What's After Joint? Multi-Domain Operations as the Next Evolution in Warfare

A Monograph

by

Major Jonathan W. Bott
United States Air Force

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

2017

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
15-03-2017	Master's Thesis	JUN 2016 – MAY 2017

4. TITLE AND SUBTITLE
What's After Joint: Multi-Domain Operations as the Next Evolution in Warfare.

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Maj Jonathan Bott

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Command and General Staff College
ATTN: ATZL-SWD-GD
Fort Leavenworth, KS 66027-2301

8. PERFORMING ORG REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Advanced Operational Arts Studies Fellowship, Advanced Military Studies Program.

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This study describes potential problems facing future joint forces, and tests multi-domain theory as a possible solution. After framing the problem, this study uses micro-case studies and recent academic discussions to describe multi-domain operations and its conceptual evolution. It shows how the American joint model developed, the influence of the Goldwater-Nichols Act, and the difficulty of military transformation over the past three decades. After annotating some conceptual joint improvements, this study concludes with a specific discussion of why the adoption of multi-domain theory is an immediate requirement and improves joint operations through problem-based rather than Service-based solutions, integrated rather than deconflicted operations, and by creating options that exploit emergent opportunities.

15. SUBJECT TERMS
Multi-Domain Operations; Multi-Domain Battle; Joint Warfare; Anti-Access/Area Denial; Goldwater-Nichols Act; Interdependancy; Emergence; Mission Command; Cross-Domain; Military Affairs Evolution

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
					Maj Jonathan Bott
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. PHONE NUMBER** *(include area code)*
(U)	(U)	(U)	(U)	66	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

Monograph Approval Page

Name of Candidate: Major Jonathan W. Bott

Monograph Title: What's After Joint? Multi-Domain Operations as the Next Evolution in Warfare

Approved by:

_____, Monograph Director
Daniel G. Cox, PhD

_____, Seminar Leader
Robert L. Smith, COL

_____, Director, School of Advanced Military Studies
James C. Markert, COL

Accepted this 25th day of May 2017 by:

_____, Director, Graduate Degree Programs
Prisco R. Hernandez, PhD

Abstract

What's After Joint? Multi-Domain Operations as the Next Evolution in Warfare, by Maj Jonathan W. Bott, USAF, 66 pages.

This study describes potential problems facing future joint forces, and tests multi-domain theory as a possible solution. After framing the problem, this study uses micro-case studies and recent academic discussions to describe multi-domain operations and its conceptual evolution. It shows how the American joint model developed, the influence of the Goldwater-Nichols Act, and the difficulty of military transformation over the past three decades. After annotating some conceptual joint improvements, this study concludes with a specific discussion of why the adoption of multi-domain theory is an immediate requirement and improves joint operations through problem-based rather than service-based solutions, integrated rather than deconflicted operations, and by creating options that exploit emergent opportunities.

Military commentators have identified an impending crisis based on the proliferation of technology, anti-access strategies, growing multi-polarity, and increased complexity mixing regular and irregular warfare. As competitors increase their joint capabilities, the United States military must evolve its military theories, avoiding the stasis. Joint operations often deconflict rather than integrate operations. The military cannot depend on continuous domain superiority and must become resilient while temporarily ceding superiority in any one domain. Without the catalyst of a number of recent high-profile failures, this study aims to motivate action by furthering the discussion about what comes after joint in the absence of a visceral emergency.

This study concludes with a number of recommendations. Multi-domain discussions must lead to action and regular improvements rather than descending into jargon-filled, traditional biased service arguments over funding. Updating joint doctrine to include multi-domain theory is a necessary first step. Multi-domain discussions must include interagency partners as a whole-of-government approach to defeating enemy systems. Understanding capabilities, limitations, and maneuver in other domains will improve by incorporating multi-domain training events in joint exercises. Services should practice with and *against* each other to develop multi-domain capabilities since actions in one domain set conditions in another. Creating options across domains cannot be solely reliant on one service. The philosophy of mission command is critical for multi-domain theory to enable disciplined initiative to achieve a commander's intent in contested environments. Given the conceptual framework and the opportunity, many implementation ideas will emerge from tacticians practicing these theories. Widening understanding improves problem assessment and option creation in the presence of emergent opportunities. Since technological improvements are temporary advantages, the next evolution in military affairs is multi-domain operations, a method of thinking differently and creating innovative solutions with currently fielded forces.

Contents

Acknowledgements

Dr. Jeffrey O'Reilly, the Director of Joint Education at The Air Command and Staff College, inspired this monograph and provided perhaps the best education I have experienced through his Multi-Domain Operational Strategist course. It is my hope that this monograph aids in the effort he leads to expand the discussion on this important topic.

I am also indebted to the direction and assistance of Dr. Dan Cox, Professor at the School of Advanced Military Studies. He challenged my thinking about future warfare and thoughtfully bounded this project while gracefully allowing me the time and space to explore. Without his guidance, this study would have been a book-length work that no one would want to read.

To my friend and neighbor, Major Josh Powers, I will be forever thankful of our year spent together synthesizing our education, usually over a frosty beverage. Thank you for the family dinner nights, explaining all things Army, and for creating a coherent story with your edits on my wild ideas.

Finally, and most importantly, I would like to thank my wife Erin. Thank you for your patience when I was distracted, motivating me when I procrastinated, and for being the beautifully strong wife and mother to our family. You are a graceful blessing that makes me a much better man.

Introduction

> There are not more than five musical notes, yet the combinations of these five give rise to more melodies than can ever be heard. There are not more than five primary colors, yet in combination, they produce more hues than can ever be seen. There are not more than five cardinal tastes, yet combinations of them yield more flavors than can ever be tasted.
>
> — Sun Tzu, *The Art of War*

Picture a strategically important island within the operational reach of an enemy combatant. The enemy has garrisoned troops on this island, including a small air force contingent as a defense force. They also contest the surrounding seas with their naval assets. A traditional joint operation would likely unfold like this: the United States military would identify a joint force commander who would determine the best plan to control this decisive terrain, tell his subordinate service component commanders what role they have in the operation, and then use massive, overwhelming force to dominate the island. The Air Force typically establishes air superiority by destroying air defenses and the enemy air force before attacking operationally important targets to assist the landing. The Navy typically tasks a carrier or expeditionary strike group or to dominate the maritime environment around the island and transport marines for an amphibious landing. Depending on the size of the island, the Marine Corps or the Army would then execute the incursion, defeat the land forces, and establish control of the island. Three major assumptions are foundational to this scenario. First, that the United States has sufficient available combat power to defeat the enemy force. Second, time and space exist for the sequential operation described to occur. Finally, services can establish and maintain domain superiority. Maintaining these assumptions will likely lead to disaster in future conflicts considering the increasing fiscal constraints, global US military requirements, technological proliferation, and adversary advances in anti-access strategies.

Structure and Methodology:

This study describes potential problems facing future joint forces and tests multi-domain theory as a possible solution. After framing the problem, this study uses micro-case studies and recent academic discussions to describe multi-domain operations and its conceptual evolution. It shows how the American joint model developed, the influence of the Goldwater-Nichols Act, and the difficulty of military transformation over the past three decades. After annotating some conceptual joint improvements, this study concludes with a specific discussion of why the adoption of multi-domain theory is an immediate requirement and how it may improve joint operations through problem-based rather than service-based solutions, integrated rather than deconflicted operations, and by creating options that exploit emergent opportunities.

The Problems

Hew Strachan wrote that "getting the questions right is the first step to finding the correct answers."[1] He echoed Moltke's critical planning question, "What is the great conundrum of our era?"[2] The poignant question for the modern American military is how to succeed in a contested, degraded, anti-access environment against capable adversaries who challenge traditional American strengths.

The US military can no longer assume that the Air Force will gain air dominance, the Navy maritime, the Army land dominance, and that space and cyber will remain uncontested. Traditional battlespace conceptualization must shift since lack of access to one domain affects all domains.[3] Whether specific doctrine states it or not, contested battlespace now includes land, sea,

[1] Hew Strachan, *The Direction of War: Contemporary Strategy in Historical Perspective* (Cambridge: Cambridge University Press, 2013), 97.

[2] Helmuth Von Moltke, *Moltke on the Art of War: Selected Writings*, ed. Daniel Hughes (New York: Random House Publishing Group, 1996), 149.

[3] Jeffrey M. Reilly, "Multidomain Operations," *Air and Space Power Journal* vol 30, no. 1 (Spring 2016): 66.

air, space, and the electromagnetic spectrum, including cyberspace. Competitors operate in, through, and between these mediums. Examples include Russian cyber intrusions, China's anti-satellite testing, and Daesh's social media recruitment as a form of logistics.[4] China's assessments of conflicts note that campaigns will be conducted in all domains simultaneously and an emphasis on the electromagnetic spectrum drives a comprehensive approach.[5] This stresses that the electromagnetic spectrum is a vital dimension equally as important as traditional domains.[6]

According to doctrine, the electromagnetic spectrum is a physics-based maneuver space essential for control during all military operations."[7] It is crucial for communication, command and control, modern equipment operations, surveillance, and a bevy of common joint functions. The military has invested billions of dollars in war-fighting capabilities that rely on the spectrum.[8] It requires prioritization and deconfliction between units, which obliges joint force staffs to understand access and maneuver of spectrum-dependent systems. The spectrum is like a class of supply. The spectrum transcends all physical and international boundaries with the potential for unintentional collateral effects necessitating extensive multinational coordination. Jeffery Reilly noted that it "mandates an innovative level of operational planning that facilitates

[4] "A Cyber-Riot," *The Economist* (May 10, 2007), accessed December 16, 2016 http://www.economist.com/node/9163598; Jim Sciutto and Jennifer Rizzo, "War in Space: Kamikazes, kidnapper satellites and lasers," CNN report, accessed December 16, 2016, http://www.cnn.com/2016/11/29/politics/space-war-lasers-satellites-russia-china/; Lisa Blaker, "The Islamic State's Use of Online Social Media," *Military Cyber Affairs* Vol. 1, No. 1, accessed December 16, 2016, http://dx.doi.org/10.5038/2378-0789.1.1.1004.

[5] Deepak Sharma, "Integrated Network Electronic Warfare: China's New Concept of Information Warfare," *Journal of Defense Studies* 4, no 2 (April 2010): 37–38.

[6] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China* (Washington, DC: Office of the Secretary of Defense, 2013): 36, accessed October 16, 2016, https://www.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf

[7] Joint Publication (JP) 6-01, *Joint Electromagnetic Spectrum Management Operations* (Washington, DC: Office of the Secretary of Defense, 2012), I-1.

[8] Reilly, 69-70.

prioritized allocation of bandwidth, efficient data exchange, flexible security requirements, and the organizational processes necessary to support the operation."[9]

The electromagnetic spectrum is vital to space operations, another future contested operating environment.[10] Increasingly reliant on space-based capabilities, the military utilizes space for communications, precision weapons; and enhanced intelligence.[11] Competitors recognize space as a US force multiplier and as a vulnerability. Options to interfere with these capabilities include striking land-based controls, jamming links, and using directed energy to blind satellites.[12] Russia designed a satellite to maneuver to and destroy another satellite. Some park behind other satellites, listening to communications. China tested equipment that kidnaps and moves other satellites.[13] As competitors test options in the expanded battlespace, America must leverage emergent strengths to maintain relative advantages.

Increasingly powerful, inexpensive, and commercially available technology is decreasing America's traditional technological advantage.[14] As a consequence of Moore's Law, the doubling of transistors per circuit, the availability of advanced technology greatly increases the complexity

---

[9] Reilly, 70.

[10] Department of Defense, *Joint Operating Environment 2035* (Washington, DC: Government Printing Office, 2016), accessed December 7, 2016. http://www.dtic.mil/doctrine/concepts/joe/joe_2035_july16.pdf. United States Air Force Strategic Environment Assessment 2016-2046, (Washington, DC: Government Printing Office, 2016), accessed December 16, 2016. https://www.my.af.mil/gcss-af/USAF/AFP40/d/s6925EC13520D0FB5E044080020E329A9/Files/editorial/AFSEA_2016_FINAL.PDF.

[11] Joint Publication (JP) 3-14, *Space Operations* (Washington, DC: Government Printing Office, 2016). accessed December 7, 2016. http://www.dtic.mil/doctrine/new_pubs/jp3_14.pdf; Joint Publication (JP) 2-03, *Geospatial Intelligence Support in Joint Operations* (Washington, DC: Government Printing Office, 2016). accessed December 7, 2016. http://www.dtic.mil/doctrine/new_pubs/jp2_03.pdf; Joint Publication (JP) 3-59, *Meteorological and Oceanographic Operations* (Washington, DC: Government Printing Office, 2016). accessed December 7, 2016. http://www.dtic.mil/doctrine/new_pubs/jp3_59.pdf.

[12] Reilly, 69.

[13] Jim Sciutto and Jennifer Rizzo, "War in Space: Kamikazes, kidnapper satellites and lasers," CNN report, accessed December 16, 2016, http://www.cnn.com/2016/11/29/politics/space-war-lasers-satellites-russia-china/.

[14] Reilly, 61.

of national security.[15] Both state and non-state actors are acquiring capabilities to challenge American strengths across all domains. Proliferation of technology drives access to previously inaccessible domains and increases battlespace complexity.[16] This challenges traditional perspectives of multi-domain interdependence.[17] This also correlates with a requirement to think across domains at increasingly lower levels to generate tempo and exploit fleeting opportunities.[18]

In *Anti-Access Warfare*, Sam Tangredi found the problem behind the current joint ideology is "that it drives planning to the lowest common denominator of strategy."[19] Although joint interoperability has continuously improved since the signing of the Goldwater-Nichols Act of 1986, the mindset of equal contributions of all services must change. Tangredi wrote about the importance of tailoring force composition to each scenario.[20] Alexandr Svechin wrote that although not all services must participate in execution, all services should be part of the planning process to ensure potential options are considered.[21] Conceptually, contemporary joint warfare coordinates services. The military needs multi-domain operations to integrate effects across and through domains regardless of service.

Multi-domain operations have existed organically throughout history. For example, militaries have used light, as a portion of the electromagnetic spectrum, for millennia to signal between elements. Much like launching a rock through the air via a sling, these simple examples

---

[15] Gordon E. Moore, "Cramming More Components onto Integrated Circuits," *Electronics* 38, no. 8 (April 1965): 114–17.

[16] Reilly, 69.

[17] Ibid.

[18] Department of Defense, *Joint Operational Access Concept*, version 1.0 (Washington, DC: Department of Defense, 2012), 16.

[19] Sam J. Tangredi, *Anti-Access Warfare: Countering A2/AD Strategies* (Annapolis: Naval Institute Press, 2013), 241.

[20] Ibid, 242.

[21] Aleksandr A Svechin and R A. Svechin, *Strategy*, 2nd ed. (Minneapolis: East View Publishing, 1991), 70.

show that the use of multiple domains in battle is not necessarily complicated. In these cases, the electromagnetic domain enables coordinated land action and the slingshot allows weapons greater flexibility through another medium. A more concrete example from antiquity exists in the case of Ramses III versus the Sea Peoples.

In 1178 B.C., Ramses III of Egypt faced a serious threat from the Sea Peoples and their capable naval forces.[22] Instead of the traditional naval battle, executed by his predecessors, Ramses III combated the Sea Peoples' naval strength with the power of his archers and achieved envelopment in multiple domains, permanently annihilating this threat.[23] Hiding the majority of his fleet, Ramses III baited the Sea Peoples' invasion force to enter the Nile Delta by presenting only a weak naval defense.[24] He secretly positioned his archers along the shoreline. As the invasion force entered the Nile, the Egyptian fleet denied the Sea People retreat to the Mediterranean Sea. This was limited to the weapons at their disposal however, as naval warfare of the age consisted mostly of ramming or hand-to-hand combat between ships.[25] The Egyptian fleet worked the enemy boats toward the shore and the archers on both sides of the Nile sent flaming arrows to ignite them. Using the archers to kill most of the crew, the Egyptian fleet completed the rout by overturning the Sea Peoples' ships. As a multi-domain example, the Egyptian fleet created targeting opportunities for the archers and reciprocally the archer's actions prevented the Egyptian fleet from needing to defeat the Sea Peoples' naval strength directly.

---

[22] James H. Breasted, *Extracts from Medinet Habu Inscription* (Chicago: The University of Chicago Press, 1906), 65-78; Gabriel, Richard, and Donald W. Boose, *The Great Battles of Antiquity: A Strategic and Tactical Guide to Great Battles That Shaped the Development of War* (Westport: Greenwood Publishing Group, 1994), 23-28.

[23] James H. Breasted, 65-66.

[24] Marc Van De Mieroop, *A History of Ancient Egypt* (New Jersey: Wiley-Blackwell, 2010), 240-257; Margaret Bunson, *The Encyclopedia of Ancient Egypt* (New York: Gramercy Books, 1999), 111; Arther Ferrill, *The Origins of War* (London: Westview Press, 1985), *86-87.*

[25] John Keegan, *A History of Warfare* (New York: Alfred Knopf, 1993), 64.

Clausewitz noted that battles from antiquity lack detail required for examining conditions in modern warfare.[26] However, the critical factor in the preceding vignette is that warfare has always contained multi-domain elements. When used in a coordinated, mutually beneficial manner, multi-domain operations can decisively defeat an enemy's clear strength. This short story also shows the importance of creating opportunity in one domain through actions in another: a consistent objective of multi-domain operations.

Thinking widely and broadly about possibilities develops what Clausewitz called "presence of mind" to deal with the unexpected, which is more important than specific solutions.[27] In turn, this enables effective exploitation of emergent opportunities, especially in unpredictable conflict situations. James Rosenau wrote about the importance of creative theorizing. He concluded, "To think theoretically one must be tolerant of ambiguity, concerned about probabilities, and distrustful of absolutes."[28] For example, fighter aircraft traditionally generate air superiority in the introductory island invasion scenario. In the multi-domain construct, potentially an electromagnetic spectrum action informs the enemy that US forces are attacking from a different direction. Lack of US aircraft indicates freedom of maneuver for the enemy, setting up a pre-planned ambush with surface-to-air systems to destroy enemy aircraft. The central idea of acting in and through one domain to achieve effects in another, supports a vast increase in methods and an upsurge in flexibility to achieve objectives. Linking service actions on the tactical level requires a mentality shift on an enterprise level. America's contemporary enemies have implemented strategies to neutralize US superiority based on their study of American warfare over the last 30 years. The hallmarks have been superiority through numbers, technology, and tempo. The foundation of the American warfare must shift to flexibility; creating

[26] Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1984), 173.

[27] Von Clausewitz, *On War*, 103.

[28] James N. Rosenau, *Thinking Theory Thoroughly* (London: Pinter, 1980), 34.

options, enabling freedom of action, increasing synchronization, and placing the enemy on the horns of a dilemma. Defending against a particular strength is possible with appropriate strategy and resources; defending against a flexible enemy with numerous options becomes cost-prohibitive, even if one could identify each possible method of attack.

Studies about future warfare are speculative and short-lived by nature. Since future war cannot be determined with extreme certainty, associated theories must speculate based on trends and context. As Colin Gray wrote, "Future warfare poses a severe challenge to the scholar. It cannot be researched, documented, illustrated with exciting maps, [nor] have its mysteries revealed conclusively."[29] Since war seems intractably linked to the human condition, fresh conflicts will provide new information on the trends of war thus necessitating an iterative approach to the study of future warfare and associated theories. Gray, borrowing from Clausewitz, concludes that war has an unchanging nature, but a highly variable character.[30] The changes necessitate variation in the military's approach to achieving victory: the revision of doctrine, improvement of technology, and avoiding stasis because of past success.

As the maxim states, past performance does not indicate future success. However, since war is between people according to General Rupert Smith, establishing patterns of thought and organizing for flexibility allows the military to leverage current strengths in the creation of innovative dilemmas for their enemies.[31] Additionally, one's enemies challenge areas of known strength by exploiting perceived weaknesses, exemplified by contemporary anti-access, area-denial strategies. Shifting perception of the primary role of specific forces invalidates assumptions underlying both friendly and enemy strategies. Historically, services focused on

---

[29] Colin S. Gray, *Another Bloody Century: The Battle for the 21st Century* (London: Weidenfeld & Nicolson, 2005), 370.

[30] Ibid, 380; Clausewitz, *On War*, 76-88. Clausewitz discusses the links between human hostile feelings and hostile intentions on page 76 and warfare's variation in character on pages 87 and 88.

[31] General Sir Rupert Smith, *The Utility of Force: The Art of War in the Modern World* (New York: Vintage Books, 2008), 271.

defeating an enemy operating in their domain. For instance, Helmuth von Moltke designed the Prussian Army of 1870 to defeat the French Army, not the French Navy.[32] The Goldwater-Nichols Act of 1986 necessitated more service integration.[33] For example, current Air Force doctrine states, "the Air Force employs airpower to achieve the joint force commander's objectives and to complement the other components of the joint force."[34] The step beyond complementary action occurs when the priority becomes providing action from one domain with direct effect on another domain. The introductory landing force using coastal artillery systems to destroy an enemy fleet or resupplying via air are examples. This does not preclude action versus enemy in the same domain. Furthermore, multi-domain operations include utilizing action within a single domain to achieve specific objectives in another domain. Historic examples abound and can be as simple as a naval blockade to prevent resupply of ground forces. Multi-domain operations also build upon each other. For instance, a land element destroying an air defense system to enable localized aerial superiority, in turn enables an attack in the electromagnetic spectrum to disable enemy communications. This creates a marked advantage across domains. The mentality behind multi-domain operations sets the conceptual bar higher. Leaders and planners must think about the second order effects of action to aid other domains. They must specifically focus on acting directly on another domain to achieve freedom of action rather than solely domination of one's own domain.

---

[32] Geoffrey Wawro, *The Franco-Prussian War: The German Conquest of France in 1870 – 1871* (Cambridge: Cambridge University Press, 2005), 189. The Prussians were "latecomer to sea power" necessitating a modification of Moltke's campaign plans in order to shift significant troop detachments for coastal defense. The French Navy in 1870 consisted of 470 ships and was second only to England's Royal Navy in overall maritime power. Moltke tasked the Prussian coastal detachments with defending against French marine landings rather than defeating the French Navy. Prussian technology and doctrine were not geared for land to sea effects.

[33] United States Congress, *Goldwater-Nichols Act, The Department of Defense Reorganization Act of 1986, Pub.L. 99–43* (Washington, DC, 1986), accessed November 16, 2016, https://www.congress.gov/bill/99th-congress/house-bill/3622.

[34] Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine, Organization, and Command* (Washington DC: Government Printing Office, 2015), 23.

The multi-domain approach to the introductory situation contains numerous possibilities. For instance, an electromagnetic effect and space action blind the enemy early warning. A small force transported undersea, rather than by traditional air or maritime means, creates temporary lodgment. Air Forces enable maritime freedom of movement for a limited initial incursion. A Marine task force establishes a beachhead, followed by an Army Brigade Combat Team with short-range air defense and sensors to defend against maritime units. Civil engineering units build or adapt an expeditionary airfield for appropriate air forces to maintain local air superiority. The military then continues expanding its control over domains in both time and space. These actions indicate an evolution in current plateaued joint operations.

Joint Development

Military doctrine defines joint as "activities, operations, organizations, etc., in which elements of two or more Military Departments participate."[35] According to Joint Publication 1, "Effective integration of joint forces is intended to address functional or geographic vulnerabilities."[36] Combatant Commands and Joint Task Forces are typical organizational structures. "A unified combatant command [has] broad continuing missions under a single commander and…components of two or more Military Departments."[37] Closely associated is the use of a Joint Task Force, "established on a geographical area or functional basis when the mission has a specific limited objective and does not require centralized control of logistics."[38]

Joint doctrine originates with commanders solving the eternal problems of coordinating operations among disparate forces. "The challenges inherent in coordinating different military forces have existed since armies became distinct from navies. The nation-states of ancient Greece

---

[35] Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2016), 121.

[36] Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: Government Printing Office, 2013), i.

[37] Ibid, xviii.

[38] Ibid, xix.

that maintained both armies and navies faced the same challenges of joint coordination that General Grant and Admiral Porter addressed at the battle of Vicksburg."[39] Rather than a singular military organization, America organized services with different functions. While reviewing the lessons of World War II, America created a separate Air Force and began tackling inter-service coordination specifically.

Goldwater-Nichols Necessity

The National Security Act of 1947 set forth the separate organization of the Army, Navy, and Air Force under the Authority of the Secretary of Defense. It also established unified combatant commands, directed the elimination of duplication within military acquisitions, and desired integration of land, naval, and air forces into an efficient team without establishing an armed forces chief or general staff.[40] Although this clarified and improved the previously separate administration of the Army and Navy, it took nearly four decades to institute more service interoperability changes through the Goldwater-Nichols Act of 1986. The Goldwater-Nichols Act "augmented command relationships, strengthened the role of the Chairman of the Joint Chiefs of Staff, enhanced joint procurement, and redesigned personnel incentives in order to prioritize "jointness" among the services—a characteristic that the US Department of Defense demonstrably lacked prior to the reforms."[41] The Goldwater-Nichols Act produced more coordinated strategic advice for the government, yet only minimally integrated operations among the services.[42]

---

[39] Joint Chiefs of Staff, *Joint Military Historical Operations* (Washington, DC, 1997), V.

[40] United States Congress, *National Security Act of 1947*, accessed November 16, 2016. http://www.intelligence.senate.gov/sites/default/files/laws/nsact1947.pdf.

[41] Kathleen J. McInnis, *Goldwater-Nichols at 30: Defense Reform and Issues for Congress* Congressional Research Service (CRS Report No. R44474) (Washington, DC: Congressional Research service, 2016), 1, accessed November 6, 2016, https://fas.org/sgp/crs/natsec/R44474.pdf.

[42] Hew Strachan, 69.

President Regan established a Blue Ribbon Commission on Defense Management in 1985 headed by David Packard, founder of Hewlett-Packard and former Deputy Secretary of Defense. Although wide-ranging in scope, the commission's primary objective was to "identify efficiencies and associated cost savings."[43] Simultaneously, the reports from incidents including Desert One, Grenada, and the bombing of the Beirut Marine barracks, spurred Congressional Armed services committees to conduct their own reviews.

Desert One or Operation Eagle Claw, the 1980 operation to rescue hostages from Iran, resulted in abject failure and the loss of eight servicemen, seven helicopters, one C-130, communications equipment, and secret documents. The after action review determined that the services inability to operate together was the underlying cause of failure.[44] The hasty combination of forces from multiple services uncovered "service insularity" in a public fashion.[45] National Security Advisor Zbigniew Brezezinski testified before congress, "Inter-service interests dictated very much the character of the force that was used…every service wished to be represented in this enterprise and that did not enhance cohesion and integration."[46]

Congressional reviews found little interoperability improvement by Operation Urgent Fury in 1983. Although considered an operational success, major shortcomings included inter-service fire support, and command and control.[47] The services did not coordinate assault plans,

---

[43] David Packard, "President's Blue Ribbon Commission on Defense Management," Packard Commission Report, June 1986, 1, accessed December 8, 2016, http://www.documentcloud.org/documents/2695411-Packard-Commission.html.

[44] Mark Bowden, "The Desert One Debacle," *The Atlantic* (May 2006), accessed December 8, 2016, http://www.theatlantic.com/magazine/archive/2006/05/the-desert-one-debacle/304803/.

[45] Roger A. Beaumont, *Joint Military Operations: A Short History* (Westport: Greenwood Press, 1993), 167.

[46] Senate Committee on Armed services, *Defense Organization: The Need for Change, Staff Report to the Committee on Armed services*, Senate Report 99-86 (Washington, DC, 1985), 367, accessed December 9, 2016, https://www.gpo.gov/fdsys/pkg/STATUTE-99/content-detail.html.

[47] Kathleen J. McInnis, *Goldwater-Nichols at 30: Defense Reform and Issues for Congress* Congressional Research Service (CRS Report No. R44474) (Washington, DC: Congressional Research service, 2016), 4, accessed November 6, 2016, https://fas.org/sgp/crs/natsec/R44474.pdf.

were unaware of each other's requirements, and lacked the ability to communicate between units conducting the operation. Communication was strained to the point that one Army officer used a calling card from a civilian pay phone during the assault to call Fort Bragg and ask his headquarters to address the problem.[48] Inability to share intelligence and the lack of a unified command element also contributed to the fratricide of seventeen soldiers when the Navy bombed an Army headquarters building.[49] The congressional committees determined that services operated as independent agencies and only communicated on an ad hoc basis.[50]

Finally, the 1983 Beirut Marine barracks bombing which killed 241 Servicemen revealed parallel and dysfunctional chains of command. The review found that the Unified Combatant Commander had limited ability to direct service components within his area of responsibility.[51] Prior to the Goldwater-Nichols Act, the service components prioritized orders from service headquarters over their Unified Combatant Commander, essentially bypassing him on operations and resulting intelligence.[52] Ultimately, the Packard Commission and Congressional review found that the Department of Defense structure and service heuristics encouraged inter-service rivalry, primarily attended service priorities, and led to operational failures.[53] Although the Goldwater-Nichols Act addressed the configuration of the Department of Defense, improved the quality of military of advice given to civilian leaders, and attempted to reverse the service

---

[48] Senate Committee on Armed services, *Defense Organization: The Need for Change, Staff Report to the Committee on Armed services,* Senate Report 99-86 (Washington, DC, 1985), 365, accessed December 9, 2016, https://www.gpo.gov/fdsys/pkg/STATUTE-99/content-detail.html.

[49] Ronald H. Cole, "Grenada, Panama, and Haiti: Joint Operational Reform," *Joint Forces Quarterly* (Autumn/Winter 1998-1999): 58.

[50] Ibid, 59.

[51] James R. Locher III, *Victory on the Potomac: The Goldwater-Nichols Act Unifies the Pentagon,* (College Station: Texas A&M University Press, 2002), 153.

[52] Admiral William Crowe, as quoted in: James R. Locher III, *Victory on the Potomac: The Goldwater-Nichols Act Unifies the Pentagon* (College Station: Texas A&M University Press, 2002), 157.

[53] Kathleen J. McInnis, *Goldwater-Nichols at 30: Defense Reform and Issues for Congress* Congressional Research service (CRS Report No. R44474) (Washington, DC: Congressional Research service, 2016), 6, accessed November 6, 2016, https://fas.org/sgp/crs/natsec/R44474.pdf.

dominance over joint operations, the primary objective as highlighted in Section 3 was to improve joint interoperability.[54]

Successes during Operation Just Cause in Panama and Operation Desert Storm indicate improvements. However, statements before Congress over the past three decades showed continued criticism pertains to joint personnel education, inefficiencies in defense spending, and joint operational integration and development of plans.[55] In 2016, the Congressional Armed service Committees implemented reviews seeking legislative reform.[56] They found that the Department must retain its strength while becoming more agile to meet a variety of emerging national security challenges.[57] The international security environment has grown increasingly interdependent, in manners unforeseen by the Goldwater-Nichols legislation.[58] However, consensus lacked on what "specific direction reform ought to take."[59] Congressional interest motivated Secretary of Defense Ashton Carter to review the Goldwater-Nichols legislation and related organizational issues. Among the findings was the recommendation to elevate Cyber Command to a unified combatant command in recognition of the growing cyber requirements as

---

[54] United States Congress, *Goldwater-Nichols Act, The Department of Defense Reorganization Act of 1986, Pub.L. 99–43* (Washington, DC, 1986), accessed November 16, 2016, https://www.congress.gov/bill/99th-congress/house-bill/3622.

[55] Kathleen J. McInnis, *Goldwater-Nichols at 30: Defense Reform and Issues for Congress* Congressional Research service (CRS Report No. R44474) (Washington, DC: Congressional Research service, 2016), 9-10, accessed November 6, 2016, https://fas.org/sgp/crs/natsec/R44474.pdf.

[56] Center for Strategic and International Studies, "Defense Reform in the 21st Century: Guiding Principles for Reform Panel Discussion," March 2016, accessed November 16, 2016, http://csis.org/multimedia/video-defense-reform-21stcentury.

[57] Ibid.

[58] Peter Levine and Lt. Gen Thomas Waldhauser, Goldwater-Nichols Working Group Recommendations, Deputy Chief Management Officer, Information Memorandum, March 2016, accessed December 9, 2016, http://1yxsm73j7aop3quc9y5ifaw3.wpengine.netdna-cdn.com/wp-content/uploads/2016/04/DoD-G-N-WG-recommendations.pdf; John J. Hamre, "Reform of the Defense Department," Testimony Before the Senate Armed Services Committee, November 10, 2015, 2, accessed December 9, 2016, http://1yxsm73j7aop3quc9y5ifaw3.wpengine.netdna-cdn.com/wp-content/uploads/2016/04/DoD-G-N-WGrecommendations.pdf.

[59] Kathleen J. McInnis, *Goldwater-Nichols at 30: Defense Reform and Issues for Congress* Congressional Research service (CRS Report No. R44474) (Washington, DC: Congressional Research service, 2016), 1, accessed November 6, 2016, https://fas.org/sgp/crs/natsec/R44474.pdf.

part of modern warfare.[60] The factionalism present during the "Star Wars" movement to develop an anti-ICBM space system that caused each service to develop their own space command is repeating itself in the rise of cyber warfare. Services are making improvements, but not coordinating them synergistically to avoid duplicity. Brian Linn's post-Vietnam question remains poignant, "The best trained, armed, led but for what war?"[61]

Military Transformation

Military transformation over the past two decades has largely revolved around improving technological means. In *Military Transformation and Modern Warfare*, Elinor Sloan describes the need to combine technological, doctrinal, and organizational change. She defines transformation as a "marked change in character or form, usually for the better."[62] The military technical revolution began in the 1980s, stemming from 1970s technological advances. This culminated initially in the dramatic 1991 Gulf War victory. Technologies were crucial to success, including command and control developments, sensors, and precision weapons.[63] Andrew Marshall, Director of the Pentagon Office of Net Assessment, argued that technological dominance during the Gulf War was extraordinary but required accompanying doctrinal and organizational changes to maintain superiority. He based his findings on historical analogies, such as the German development of blitzkrieg by combining emergent World War One technologies such as tanks and aircraft, with updated organizational support and appropriate doctrine. His office advocated for the transition to a revolution in military affairs in the 1990s.[64] Although the

---

[60] John J. Hamre, "Reform of the Defense Department," Testimony Before the Senate Armed Services Committee, November 10, 2015, 2, accessed December 9, 2016, http://1yxsm73j7aop3quc9y5ifaw3.wpengine.netdna-cdn.com/wp-content/uploads/2016/04/DoD-G-N-WGrecommendations.pdf.

[61] Brian McAllister Linn, *The Echo of Battle: The Army's Way of War* (Cambridge: Harvard University Press, 2009), *232.*

[62] Elinor Sloan, *Military Transformation and Modern Warfare* (Westport: Praeger, 2008), 1.

[63] Ibid, 2.

[64] Ibid, 3.

technological focus continued, Marshall's assessment became the intellectual foundation for a number of conceptual works for updating doctrine and organization.

After the force reduction emphasis of the early 1990s waned, a renewed focus on improving joint operations began with the 1995 Commission on the Roles and Missions of the Armed Forces. The commission recommended focusing every Department of Defense element in support of Combatant Commanders.[65] Other recommendations stressed improving what the commission called "jointness." Specific findings included integrating support, improving joint doctrine, developing joint readiness standards, increasing joint training, and proposing a unified joint operations vision.[66] The Chairman of the Joint Chiefs of Staff first produced this vision, Joint Vision 2010, in 1996. This iteration formed a foundational document for the military to exploit its technological superiority.[67] Its underlying theory was that improving joint effectiveness offsets force reductions.[68] Only one year later, the independent National Defense Panel Report argued that transformation should be broader and accelerated to include bringing the concept of "jointness" to the entire interagency national security establishment.[69] Although acknowledged, broadening interoperability reforms did not regain traction until major reviews

[65] Kathleen J. McInnis, *Goldwater-Nichols at 30: Defense Reform and Issues for Congress* Congressional Research Service (CRS Report No. R44474) (Washington, DC: Congressional Research service, 2016), 50, accessed November 6, 2016, https://fas.org/sgp/crs/natsec/R44474.pdf.

[66] Roles and Missions Commission of the Armed Forces, "Report to Congress, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff," May, 1995, accessed December 9, 2016, http://fas.org/man/docs/corm95/di1062.html.

[67] Department of Defense, *Joint Vision 2010* (Washington, DC: Government Printing Office, 2000), 1, accessed December 9, 2016, http://www.dtic.mil/jv2010/jv2010.pdf.

[68] Elinor Sloan, 148.

[69] Report of the National Defense Panel, Transforming Defense-National Security in the 21st Century, December 1997, accessed December 13, 2016, http://www.dtic.mil/dtic/tr/fulltext/u2/a402688.pdf.

following the September 11, 2001 terrorist attacks. Instead, military reform focused on reducing overhead and strengthening joint operations through technology.[70]

Released in 2000, Joint Vision 2020 expanded the operational concepts described in Joint Vision 2010, suggesting the services focus on dominant maneuver, full dimensional protection, precision engagement, speed, and logistics.[71] Criticism of Joint Vision 2020 included its reliance on overwhelming offensive power and only a defensive strategy against asymmetry. Joint Vision 2020 and its suggested reforms did not address conflicts that are not primarily state against state under the traditional American way of war.[72] The 2001 Quadrennial Defense Review Report suggested planning improvements that included shifting from "threat-based" models to "capability-based" models; centering on defeating how an adversary may fight instead of who may become adversaries. It also addressed the need for "modularity in the joint force," modernizing military capabilities for increased options to limited engagements.[73] The 2003 Transformation Planning Guidance identified the logical next step of increased flexibility and decreased response time for military force.[74] However, detailed analysis of reform barriers did not occur until the 2004 Joint Defense Capabilities Study, two decades after Andrew Marshall explained the need for organizational interoperability changes paralleling the technological improvements. The study found that rather than a joint or Combatant Command focus, services dominated requirements processes. It also found that service emphasis in planning lacks

---

[70] Department of Defense, *2001 Quadrennial Defense Review Report* (Washington, DC: Government Printing Office, 2001), accessed December 13, 2016, http://www.comw.org/qdr/qdr2001.pdf.

[71] Department of Defense, *Joint Vision 2020 (*Washington, DC: Government Printing Office, 2010), accessed December 9, 2016, http://www.dtic.mil/jv2020/jv2020.pdf.

[72] Melissa Applegate, "Preparing for Asymmetry: As Seen Through the Lens of Joint Vision 2020" *Strategic Studies Institute* (Carlisle, PA: US Army War College Press, 2001), v and 1-2.

[73] Department of Defense, *2001 Quadrennial Defense Review Report* (Washington, DC: Government Printing Office, 2003).

[74] Department of Defense, *Transformation Planning Guidance* (Washington, DC: Government Printing Office, 2003), accessed December 13, 2016, http://www.acq.osd.mil/brac/Downloads/Prior%20BRAC%20Rounds/transformationplanningapr03.pdf.

consideration for the full range of interagency and joint solutions to warfighting.[75] Its recommended solutions, such as planning joint capabilities above the component level and issuing strategic planning guidance, but did not address the underlying lack of shared understanding between services. The 2006 Quadrennial Defense Review reoriented on the Global War on Terror but also identified key reform priorities. They included the need for greater interagency collaboration, combining major acquisition programs under "joint capability portfolios," and the use of common information sources.[76] Although the wars in Iraq and Afghanistan helped identify and improve joint tactical interoperability and coordination, Secretary of Defense Robert Gates ensured the military focused on winning the contemporary unconventional conflicts rather than improving conventional operations and operational interoperability for the future.[77]

Joint Conceptual Improvements

Around 2011, conversations increased about evolving joint operations as indicated by General Dempsey's question: "What's after Joint?" They gained notoriety with the release of the Joint Operational Access Concept in 2012. It was the precursor to current multi-domain discussions. Recent concepts highlight the synergistic potential of jointness. The Capstone Concept for Joint Operations V3.0 called for achieving "joint synergy" and noted the importance of thinking in terms of joint functions independent of a specific service. The 2013 Joint Operational Access Concept changed emphasis from service capabilities to domain-based

[75] Department of Defense, *Joint Defense Capabilities Study* (Washington, DC: Government Printing Office, 2004), accessed December 13, 2016, https://assets.documentcloud.org/documents/2695409/Joint-Defense-Capabilities-Study-Aldridge-Study.pdf.

[76] Department of Defense, *2006 Quadrennial Defense Review* (Washington, DC: Government Printing Office, 2006), accessed December 13, 2016, http://archive.defense.gov/Home/features/2014/0314_sdr/qdr/docs/Report20060203.pdf.

[77] Robert M. Gates, *Duty*: *Memoirs of a Secretary at War* (New York: Knopf Publishing Group, 2014), 567-573.

capabilities.[78] Its central concept is "cross-domain synergy," a seamless application of combat power between domains, with greater integration at dramatically lower echelons than joint forces currently achieve." The Capstone Concept for Joint Operations: Joint Force 2020 stated, "cross-domain synergy should become a core operating concept in all joint operations."[79] These documents reflect the security environment complexity, embrace technological advancement, and stress the necessity of combining capabilities within and across domains for optimal threat response. [80] They emphasize a multi-domain perspective regardless of problem domain or service asset ownership.

The introduction of the Cross-Domain Synergy in Joint Operations Planner's Guide highlights the imperative of combining capabilities across all domains.[81] The major shift from "cross-domain" to "multi-domain" has three major benefits. First, multi-domain is distinguishable from a discussion only involving cyberspace. The term 'cross-domain' has historically been an information technology term, often referring to information assurance techniques across multiple systems or classification levels.[82] Second, the Department of Defense must think in terms of multiple domains working in concert simultaneously to achieve goals rather than solely operating in or between two domains. Finally, the term implies that operations in one domain have effects in others.

---

[78] Department of Defense, *Joint Operational Access Concept* (Washington, DC: Department of Defense, 2012).

[79] Department of Defense, *Capstone Concept for Joint Operations: Joint Force 2020* (Washington, DC: Department of Defense, 2012), accessed November 16, 2016, http://www.dtic.mil/doctrine/concepts/ccjo_jointforce2020.pdf.

[80] William O. Odom and Christopher D. Hayes, "Cross-Domain Synergy: Advancing Jointness," *Joint Force Quarterly* Vol 73 (April 2014): 124.

[81] Department of Defense, *Cross-Domain Synergy in Joint Operations Planner's Guide* (Washington, DC: Department of Defense, 2016).

[82] Defense Information Security Agency, "Cross Domain Solutions," Network services. Last modified May 2016, accessed September 29, 2016, http://www.disa.mil/network-services/enterprise-connections/connection-process-guide/disn-service-appendices/cross-domain-solutions.

One germane example was the update to Joint Publication 3-18, Joint Forcible Entry Operations. The 2012 edition expanded the principles for success in operations with seize and hold contested lodgments to include control of all five domains. It specifically discusses the importance of control in the air, space, and maritime domains, while managing the electromagnetic spectrum and concludes with a need to integrate support operations in all domains.[83] The publication primarily centers interoperability discussions on command, control, and communications efforts.[84] This directly reflects the goals of the Goldwater-Nichols Act.[85] Current doctrine typically focuses on interoperability at the Joint Forces Commander level, which often leads to deconfliction discussions and phased operations rather than fully integrated capabilities at the tactical level. Conversely, the multi-domain theories recently gaining popularity include the need to integrate operations at small unit levels to achieve advantageous maneuver across domains.

Joint Publication 1 states that "jointness" is perishable and "must be advance through continual joint force development efforts." Joint interoperability is "sustained through joint doctrine, education, training, and exercises."[86] Although fires are the most common example, Joint functions, and by extension multi-domain operations, also include command and control, intelligence, movement and maneuver, protection, and sustainment.[87] According to Joint Publication 1, joint implies synergistic capability across services rather than simply overlapping capabilities or responsibilities.[88] Current joint effective action requires interoperability and

---

[83] Joint Publication (JP) 3-18, *Joint Forcible Entry Operations* (Washington, DC: Government Printing Office, 2012), vii-viii.

[84] Ibid, II-1 – II-11 and IV-1.

[85] Department of Defense, *Joint Military Operations Historical Collection* (Washington, DC: Government Printing Office, 1997), V-2.

[86] Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: Government Printing Office, 2013), VI-1.

[87] Ibid, xi-xii.

[88] Ibid, I-2.

interdependence, the purposeful reliance on another service's capabilities to reinforce effects.[89] The next evolution retains interoperability, while creating options in multiple domains that are not directly reliant on another service. The most effective manner of dominating airspace may be to use air forces, but the environment may make using land forces more efficient for a time. Threats, distance, available forces, relative priorities, or emergent opportunities may drive the decision to use a non-traditional capability to achieve effects in a separate domain. This only works by developing the capability to act. A critique that overlapping responsibilities creates inefficiencies in developing overlapping capabilities and thus wasted resources is already present in the current joint force. All services have their own air component, land forces, and electromagnetic spectrum capability. Reorganizing the services specifically by domain is a bureaucratic and political hurdle unlikely conquered in the near-term. However, adjusting the mindset, joint operational theories, and practical application of the current service capabilities create advantages available in the reasonably short-term. As the fundamental principles guiding "the employment of US military forces in coordinated action toward a common objective," joint doctrine must include the theory of utilizing multiple domains to achieve an objective rather than just linking actions by services.[90] It is in integration and operational art, or the linking of tactical actions to strategic ends, that multi-domain operations theory is most useful.

Multi-Domain Operations

Conceptual Evolution

The changing environment necessitates an evolution in concept. Since World War II, American military operations have sought to gain sea and air superiority to enable land combat while maintaining dominance in space and the electromagnetic spectrum. Area denial strategies contest air and sea support, disrupt communications with hacking and jamming, impede space-

[89] Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: Government Printing Office, 2013), I-3.

[90] Ibid, xxvi.

based surveillance, degrade supply lines, and easily target large bases.[91] Admiral John Richardson addressed the assumption that "anti-access/area denial is too often taken as a *fait accompli*, when it is, more accurately, an aspiration."[92] Hew Strachan wrote, "An army which lacks a "can do" mentality and feels it cannot use its capabilities to good effect is not of any value to the state which pays for it."[93]

Multi-domain operations create options for decision-makers in light of increasing 'non-traditional' military methods. Russia's resource-based coercion of Ukraine, or China's manipulation of the rare-earth material market in response to Japan's arrest of fishermen, also highlight the manipulation of information channels for strategic effect.[94] Just as leaders often discuss the need to improve cyber defenses and prepare to operate without electronic systems, so too must the military become resilient during the temporary loss of superiority in any domain.

Robert Axelrod and Michael Cohen describe the increasing dissatisfaction with industrial models of thinking, primarily regarding their rigidity, slowness, and inability to adjust to changing circumstances and local conditions.[95] Regarding emergent properties, a characteristic of complex adaptive systems like modern military organizations, they suggest preparing to take advantage of them rather than attempting to force or predict them.[96] They assert that organizations harness complexity by deliberately changing structures to increase performance

---

[91] General Mark A. Milley, "Multi-Domain Battle: Ensuring Joint Freedom of Action," presented at the Association of the United States Army Annual Meeting, Washington, DC, October 05, 2016, accessed October 16, 2016, http://www.youtube.com/watch?v=pt0HzNbbSBk.

[92] Admiral John Richardson, "Chief of Naval Operations Adm. John Richardson: Deconstructing A2A," The National Interest, accessed December 30, 2016, http://nationalinterest.org/feature/chief-naval-operations-adm-john-richardson-deconstructing-17918.

[93] Hew Strachan, 89.

[94] Michael J. Mazarr, "Rivalry's New Face," *Survival* 54, no. 4 (2012): 97, accessed December 3, 2016, http://dx.doi.org/10.1080/00396338.2012.709390.

[95] Robert M. Axelrod and Michael D. Cohen, *Harnessing Complexity: Organizational Implications of a Scientific Frontier* (New York: Basic Books, 2000), 28-29.

[96] Axelrod and Cohen, 18 and 62.

through understanding the complex system.[97] Joint efforts benefit modern warfare in complex environments. The next step is harnessing joint operating experience to produce integrated solutions through multiple domains rather than ignoring the difficulty of overcoming service heuristics. Typically, populations use known methods, which are often service specific, to solve challenges.[98] Services must leverage the experiences and capabilities of other organizations to create options. Complexity is about numbers of relationships rather than only numbers of things.[99] Complexity research grounds analysis of "leverage points" and suggests small changes have large effects.[100] The largest effect of multi-domain operations is in the cognitive realm: expanding decision maker's aperture for viewing both problems and potential solutions. Ideally, the pattern of response becomes problem-based rather than service-based.

A decisive battle during the American Revolutionary War, the Battle of Yorktown represents multi-domain operations and shows foundational elements for American joint warfare. Components of the battle that crossed domains or enabled action in another domain include the French fleet enabling freedom of maneuver on the land by blockading the Chesapeake River and removing Cornwallis' Army's escape options. Additionally, French artillery struck the few British ships near shore, while the French Navy protected the allied advance through the outer defensive works.[101] Military practitioners during that period used contemporary joint concepts.[102] General Washington understood the importance of unifying his efforts with his French allies. With no American Navy, Washington relied on French maritime power. While Washington had

---

[97] Ibid, 9.

[98] Axelrod and Cohen, 6.

[99] Everett C. Dolman, *Pure Strategy: Power and Principle in the Space and Information Age* (London: Frank Cass, 2005), 119.

[100] Axelrod and Cohen, 21.

[101] John D. Grainger, *The Battle of Yorktown: 1781: A Reassessment* (London: Boydell Press, 2005), 124-127.

[102] William B. Willcox, *Portrait of a General* (New York: Alferd A. Knopf, 1964), 272.

no direct command authority, he worked to integrate the power of the French forces.[103] Washington understood the joint nature of the campaign and the importance of his allies' military capabilities. Washington stated the importance of domain superiority to create freedom of maneuver in an adjacent domain. "Our affairs were very attentively considered in every point of view, and it was finally determined to make an attempt on New York, with its present garrison, in preference to a southern operation, as we had not decided the command of the water."[104] In this vignette, maritime superiority created maneuver options in the land domain. General Washington was thinking about multiple domains, something future military leaders must do regularly.

Defining It

As a relatively new discussion, the delineation between multi-domain and the current joint operations constructs may seem like semantics. However, joint and multi-domain differ in ends, ways and means. Ends evolve from coordinated separate service objectives to complementary enabling objectives with a mutual goal. Ways, or the actions achieving conditions for victory, transform from dominating one's own domain to achieving windows of temporary advantage and projecting power across domains to enable freedom of action for actors in another domain. Available means of massed forces with large forward bases, constant communication, and regular supply change to dispersed flexible forces operating with commander's intent in a rapid, self-sufficient manner.[105] The current environment implies that failure in one domain has

[103] Patrick H. Hannum, "Command and Control During the Yorktown Campaign," *Journal of the American Revolution* (May 18, 2016), accessed October 13, 2016, https://allthingsliberty.com/2016/05/command-and-control-during-the-yorktown-campaign/

[104] Henry P. Johnson, *The Yorktown Campaign and the Surrender of Cornwallis, 1781* (New York: Harper and Brothers, 1975), 76-77. Letter from Washington to Greene, June 1, 1781.

[105] General Mark A. Milley, "Multi-Domain Battle: Ensuring Joint Freedom of Action," presented at the Association of the United States Army Annual Meeting, Washington, DC, October 05, 2016, accessed October 16, 2016, http://www.youtube.com/watch?v=pt0HzNbbSBk.

cascading effects in one or more of the others.[106] At a campaign level and often tactically, domains must now be integrated and interdependent, even if the services are not.[107]

There is no doctrinal definition of domain. Jeffrey Reilly defines it as "a critical sphere of operational influence whose control provides the foundation for freedom of action." [108] Doctrine recognizes land, maritime, air, space, and cyberspace, which is "a global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the internet, telecommunications networks, computer systems, and embedded processors and controllers."[109]The land domain is "the area of the Earth's surface ending at the high water mark and overlapping with the maritime domain in the landward segment of the littorals."[110] The maritime domain is the "oceans, seas, bays, estuaries, islands, coastal areas, and the airspace above these, including the littorals."[111] The air domain is "the atmosphere, beginning at the Earth's surface, extending to the altitude where its effects upon operations become negligible."[112] Space consists of the environment where electromagnetic radiation, charged particles, and electric and magnetic fields are the dominant physical influences, and that encompasses the earth's ionosphere and magnetosphere, and beyond.[113] However, services disagree on what constitutes multi-domain. For instance, the Air Force Future Operating

---

[106] Reilly, 67.

[107] John P. Kotter, *Power and Influence: Beyond Formal Authority* (New York: The Free Press, 1985), xi. However, there is an ever-present need for leadership. As John Kotter notes, without leadership, "interdependence results in parochial politics, bureaucratic infighting, and destructive power."

[108] Reilly, 71.

[109] Joint Publication (JP) 3-12, *Cyberspace Operations* (Washington, DC: Government Printing Office, 2013), I-2.

[110] Joint Publication (JP) 3-31, *Command and Control for Joint Land Operations* (Washington, DC: Government Printing Office, 2014), ix.

[111] Joint Publication (JP) 3-32, *Command and Control for Joint Maritime Operations* (Washington, DC: Government Printing Office, 2013), I-1.

[112] Joint Publication (JP) 3-30, *Command and Control for Joint Air Operations* (Washington, DC: Government Printing Office, 2013), I-1.

[113] Joint Publication (JP) 3-59, *Meteorological and Oceanographic Operations* (Washington, DC: Government Printing Office, 2012), I-1.

Concept suggests that multi-domain refers to air, space, and cyberspace.[114] It does not include land, maritime, or fully account for the electromagnetic spectrum. This requires clarity that cyberspace is a subset of the much larger electromagnetic domain.[115] The current definition is like discussing blue-water oceans and not covering littorals or riverine operations in the maritime environment. The electromagnetic spectrum includes directed energy weapons, jamming platforms, communication and signaling, and a variety of support structures beyond computer-based networks. The military application of multi-domain operations is the use of two or more domains to achieve a relative advantage, frequently involving capabilities from one domain to another.[116] Multi-domain operations involve the simultaneous exploitation of asymmetric advantages across domains to achieve the freedom of action required by the mission.[117]

According to a Congressional report, "if joint operations are to be successful, systems must be "interoperable"—capable of exchanging information and operating effectively together."[118] The military needs a common operating picture.[119] Historian Roger Beaumont found "many of the structures and attitudes in [joint] organizations are products of historical momentum rather than deliberate design."[120] He posited that "jointness" improves during conflict from the need to blend service elements to improve function. He also compared the persistent resistance to

---

[114] Air Force Future Operating Concept (AFFOC), *Air Force Future Operating Concept: A View of the Air Force in 2035* (Washington, DC: Government Printing Office, 2015), 14.

[115] David Clark, "Characterizing Cyberspace: Past, Present, and Future", MIT CSAIL, Office of Naval Research, accessed December 16, 2016. https://projects.csail.mit.edu/ecir/wiki/images/7/77/Clark_Characterizing_cyberspace_1-2r.pdf.

[116] William O. Odom and Christopher D. Hayes, "Cross-Domain Synergy: Advancing Jointness," *Joint Force Quarterly* Vol 73 (April 2014), 124.

[117] Reilly, 71.

[118] GAO Report, "Joint Military Operations: Weaknesses in DOD's Process for Certifying C4I Systems Interoperability," Letter Report to Congress, March, 13 1998, accessed December 8, 2016, https://fas.org/irp/gao/nsiad98073.htm.

[119] Army Doctrine Reference Publication (ADRP) 6-0, *Mission Command* (Washington, DC: Government Printing Office, 2012), 2-1.

[120] Roger A. Beaumont, 186.

joint improvement to a biologist that must kill to dissect and understand.[121] The inter-service rivalries that slow progress come from service pride rather than disdain of other services. General Pedro del Valle described the successful joint operations during the World War II Pacific campaign as stemming from the subordination of unit glory to the task at hand.[122] The "bureaucratic tribes with celebrated rivalries" have developed generations of barriers to integration.[123]

Differences in primary operating environments engender different expectations, skills, and attitudes.[124] Peacetime differences will affect wartime action. Giving command of naval or air assets to a land commander is anathema to the Navy and Air Force. A founding tenet in Air Force doctrine is that an Airman must command air forces.[125] Marines focus on maintaining a cogent MAGTF rather than separating portions such as aircraft or air defense assets when a training situation calls for it. Yet all of these actions have occurred situationally in wartime. Rivalries and lack of understanding between services during peacetime creates a difficult chasm to cross in war.

A critical barrier for leading in a multi-domain environment is the weak understanding of maneuver in other domains. Speed differences in operating environment alone change a basic understanding of time. The land component may measure pace in meters or miles per hour,

---

[121] Ibid, 187-187. General John Herr provides an example of resistance to change, especially when a particular capability has proven successful. Herr led the impressive cavalry breakthrough of the Hindenburg Line in World War I. During the early years of World War II, he was the US Army Calvary Chief. Despite Germany's successful use of mechanized armor in their blitzkrieg offensives, he advocated expanding horse mounted capabilities. Although Germany continued to use horses for some units throughout WWII, increasing mechanization was globally evident. Herr disagreed with the prevailing push for mechanization. General Marshall fired Herr and eliminated his position in 1942 due to his recalcitrance and resistance to change. Herr's experience and horse-mounted bias became an impediment to the needed military reforms. As the conversation about multi-domain operations develops, decision-makers must understand their own biases and their effect on developmental priorities.

[122] Roger A. Beaumont, 186.

[123] Ibid, 190.

[124] Ibid.

[125] Air Force Doctrine Document (AFDD) 1-1, *Air Force Basic Doctrine, Organization, and, Command* (Washington, DC: Government Printing Office, 2011), 1-2.

whereas the maritime uses tens of miles per hour, air forces use hundreds, or tens of thousands of miles per hour in space, and the electromagnetic spectrum moves at the speed of light. “Behaviors that…reinforce rather than undercut each other” improve mutual power according to Joseph Nye.[126] Leaving mutual understanding between services up to fate during crisis management is as risky as mandating specific models.[127]

Historic ways of achieving military ends have changed many times. In fact, US Army warrant officers began as multi-domain operators, defending American coastlines during World War I. The Act of July 1918 introduced warrant officers, establishing the Army Mine Planter service in the Coast Artillery Corps.”[128] They laid minefields as part of port defense and contested the maritime environment from the land. This mirrors Admiral Harry Harris’ recent multi-domain suggestion that the Army contest the seas from the shore.[129] The updated Marine Corps Doctrine Publication One includes a maneuver warfare philosophy similar to the pre-World War II German way of war described by Rob Citino.[130] German World War I “stormtroopers” formed small teams that advanced independently, bypassed strong points, and penetrated weaknesses rather than advance in a steady line into machinegun fire.[131] The mechanization of this philosophy became the blitzkrieg of World War II and the Marine Corps essentially widened its scope for

[126] Joseph S. Nye, *The Future of Power* (New York: PublicAffairs, 2011), 225.

[127] Roger A. Beaumont, 193.

[128] Warrant Officer Program, United States Army Combined Arms Center, accessed November 9, 2016, http://usacac.army.mil/organizations/cace/wocc/woprogram.

[129] Adm. Harry Harris, Jr. “Statement Before the Association of the United States Army Conference,” (Presented at the United States Army Conference, Washington, DC, October 04, 2016.), http://www.pacom.mil/Media/Speeches-Testimony/Article/963703/association-of-the-united-states-army-ausa-conference/.

[130] Marine Corps Doctrine Publication (MCDP) 1, *Marine Corps Operations* (Washington, DC: Government Printing Office, 2011), 1-3.

[131] Robert Citino, *The German Way of War: From the Thirty Years’ War to the Third Reich (modern War Studies)*, 3rd ed. (Lawrence: University Press of Kansas, 2008), 111.

contemporary conflict.[132] Multi-domain operations is similarly a philosophy: descriptive in nature not prescriptive, a mindset rather than a method.

Change Cannot Wait

The military must evolve; stasis allows threats to catch up. Yaneer Bar-Yam observed that group behavior changes over time and less successful groups emulate winning strategies.[133] Potential adversaries recognize America's past success and are striving to improve their own joint capabilities.[134] Gen Mark Milley said that other nations have studied American combat concepts…modernizing their militaries "to avoid our strengths [and] defeat us."[135] Determining the next evolution is difficult, since it is impossible to predict the future of warfare.[136] Military integration still leaves out interagency contributions. Domains may not remain static, as evidenced by the increasingly understood and contested space and cyber realms. The human domain remains a potential expansion of multi-domain theory not undertaken in this study. However, multi-domain theory allows for expansion while maintaining the same fundamental principles.

According to Thomas Kuhn, "External conditions may…transform a mere anomaly into a source of acute crisis."[137] As the discussion of the events preceding the Goldwater-Nichols Act proved, waiting for a crisis to spurn change is unacceptable and a lengthy process that may not

---

[132] Sydney J. Freedberg, Jr., "A Highly Lethal War of Fleeting Advantages: Mulit-Domain Battle," *Breaking Defense*, November 14, 2016, accessed December 30, 2016, http://breakingdefense.com/2016/11/under-enemy-skies-armys-multi-domain-battle/.

[133] Yaneer Bar-Yam, *Making Things Work: Solving Complex Problems in a Complex World* (Cambridge: NECSI Knowledge Press, 2004), 81.

[134] Phillip C. Saunders and Joel Wuthnow, "China's Goldwater-Nichols? Assessing PLA Organizational Reforms," *Joint Forces Quarterly* vol 82, 3rd quarter (July 2016), accessed October 3, 2016, http://ndupress.ndu.edu/JFQ/Joint-Force-Quarterly-82/Article/793267/chinas-goldwater-nichols-assessing-pla-organizational-reforms/.

[135] Milley, in Rick Maze, "Radical Change is Coming"

[136] Von Clausewitz, 77-80.

[137] Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: The University of Chicago Press, 1962), xii.

achieve the required change independently.[138] Faith in the path of the new method is necessary, even if it proves incorrect.[139] Contrary to those impeding change, Kuhn asks if it is "really any wonder that the price of significant scientific advance is a commitment that runs the risk of being wrong?"[140] He wrote that new paradigms "must resolve some outstanding and generally recognized problem."[141] Regardless of whether multi-domain constitutes a paradigm shift or the more likely evolution of military affairs, it solves the recognized necessity of continued progression. Historian David Chandler cautioned, "Military doctrine must be a growing science, ceaselessly developing and improving, for once it degenerates into mere dogma…disaster invariably looms close ahead.[142] Kuhn further stated the need to "preserve a relatively large part of the concrete problem-solving ability [of] processors."[143] All potential applications and hard-won lessons in joint doctrinal concepts remain applicable as multi-domain operations increase options for military forces. One does not stop walking simply because one learns how to ride a bike.

Kuhn also suggests that during transition periods large, but incomplete overlaps will exist between problems solved by the old and new way of operating.[144] The current method of joint operations works in most circumstances yet will face increasing difficulty as near-peer competitors improve anti-access strategies and their own joint capabilities. Norman Maclean wrote, "Recognizing that you are wrong is like coming to recognize that you are sick. You feel

---

[138] See the discussion in Chapter II, Joint Development, of this monograph.

[139] Kuhn, 158.

[140] Kuhn, 101.

[141] Ibid, 169.

[142] David G. Chandler, *The Campaigns of Napoleon,* 2nd ed. (London: Wedienfeld and Nicolson, 1966), 137.

[143] Kuhn, 169.

[144] Ibid, 85.

bad long before you admit your symptoms."[145] Studying and treating symptoms earlier cedes less initiative to the illness. Current military commentators agree that regularly contested and degraded domains, such as contesting maritime supremacy and degrading electromagnetic spectrum capability, present the major challenge for modern, interconnected joint warfare.[146] As Kuhn discussed regarding paradigm shifts, conversations are an early step in promoting new schools of thought.[147]

The Office of Force Transformation identified that the "compelling need for military transformation may be examined in terms of four imperatives: strategy, technology, threat, and risk mitigation."[148] Multi-domain theory helps identify strategies and attributes within competitive spaces to gain an advantage across the range of military operations. The patterns of mind develop flexible theorizing about the use of force in creative ways that fit a given scenario without linking to only one style. This is a change from the tradition of defeating an enemy's strength with greater like strength. General Mark Milley said, "Every assumption we hold, every claim, every assertion…must be challenged."[149] Disturbing the sense of what are 'normal,' aids in assessing previously unidentified assumptions. [150]

---

[145] Norman Maclean, *Young Men and Fire* (Chicago: University of Chicago Press, 1992), 189.

[146] Sam J. Tangredi, *Anti-Access Warfare* (Annapolis: Naval Institute Press, 2013), 23 and 75.

[147] Kuhn, 576.

[148] Office of Force Transformation, *Military Transformation: A Strategic Approach* (Washington DC: Office of Force Transformation, 2003), accessed December 15, 2016, http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA457320.

[149] Gen Mark A. Milley, in Rick Maze, "Radical Change is Coming: Gen Mark A. Milley Not Talking About Just Tinkering Around the Edges," *Association of the United States Army*, December 13, 2013, accessed December 14, 2016, https://www.ausa.org/articles/radical-change-coming-gen-mark-milley-not-talking-about-just-tinkering-around-edges.

[150] Chris Brown and Kirsten Ainley, *Understanding International Relations* (New York: Palgrave Macmillian, 2009), 57.

Technology contributes to operational strategy. Unfortunately, some assessments equate the military with a technocracy, with decisions tied to available technology and expertise.[151] Due to Moore's Law and rapid technological proliferation, America can only depend on a technological advantage for an increasingly brief time.[152] This equation also includes people and tactics: those who use the technology and how they use it. Appropriate multi-domain operations depend more on people and tactical incorporation than technology. Successful historical use of theories underlying multi-domain operations show that focus on technology is insufficient. In the 2010 Quadrennial Defense Review, Secretary of Defense Robert Gates stressed uncertainty, decentralization, and a spectrum of conflict while downplaying faith in technology, centralization, and linear operations.[153]

The military must remain a learning organization. Paraphrasing Boyd, the key to multi-domain operations is developing mental agility. It increases one's ability to constrain opponents, understand systems, and achieve indirect effects from multiple avenues.[154] Freedman wrote that benefitting from the experiences of all members trumps depending solely on senior management."[155] Just as operational art is no longer the domain of flag officers according to Huba Was de Czege, multi-domain operations is not the sole responsibility of joint planners.[156] The

---

[151] John L. McLucas, *Reflexions of a Technocrat: Managing Defense, Air, and Space Programs during the Cold War* (Maxwell AFB: Air University Press, 2006), 97-110, accessed December 9, 2016, https://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA456851.

[152] Moore, 114. See also footnote 15.

[153] Robert M. Gates, "A Balanced Strategy: Reprogramming the Pentagon for a New Age," *Foreign Affairs* 88, no. 1 (January-February 2009): 28-40.

[154] Frans P. B. Osinga, *Science, Strategy and War: The Strategic Theory of John Boyd* (London: Routledge, 2007), 117 and 123.

[155] Freedman, Sir Lawrence, *Strategy: A History* (Oxford: Oxford University Press, 2013), 554-555.

[156] Huba Wass de Czege, Thinking and Acting like an Early Explorer: Operational Art is not a Level of War. *Small Wars Journal* (March 2011), accessed December 15, 2016, http://www.smallwarsjournal.com/blog/journal/docs-temp/710-deczege.pdf. "Operational art is not a level of war, or the art of generalship. It is what goes on in the explorer's mind, the mediating and balancing interaction between his strategic and tactical reasoning."

current joint model emphasizes coordinating theater operations. The evolving risks drive a multi-domain model emphasizing daily normality with interdependence and interoperability.

What's After Joint

Multi-domain theory improves on the joint model by fully integrating domains, developing problem-based solutions, and creating options. Joint theory originally combated insular service nature. Despite improvements, it has not achieved desired simultaneity and interdependence. It often only improves deconfliction. The nature of joint is working together. The nature of multi-domain is interoperability, working across seams with knowledge of others' capabilities. Current multi-domain discussions essentially push warfighters not to ask, "How can I solve this?" and rather ask, "Who has the ability to solve this problem and which method best works here?" Joint warfare has been an American strength since the Gulf War. Currently, joint operations focus on the deconfliction and utilization of service capabilities.[157] Multi-domain operations integrate "across domains without regard for which service provides the action or capability."[158] This concept envisions a greater degree of integrated actions across domains to include integrating space and cyberspace operations into traditional battlespaces. It suggests a seamless application of combat power between domains, with greater integration at dramatically lower echelons than joint forces currently achieve.[159] This is similar to the Marine Corps single-battle concept, where operations in one part of the battlespace have consequences on other areas, with an indivisible combat environment.[160] Joint improvement requires a shift from service-centric approaches to a holistic view of problems that considers all available capabilities.[161]

---

[157] Department of Defense, *Joint Operational Access Concept*, 17.

[158] Ibid.

[159] Ibid.

[160] Marine Corps Warfighting Publication (MCWP) 5-10, *Marine Corps Planning Process* (Washington, DC: Government Printing Office, 2010), 1-6.

[161] William O. Odom and Christopher D. Hayes, "Cross-Domain Synergy: Advancing Jointness," *Joint Force Quarterly* vol 73 (April 2014), 123.

Multi-domain perspectives create cross-domain synergy through a comprehensive view of adversaries, the environment, and a singular multi-domain effort. [162] Multi-domain theory contains the potential for problem-based rather than service-based solutions, integration and interdependent operations, and creating options for warfighters and decision-makers.

Philosophy

Successful multi-domain operations depend on an underlying philosophy already found in military doctrine; one not yet practiced fully. Subordinates must receive a mission and be empowered to meet the commander's intent through adjustments as dictated by the situation. The Army's "mission command" and the Air Force's "centralized control, decentralized execution" doctrines represent this philosophy.[163] Competitors will contest the electromagnetic spectrum, thus creating the potential for days without contact to higher headquarters. Applying this philosophy to the opening example, the landing forces know that the decisive points are contesting the enemy's control nodes and dominating the island's airfield. Naval and air forces supporting the mission share that understanding and have pre-coordinated, practiced means of tactical communications with land forces. When communication with the joint task force headquarters is lost, the mission and integrated efforts proceed. This philosophy, unifying and integrating efforts even on a tactical level, is crucial to multi-domain theory.

---

[162] Ibid.

[163] Army Doctrine Reference Publication (ADRP) 6-0, *Mission Command* (Washington, DC: Government Printing Office, 2012), 1-1 and 2-1; "Mission command is the exercise of authority and direction by the commander using mission orders to enable disciplined initiative within the commander's intent to empower agile and adaptive leaders in the conduct of unified land operations." Six principals guide mission command: "building cohesive teams through mutual trust, creating shared understanding, providing a clear commander's intent, exercising disciplined initiative, using mission orders, and accepting prudent risk;" Air Force Doctrine Document (AFDD) 1-1, *Air Force Basic Doctrine, Organization, and Command* (Washington, DC: Government Printing Office, 2011), 38-39; centralized control is commanding with a "broad focus on the [joint] objectives to direct, integrate, prioritize, plan, coordinate, and assess the use of air, space, and cyberspace assets..." Decentralized control is the delegation of authority to designated lower-level commanders and other tactical-level decision-makers to achieve effective span of control and to foster disciplined initiative and tactical flexibility." Centralized control, decentralized control enables responses to changes in the operational environment and exploitation of fleeting opportunities. "Discipline demands that senior leaders resist the temptation to get involved with execution decisions that are normally best left to subordinate commanders and forward decision-makers."

Objectives

Dr. Everett Dolman used chess as a metaphor to explain strategy in his essay *Seeking Strategy*. Extending his metaphor is useful for demonstrating the possibilities of multi-domain operations on tactical maneuver, training, and operational art. "Savvy chess players never seek to take the king; instead they force the king to move to a vulnerable square. Great players gain control or dominate a space next to the king, not the king's space, and then force the king to move into it."[164] Multi-domain operations can dominate or temporarily control the domain adjacent to the desired action domain, then act against presented vulnerabilities. This requires a change in thinking about exercises: not only how to dominate in a domain, but how to open vulnerabilities in other domains. Reciprocally, one must think about how to use another domain to open vulnerabilities in one's own primary domain.

Training

Dolman continued his example from the perspective of a strategist teaching his daughter chess.[165] This links to the practical example of multi-domain operations in training. Services should practice *against* each other rather than solely with each other for integration. The competition between units traditionally operating in different domains can motivate while also showing wider applicability that subsequently increases combat options and potentially money for training and procurement.[166] Service personnel would then fill the roles of both teacher and student. These exercises would demonstrate how to defeat a capable foe in another domain while also identifying one's own vulnerabilities to multi-domain action. It would also highlight the current limits of operating across domains and promote mutual improvement and trust. As Sinek

---

[164] Everett C. Dolman, "Seeking Strategy," in *Strategy: Context and Adaptation from Archidamus to Airpower* ed. Richard J Bailey Jr, et al. (Annapolis: Naval Institute Press, 2016), 18.

[165] Ibid, 34.

[166] James G. March and Chip Heath, *A Primer on Decision Making: How Decisions Happen* (New York: Simon & Schuster Adult Publishing Group, 2009), 152-154.

discussed, trust is not a checklist, rather one builds it with a sense of another organization, and understanding shared values, beliefs, and capabilities.[167] J.F.C. Fuller initially advocated a single use for armor upon its early twentieth-century development. Only after describing armor's diverse uses rather than advocating it as a panacea, did it become more commonly accepted.[168] Incorporating armor with infantry in small exercises was an important early first step just as incorporating multi-domain training events in joint exercises is a contemporary necessity.[169]

Practice

Individual services should continue practicing techniques that have made them arguably the most effective military forces in history. However, the idea of multi-domain operations requires an expansion of perspective. Strachan wrote, "All war is potentially asymmetric, and an intelligent opponent should try to maximize the enemy's vulnerability rather than play to their strength."[170] According to Moltke, in selecting an option, "commanders should always keep an eye on the most effective mutual support possible between the different arms."[171] This idea is central to multi-domain theory. Practically, services should institute this in a number of ways. Any multi-service exercise should include specific multi-domain objectives and operations. For instance, asking services to combat each other tactically shifts some exercise objectives to a multi-domain theory from the typical joint coordination of actions Although massive coordination and assessment hurdles must be crossed, the benefits include broadening service personnel's perceptions and practicing actions to achieve direct effects on another domain. In conjunction, capstone events for traditional joint exercises provide opportunities to practice multi-

[167] Simon Sinek, *Start With Why: How Great Leaders Inspire Everyone to Take Action* (London: Portfolio/Penguin, 2013), 84.

[168] Brian Bond and Martin Alexander, "Liddell Hart and De Gaulle: The Doctrines of Limited Liability and Mobile Defense," in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, ed. Peter Paret, et al. (Princeton: Princeton University Press, 1986), 602.

[169] Ibid, 605.

[170] Hew Strachan, 82.

[171] Von Moltke, 159.

domain coordination and planning. For example, using airborne intelligence as direct target guidance for maritime missile systems or linking an electromagnetic operation with a ground maneuver objective. The services must also re-think and expand the use of multiple domains in traditional tactics. Examples include expanding the use of the electromagnetic spectrum in shaping operations or inserting large forces via subsurface vessels similar to the insertion of airborne units via aircraft. John Kotter noted that fostering original ideas requires diversity and interdependence.[172] These suggestions enable emergent properties from tactical operators that can experiment and share results. Practicing across domains on the tactical level spawns the necessary innovation for improvement across operations.

Experimentation and moderate risk-taking, especially in training, lead to breakthroughs in a learning organization. The promotion system and training philosophy reward success and practice actions that previously worked. Moltke wrote, "Great successes in war are not to be obtained without great danger."[173] Success in training reduces motivation to innovate.[174] In the short-term, an emphasis on multi-domain operations should reward innovative thinkers and help identify decision-makers that learn from failure. A system structured for competition drives improvement.[175] Rather than waiting for doctrinal definitions of specific tactics or techniques, an immediate focus on experimental training and regular multi-domain exercises provide a canvas for innovation, make failure in training more common and acceptable, and improve problem-solving capabilities at multiple levels. When there is no book answer, creativity and resiliency become desired traits. Purposeful multi-domain experimenting in conjunction with traditional training is a low-risk, high-reward strategy. "Truth emerges more readily from error than from

[172] Kotter, 32.

[173] Von Moltke, 219.

[174] Marsh, 49.

[175] Bar-Yam, 85.

confusion."[176] In keeping with Francis Bacon's dictum, practicing novel techniques in training is more desirable than hoping they develop in the fog of war. This may require a service-level review on methods of capturing and inculcating best practices. Doctrine either becomes less specific and prescriptive or requires frequent updates regarding decision-making, experimentation, and potential techniques in conjunction with known successful methods.

Education

Services must include multi-domain discussions at the onset of professional education and reinforce the concepts whenever possible. Commissioning sources and subsequent developmental education are important for improving multi-domain use and understanding. Currently education focuses primarily on the importance of the individual service working in the domain that they control.[177] Accelerating improvement in multi-domain operations requires expanding curriculum regarding the purpose of forces to include creating freedom of action for other domains and creating direct effects in another domain to achieve unified objectives. Start by rewriting Joint Publication 1 as a foundation for multi-domain theory, then change and educate accordingly.

Coordination

Multi-domain operations must include interagency and connections with industry, especially due to the economic and cyberspace linkages. The Roles and Missions Commission of 1995 highlighted the need for better government agencies coordination in national security

---

[176] Francis Bacon, *The Works of Francis Bacon*, ed. James Spedding, Robert Leslie Ellis, and Douglas Denon Heath (London: Longman, 1861), 210.

[177] United States Navy, Naval Officer Candidate School, accessed November 9, 2016, http://www.ocs.navy.mil/ocs.html; United States Air Force, United States Air Force Officer Training School, accessed November 9, 2016, https://www.airforce.com/education/military-training/ots; United States Army, United States Army Officer Candidate School, accessed November 9, 2016, http://www.goarmy.com/ocs.html; United States Marine Corps, United States Marine Corps Officer Candidate School, accessed November 9, 2016, http://www.marines.com/becoming-a-marine/officer-candidates-school. Curriculum overviews are available at each of these sites for the respective officer candidate schools. The author assumed that respective military academy and ROTC curriculum regarding service orientation is similar to the direct commissioning source of Officer Training or Candidate Schools.

strategy, intelligence sharing, and "operations other than war."[178] This conversation gained renewed interest following the intelligence failures of September 11, 2001, yet further bureaucratic and legislative reform continue. Many scholars have written on the need for a whole-of-government approach to strategy. Multi-domain theories are currently a whole-of-military approach against enemy systems.

Integration

Linking the whole-of-government and interagency action is a logical future step in multi-domain operations. Freedman wrote, "The two spheres [civilian and military] need to be in constant dialog."[179] Integrating through domains increases the importance of linking military strategy to political and interagency strategies. Freedman further posited that, "military campaigns had to be designed according to their circumstances and successful commanders would show flexibility in their operational decisions."[180] Although multi-domain operations promises to increase understanding of maneuver in other domains, the complexity of modern warfare defies comprehension of all relative factors. Instead, the best practitioners use it to improve their judgment and open options. To borrow from Freedman again, they rely on their improved judgement to assess the most pressing problems, describe a means to advance to a better state, and improvise using a wide array of options in the presence of emergent opportunities.[181]

As complexity increases, the tendency to decompose problems into component parts remains. This limits vision and can lead to a focus on what James March calls a "fetish of

---

[178] Roles and Missions Commission of the Armed Forces, "Report to Congress, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff," May 1995, accessed December 9, 2016. http://fas.org/man/docs/corm95/di1062.html.

[179] Freedman, 242.

[180] Ibid.

[181] Freedman, 242-243.

metrics" rather than effectiveness.[182] The cost and scope of responsibility for military action requires effective solutions. Deliberate decomposition decreases mental preparation for emergent opportunities.[183] Decomposition relates directly to Fredrick Taylor's scientific management theory.[184] As Mariann Jelinek presented, decomposition allowed the codification of routine tasks, the large-scale coordination of details, the "abstraction of management from [daily] operations" to concentrate on planning and policy.[185] Decomposition works tactically but not on the strategically. Complexity theory proposes the impossibility of foreseeing all possible results and changes.[186] Thus preparing mental agility decreases systematic shock and increases response time to unforeseen circumstances.[187] Success induced bias, described by March as the propensity to attribute success to ability and failure to luck, is evident in arguments for maintaining the current joint operations model. He further states, "Persistent success leads to a tendency to underestimate…risk."[188] The military must think beyond past success and anticipate solutions to future challenges.

Shared Understanding

In *Start with Why*, Simon Sinek discusses a golden circle with three concentric rings; why is in the center, how in the middle, and what forms the outer layer.[189] The innermost circle is the core belief and *why* the organization exists. The middle circle is *how* the organization fulfills that

---

[182] March, 12-14.

[183] Henry Mintzberg, *The Rise and Fall of Strategic Planning* (New York: Simon and Schuster, 1994), 13.

[184] Fredrick W. Taylor, *The Principals of Scientific Management* (Los Angeles: Harper, 1914), 39-40.

[185] Mariann Jelinek, *Institutionalizing Innovation* (New York: Praeger, 1979), 136-137.

[186] Axelrod and Cohen, 11.

[187] Osinga, 251.

[188] March, 46.

[189] Sinek, 37.

core belief. The outer ring is *what* the organization does to fulfill that core belief.[190] For the military reader, this equates to ends, ways, and means respectively.[191] The current service's descriptions of why either focuses on the broad, winning the nations wars, or the specific, dominating a particular domain. Holistically, the military's purpose is to prepare for and win war when called upon.[192] Assuming the services remain divided primarily along domain lines, the golden circle for services changes. The service's golden circle in multi-domain operations becomes achieving unified military objectives by providing domain superiority and effects across domains with integrated, dominate service forces. This subordinates service-centric ideology to the broader military purpose. Multi-domain operations rely on options created by action in and through domains rather than dominance within a particular domain.

Options

Moltke wrote, "In all battles and under all circumstances, one must use everything that is available."[193] Multi-domain theory suggests that one use any assets available to cause desired effects in other domains; potentially in ways not originally intended for that asset. The range of options for the commander opens when a desired effect in one domain does not require use of that same domain. As enemies use anti-access strategies, the American military can use alternative means to gain access. For example, enemy air defenses may prevent intelligence collection, resupply, or targeting from the air. The solutions may include intelligence collection from space, undersea resupply, or targeting via land forces.

---

[190] Ibid, 39.

[191] Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2016). Ends are defined as the strategic outcomes or end states desired. Ways are defined as the methods, tactics, and procedures, practices, and strategies to achieve the ends. Means are defined as the resources required to achieve the ends, such as troops, weapons systems, money, political will, and time.

[192] Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States*, I-3.

[193] Von Moltke, 219.

Dolman imagined a game of chess were the rules are not fixed, where half way through a game, pawns move as queens.[194] Similarly, multi-domain operations allow changes to the rules of current battle. Instead of combating strength versus strength, what if the Army develops methods of defeating the enemy's air force, the Air Force designs methods to defeat the enemy's navy, and operations in the electromagnetic spectrum can disrupt the enemy's army causing operational shock? These operations would create options for commanders while allowing a national interagency strategy time to produce results. Multi-domain operations force an operational artist to think creatively, "outside the circumstances of his or her current condition."[195] Patterns of mind developed by multi-domain operations enable master tacticians to create options and operational artists to consider things outside of established traditional criteria for victory. It has the short-term potential to link expert tacticians and master strategists while creating relative advantages over America's potential competitors. The relative advantage will decrease as enemies adjust; however, the mindset created by multi-domain operations allows continued ingenuity in combining available forces to achieve military ends through non-traditional means.

Other Counter-Arguments

Counter-arguments include: the complication of action across domains, the complexity of forecasting alternative options, and the coordination of actions between services. The first of these echoes Clausewitz; "Everything in war is very simple, but the simplest thing is difficult."[196] Critics of multi-domain theory cite the difficulty of operating in environments not originally intended.[197] This same argument developed during early integration following the Goldwater-

[194] Dolman, "Seeking Strategy," 17.

[195] Ibid, 29.

[196] Von Clausewitz, 119.

[197] Richard Hart Sinnreich, "'Multi-Domain Battle': Old Wine in a New Bottle?," *Lawton Constitution*, October 30, 2016, accessed December 16, 2016, http://www.swoknews.com/misc-columns/multi-domain-battle-old-wine-new-bottle; Shawn Woodford, "Army and Marine Corps Join Forces to Define Multi-Domain Battle Concept," *The Depuy Institute* (February 3, 2017) accessed February

Nichols Act.[198] However, the US Marine Corps regularly combined arms in the land, sea, and air domains and integrated action on a smaller scale.[199] Marine Corps Operating Concept states that expanding proven maneuver and combined arms principals to space and the electromagnetic spectrum are necessary to maintain American advantages.[200]

Complex enemies require complex responses. Counter to the argument that thinking in multiple domains increases the complexity of war, Axelrod states, "complexity itself allows for techniques that promote effective adaptation."[201] These come from harnessing the experiences of numerous participants, trial-and-error learning, imitation, and consistent review. War is complex regardless of how one thinks about it. Educated Servicemen steeped in multi-domain operations provides an advantage. Clausewitz wrote that diversity in intellect is necessary.[202] Intellectual experience widens perspectives and improves shared understanding, a hallmark of mission command. Axelrod wrote, "Even though one action seems best, it usually pays to maintain variety among actions…to learn and adapt."[203] Frans Osinga emphasized creativity in systems thinking. Iterating from concrete experience to reflection forms new mental-models for testing conclusions.[204] Creativity stems from different viewpoints and purposefully developing characteristics such as coping with novelty, flexible decision-making, tolerating ambiguity,

---

6, 2017, http://www.dupuyinstitute.org/blog/2017/02/03/army-and-marine-corps-join-forces-to-define-multi-domain-battle-concept/.

[198] United States Congress, *Goldwater-Nichols Act, The Department of Defense Reorganization Act of 1986, Pub.L. 99–43* (Washington, DC, 1986), accessed November 16, 2016, https://www.congress.gov/bill/99th-congress/house-bill/3622.

[199] United States Marine Corps, *Marine Corps Operating Concept: How an Expeditionary Force Operates in the 21st Century* (Washington, DC: Government Printing Office, 2016), 8.

[200] United States Marine Corps, *Marine Corps Operating Concept, 8.*

[201] Axelrod and Cohen, xii.

[202] Von Clausewitz, 139.

[203] Axelrod and Cohen, xii.

[204] Osinga, 78-79.

intellectual risk-taking, assessing knowledge gaps, and challenging assumptions.[205] Multi-domain training provides development space for these desired characteristics. Practice builds bonds and tests options. Paraphrasing the proverb, as iron sharpens iron, so one service sharpen another, especially when directly exercising together or against each other's capabilities.[206]

All commanders and staffs need to understand capabilities and maneuver in all domains to aid in sound reasoning and practical decision-making. Specific education, reinforced with training and repetition are far superior than ad-hoc attempts to overcome problems in war. Even when encountering novel situations, prior experience aids the ad-hoc decision making. As the military adage states, "hope is not a tactic," and neither should it be a strategy for multi-domain operations. Clausewitz prescribed practice and experience to overcome some friction in combat.[207] Services fight as they practice. Services often practice alone without thinking of integration. Alternatively, they simulate integration without true understanding of the benefits, limitations, and requirements inherent to operating across multiple domains with other services.[208] Training is important. It encourages use and identifies conceptual shortfalls. Practice makes decision-makers more accepting of alternatives, trains the minds of planners to think asymmetrically, and improves practitioners' effectiveness. A soldier should not fire a rifle for the first time in combat, nor should the military expect a planner to envision using the electromagnetic spectrum to constrain an enemies air defenses for the first time in combat without major reservations.

[205] Ibid, 79.

[206] *The Holy Bible, New International Version* (Grand Rapids: Zondervan Publishing House, 2011). Proverbs 27:17 states, "As iron sharpens iron, so one person sharpens another."

[207] Von Clausewitz, 120.

[208] Wawro, 157.

Conclusion

Richard Swain posited, “Ideas are important. They affect man’s understanding of the world and influence behavior. An army’s doctrine is a body of ideas and concepts designed to anticipate circumstances a military organization might encounter, and to limit responses to those deemed best most of the time.”[209] He also described doctrine as a means of explaining requirements for organizing, training, and equipping militaries and a way to avoid past errors.[210] Doctrine is a formal body of precepts affected by culture and experience, not one created in a vacuum.[211] Prior to the Goldwater-Nichols Act, doctrine was oriented with service-centric parochial views.[212] These views created gulfs between the services, seeing the others as supporting agencies while limiting solutions and cross-service understanding. This also limited the dilemmas posed to the enemy. Commanding the Army’s Training and Doctrine Command, General DePuy reinvigorated and changed the Army’s perspective from a mobilization army to one that was perpetually ready. The multi-domain operations discussion similarly changes service perspective from dominating one’s own domain to supporting across domains. As Swain wrote, “Concept must lead action.”[213] Depuy’s changes led to AirLand Battle and tended to have a narrow focus on defending a Soviet invasion of Germany.[214] The contemporary problem requires wide applicability. Moltke advocated giving only as much direction as needed and teaching others how to think.[215] This means practicing an empowering, intent-driven philosophy with

---

[209] Richard Swain, “Filling the Void: The Operational Art and the US Army,” in *Operational Art: Developments in the Theories of War*, ed B.J.C. McKercher and Michael Hennessy (Westport: Praeger, 1996), 147.

[210] Ibid.

[211] Richard Swain, “Filling the Void,” 147.

[212] Ibid.

[213] Ibid, 150.

[214] Ibid, 151.

[215] Von Moltke, 133; Moltke discussed the philosophy inherent to mission command and training of decision-makers at length. He stated, “In the time of peace, the habit of acting in accordance with correct

subordinates in peacetime. As doctrine changes and units practice multi-domain battle, decision-makers should posit hard questions and create challenging opportunities to incorporate this new concept.

Due to their inability to determine novel ways to study war, Freedman postulated that, "writers on military strategy continue to assert their fealty to the great master [Clausewitz]."[216] Clausewitz assessed "…in 1793 a force appeared that beggared all imagination. Suddenly war again became the business of the people…the resources and efforts now available for use surpassed all conventional limits; nothing now impeded the vigor with which war could be waged."[217] Just as nationalization changed thoughts on war forever, harnessing integrated forces to maneuver across all available domains challenges conventional wisdom.

Paraphrasing Freedman, militaries adapt to shocks by reducing to subsystems that are more viable, decreasing dependencies, and finding alternatives.[218] Multi-domain concepts increase adaption capacity. Developing patterns of mind that seek alternatives in different domains creates options. Alternatives and early identification counter shocks. Integrated subsystems diversify support structures and decrease dependencies. According to Talib, this makes organizations more anti-fragile and resilient.[219] Similar to John Gaddis' discussion of using a variety of historical lenses gain clarity in *The Landscape of History*, the practice of

---

principles can be learned only if every officer is allowed the greatest possible independence. In that case, the practical intelligence of subordinate commanders will understand how to act in war according to the wishes of the superior commander, even when the latter cannot expressly state his will because of time or conditions."

[216] Freedman, 237.

[217] Von Clausewitz, 591-592.

[218] Freedman, 239-240.

[219]Nassim Nicholas Taleb, *Antifragile: How to Live in a World We Don't Understand* (London: Penguin Books, 2013), 264-270.

looking at a situation from different perspectives during planning builds a habit pattern for use in execution.[220]

Technology

Technology should not drive theory, but it can increase viability while decreasing dependency on singular options. An unrecognized threat to land forces along an avenue of approach is a shock. Destroying it with naval fires taking cueing from ground units is a multi-domain solution. Utilizing combined space-based collection to obtain particular intelligence instead of waiting on an air-based platform while lacking air superiority is an example of decreasing dependency. Defense technology improves detection and increases lethal range. Smaller sustained footprints with adaptive options present smaller targets. History displays examples of this such as when rifle technology improved weapon range and accuracy, units dispersed and became more difficult to defeat.[221] Viability improves with technological advancements such as cube satellites providing relatively low-cost capability resiliency in space.[222] However, to paraphrase former Secretary of Defense Rumsfeld, a nation fights with the military it has not with the one it wants.[223] Thus, decision-makers must find alternatives with existing capabilities during operational execution; a task made easier by regular practice using current assets to achieve affects in multiple domains.

---

[220] John Lewis Gaddis, *The Landscape of History: How Historians Map the Past* (Oxford: Oxford Univeristy Press, 2004), 20-22.

[221] Azar Gaat, *A History of Military Thought: From the Enlightenment to the Cold War* (Oxford: Oxford University Press, 2001), 101; James J. Schneider, *Vulcan's Anvil: The American Civil War and the Foundations of Operational Art* (New York: Presidio Press, 1994), 6.

[222] Matthew Richard Crook, "NPS Cubesat Launcher Design, Process, and Requirements" (Thesis Naval Postgraduate School, 2009), 1, accessed December 9, 2016, http://www.dtic.mil/get-tr-doc/pdf?AD=ADA501503.

[223] Cable News Network, "Troops put Rumsfeld on the Hot Seat," CNN, December 8, 2004, accessed December 16, 2016, http://www.cnn.com/2004/US/12/08/rumsfeld.kuwait/index.html. Original: Donald Rumsfeld responded, "As you know, you go to war with the army you have, not the army you might want or wish to have at a later time."

Underestimation

Underestimation results in two primary effects according to James Marsh. The first is a "perversity of planning" regarding events outside of an organizations' control.[224] Planners tend to ignore or minimize extremely unlikely events, treating them as if they have no likelihood of occurring even if they would have substantial consequences. Although they are extremely unlikely, Marsh postulates that some unlikely event will occur even if events are individually unlikely. Plans developed for a specific future are wrong.[225] The links to multi-domain theory are two-fold. First, the patterns of mind broadly developed for multi-domain operations build resiliency to shock in individuals and units, while allowing them capitalize on emergent opportunities.[226] Secondly, applying action asymmetrically through alternative domains is a hallmark of multi-domain operations. This opens options to planners for offensive action deemed extremely unlikely and ignored by enemy defensive planners.

The second effect of underestimation is on command, control, and motivation of an organization.[227] Dr. Marsh suggests that most leaders in high-reliability organizations never experience a failure, which results in exaggerated confidence, relaxed attention to reliability, and a degradation over time.[228] The US military has grown accustomed to tactical victory over the past few decades, thus expecting the "American way of war" to be successful again in the future.[229] The danger of victory is in the adage, "past performance does not guarantee future success."

---

[224] Ibid, 48.

[225] Ibid.

[226] Taleb, *31-32*; Steven Johnson, *Emergence: The Connected Lives of Ants, Brains, Cities, and Software* (New York: Simon & Schuster Adult Publishing Group, 2002), 19.

[227] James G. Marsh, 48.

[228] Ibid, 48-49.

[229] Colin S. Gray, *War, Peace and Victory: Strategy and Statecraft for the Next Century* (New York: Simon and Schuster, 1991), 115-120.

According to Thomas Kuhn, what a man sees depends upon what he looks and what his previous experience taught him to see.[230] Training for multi-domain operations teaches decision-makers to look for asymmetric options to accomplish the mission, while increasing their aperture for understanding effects in other domains. As Dietrich Dorner posited, "Theoretical knowledge is not the same as hands-on knowledge."[231] Thus, military members must begin acting to engender a new way of thinking.[232] These include inculcating multi-domain thinking at all levels through early exposure, purposeful education, and consistent practice. The military must utilize currently fielded technologies for a wider variety of effects. The pace of technological improvement precludes allowing technology to drive operational change. Instilling a collective mindset takes time, especially when combating years of service heuristics.[233] Additionally, inclusion of multi-domain training opportunities in all major exercises supports cross-service culture and provides opportunity for experimentation. Consistent exposure to multi-domain thinking will make it the dominant theory in American warfare for the next thirty years. Members will develop increasing understanding over the course of a career.

Contemporary analysts have identified an impending crisis based on the proliferation of technology, anti-access strategies, growing multi-polarity, and increased complexity mixing regular and irregular warfare. Competitors are increasing their joint capabilities so military theory must evolve. The idea that past performance guarantees future success is dangerous against complex adaptive enemies. It is always easier to speak in buzzwords than to describe or take

---

[230] Thomas S. Kuhn, 113. This mindset evoke Miles' Law; "where you stand depends on where you sit. Mile's Law specifically states that actors pursue policies that benefit organizations that they represent rather than collective interests. It is named for the Truman-era bureaucrat, Rufus E. Miles, who coined the phrase.

[231] Dietrich Dorner, *The Logic of Failure: Why Things Go Wrong and What We Can Do to Make Them Right* (New York: Metropolitan Books, 1996), 31.

[232] Ben Ramalingam, *Aid on the Edge of* Chaos (Oxford: Oxford University Press, 2013), 23.

[233] Von Moltke, 35. Moltke wrote, "The army is not a makeshift. It cannot be improvised in weeks or months; it requires long years of training because the foundation of all military organization rests on permanency and stability."

tangible improvement steps. An interagency and whole-of-government approach to multi-domain theory is required to combat potential unrestricted warfare.[234] Just as one service should not dominate military thinking, neither should the military dominate a fully multi-domain approach.[235] Understanding domains and their linkages will expand to encompass interagency, industry, and infrastructure. Rather than attempting to predict future warfare, America should learn adaptive behaviors for the complex environment.[236] A plateau in US joint improvement is unacceptable in the face of advancing adversary joint capabilities. Setting theoretical integration goals, such as multi-domain operations, beyond the military institution will enable the Unites States to maintain an advantage for decades. The robust interconnections inherent to multi-domain theory provide futile ground for necessary innovation.[237] Multi-domain theory contains the potential for problem-based rather than service-based solutions, integration and interdependent operations, and creates options for warfighters and decision-makers. Paraphrasing from Boyd, the first to adapt, wins.[238] Multi-domain may not be what is after joint, but the discussion is important to identify the necessary evolution in warfare.[239]

---

[234] Qiao Liang and Wang Xiangsui, *Unrestricted Warfare* (Beijing: PLA Literature and Arts Publishing House, 1999), 145-146.

[235] Harris Jr., Adm. Harry, "Statement Before the Association of the United States Army Conference," presented at the United States Army Conference, Washington, DC, October 04, 2016, http://www.pacom.mil/Media/Speeches-Testimony/Article/963703/association-of-the-united-states-army-ausa-conference/. Original: "We need a degree of jointness, in my opinion, in which no one military service dominates and no domain has a fixed boundary."

[236] Dolman, *Pure Strategy*, 136.

[237] Mary Uhl-Bien and Russ Marion, "Complexity Leadership in Bureaucratic Forms of Organizing: A Meso Model," *Management Department Faculty Publications*, Paper 38, accessed January 31, 2017, http://digitalcommons.unl.edu/managementfacpub/38.

[238] Osinga, 79. Osinga presents John Boyd's full OODA loop.

[239] Kuhn, 19; Brian McAllister Linn, *The Echo of Battle: The Army's Way of War* (Cambridge: Harvard University Press, 2009), 150.

Bibliography

"A Cyber-Riot." *The Economist.* (May 10, 2007). Accessed December 16, 2016. http://www.economist.com/node/9163598.

Air Force Doctrine Document (AFDD) 1. *Air Force Basic Doctrine, Organization, and Command.* Washington DC: Government Printing Office, 2015.

Air Force Doctrine Document (AFDD) 1-1. *Air Force Basic Doctrine, Organization, and Command.* Washington, DC: Government Printing Office, 2011.

Air Force Doctrine Document (AFDD) 3-12. *Cyberspace Operations.* Washington, DC: Government Printing Office, 2012.

Air Force Future Operating Concept (AFFOC). *Air Force Future Operating Concept: A View of the Air Force in 2035*. Washington, DC: Government Printing Office, 2015.

Applegate, Melissa. "Preparing for Asymmetry: As Seen Through the Lens of Joint Vision 2020." *Strategic Studies Institute*. Carlisle: US Army War College Press, 2001.

Army Doctrine Publication (ADP) 6-0. *Mission Command*. Washington, DC: Government Printing Office, 2012.

Army Doctrine Reference Publication (ADRP) 6-0. *Mission Command*. Washington, DC: Government Printing Office, 2012.

Axelrod, Robert and Michael D. Cohen. *Harnessing Complexity: Organizational Implications of a Scientific Frontier*. New York: Basic Books, 2001.

Bacon, Francis. *The Works of Francis Bacon*. Edited by James Spedding, Robert Leslie Ellis, and Douglas Denon Heath. London: Longman, 1861.

Bar-Yam, Yaneer. *Making Things Work: Solving Complex Problems in a Complex World*. Cambridge: Knowledge Press: NECSI, Knowledge Press, 2005.

Bearss, Edwin C. *Hardluck Ironclad: The Sinking and Salvage of the Cairo*. Baton Rouge: Louisiana State University Press, 1966.

Beaumont, Roger A. *Joint Military Operations: A Short History.* Westport: Greenwood Press, 1993.

Biddle, Stephen and Ivan Oelrich. "Future Warfare in the Western Pacific: Chinese Antiaccess/Area Denial, U.S. AirSea Battle, and Command of the Commons in East Asia." *International Security* 41, no. 1 (July 2016): 7–48. 10.1162/isec_a_00249.

Blaker, Lisa, and Baltimore County. ""The Islamic state's use of online social media" (2015). Accessed January 6, 2017. http://scholarcommons.usf.edu/mca/vol1/iss1/4/.

Bond, Brian, and Martin Alexander. "Liddell Hart and De Gaulle: The Doctrines of Limited Liability and Mobile Defense." In *Makers of Modern Strategy from Machiavelli to the*

Nuclear Age. Edited by Peter Paret, et al., 598-623. Princeton: Princeton University Press, 1986.

Bowden, Mark. "The Desert One Debacle." *The Atlantic* (May 2006). Accessed: December 8, 2016. http://www.theatlantic.com/magazine/archive/2006/05/the-desert-one-debacle/304803/

Breasted, James H. *Extracts from Medinet Habu Inscription.* Chicago: The University of Chicago Press, 1906.

Brown, Chris, and Kirsten Ainley. *Understanding International Relations.* New York: Palgrave Macmillian, 2009.

Bunson, Margaret. *The Encyclopedia of Ancient Egypt.* New York: Gramercy Books, 1999.

Center for Strategic and International Studies. "Defense Reform in the 21st Century: Guiding Principles for Reform Panel Discussion." March 2016. Accessed November 16, 2016. http://csis.org/multimedia/video-defense-reform-21stcentury.

Cable News Network. "Troops put Rumsfeld on the Hot Seat. CNN.com, December 8, 2004. Accessed December 16, 2016. http://www.cnn.com/2004/US/12/08/rumsfeld.kuwait/index.html.

Chandler, David G. *The Campaigns of Napoleon*. 2nd edition. London: Wedienfeld and Nicolson, 1966.

Citino, Robert M. *The German Way of War: From the Thirty Years' War to the Third Reich (modern War Studies)*. 3rd edition. Lawrence: University Press of Kansas, 2008.

Clark, David. "Characterizing Cyberspace: Past, Present, and Future." MIT CSAIL, Office of Naval Research. Accessed December 16, 2016. https://projects.csail.mit.edu/ecir/wiki/images/7/77/Clark_Characterizing_cyberspace_1-2r.pdf.

Cole, Ronald H. "Grenada, Panama, and Haiti: Joint Operational Reform." *Joint Forces Quarterly* 20 (Autumn/Winter 1998-1999): 57-64.

Crook, Matthew R. "NPS Cubesat Launcher Design, Process, and Requirements." Thesis, Naval Postgraduate School, 2009. Accessed December 9, 2016. http://www.dtic.mil/get-tr-doc/pdf?AD= ADA501503.

Davis, Paul K. *100 Decisive Battles: From Ancient Times to the Present*. Santa Barbara: ABC-CLIO, 1999.

Defense Information Security Agency. "Cross Domain Solutions." Network services. Last modified May 2016. Accessed September 29, 2016. http://www.disa.mil/network-services/enterprise-connections/connection-process-guide/disn-service-appendices/cross-domain-solutions.

Department of Defense. *2001 Quadrennial Defense Review Report*. Washington, DC: Government Printing Office, 2001. Accessed December 13, 2016. http://www.comw.org/qdr/qdr2001.pdf.

Department of Defense. *2006 Quadrennial Defense Review*. Washington, DC: Government Printing Office, 2006. Accessed December 13, 2016. http://archive.defense.gov/Home/features/ 2014/0314_sdr/qdr/docs/Report20060203.pdf.

Department of Defense. *Capstone Concept for Joint Operations: Joint Force 2020.* Washington, DC: Department of Defense, 2012. Accessed November 16, 2016. http://www.dtic.mil/doctrine/concepts/ccjo_jointforce2020.pdf.

Department of Defense. *Cross-Domain Synergy in Joint Operations Planner's Guide*. Washington, DC: Department of Defense, 2016.

Department of Defense. *Joint Defense Capabilities Study*. Washington, DC: Government Printing Office, 2004. Accessed December 13, 2016. https://assets.documentcloud.org/documents/2695409/Joint-Defense-Capabilities-Study-Aldridge-Study.pdf.

Department of Defense. *Joint Military Operations Historical Collection*. Washington, DC: Government Printing Office, 1997.

Department of Defense. *Joint Operational Access Concept*, version 1.0. Washington, DC: Department of Defense, 2012.

Department of Defense. *Joint Operating Environment 2035.* Washington, DC: Government Printing Office, 2016. Accessed December 7, 2016. http://www.dtic.mil/doctrine/concepts/joe/joe_2035_july16.pdf.

Department of Defense. *Joint Vision 2010*. Washington, DC: Government Printing Office, 2000. Accessed December 9, 2016, http://www.dtic.mil/jv2010/jv2010.pdf.

Department of Defense. *Joint Vision 2020*. Washington, DC: Government Printing Office, 2010. Accessed December 9, 2016, http://www.dtic.mil/jv2020/jv2020.pdf.

Department of Defense. *National Military Strategy of the United States of America.* Washington, DC: Government Printing Office, 2015.

Department of Defense. *Transformation Planning Guidance*. Washington, DC: Government Printing Office, 2003. Accessed December 13, 2016. http://www.acq.osd.mil/brac/ Downloads/Prior%20BRAC%20Rounds/transformationplanningapr03.pdf.

Dolman, Everett C. *Pure Strategy: Power and Principle in the Space and Information Age*. London: Frank Cass, 2005.

———. "Seeking Strategy." In *Strategy: Context and Adaptation from Archidamus to Airpower*, edited by Richard J Bailey Jr, et al., 5-37. Annapolis: Naval Institute Press, 2016.

Dörner, Dietrch. *The Logic of Failure: Why Things Go Wrong and What We Can Do to Make Them Right.* New York: Metropolitan Books, 1996.

Ferrill, Arther. *The Origins of War*. London: Westview Press, 1985.

Fleming, Thomas. *The Battle of Yorktown: The Story of the Climactic Battle of the American Revolution*. New York: Milk and Cookies Press, 2006.

Franz, Paul, Center and International Studies. *1986 Packard Commission Report – Blue Ribbon Commission on Defense.* Accessed December 13, 2016. http://www.documentcloud.org/documents/2695411-Packard-Commission.html.

Freedberg, Sydney J. "A 'Highly Lethal' War of 'Fleeting' Advantages: Multi-Domain Battle." *Breaking Defense* (November 2016). Accessed January 2, 2017. http://breakingdefense.com/2016/11/under-enemy-skies-armys-multi-domain-battle/.

———. "Air force leading way to 3rd offset: Bob Work." *Breaking Defense* (November 2016). Accessed September 29, 2016. http://breakingdefense.com/2016/09/air-force-ops-centers-lead-way-to-3rd-offset-bob-work/.

Freedman, Sir Lawrence. *Strategy: A History*. Oxford: Oxford University Press, 2013.

Gaat, Azar. *A History of Military Thought: From the Enlightenment to the Cold War*. Oxford: Oxford University Press, 2001.

Gabriel, Richard, and Donald W. Boose. *The Great Battles of Antiquity: A Strategic and Tactical Guide to Great Battles That Shaped the Development of War*. Westport: Greenwood Publishing Group, 1994.

Gabriel, Richard, A. *Thutmose III: The Military Biography of Egypt's Greatest Warrior King*. Washington, DC: Potomac Books, 2009.

Gaddis, John L. *The Landscape of History: How Historians Map the Past*. Oxford: Oxford University Press, 2004.

GAO Report. *Joint Military Operations: Weaknesses in DOD's Process for Certifying C4I Systems Interoperability*. Letter Report to Congress, March, 13 1998. Accessed December 8, 2016. https://fas.org/irp/gao/nsiad98073.htm.

Gates, Robert M. *Duty: Memoirs of a Secretary at War*. New York: Knopf Publishing Group, 2014.

———. "A Balanced Strategy: Reprogramming the Pentagon for a New Age." *Foreign Affairs* 88, no. 1 (January-February 2009): 28-40.

Grainger, John D. *The Battle of Yorktown: 1781: A Reassessment*. London: The Boydell Press, 2005.

Gray, Colin S. *Another Bloody Century: The Battle for the 21st Century*. London: Weidenfeld & Nicolson, 2005.

———. *War, Peace and Victory: Strategy and Statecraft for the Next Century*. New York: NY, Simon and Schuster, 1991.

Greene, Jerome A. *The Guns of Independence: The Siege of Yorktown, 1781*. New York: Savas Beatie, 2009.

Hamre, John J. "Reform of the Defense Department." Testimony Before the Senate Armed services Committee, November 10, 2015, 2. Accessed December 9, 2016. http://1yxsm73j7aop3quc9y5ifaw3.wpengine.netdna-cdn.com/wp-content/uploads/2016/04/DoD-G-N-WGrecommendations.pdf.

Hannum, Patrick H. "Command and Control During the Yorktown Campaign." *Journal of the American Revolution* (May 18, 2016). Accessed October 13, 2016. https://allthingsliberty.com/2016/05/command-and-control-during-the-yorktown-campaign/

Harris Jr., Adm. Harry, "Statement Before the Association of the United States Army Conference." Presented at the United States Army Conference, Washington, DC, October 04, 2016. Accessed October 16, 2016. http://www.pacom.mil/Media/Speeches-Testimony/Article/963703/association-of-the-united-states-army-ausa-conference/.

Herring, George C. *From Colony to Superpower: U. S. Foreign Relations Since 1776*. Oxford: Oxford University Press, 2009.

Hofmann, George, and Donn Starry. *Through Mobility We Conquer: The Mechanization of U. S. Cavalry*. Lexington: University Press of Kentucky, 2006.

Jelinek, Mariann. *Institutionalizing Innovation.* New York: Praeger, 1979.

Johnson, Henry P. *The Yorktown Campaign and the Surrender of Cornwallis, 1781*. New York: Harper and Brothers, 1975.

Johnson, Steven. *Emergence: The Connected Lives of Ants, Brains, Cities, and Software*. New York: Simon & Schuster Adult Publishing Group, 2002.

Joint Publication (JP) 1. *Doctrine for the Armed Forces of the United States.* Washington, DC: Government Printing Office, 2013.

Joint Publication (JP) 1-02. *Department of Defense Dictionary of Military and Associated Terms.* Washington, DC: Government Printing Office, 2016.

Joint Publication (JP) 2-03. *Geospatial Intelligence Support in Joint Operations.* Washington, DC: Government Printing Office, 2016.

Joint Publication (JP) 3-03. *Joint Interdiction*. Washington, DC: Government Printing Office, 2016.

Joint Publication (JP) 3-12. *Cyberspace Operations.* Washington, DC: Government Printing Office, 2013.

Joint Publication (JP) 3-14. *Space Operations.* Washington, DC: Government Printing Office, 2016.

Joint Publication (JP) 3-18. *Joint Forcible Entry Operations.* Washington, DC: Government Printing Office, 2012.

Joint Publication (JP) 3-30. *Command and Control for Joint Air Operations.* Washington, DC: Government Printing Office, 2013.

Joint Publication (JP) 3-31. *Command and Control for Joint Land Operations.* Washington, DC: Government Printing Office, 2014.

Joint Publication (JP) 3-32. *Command and Control for Joint Maritime Operations.* Washington, DC: Government Printing Office, 2013.

Joint Publication 3-59. *Meteorological and Oceanographic Operations.* Washington, DC: Government Printing Office, 2016.

Joint Publication 6-01. *Joint Electromagnetic Spectrum Management Operations.* Washington, DC: Office of the Secretary of Defense, 2012, I-1.

Keegan, John. *A History of Warfare*. 2nd edition. New York: Distributed by Random House, 1993.

Kotter, John P. *Power and Influence*. New York: The Free Press, 2008.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 3rd edition. Chicago: The University of Chicago Press, 1996.

Levine, Peter and Lt. Gen Thomas Waldhauser. *Goldwater-Nichols Working Group Recommendations.* Deputy Chief Management Officer, Information Memorandum, March 2016. Accessed December 9, 2016. http://1yxsm73j7aop3quc9y5ifaw3.wpengine.netdna-cdn.com/wp-content/uploads/2016/04/DoD-G-N-WG-recommendations.pdf .

Liang, Qiao, and Wang Xiangsui, *Unrestricted Warfare.* Beijing: PLA Literature and Arts Publishing House, 1999.

Linn, Brian M. *The Echo of Battle: The Army's Way of War*. Cambridge: Harvard University Press, 2009.

Locher III, James R. *Victory on the Potomac: The Goldwater-Nichols Act Unifies the Pentagon.* College Station: Texas A&M University Press, 2002.

Mackesy, Piers, and John W. Shy. *The War for America: 1775-1783*. Lincoln: University of Nebraska Press, 1993.

Maclean, Norman. *Young Men and Fire*. Chicago: University of Chicago Press, 1992.

March, James G and Chip Heath. *A Primer on Decision Making: How Decisions Happen*. New York: Simon & Schuster Adult Publishing Group, 2009.

Marine Corps Warfighting Publication (MCWP) 5-10. *Marine Corps Planning Process.* Washington, DC: Government Printing Office, 2010.

Maze, Rick. "Radical Change is Coming: Gen. Mark A. Milley Not Talking About Just Tinkering Around the Edges." *Association of the United States Army.* December 13, 2016. Accessed December 15, 2016. https://www.ausa.org/articles/radical-change-coming-gen-mark-milley-not-talking-about-just-tinkering-around-edges.

Mazarr, Michael J. "Rivalry's New Face." *Survival* 54, no. 4 (2012): 97. Accessed December 3, 2016. http://dx.doi.org/10.1080/00396338.2012.709390.

McInnis, Kathleen J. *Goldwater-Nichols at 30: Defense Reform and Issues for Congress.* Congressional Research Service (CRS Report No. R44474) Washington, DC: Congressional Research Service, 2016. Accessed November 6, 2016. https://fas.org/sgp/crs/natsec/R44474.pdf.

McLucas, John L. *Reflexions of a Technocrat: Managing Defense, Air, and Space Programs during the Cold War*. Maxwell AFB: Air University Press, 2006. Accessed December 9, 2016. https://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA456851.

Milley, General Mark A. “Multi-Domain Battle: Ensuring Joint Freedom of Action.” Presented at the Association of the United States Army Annual Meeting, Washington, DC, October 05, 2016. Accessed October 16, 2016. http://www.youtube.com/watch?v=pt0HzNbbSBk.

Mintzberg, Henry. *The Rise and Fall of Strategic Planning*. New York: Simon and Schuster, 1994.

Moore, Gordon E. “Cramming More Components onto Integrated Circuits.” *Electronics* 38, no. 8 (April 1965): 114–17.

Ng, Teddy. "PLA Considers Setting Up Joint Command for Era of Modern Warfare.” *South China Morning Post.* April 2, 2013. Accessed November 23, 2016. http://www.scmp.com/news/china/article/1396445/chinas-military-launch-joint-command-armed-forces-report-says.

Nichols, Bill. "H.R.3622 - 99th Congress (1985-1986): Goldwater-Nichols Department of Defense Reorganization Act of 1986." January 10, 1986. Accessed December 13, 2016. https://www.congress.gov/bill/99th-congress/house-bill/3622.

Nye, Joseph S. *The Future of Power*. New York: PublicAffairs, 2011.

Odom, William, and Christopher D. Hayes. “Cross-Domain Synergy: Advancing Jointness.” *Joint Forces Quarterly* Vol 73 (April 2014). Accessed September 29, 2016. http://ndupress.ndu.edu/Media/News/News-Article-View/Article/577517/jfq-73-cross-domain-synergy-advancing-jointness/.

Office of Force Transformation. *Military Transformation: A Strategic Approach*. Fall 2003. Accessed December 15, 2016.

http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA457320.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*. Washington, DC: Government Printing Office, 2013. Accessed October 16, 2016. https://www.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf.

Osinga, Frans P B. *Science, Strategy and War: The Strategic Theory of John Boyd*. London: Routledge, 2007.

Packard, David. *President's Blue Ribbon Commission on Defense Management.* Packard Commission Report. Washington DC: U.S. Government Accountability Office, 1986. Accessed December 8, 2016, http://www.documentcloud.org/documents/2695411-Packard-Commission.html.

Paine, S. C. M. *The Sino-Japanese War of 1894-1895: Perceptions, Power, and Primacy*. New York: Cambridge University Press, 2005.

Palazzo, Albert and David P McLain. "Multi-domain battle: A New Concept for Land Forces." *War on the Rocks.* Accessed January 3, 2017. Last Updated September 15, 2016. https://warontherocks.com/2016/09/multi-domain-battle-a-new-concept-for-land-forces/.

Ramalingam, Ben. *Aid on the Edge of Chaos: Rethinking International Cooperation in a Complex World*. Oxford: Oxford University Press, 2013.

Reilly, Jeffrey M. "Multidomain Operations." *Air and Space Power Journal* Vol 30, no. 1 (Spring 2016): 61-73. Accessed October 3, 2016. http://www.au.af.mil/au/afri/aspj/article.asp?id=321.

Report of the National Defense Panel. *Transforming Defense-National Security in the 21st Century*. December 1997. Accessed December 13, 2016. http://www.dtic.mil/dtic/tr/fulltext/u2/a402688.pdf.

Admiral John Richardson. "Chief of Naval Operations Adm. John Richardson: Deconstructing A2A." *The National Interest*. Accessed December 30, 2016. http://nationalinterest.org/feature/chief-naval-operations-adm-john-richardson-deconstructing-17918.

Roles and Missions Commission of the Armed Forces. *Report to Congress, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff.* May, 1995. Accessed December 9, 2016. http://fas.org/man/docs/corm95/di1062.html.

Rosenau, James N. *Thinking Theory Thoroughly*. London: Pinter, 1980.

Saunders, Phillip, and Joel Wuthnow. "China's Goldwater-Nichols? Assessing PLA Organizational Reforms." *Joint Forces Quarterly* vol 82, 3rd quarter (July 2016). Accessed October 3, 2016. http://ndupress.ndu.edu/JFQ/Joint-Force-Quarterly-82/Article/793267/chinas-goldwater-nichols-assessing-pla-organizational-reforms/.

Schneider, James J. *Vulcan's Anvil: The American Civil War and the Foundations of Operational Art.* New York: Presidio Press, 1994.

Sciutto, Jim and Jennifer Rizzo. "War in Space: Kamikazes, kidnapper satellites and lasers." CNN report. Accessed December 16, 2016. http://www.cnn.com/2016/11/29/politics/space-war-lasers-satellites-russia-china/.

Senate Committee on Armed Services. *Defense Organization: The Need for Change, Staff Report to the Committee on Armed services* (Senate Report 99-86). Washington, DC, 1985. Accessed December 9, 2016. https://www.gpo.gov/fdsys/pkg/STATUTE-99/content-detail.html.

Sharma, Deepak. "Integrated Network Electronic Warfare: China's New Concept of Information Warfare," *Journal of Defense Studies* 4, no 2 (April 2010): 37–38.

Showalter, Dennis. *Philosophers of War [2 Volumes]: The Evolution of History's Greatest Military Thinkers*. Edited by Daniel Coetzee and Lee W. Eysturlid. Westport: Praeger, 2013.

Sinek, Simon. *Start With Why: How Great Leaders Inspire Everyone to Take Action.* London: Portfolio/Penguin, 2013.

Sinnreich, Richard Hart. "'Multi-Domain Battle': Old Wine in a New Bottle?" *Lawton Constitution.* October 30, 2016. Accessed December 16, 2016, http://www.swoknews.com/misc-columns/multi-domain-battle-old-wine-new-bottle.

Sloan, Elinor. *Military Transformation and Modern Warfare*. Westport, CT: Praeger, 2008.

Smith, General Sir Rupert. *The Utility of Force: The Art of War in the Modern World.* New York: Vintage Books, 2008.

Stars and Stripes. "PACOM Chief Urges Pacific Army to Master Cross-Domain Warfare." May 26, 2016. *Stars and Stripes.* Accessed September 29, 2016. http://www.stripes.com/news/pacific/pacom-chief-urges-pacific-army-to-master-cross-domain-warfare-1.411491.

Strachan, Hew. *The Direction of War: Contemporary Strategy in Historical Perspective.* Cambridge: Cambridge University Press, 2013.

Svechin, Aleksandr A, and R A. Svechin. *Strategy*. 2nd edition. Minneapolis: East View Publ., 1991.

Swain, Richard M. "Filling the Void: The Operational Art and the U.S. Army." In *Operational Art: Developments in the Theory of War,* edited by B.J.C McKercher and Michael Hennessy, 147-171. Westport: Praeger, 1996.

Taleb, Nassim N. *Antifragile: How to Live in a World We Don't Understand*. London: Penguin Books, 2013.

Tangredi, Sam J. *Anti-Access Warfare: Countering A2/AD Strategies*. Annapolis: Naval Institute Press, 2013.

Taylor, Fredrick W. *The Principals of Scientific Management.* Los Angeles: Harper, 1914.

The Holy Bible, New International Version. Grand Rapids: Zondervan Publishing House, 2011.

Uhl-Bien, Mary, and Russ Marion. "Complexity Leadership in Bureaucratic Forms of Organizing: A Meso Model." *Management Department Faculty Publications*, Paper 38. Accessed January 31, 2017. http://digitalcommons.unl.edu/managementfacpub/38 .

United States Air Force. United States Air Force Officer Training School, Accessed November 9, 2016. https://www.airforce.com/education/military-training/ots.

United States Air Force. *United States Air Force Strategic Environment Assessment 2016-2046*. Washington, DC: Government Printing Office, 2016. Accessed December 16, 2016. https://www.my.af.mil/gcss-af/USAF/AFP40/d/s6925EC13520D0FB5E044080020E329A9/Files/editorial/AFSEA_2016_FINAL.PDF.

United States Army. United States Army Officer Candidate School. Accessed November 9, 2016. http://www.goarmy.com/ocs.html.

United States Army. Warrant Officer Program. United States Army Combined Arms Center. Accessed November 9, 2016, http://usacac.army.mil/organizations/cace/wocc/woprogram.

United States Congress. *Goldwater-Nichols Act, The Department of Defense Reorganization Act of 1986, Pub.L. 99–43* (Washington, DC, 1986). Accessed November 16, 2016. https://www.congress.gov/bill/99th-congress/house-bill/3622.

United States Congress. *National Security Act of* 1947. Accessed November 16, 2016. http://www.intelligence.senate.gov/sites/default/files/laws/nsact1947.pdf.

United States Marine Corps. United States Marine Corps Officer Candidate School. Accessed November 9, 2016. http://www.marines.com/becoming-a-marine/officer-candidates-school.

United States Marine Corps. *Marine Corps Operating Concept: How an Expeditionary Force Operates in the 21st Century.* Washington, DC: Government Printing Office, *2016.*

United States Navy. Naval Officer Candidate School. Accessed November 9, 2016. http://www.ocs.navy.mil/ocs.html.

Van De Mieroop, Marc. *A History of Ancient Egypt.* New Jersey: Wiley-Blackwell, 2010.

Von Clausewitz, Carl. *On War*. Edited by Michael Howard and Peter Paret. Princeton: Princeton University Press, 1984.

Von Moltke, Helmuth Graf. *Moltke on the Art of War: Selected Writings*. Edited by Daniel Hughes. New York: Random House Publishing Group, 1996.

Wass de Czege, Huba. "Thinking and Acting like an Early Explorer: Operational Art is not a Level of War." *Small Wars* Journal (March 2011). Accessed December 15, 2016. http://www.smallwarsjournal.com/blog/journal/docs-temp/710-deczege.pdf.

Wawro, Geoffrey. *The Franco-Prussian War: The German Conquest of France in 1870 - 1871*. Cambridge: Cambridge University Press, 2005.

Willcox, William B. *Portrait of a General*. New York: Alferd A. Knopf, 1964.

Woodford, Shawn. "Army and Marine Corps Join Forces to Define Multi-Domain Battle Concept." *The Depuy Institute*, Last modified February 3, 2017. Accessed February 6, 2017. http://www.dupuyinstitute.org/blog/2017/02/03/army-and-marine-corps-join-forces-to-define-multi-domain-battle-concept/.