase their footprint within the service . . . by proving their indispensability."[342]

As of 2019, when Zimmerman and colleagues conducted their research, those in non-pilot career paths still perceived pilots as receiving "the lion's share of resources."[343] One person whom the researchers interviewed bluntly argued, "Unless your chief gets fired, the likelihood of space or cyber becoming chief are low."[344] However, the study's interviews implicitly suggested that IW would eventually be adopted by the Air Force's senior leadership as an important warfighting function. As the authors note, change does come to the Air Force, albeit slowly. For instance, the Air Force gradually adopted UAVs into its institutional culture. Similarly, it will take time to fully adopt IW. "People are now coming to [the Air Force] academy and choos[ing] ISR and . . . public affairs and strategic affairs," one interviewee shared, adding, "I would like to think the Chief of Staff and Secretary would reach out to all airmen."[345] The authors also suggest that the Air Force may have

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[340] Robert Farley, "US Air Force Culture, 1947–2017," in Peter R. Mansoor and Williamson Murray, eds., *The Culture of Military Organizations*, Cambridge University Press, 2019, p. 435.

[341] Donnithorne, 2013, p. 31.

[342] Zimmerman et al., 2019, p. 77.

[343] Zimmerman et al., 2019, p. 85.

[344] Zimmerman et al., 2019, p. 90.

[345] Zimmerman et al., 2019, p. 88.

room to grow as it "prepares for near-peer conflict," a competition that will require IW, as adversarial states already practice it against the United States and its allies and partners.[346]

Nevertheless, Zimmerman and colleagues' report implicitly articulates that cyber, at least, has grown in importance. It is perhaps unsurprising, therefore, that 16 AF was established as 16 AF (Cyber), even though it was designed to serve as the service's core institution devoted to IW.

Finally, Zimmerman and colleagues' study posits the question of whether the IW career path will eventually reap the same rewards as the pilot track.[347] As our study demonstrates, there is some evidence that this is already taking shape, albeit slowly. Apart from the reestablishment of 16 AF, in 2018, the USAF established an IO badge for AFSC 14F.[348]

Analytical Findings

Back issues of *ASPJ* and *SSQ*, USAF leadership Corona agendas, and the public statements of and articles by 30 general and flag officers from 2016 to 2021 generally correlate with interviewees' assessment that IW was not prioritized in the USAF until the reestablishment of 16 AF in 2019. Indeed, our content analysis indicates that IW is still fighting for attention from USAF leadership. Furthermore, it reveals that many individuals in the USAF believed, until recently, that *IW* simply meant CO and occasionally ISR or EMSO, whereas MISO, IO, PA, and especially weather were mentioned with far less frequency. In this section, we will review each entity's IW discussion.

As noted previously, *ASPJ* is an official publication of Air University Press. It provides an opportunity for mid-career airmen in particular to articulate novel concepts about the USAF and its future. General and flag officers published five times in *ASPJ* on any aspect of IW between 2016 and 2021, and the journal published 30 articles or commentaries on at least one aspect of IW during this period. In other words, only 15.8 percent of the 189 articles and commentaries published in *ASPJ* between spring 2016 and winter 2021 dealt with at least one pillar of IW. Of these 30 articles, 19, or 63.3 percent, also included cyber operations. CO discussion, therefore, dominated *ASPJ* articles from 2016 until the publication of the special winter 2020 edition, when a more general discussion of operations in and through the information environment took precedence. This latter shift is unsurprising, given that 16 AF was officially stood up in October 2019, merging the 24th and 25th Air Forces.

Until the publication of the special IW winter 2020 issue, only three senior USAF leaders published on IW in *ASPJ*. Lt Gen William J. Bender coauthored an article examining the importance of CO in the information age.[349] His focus is perhaps unsurprising, given that he was chief of the Office of Information Dominance and chief information officer to the Office of the Secretary of the Air Force at the time of the article's publication. In fall 2020, Brig Gen Gregory J. Gagnon authored

[346] Zimmerman et al., 2019, p. 92.

[347] Zimmerman et al., 2019, p. 91.

[348] Robert Stelmack and Don Gomez, "Breaking Out of Our Silos: How to Strengthen Relationships Between Service-Specific Information Operations Communities, and Why We Need to," Modern War Institute at West Point, July 12, 2021.

[349] William J. Bender and William D. Bryant, "Assuring the USAF Core Missions in the Information Age," *Air & Space Power Journal*, Vol. 30, No. 3, Fall 2016.

an article acknowledging that, "As a subset of IW, military activities in cyberspace often receive an increased amount of press."[350]

The third article authored by senior leadership is important, as it conveys a somewhat broader conception of IW than simply CO and was coauthored by General Haugh, then–director of intelligence at CYBERCOM. Haugh called for a reassessment of ISR "to close the highest priority intelligence gaps" that faced the United States.[351]

This is not to say that the CO concepts expressed in this period were not important. The relevant articles showcase the perspectives that have emerged among leadership on the nature of conflict as the United States has gradually shifted from counter–violent extremist organization operations to competition with near-peer rivals. Some articles specifically deal with digital tools that have become commonplace and susceptible to foreign malign use. For instance, in summer 2017, Lt Col Dieter A. Waldvogel authored a backgrounder on the need for the USAF to balance airmen's social media use and First Amendment rights with critical security issues.[352] He noted that social media platforms used by airmen "are vulnerable to web application attacks" from adversaries, malicious software, and disinformation and could reveal forces' locations.[353] Other articles offer ways for the USAF to take a leading role in fighting Russian disinformation efforts to prevent future interference in presidential elections.[354] Some officers, such as Maj Albert Harris III, have sought to translate lessons from the USAF's space and cyber domains to properly prepare for multi-domain warfare.[355]

The content of the articles also spoke to the USAF's concerns about data security over the course of this period. In spring 2018, Col Shane P. Hamilton, deputy director of intelligence at Headquarters ACC, and Lt Col Michael P. Kreuzer, executive officer at ACC's Directorate of Intelligence, warned that the USAF needs to take proactive ownership of and harness big data for both warfighting and competition below the threshold of armed conflict.[356] In an implicit response in spring 2020, Maj William Giannetti authored an article detailing DoD's internal cloud network, called TITAN (Technology for Innovation and Testing on Accredited Networks), and its role in the future of DoD AI.[357] In particular, Giannetti announced DoD's new strategy of developing AI programs that could learn to craft their own code. "With time and considerable training," Giannetti posited, "AI will discern tanks from trucks or MiGs from run-of-the-mill airplanes. Autonomous vehicles will

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[350] Gregory J. Gagnon, "Information Warfare, Cyberspace Objectives, and the US Air Force," *Air & Space Power Journal*, Vol. 34, No. 3, Fall 2020, p. 5.

[351] Timothy D. Haugh and Douglas W. Leonard, "Improving Outcomes: Intelligence, Surveillance, and Reconnaissance Assessment," *Air & Space Power Journal*, Vol. 31, No. 4, Winter 2017, p. 11.

[352] Dieter A. Waldvogel, "Social Media and the DOD: Benefits, Risks, and Mitigation," *Air & Space Power Journal*, Vol. 31, No. 2, Summer 2017.

[353] Waldvogel, 2017, p. 120.

[354] William Giannetti, "A Duty to Warn: How to Help America Fight Back Against Russian Disinformation," *Air & Space Power Journal*, Vol. 31, No. 3, Fall 2017.

[355] Albert Harris III, "Preparing for Multidomain Warfare: Lessons from Space/Cyber Operations," *Air & Space Power Journal*, Vol. 32, No. 3, Fall 2018.

[356] Shane P. Hamilton and Michael P. Kreuzer, "The Big Data Imperative: Air Force Intelligence for the Information Age," *Air & Space Power Journal*, Vol. 32, No. 1, Spring 2018.

[357] William Giannetti, "Quiet Giant: The TITAN Cloud and the Future of DOD Artificial Intelligence," *Air & Space Power Journal*, Vol. 34, No. 1, Spring 2020.

transport troops to the frontlines, and someday pilotless aircraft might transport cargo and refuel fighters."[358]

Despite the clear CO emphasis, not all articles published in this pre–winter 2020 period focus on CO. In summer 2020, for instance, Lt Col Will Atkins, Lt Col Donghyung Cho of the Republic of Korea Air Force, and MAJ Sean Yarroll of the U.S. Army authored "More Cowbell: A Case Study in System Dynamics for Information Operations." Shifting the focus away from CO, the three authors argued that while IW may never be the USAF's primary mission tool, it nonetheless "is often the capability that binds joint operations together to make it successful."[359] They suggested adopting a systems approach to IO and IW more broadly, mapping out systems of potentialities, "forecast[ing] the best and worst-case scenario within the systems map," "identify[ing] key nodes for information operations," and then "develop[ing] specific IO actions."[360]

The winter 2020 edition of *ASPJ* deserves special attention, as it focuses exclusively on IW. Published just over a year after the reestablishment of 16 AF, it signaled that the USAF had begun to examine non-CO pillars of IW, as well as CO. The forward to the winter 2020 edition was written not by a CO commander but by Lt Gen Mary F. O'Brien, DCS for ISR in Headquarters Air Force. Brig Gen George M. Reynolds called for "convergence in the information environment": specifically, the combination of "weather, public affairs, cyberspace operations, electronic warfare, information operations, and intelligence, reconnaissance, and surveillance" to produce powerful information.[361] But General O'Brien acknowledged that IW operations must be swift and agile if they were to succeed. Traditional tactics familiar to kinetic platform users may slow IW airmen down and ultimately lead to defeat.[362] In the same issue, General O'Brien called for the reestablishment of 16 AF as an opportunity to push IW to the front of every USAF operation. General O'Brien suggested that the Air Force conceive of conflict not as kinetic or peaceful, but rather as a continuum of competition, where IW would still provide critical information advantage.[363] General O'Brien's comments presage several articles in the issue that seek to both examine IW holistically, incorporating all of its pillars, and debunk the myth that IW is a type of activity that is practiced only during wartime to support kinetic warfare.

Capt Jayson Warren's article titled "Not All Wars Are Violent: Identifying Faulty Assumptions for the Information War" is arguably the most relevant article in the special issue. In this article, Warren dispels three common misperceptions that have implications for IW: "(1) All wars are violent; (2) deterrence is working if there is no violence; and (3) information warfare Airmen are *support* professionals because they do not engage in violence."[364] In debunking the first myth, Warren highlights information tactics that Russia employed globally during its illegal occupation of Crimea

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[358] Giannetti, 2020, p. 54.

[359] Will Atkins, Donghyung Cho, and Sean Yarroll, "More Cowbell: A Case Study in System Dynamics for Information Operations," *Air & Space Power Journal*, Vol. 34, No. 2, Summer 2020, p. 21.

[360] Atkins, Cho, and Yarroll, 2020, pp. 25–31.

[361] Reynolds, 2020, p. 6.

[362] Reynolds, 2020, p. 7.

[363] Mulgund and Kelly, 2020, pp. 17–18.

[364] Jayson Warren, "Not All Wars Are Violent: Identifying Faulty Assumptions for the Information War," *Air & Space Power Journal*, Vol. 34, No. 4, Winter 2020, p. 75. Emphasis in original.

and support for separatists in Ukraine's Donbas region in 2014. In debunking the second myth, Warren argues that "a more nuanced understanding of deterrence across all four instruments of national power [diplomatic, informational, military, and economic] (DIME)" is required.[365] In debunking the third and final myth, Warren bluntly articulates that IW airmen are frontline airmen, like fighter pilots. He argues that they are "the primary mechanism by which the USAF engages in strategic competition."[366]

In the spring 2021 issue, Maj Andrew Caulk, PA director for Special Operations Command Africa, critically examined the current state of DoD-wide IW and called for, among other issues, not "withholding engagement authorities at too high a level," so that IW airmen could act quickly and with agility.[367] He foresaw a new whole-of-government approach in which DoD "could serve as the information engagement framework into which the [Department of State] can plug and play under defense support to public diplomacy."[368] However, Caulk's plan aside, the frequency of IW articles published in *ASPJ* began to diminish after spring 2021; of those published, the majority dealt with CO—perhaps a legacy of 16 AF commander General Haugh, who had previously served as director of intelligence at CYBERCOM.

SSQ, published by Air University Press, is a sister publication of *ASPJ*. Like *ASPJ*, *SSQ* is geared toward senior DAF leadership. However, it is somewhat more academic in nature than *ASPJ*; most articles are authored by scholars, some of whom have an affiliation with the U.S. Air Force Academy or the Air Force Institute of Technology. Between 2016 and 2021, *SSQ* published 18 articles relating to IW; all but one concerned CO. IW articles constituted only about 11 percent of the 164 articles and commentaries published in *SSQ* in this period.

Although the IW articles published in *SSQ* in this period focused almost exclusively on CO, they covered a variety of CO topics. In summer 2016, Col Corey M. Ramsby and Panayotis A. Yannakogeorgos argued in favor of developing cyberwarfare groups within existing military components. In so doing, they presaged the eventual reestablishment of 16 AF within the USAF in October 2019.[369] *SSQ* scholars well understood CO's importance to IW. In winter 2016, James E. McGhee, then a legal adviser for Special Operations Command North, argued that "cyber offense" should be "liberated."[370] Echoing Caulk's argument in *ASPJ*, McGhee argued that CO decisionmaking should be pushed down the command hierarchy to be more flexible, fast, and agile in a rapidly moving contested environment.[371] Commanders, too, need to understand what CO can do for them.[372] Interagency CO sharing must be greatly enhanced, and there needs to be a concrete, interagency

[365] Warren, 2020, p. 82.

[366] Warren, 2020, p. 86.

[367] Andrew Caulk, "An Information Warfare Framework for the Department of Defense," *Air & Space Power Journal*, Vol. 35, No. 1, Spring 2021, p. 62.

[368] Caulk, 2021, p. 66.

[369] Corey M. Ramsby and Panayotis A. Yannakogeorgos, "A Reality Check on a Cyber Force," *Strategic Studies Quarterly*, Vol. 10, No. 2, Summer 2016, p. 129.

[370] James E. McGhee, "Liberating Cyber Offense," *Strategic Studies Quarterly*, Vol. 10, No. 4, Winter 2016, p. 46.

[371] McGhee, 2016, pp. 47–48.

[372] McGhee, 2016, p. 58.

definition of *offensive CO*.[373] Additionally, the time and energy required to plan proper CO must be better understood.

Other *SSQ* articles echoed their *ASPJ* counterparts, suggesting that both mid-career airmen and scholars were seeking to widen IW awareness. In winter 2017, for instance, Lt Col Jarred Prier discussed the importance of social media. Implicitly responding to Lt Col Waldvogel's summer 2017 article, Prier argued that DoD and the USAF needed to not only balance First Amendment rights with national security, as Waldvogel had argued, but also conceive of social media as an offensive information warfighting domain—one in which Russia and other near-peer adversaries were winning. In clear language, Prier explained the fundamentals of social media messaging and how messages can rapidly reach massive intended and unintended audiences through algorithm-driven networks, explored how the so-called Islamic State had successfully wielded social media, and detailed the Russia's CO involvement in the 2016 U.S. presidential election. Prier concluded that the U.S. military needed to invest significantly greater resources into offensive social media CO if it sought to win the information war. As Prier argued, "He who controls the trend will control the narrative—and, ultimately, the narrative controls the will of the people."[374]

Although only one article on general IW appeared in *SSQ* during this time, it is important. In spring 2017, Martin C. Libicki, then a visiting professor at the U.S. Naval Academy, explained how the various pillars of IW gradually become stovepiped in the 1990s and 2000s.[375] He then bluntly argued that true IW was more than the sum of its parts. And with the growing abilities of near-peer and asymmetric IW threats, it was time for the United States to adopt a holistic, all-encompassing IW approach integrating CO, ISR, PA, weather, MISO/PSYOP, IO, and EMSO.[376] "The US focus on defeating a cyberwar threat," Libicki argued, "will have to evolve into a focus on defeating a broader information warfare threat."[377] Libicki also explained how CO could leverage a variety of other IW assets, such as ISR and EMSO, to achieve the USAF's warfighting goals in an operation. Conversely, CO could be used to support a MISO/PSYOP operation. EMSO technologies could similarly be used to disrupt Bluetooth, local Wi-Fi, and other digital connections that the adversary relied on for daily tasks.[378] CO could also support operations that took place primarily in the electromagnetic spectrum. Software-defined radios "could be hijacked to jam or spoof targets hitherto inaccessible using traditional EW boxes [transceivers]."[379] Foreseeing the debates to come, Libicki concluded his article by arguing that "the use of IW elements should therefore be considered together rather than separately."[380] He also noted that the United States should not shy away from persistence: "Dabbling

[373] McGhee, 2016, pp. 60–61.

[374] Jarred Prier, "Commanding the Trend: Social Media as Information Warfare," *Strategic Studies Quarterly*, Vol. 11, No. 4, Winter 2017, p. 81.

[375] Martin C. Libicki, "The Convergence of Information Warfare," *Strategic Studies Quarterly*, Vol. 11, No. 1, Spring 2017, pp. 49–50.

[376] Libicki, 2017, p. 50.

[377] Libicki, 2017, p. 49.

[378] Libicki, 2017, p. 53.

[379] Libicki, 2017, p. 53.

[380] Libicki, 2017, p. 54.

in the arts of IW [during peacetime] could help prevent external developments from surprising the United States."[381]

More recently, Charles W. Mahoney, an associate professor of political science at California State University, Long Beach, investigated the role of defense contractors in CO. He concluded that outsourcing generally aids the United States in offensive and defensive CO, as it multiplies the number and activity of U.S. players beyond DoD and other government agencies, such as the NSA. But he warned against outsourcing too much responsibility to defense contractors, especially for cases in which a CO activity could result in casualties. DoD, he warned, must remain vigilant in its defense procurement process with defense contractors.[382]

These forward-thinking articles (among others) aside, relatively few mid-career airmen authored articles that considered IW beyond CO. While CO are certainly important, they represent only one of the pillars of IW—a point that Libicki, writing in *SSQ*, stresses. Some authors inside and outside the USAF have sought to figure out why the USAF IW community tends to focus on CO. Certainly, Russia's social media–led interference in the 2016 U.S. presidential election and the Islamic State's deft use of social media in the same period resulted in a renewed focus on CO. Prier argues that the lack of a holistic, encompassing, persistently engaged U.S. IW strategy is partly a result of the proliferation of IW-focused entities across many government organizations without any clear coordinating agency following the closure of the U.S. Information Agency in 1999.[383] Either way, the relative dearth of non-CO IW articles in *ASPJ* and *SSQ* suggests to lower-ranking airmen that the USAF is not prioritizing integrated IW, apart from CO—a problem that is magnified by the fact that the USAF only recently adopted a sanctioned definition of IW.

The deprioritization of integrated IW is underscored by IW's effective absence—again, largely apart from CO—in Corona meetings. Corona is the biannual USAF commanders' conference involving senior leadership.[384] Corona meetings in 2016 and 2017 that touched on IW focused almost exclusively on CO and, to a lesser extent, ISR.[385] IW then disappeared completely from Corona meetings until a 2021 session called "Cyber and Intel Guardian Work Force."[386]

Press briefings, news articles, and other public statements provide a useful qualitative measure of USAF priorities. As mentioned in the methodology discussion, we conducted a content analysis of public statements, interviews, press releases, quotations, and news articles produced since 2016 by the Air Force's 30 general and flag officers who focus on IW.

We uncovered a total of 76 articles and press releases published between 2016 and 2021 that connect our 30 selected general and flag officers with some aspect of IW. Of the 30 general and flag officers included in our analysis, 15 (50 percent) were mentioned at least once in a press release or an

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[381] Libicki, 2017, p. 61.

[382] Charles W. Mahoney, "Corporate Hackers: Outsourcing US Cyber Capabilities," *Strategic Studies Quarterly*, Vol. 15, No. 1, Spring 2021, pp. 81–82.

[383] Prier, 2017, p. 78.

[384] Tucker, 2005.

[385] Headquarters, U.S. Air Force, "Corona Top 2016 Week-at-a-Glance," presentation slides, 2016a, slide 3; Headquarters, U.S. Air Force, "Corona Fall Briefing Tasks," presentation slides, August 17, 2016b, slide 7; and Headquarters, U.S. Air Force, "Corona Top 2017," presentation slides, June 26, 2017, slide 3.

[386] Headquarters, U.S. Air Force, "Corona Fall," presentation slides, October 12, 2021, slide 13.

article relating to IW. Of the 76 articles, 35 concern CO (46.1 percent), nine concern EMSO (11.8 percent), eight concern ISR (10.5 percent), three concern IO (3.9 percent), 29 concern IW generally (38.2 percent), and one concerns weather (1.3 percent). (Some articles mention more than one IW discipline.) Therefore, most of the articles and press releases authored before the reestablishment of 16 AF are focused on CO and, to a lesser extent, ISR. Some generals' names are unsurprising, including General O'Brien, DCS for ISR and cyber effects operations;[387] General Mark D. Kelly, commander of ACC; and General Haugh, now–commander of 16 AF. Generals Kelly and O'Brien also authored pieces in the 2020 special issue of *ASPJ* on IW.

It is insufficient to simply quantify general and flag officers' press releases or articles that mention their names with some aspect of IW. A content analysis of these 76 articles reveals interesting details that generally support interviewees' sentiment that the USAF does not yet prioritize a holistic and integrated IW approach, despite having stood up a NAF devoted to it.

As noted previously, articles and press releases published before the reestablishment of 16 AF focus heavily, but not exclusively, on CO-related issues. In 2016, DoD admitted that it needed to focus more of its attention on defensive and offensive CO, citing Moore's Law as "caus[ing] challenges" for DoD.[388] Brig Gen Charles L. Moore, Jr., then–deputy director of global operations of the Joint Staff,[389] stated that "there is hardly a military mission that doesn't incorporate cyber capabilities, and that is both a great strength of the U.S. military and a possible weakness."[390] But this realization alone is not sufficient to lead in CO or IW more generally. In a *Defense One* article published that same day, Moore admitted, "We don't have the scale or the complexity to truly represent a realistic and relevant threat, the ones that we're truly trying to train to."[391] By 2016, it was becoming clear to USAF officials that CO would also need to be agile. CO airmen needed to become "beat cops," stated then–director of CO for NORAD and NORTHCOM Brig Gen Mark Weatherington in June 2017.[392] Weatherington also sought to enhance allied and partner CO cooperation.[393] The USAF began to realize this goal in May 2019, when General Haugh, then the director of intelligence at CYBERCOM, ordered his command to redeploy in allied and partner countries to help protect the United States during the 2020 presidential election.[394]

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[387] USAF, "Lieutenant General Mary F. O'Brien," webpage, undated.

[388] Jim Garamone, "U.S. Military's Cyber Capabilities Provide Strength, Challenges, Official Says," U.S. Department of Defense, June 22, 2016. *Moore's Law* refers to a trend observed by engineer and businessman Gordon E. Moore in 1965. Moore postulated that manufacturers "had been doubling the density of components per integrated circuit at regular intervals, and they would continue to do so as far as the eye could see." Since then, Moore's Law has become a means of predicting other trends and calculating "the pace of innovation" (Robert R. Schaller, "Moore's Law: Past, Present, and Future," *IEEE Spectrum*, Vol. 34, No. 6, June 1997, p. 53).

[389] USAF, "Lieutenant General Charles L. Moore Jr.," webpage, undated.

[390] Garamone, 2016.

[391] Patrick Tucker, "The US Military Can't Train to Fend Off the Worst Cyber Attacks on Infrastructure—Yet," *Defense One*, June 22, 2016.

[392] Mark Pomerleau, "Cyber 'Beat Cop' Needed to Add Context for SWAT Teams," C4ISRNET, June 14, 2017b.

[393] Mark Pomerleau, "US Seeks Stronger International Cyber Defense Partnerships," C4ISRNET, June 14, 2017c.

[394] Shannon Vavra, "Cyber Command Has Redeployed Overseas in Effort to Protect 2020 Elections," CyberScoop, May 7, 2019. See also Mark Pomerleau, "US Military Conducted 2 Dozen Cyber Operations to Head Off 2020 Election Meddling," C4ISRNET, March 25, 2021b.

Not all generals focused exclusively on CO, although it did preoccupy most minds. In July 2016, Maj Gen David Allvin, then the director of strategy and policy at EUCOM headquarters,[395] highlighted "cyber, propaganda[,] and information operations as elements of hybrid warfare" being developed for NATO use. He did not go into any further details.

Still, articles and press releases presaging the reestablishment of 16 AF are light on specific ways through which the USAF would actually conduct a defensive or an offensive CO. What is more, the 15 general and flag officers who are associated with some aspect of IW discuss other pillars, such as ISR, IO, MISO/PSYOP, PA, and weather, even less in their articles.

Did the CO focus of IW articles change with the reestablishment of 16 AF in October 2019? The reestablishment of 16 AF certainly demonstrated that the USAF increasingly recognized the importance of having a single, unified command for all IW activities, including CO, ISR, IO, MISO/PSYOP, PA, EMSO, and weather. But press releases and articles were less clear about how 16 AF would integrate these previously stovepiped IW pillars into a unified, agile offensive and defensive capability. Most articles from this period celebrate the appointment of General Haugh as commander of 16 AF and the promotion of General O'Brien from commander of the now-extinct 25th NAF, which focused on ISR, to DCS for ISR and cyber effects operations. Articles and press releases from this period pay only lip service to non-CO IW pillars; for instance, a March 2020 *Air Force Magazine* article states simply that "the IW cell brings together experts in intelligence, surveillance, and reconnaissance; electronic warfare; cyber; information operations; and public affairs, according to 16th Air Force commander Lt. Gen. Timothy Haugh," without analyzing what this means.[396] General Kelly, commander of ACC, stated in *Air Force Magazine* that he had "directed 16AF to shift the service's focus 'from primarily kinetic to . . . non-kinetic, from analog to digital, from conflict-focused to competition-focused, and from physical to cognitive,'" again without explaining how.[397] In the winter 2020 IW special edition of *ASPJ*, General Kelly stressed the importance of bringing the information dimension to the forefront of USAF operations, and he acknowledged that doing so would require a shift in C2 procedures that traditionally relegate IW to a supporting, secondary role.[398] However, this issue and the corresponding articles and quotations aside, senior leaders continue to remain light on details concerning how they are going to integrate the stovepiped IW pillars into a unified, highly trained, and specialized USAF.

EMSO gained some newfound impetus and detail in 2021, when the new CSAF, Gen Charles Q. Brown, Jr., highlighted its importance as a "cheaper option to defeat enemies."[399] He also "acknowledged that the Air Force has been 'asleep at the wheel' for the last 25 to 30 years when it comes to operations in the electromagnetic spectrum."[400] Brown promised that the USAF would

[395] USAF, "General David W. Allvin," webpage, undated.

[396] Cohen, 2020.

[397] John A. Tirpak, "16th Air Force Leading Shift from Conflict to Competition," *Air Force Magazine*, December 13, 2020.

[398] Mulgund and Kelly, 2020, p. 17.

[399] Mark Pomerleau, "Air Force Chief: Electromagnetic Spectrum Could Be Cheaper Option to Defeat Enemies," C4ISRNET, January 27, 2021a.

[400] Pomerleau, 2021a.

establish a new EMSO strategy as part of his broader "Accelerate Change or Lose" strategy.[401] USAF leadership released this strategy in April 2021. Specifically, the strategy defined *EMSO* for the USAF, directed the USAF to work closely with such organizations as the Defense Advanced Research Projects Agency, and instructed it to "develop robust Electromagnetic Battle Management" in support of DoD's Advanced Battle Management System.[402] Similarly, in September 2021, General Haugh revealed that 16 AF had adopted a Zero Trust policy concerning data so that "the command can securely bring in data from any sensor and confidently [use] them to gain an advantage over any adversary."[403]

16 AF's reestablishment did result in a gradual shift away from CO discussions. Of the 40 articles, press releases, and quotations identified following the reestablishment of 16 AF, 14 (35 percent) focused on CO. In comparison, 13 (32.5 percent) discussed IW more generally. Again, however, it is important to examine the content of these articles, press releases, and quotations. A November 2021 press release on the "future of information warfare," for instance, covered General Haugh's praise for the conduct of 16 AF since it was stood up but provided no details as to how 16 AF was organized, which pillars were operating well, and how well the pillars were being integrated.[404] Only one article mentioned CYBERCOM's intention to better integrate CO with IO.[405] In sum, apart from providing some insight into CO and EMSO, these articles generally reveal little about whether the USAF is prioritizing IW and, if so, how it is moving IW to the forefront of its operations. Therefore, these articles, press releases, and quotations implicitly support the argument in Warren's *ASPJ* article that IW airmen are seen by senior leadership as support personnel, not as airmen, like pilots. Furthermore, these articles provide no insight into IW training or education for airmen. Therefore, it is not surprising that airmen remain confused as to whether the USAF is serious about prioritizing IW by fully integrating its pillars and bringing it to the forefront of USAF activities in a world dominated by near-peer competition below the threshold of armed conflict.

Limitations, Biases, and Caveats

There are limitations to our qualitative content analysis approach. We examined only two journals, albeit important ones, and only during a relatively short time frame. We did not examine books or other printed or online sources published by Air University Press. Examining only *ASPJ* and *SSQ* limited our ability to obtain a true cross-section of airmen's opinions on IW in the USAF. This is because only mid to late careerists and affiliated academics tend to publish in these two journals.

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[401] Oriana Pawlyk, "No Longer 'Asleep at the Wheel:' Air Force to Roll Out New Electronic Warfare Strategy," Military.com, January 29, 2021a.

[402] J. Knowles, "US Air Force Releases EMS Superiority Strategy," *Journal of Electromagnetic Dominance*, June 11, 2021.

[403] Potomac Officers Club, "16th Air Force Commits to Zero Trust amid Rising Cyberthreats from China, Russia," September 22, 2021. As defined by the Potomac Officers Club (2021), "Zero Trust is a security concept centered on the belief that organizations should not automatically trust anything inside or outside its perimeters."

[404] Joshua Rodriquez, "Sixteenth Air Force Leaders Discuss Future of Information Warfare," Joint Base San Antonio News, November 30, 2021.

[405] Mark Pomerleau, "Cyber Command Moving Toward an Integrated Information Warfare Approach," FedScoop, March 11, 2022.

Therefore, we gained little insight into how the USAF's "rank and file" conceive of IW and how, if at all, IW is taught at the U.S. Air Force Academy. A future study would benefit from a wider variety of journals and other forms of printed and online media.

Furthermore, as mentioned above, there is a human element in selecting what gets published when and where—aside from the process of peer review. In addition, this analysis was not exhaustive and was likely biased by our Boolean search of general and flag officers' IW commentary and the way in which we crafted the Boolean search itself. A different Boolean search may have produced different results. Additionally, we did not examine how external authors—e.g., from other services—conceived of USAF IW in the 2016–2021 period; we examined the views of internal authors only. Although we selected 30 general and flag officers whom we deemed relevant (including all four-star generals), we may have overlooked potential additional sources. A future study could include multiple Boolean searches to retrieve additional responses.

Appendix D

Alternative Information Warfare Constructs

What alternative constructs might be available for the USAF's presentation of IW forces to USAF and joint units and entities, and what strengths or limitations are associated with each construct? To interrogate these questions, the project team met in person in RAND's Santa Monica office on June 28 and 29, 2022, for a workshop intended to identify, develop, and explore possible alternative constructs for the presentation and organization of USAF IW forces. To add structure to the discussion, prior to the workshop, each team member was asked to try to identify possible alternative constructs for the presentation of forces and to be prepared to answer a series of questions about them. (These questions are listed in the next section.) Team members with specific service-related expertise were tasked with preparing presentations related to how their respective services currently organize and present forces to inform consideration of service-specific constructs. Team members were encouraged to propose at least strawman alternative constructs from other sources: suggestions made in subject-matter expert interviews, constructs present in the literature, construct in use by allies or partners, historical constructs, or creative notions (perhaps drawn from team members' expert imaginations or from constructs for the presentation of other types of forces).

Workshop Methodology

The workshop unfolded over two days and followed a semi-structured schedule. On the first day, assigned team members presented service-specific (and joint) approaches to organizing and presenting forces. Building from these initial constructs, we expanded the list of candidate constructs to include additional proposals abstracted from the existing literature, suggested in subject-matter expert interviews, or brainstormed by the team. The first day's workshop concluded with a rationalization and the combining of constructs that were initially described as different but clearly converged around a single construct or concept through discussion. The eight constructs that were still under consideration at the conclusion of the first day of the workshop appear in Table D.1.

Table D.1. Candidate Constructs Considered

Construct	Level of Analysis Devoted to Construct
IW division within air staff	Fully developed; see Chapter 4
IW wing or wings	Fully developed; see Chapter 4
IW as a direct reporting unit or field operating agency	Superficially elaborated in this appendix
NAF for IW	Superficially elaborated in this appendix
IW squadron within all wings	Superficially elaborated; Appendix D
IW major command	Not elaborated
JTF for IW	Not elaborated
Air operations center equivalent for IW	Included as a possible subcomponent of other constructs

The second day of the workshop began with the down-selection of the candidate constructs to a manageable number (two) of notionally feasible possible constructs for further evaluation. Down-selection was accomplished first through discussion and debate and then through a voting process in which each team member voted for the three constructs that they believed would be the most fruitful to explore further. The selected constructs are noted in Table D.1 (and are discussed at length in Chapter 4).

To conclude the second day of the workshop, the team elaborated on the selected constructs, seeking to tease out what they would actually look like if implemented by the USAF. We used several guiding questions (part of the structure of the semi-structured workshop) to think through each of the selected constructs:

- What should the specific mission of organization(s)/unit(s) be?
  - What are the combatant command gaps/requirements that USAF IW forces could fill? How?
  - What should USAF IW specialize in (if anything)? What are its unique contributions?
- How many organization(s)/unit(s) should make up the USAF IW enterprise/force?
- How should these be organized?
  - Geographically aligned? Functionally aligned?
  - Which USAF disciplines should fall under unit(s)?
  - What echelon do USAF IW units belong at? Different units at different echelons?
  - Who should lead these units (e.g., military/civilian, rank, specialty)?

- What is the chain of command for unit(s) (e.g., who do they report to, require approval from, who has operational control/tactical control versus administrative control?[406]
- How would these unit(s) fit into the joint force?
  - How would combatant commands request these forces/employ these forces (specifically, the processes, mechanics, etc.)
  - Whose authorities would these unit(s) have to operate under?
  - Does this change from steady state, to crisis, to conflict?
  - What coordination and deconfliction mechanisms exist (or need to exist) between IW units and other actors in this space?
- What are the potential pitfalls/challenges of these constructs? And the benefits?

While Chapter 4 presents and describes the constructs that were given full analytic attention on the second day of the workshop, this appendix includes some details about some of the other constructs that were considered, for the interested reader. We provide brief overviews of current service and joint organization and presentation of information forces, as well as short descriptions of other constructs considered and discussed.

Identified Service and Joint Constructs

During the workshop, we reviewed the way in which each service approaches IW (or the service-specific language used to describe that mission area). Each approach is described below to provide USAF readers with a sense of how the other services are organizing for IW and the relative prioritization of IW across the services. One of the insights revealed by the side-by-side review of service approaches to IW was the contrast in service core culture and the implications of those cultural cores for IW.[407]

The U.S. Navy, for example, emphasizes forward presence and sea control; with its emphasis on maritime force projection through the presence of ships, Navy culture is inclined to focus IW on the detection and counter-detection of ships, which leads to a focus primarily on the technical aspects of IW. As one workshop participant noted, "Traditionally, Navy IW is beeps and squeaks."[408] The cultural touchstone of the U.S. Army is about lethality, and the core of the Army mission can be understood as "to close with and destroy the enemy."[409] For the Army, then, IW is an enabler, something that might help provide opportunities or advantages when closing with the enemy, or it is viewed as a form of fires (specifically, nonkinetic fires). This approach stands in contrast to the core

[406] For a discussion of the doctrinal distinctions between tactical control, operational control, and administrative control, see AFDP 3-30, *Command and Control*, U.S. Air Force, January 7, 2020, Appendix A: "Command Authorities and Relationships."

[407] For further discussion of U.S. military service cultures and competition between the services, see Zimmerman et al., 2019.

[408] RAND Personnel 1, information workshop, June 28, 2022.

[409] RAND Personnel 1, information workshop, June 28, 2022. This long-standing aphorism is still captured in the U.S. Army's Soldier's Creed: "I stand ready to deploy, engage, and destroy, the enemies of the United States of America in close combat" (U.S. Army, "Soldier's Creed," poster, undated).

culture of the U.S. Marine Corps; marines focus on "war [as] a contest of wills."[410] Although marines are trained to impose their will on the adversary through violence and tempo, because Marine Corps culture embraces war as a contest of wills, the service is open to integrating IW with its other combined arms capabilities because of the recognition that IW might also help it win that contest. The USAF's core culture emphasizes air superiority, so airmen are inclined to view (or, as suggested in Appendix A, too often dismiss) IW through that lens.

U.S. Navy

Operationally, the Navy organizes its combat forces into fleets and command task forces under those fleets. The fleets are geographically aligned to the various GCCs and operate at the operational level of war. The command task forces are organized by function and are generally composed of a carrier strike group, an expeditionary strike group, special forces, logistics, and airborne maritime surveillance and operate at the tactical level of war.

The fleets use the staff processes outlined in Office of the Chief of Naval Operations Manual F3500.42, *Maritime Operations Center (MOC) Standardization Manual*,[411] and doctrinal guidance from Navy Warfare Publication 3-32, *Maritime Operations at the Operational Level of War*.[412] The MOC process enables cross-directorate coordination to support the commander's military decisionmaking process, the Navy planning process,[413] and fleet operations. The application of IW to fleet operations traditionally occurs through the intelligence (N2) and communications (N6) directorates, along with the IO division (N39), integrating across the commander's battle rhythm. Currently, the Navy is testing out a concept that utilizes a designated billet to act as the IW commander at the operational fleet level. This role is filled by a captain (O-6), who is responsible for being the lead integrator for the fleet's ISR, communications, weather, and IO. The origin for this concept was built on the IW commander role that is part of the Composite Warfare Commander Concept. This concept is implemented at the command task force level, specifically at the carrier strike group and expeditionary strike group levels.

The carrier strike group and expeditionary strike group operate at the tactical level of war using the Composite Warfare Commander construct.[414] In this construct, the commander's forces are organized under four subordinate warfare commanders. There is the strike warfare commander, which is the carrier air wing commander and has a staff that has tactical control of the carrier air wing and is responsible for air warfare operations. There is the sea combat commander, which is the

[410] RAND Personnel 2, information workshop, June 28, 2022. This tenet is familiar to most and perhaps even all marines and is captured in Marine Corps Doctrinal Publication 1, *Warfighting*, Headquarters, U.S. Marine Corps, Department of the Navy, June 20, 1997.

[411] Office of the Chief of Naval Operations Manual F3500.42, *Maritime Operations Center (MOC) Standardization Manual*, Department of the Navy, January 12, 2018.

[412] Navy Warfare Publication 3-32, *Maritime Operations at the Operational Level of War*, Department of the Navy, Office of the Chief of Naval Operations, October 2008.

[413] Navy Warfare Publication 5-01, *Navy Planning*, Department of the Navy, Office of the Chief of Naval Operations, December 2013.

[414] Navy Warfare Publication 3-56, *Composite Warfare: Maritime Operations at the Tactical Level of War*, , Department of the Navy, Office of the Chief of Naval Operations, December 2015.

destroyer squadron commander and is in tactical control of the ships and is responsible for surface warfare operations. There is the air defense commander, which is the commander of the cruiser and is responsible for defending the airspace around the carrier strike group. And there is the IW commander. The IW commander has historically been composed of the carrier strike group staff's N39 division and has historically focused on cruise missile defense, but, as the need for information-related capabilities has grown, so has the responsibility of this composite warfare commander (IWC Manual on CLAN). The Navy recently established a captain billet (O-6) on the staff to lead the integration of the IW capabilities and to be on par with the other composite warfare commanders.

To further the implementation of IW, the Navy stood up Command Tenth Fleet as the IW fleet. Tenth Fleet has several roles. It is the service component to CYBERCOM, SPACECOM, and STRATCOM. It is also the service cryptologic component to the NSA. These roles allow Tenth Fleet to provide IW capabilities to the joint force while at the same time providing IW reachback support to the other fleets.

U.S. Army

Different Army organizations view information differently. For the past five years, the Army has had internal debates about how it should characterize information.[415] The Army has diverged from the joint force and decided (on three separate occasions) not to create an information warfighting function. The conversation has also evolved to exclude the information environment from Army thinking and language, preferring instead to characterize information as part of the operating environment, primarily described through three dimensions: human, information, and physical. The Army has also decided to reject the term *operations in the information environment* and has instead decided to embrace the term *information advantage*. Under the Army's information advantage concept, five core tasks are specified: enable, protect, inform, influence, and attack.[416] Army leadership is moving in this direction because it wants to make "information" a part of 'commanders' business and not have it be assigned to any one staff officer.

However, the Army is still not aligned with the joint community, or any of the other services, and is exploring how to align information advantage activities with the Information Joint Function tasks. Additionally, there has been no overarching policy from the Department of the Army on information, though there are ongoing working groups related to finalizing and propagating these changes. While the Army is the service with (numerically) the most dedicated information-focused forces, it lacks the updated doctrine, policy, force structure, resourcing, and institutional capability required to generate these forces. There is currently no single policy champion in the Army to advocate on behalf of all the related capability areas, which can lead the individual capability areas to fight against one another for limited resources. Table D.2 highlights the division of force modernization proponents across numerous Army organizations.

[415] Ross, 2021.

[416] Army Doctrine Publication 3-13, 2023, p. vii.

Table D.2. Army Functional Process Responsibilities

Designated Area	Force Modernization Proponent
CA	Commander, U.S. Army Special Operations Center of Excellence
CO	Commander, U.S. Army Cyber Center of Excellence
EW	Commander, U.S. Army Cyber Center of Excellence
Intelligence	Commander, U.S. Army Intelligence Center of Excellence
IO	Commander, U.S. Army Combined Arms Center
MILDEC	Commander, U.S. Army Combined Arms Center
MISO	Commander, U.S. Army Special Operations Center of Excellence
OPSEC	Commander, U.S. Army Combined Arms Center
PA	Chief, PA

SOURCE: Army Regulation 5-22, *The Army Force Modernization Proponent and Integration System*, Headquarters, Department of the Army, 2015.

There are three major commands in the Army that traditionally care for and feed the various information-related forces: U.S. Army Cyber Command (USARCYBER), U.S. Army Special Operations Command (USASOC), and U.S. Army Civil Affairs and Psychological Operations Command (USACAPOC). USARCYBER and USASOC are primarily active-duty organizations, and USACAPOC is predominantly a reserve element. USARCYBER is the Army component that traditionally covers signals, cyber, and EW. USASOC typically covers Army SOF, PSYOP, and CA. USACAPOC is composed of PSYOP, CA, and IO formations. Intelligence forces are gathered under the Intelligence and Security Command (INSCOM). USARCYBER, USASOC, and INSCOM are each led by three-star general officers. USACAPOC is led by a two-star general officer, and MILDEC, OPSEC, and IO all have O-6–level branch chiefs in the Combined Arms Center to advocate for their needs. The 1st IO Command is currently aligned to USARCYBER. The senior IO officer (Functional Area 30 [FA 30]) in the Army caps out at O-6 (colonel). The U.S. Army does not consider FA-30 packets at general officer selection boards, which precludes an IO officer from becoming a general officer.

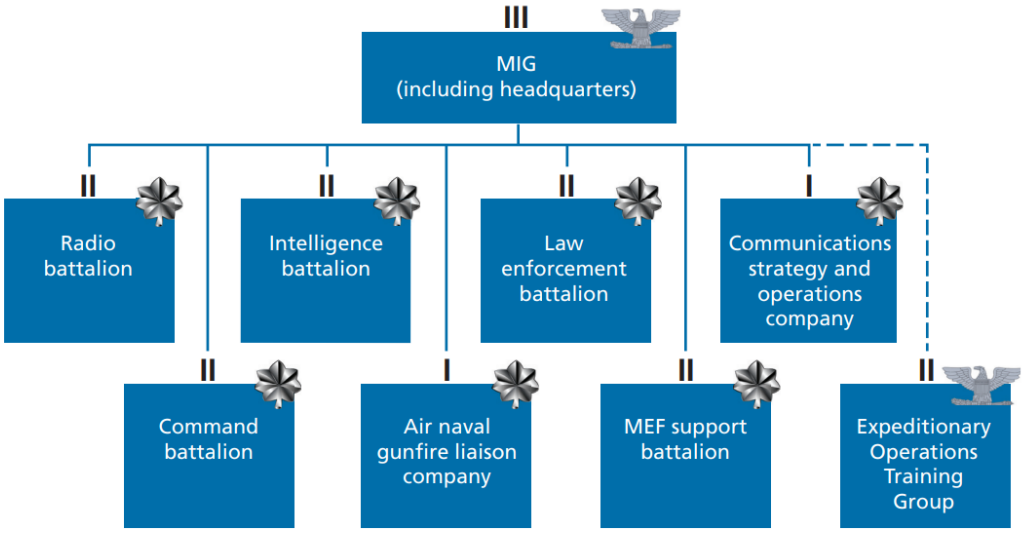
The Army has attempted to address both its force structure gaps and its capability gaps. As part of its force modernization assessment, the Army identified required capabilities across core and enabling capabilities critical to the execution of information advantage activities. It also conducted a functional needs assessment, which identified gap statements. Additionally, the Army is experimenting with different force structures to conduct information advantage. These include elements of the Multi-Domain Task Force, Theater Information Advantage Elements and Detachments, and other capability-pure organizations within USARCYBER and USASOC.

U.S. Marine Corps

The Marine Corps has made several important and relatively recent changes to how it organizes what we refer to in this report as *IW capabilities*. In 2017, the Marine Corps signaled the importance of information in the Corps by establishing the Deputy Commandant for Information and establishing information groups within each of the service's three MEFs.[417] In 2019, the Marine Corps added information to its list of warfighting functions.[418]

The Deputy Commandant for Information is a three-star headquarters office with planning and strategic functions and oversight over the Marine Corps Information Operations Center and the Marine Corps Intelligence Activity. The MEF information groups provide information capabilities that are deployable as part of MEF formations and are already integrated in MEF planning and staffing processes. Figure D.1 shows MEF information group organization. For force presentation and deployment, the Marine Corps employs the Marine Air-Ground Task Force (MAGTF) concept; MAGTFs are (typically) drawn from one of the MEFs. The most common form of MAGTF is a marine expeditionary unit: a self-contained, versatile forward-deployed formation of approximately 2,200 marines, typically embarked on amphibious assault ships.[419] Drawn from the MEF in tailored force packages, marine expeditionary units include forces drawn from the MEF information groups.

Figure D.1. Marine Expeditionary Force Information Group Command Structure



SOURCE: U.S. Marine Corps, *Marine Air Ground Task Force Information Environment Operations Concept of Employment*, July 6, 2017, p. 4, Figure 2.
NOTE: MIG = MEF information group.

[417] Mark Pomerleau, "Marines Look to Dominate in Information Environment," C4ISRNET, April 5, 2017a.

[418] Robert B. Neller, Commandant of the Marine Corps, "Establishment of Information as the Seventh Marine Corps Warfighting Function," Marine Corps Bulletin 5400, Headquarters United States Marine Corps, Department of the Navy, January 17, 2019.

[419] U.S. Marine Corps, "Marine Air-Ground Task Force," webpage, undated.

MEF information groups include a variety of information capabilities, all within an O-6–level command that is part of the MEF and available for MAGTF generation. During the workshop discussion, we recognized that the Marine Corps' integration of information forces into the base structure from which deployable formations are drawn and its endorsement of information forces forming habitual relationships with other elements of Marine Corps combat power are features that should be considered by other services, including the USAF.

Joint Force

Like the services, the joint IW community has recently begun to recognize the growing need to devote personnel, resources, and time toward countering adversary IW, protecting U.S. information and networks, and conducting its own influence campaigns. Consequently, the joint force has experimented with several construct types dedicated to IW.

The first, a JTF, is the most impermanent of the formations. As defined in joint doctrine, JTFs are "one of several command and control (C2) options for conducting joint operations. A JTF may be established when the scope, complexity, or other factors of the operation require capabilities of Services from at least two Military Departments operating under a single joint force commander."[420] From an organizational standpoint, JTFs are highly variable structures. "The size, composition, capabilities, and other attributes will vary significantly among JTFs based on the mission and various factors of the operational environment," according to the joint doctrine devoted to JTFs.[421] Given that the most-common types of JTFs are operational in nature, meaning that they are stood up in response to military operations approved by the Secretary of Defense, they are overwhelmingly used in cases in which permanent organizational structures and forces are not needed. As operational bodies involved in conflict, JTFs are often endowed with broad authority to operate, including in the information environment. On the other hand, their ephemeral nature means that they do not possess long-term funding security.

As of this writing, the Information Warfare Task Force–Afghanistan (IWTF-A) is the one example of the JTF that has been applied to IW that the research team is aware of. In their 2020 article on Army IW, then–Lieutenant General Stephen G. Fogarty and Colonel (Ret.) Bryan N. Sparling characterize the IWTF-A's role, activities, and relationships as follows:

> The Army Special Operations community led the IWTF-A development during combat operations. The IWTF-A was formed in theater, with augmentation from [the Army's] 1st IO Command, around a revolutionary operational approach, designed and focused on achieving cognitive effects through the synchronized employment of maneuver forces and information activities. Leveraging hostile fire zone authorities, the IWTF employs Military Information Support Operations

[420] JP 3-33, *Joint Task Force Headquarters*, Joint Chiefs of Staff, January 31, 2018, p. xi.

[421] JP 3-33, 2018, p. xi.

(MISO), social media collection, data analytics capabilities, and cutting-edge digital advertising technology to deliver highly effective influence messaging.[422]

With respect to more-permanent institutional constructs, the joint force has established the joint MISO WebOps Center (JMWC); JIOWC; and the Joint Staff, J39.[423] The JMWC, as its name might suggest, is a joint entity that specializes in web-based MISO campaigns. It is located in Tampa under SOCOM's chain of command but is home to representatives from various GCCs and TSOCs. For its part, JIOWC "supports the Joint Staff to meet [combatant command] requirements, improve development of information-related capabilities, develop and conduct IO assessment; and ensure operational integration coherence across the [combatant commands] and other DOD activities."[424] JIOWC, which is a chairman of the Joint Chiefs of Staff–controlled activity that reports to the J3, was located at Lackland Air Force Base but has since relocated to the D.C. metro area.

Other U.S. Air Force Constructs Considered

Over the course of the two-day, in-person workshop, the research team brainstormed and examined several different constructs for presenting IW forces to combatant commanders.

The first such construct was a direct reporting unit or field operating agency, similar in structure to NASIC. The advantage of such a structure would be that it could directly report to the CSAF and thus would help solve the challenge of IW not receiving prioritization and attention from senior USAF leaders. It would also clearly be a USAF-wide organization, helping promote the use and understanding of IW throughout the USAF. Its primary purpose would be to serve as a reachback organization, similar to how NASIC operates. It would be staffed by a variety of IW professionals, organized either by discipline (IO, cyber, weather, etc.) or by mission effect (cognitive effects, mission assurance, etc.) into different groups and/or directorates, depending on its overall size. It could provide in-depth analysis, assessment, planning, and training to operational units globally. However, such agencies are increasingly difficult to establish, because of recent congressional restrictions on their creation. Even if permission to create one were granted, it would require substantial new investment that is unlikely to be prioritized in the current resource-constrained environment.

The next concept we considered was a restructure and redesignation of 16 AF as an IW NAF. While 16 AF is already known as such, our analysis and findings demonstrate that, in practice, relatively little of the overall NAF structure and few of the assigned personnel are involved in IW day to day—that is, planning for and executing the *convergence* of IW effects. In this construct, all wings under 16 AF would be redesignated as IW wings, no longer stovepiped according to ISR, cyber, and other capabilities. Personnel would be mixed throughout the NAF so that every wing, group, and squadron would be focused on IW. The challenge with such a construct is obvious: The ongoing, necessary, and mandated missions of 16 AF would need to be shifted to another NAF or risk being

[422] Stephen G. Fogarty and Bryan N. Sparling, "Enabling the Army in an Era of Information Warfare," *Cyber Defense Review*, Summer 2020, p. 24.

[423] Michael Schwille, Jonathan Welch, Scott Fisher, Thomas M. Whittaker, and Christopher Paul, *Handbook for Tactical Operations in the Information Environment*, RAND Corporation, TL-A732-1, 2021, p. 73.

[424] Joint Chiefs of Staff, *Joint Officer Handbook: Staffing and Action Guide*, 4th ed., 2018a, p. 27.

neglected. In the end, we decided that a wholesale restructuring of such a large organization would be too heavy a lift and too risky for the USAF to adopt.

Finally, to address the challenge of promoting and adopting IW throughout the entire USAF, we considered establishing a new IW squadron within all wings. This construct has obvious advantages in that it would create billets in every part of the USAF in which personnel are dedicated to thinking about, planning for, executing, and assessing IW to complement and support the mission each wing is tasked with. However, we judged that in comparison with the air staff designee (deputy A3) concept, this concept would again require too many resources and be too major a shift to accomplish as quickly as is needed.

Abbreviations

16 AF	Sixteenth Air Force
616 OC	616th Operations Center
ACC	Air Combat Command
AETC	Air Education and Training Command
AFDP	Air Force Doctrine Publication
AFSC	Air Force Specialty Code
AFSOC	Air Force Special Operations Command
AI	artificial intelligence
ASPJ	*Air & Space Power Journal*
C2	command and control
CA	civil affairs
CO	cyberspace operations
CONUS	continental United States
CSAF	chief of staff of the Air Force
CYBERCOM	U.S. Cyber Command
DAF	Department of the Air Force
DCAPES	Deliberate and Crisis Action Planning and Execution Segments
DCS	deputy chief of staff
DoD	U.S. Department of Defense
EMSO	electromagnetic spectrum operations
EUCOM	U.S. European Command
EW	electronic warfare
FREX	Frequency-Exclusivity
GCC	geographic combatant command
GWOT	Global War on Terror

IE	information environment
INDOPACOM	U.S. Indo-Pacific Command
IO	information operations
ISR	intelligence, surveillance, and reconnaissance
IW	information warfare
IWTF-A	Information Warfare Task Force–Afghanistan
JIOWC	Joint Information Operations Warfare Center
JOPES	Joint Operation Planning and Execution System
JP	Joint Publication
JTF	joint task force
MAGTF	Marine Air-Ground Task Force
MEF	marine expeditionary force
MILDEC	military deception
MISO	military information support operations
NAF	numbered air force
NASIC	National Air and Space Intelligence Center
NATO	North Atlantic Treaty Organization
NCO	noncommissioned officer
NORAD	North American Aerospace Defense Command
NORTHCOM	U.S. Northern Command
NSA	National Security Agency
OCR	office of corollary responsibility
OIE	operations in the information environment
OPR	office of primary responsibility
Ops.	operations
OPSEC	operations security
P and T	personnel and training
PA	public affairs
PACAF	Pacific Air Forces

POM	Program Objective Memorandum
PSYOP	psychological operations
RDT and E	research, development, test, and evaluation
SAP	special access programs
SNCO	senior noncommissioned officer
SOCEUR	Special Operations Command Europe
SOCOM	U.S. Special Operations Command
SOF	special operations forces
SPACECOM	U.S. Space Command
SSQ	*Strategic Studies Quarterly*
STRATCOM	U.S. Strategic Command
TSOC	theater special operations command
UAV	unmanned aerial vehicle
USACAPOC	U.S. Army Civil Affairs and Psychological Operations Command
USAFE	U.S. Air Forces Europe
USASOC	U.S. Army Special Operations Command
USAF	U.S. Air Force
USARCYBER	U.S. Army Cyber Command
USSF	U.S. Space Force
UTC	unit type code

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PROJECT AIR FORCE

Information warfare (IW) and analogous terms of art are not new to the U.S. military's vocabulary writ large or that of the U.S. Air Force (USAF) specifically. Yet even with the decades-old recognition by senior USAF leadership that IW is fundamental to all aspects of air operations, the USAF's approach to conducting IW remains relatively nascent. Years after the establishment of the Sixteenth Air Force (16 AF), which lies at the center of the USAF's approach to contemporary IW, the USAF continues to wrestle with its operationalization of IW. It is against this backdrop that RAND researchers were tasked with identifying actionable recommendations for how the USAF should organize, train, and equip for IW.

First, the researchers characterized the current state of USAF IW and compared it with the approaches taken by other service and joint force organizations. Next, they identified the gaps that exist between policy, expectations, and reality regarding the roles, tasks, and missions the USAF IW community is expected to support. To address these gaps, they developed alternative constructs for the USAF's presentation of IW forces, describing both strengths and challenges of these constructs. Lastly, the researchers teased out the organize, train, and equip requirements associated with these constructs. This report describes the research and presents key findings and recommendations that emerged.

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