

Wargaming All Domain Operations and Leader Development

A Monograph

by

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Abstract

Wargaming All Domain Operations and Leader Development, by MAJ Andrew L. S. Powell, 49 pages.

All Domain Operations (ADO) is the evolution of the joint concept of the United States military that addresses strategic adversaries who look to leverage the emerging character of warfare to disrupt and overcome American efforts upon an increasingly complex and global battlefield. ADO as a concept is important because it at once recognizes the complexity of the operational environment and how adversaries intend to achieve strategic advantage within it. The concept describes how the US Army can enable the Joint Force and prevent, deny, and exploit adversaries while consolidating gains. Continued development of the ADO concept is crucial as the operational environment emerges and the US Army seeks to gain and maintain enduring advantages into the future.

Wargaming continues to serve as an essential function and tool for military organizations. Wargames simulate processes and consequences based off players' decisions with varying degrees of reality and abstraction. Wargame theory is critical to leader development and the US Army because it supplies a process from which critical decision-making is reduced through abstract mechanics into an iterative process that enables the exploration of failure and rewards learning to make more appropriate decisions. Wargaming is a crucial element towards testing the concepts of ADO as well as training and educating leaders into the future.

Key to ADO is developing the capacity to understanding the concept and the operational environment. Wargaming ADO allows leaders and military theorists to learn and explore the operational environment including adversary versus US and allied capabilities across operational context. Designing a wargame regarding the operational concept of ADO creates a framework within which leaders can practice planning, execution, and reflect upon the key elements. This monograph proposes a proof of concept *Theatrum Belli* for future leader development through education and training that focuses on the Army's operational approach to ADO planning and execution.

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Abbreviations

ADO	All-Domain Operations
AMSP	Advanced Military Studies Program
EABO	Expeditionary Advanced Base Operations
EMS	Electro-Magnetic Spectrum
JADC2	Joint All-Domain Command and Control
JADO	Joint All-Domain Operations
JP	Joint Publication
PME	Professional Military Education
TP	TRADOC Pamphlet

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Introduction

Men are born for games. Nothing else. Every child knows that play is nobler than work. He knows too that the worth or merit of a game is not inherent in the game itself but rather in the value of that which is put at hazard. Games of chance require a wager to have meaning at all. Games of sport involve the skill and strength of the opponents and the humiliation of defeat and the pride of victory are in themselves sufficient stake because they inhere in the worth of the principals and define them. But trial of chance or trial of worth all games aspire to the condition of war for here that which is wagered swallows up game, player, all.

—The Judge, *Blood Meridian*

At their best, wargames provide a nonthreatening environment in which the collective play of participants can reveal unpleasant truths about a particular strategy or set of goals.

—Mark Herman, *Wargaming for Leaders*

The notion of war is ever present. To some varying degree, actors always prepare for and/or engage in conflict. The character of war and the concepts of modern warfare relentlessly march forward in time. Professionals of warfare and policy makers in the US predominantly believe that All-Domain Operations (ADO) is the future concept of warfare.¹ ADO represents the modern, joint concept and approach of the US military to warfighting in 2020 and into the near future. The concept integrates the air, land, maritime, cyberspace, electromagnetic, and space domains in planning and synchronized execution across time and space.² The complexity inherent to ADO requires leaders with an understanding of capabilities, planning, and execution that spans domains.

The developmental path of leaders starting at the tactical levels limits joint and operational experience. Understanding and better execution of ADO requires leaders to learn planning and implementation of the nascent concepts earlier in their experiential development. Real world, hands on experience is by far the best but difficult to replicate, and even more so at

¹ US Department of the Air Force, Air Force Doctrine Publication (AFDP) 3-99, *Department of the Air Force Role in Joint All-Domain Operations* (Maxwell AFB, AL: Curtis E. Lemay Center for Doctrine Development and Education, 2020), 5.

² Ibid., 8.

the joint, operational warfare. Wargaming offers a tool to supplement education and training, using mechanics to help frame understanding of problems and decision-making processes.³ A comprehensive wargaming tool could be crucial to the leader development of future operational leaders in ADO.

The purpose of this monograph is to show how wargaming may develop and educate leaders for the US Army's role in ADO. The study is intended to provide a foundation for leaders interested in ADO and developing and educating through wargames. This monograph demonstrates how a wargame models the concept of ADO in order to instruct and facilitate education. The wargame's aims include planning and managing military operations across time and space, through all domains, while incorporating elements of both operational art and science across phases tied to ADO. The wargame model should be adaptable in any scenario with a modular design that allows for contextual emphasis as needed. The designer develops the wargame through episodic phasing between at least two major adversaries according to existing operational framework that enables reflection and discussion. This monograph provides a proof of concept, *Theatrum Belli* as a baseline for further development and addresses a significant gap in Army doctrine regarding wargaming.

A major gap in Army wargaming exists for the concepts and doctrine of ADO. Few existing models sufficiently incorporate all five domains of warfare in a modern fashion to appropriately represent the elements of ADO. Furthermore, the US Army lacks an analog, standardized model that best portrays execution of ADO at the operational level from the Division to Theater Army. The US Air Force and US Navy are currently developing an ADO-oriented wargame that still lacks incorporation of significant ground forces.⁴ This monograph

³ Mark Herman, Mark Frost, and Robert Kurz, *Wargaming for Leaders: Strategic Decision Making from the Battlefield to the Boardroom* (New York: McGraw-Hill, 2009), 33.

⁴ Staff, Wargaming Division, "An Invigorated Approach to Wargaming," *Marines Corps Gazette* 104, no. 2 (February 2020): 19.

proposes a wargame design that enables the education and development of leaders at the operational level of planning and execution in ADO. Given that main goal of the wargame, a designer must acknowledge the limitations of the model and research.

Firsthand and real-world experience is the best environment in which to learn. However, the cost in time, material, and personnel to create a real-world training environment for ADO at the operational level is probably prohibitive.⁵ A wargame is a model with a clear objective that accurately depicts some elements of warfare between at least two opposing sides.⁶ To achieve this clear objective, factors of the design must be prioritized. The model only simulates some parts of reality and warfare, prioritized towards carrying out the objective of the wargame. The more exact and comprehensive the details of the design, the more complex it becomes. Wargames often sacrifice varying degrees of accuracy to achieve simplicity that unburdens participants from the costs of time and effort otherwise required.⁷ The design's aim to instruct upon ADO presents other limitations. Wargames can teach similar learning objectives through multiple iterations, but every abstraction of reality means the application of the model can only address so much at any given point.

Access and availability of the wargame represent key limitations to the proposed wargame. Any classified material in the wargame significantly diminishes access throughout most professional military education (PME) programs. The design then inevitably obscures some aspects inherent to ADO given the lack of classified material. This enables wider dissemination of a model meant for training and education purposes that may even include allied forces. Furthermore, the model's increased dissemination encourages wider levels of engagement outside

⁵ Jane McGonigal, *Reality is Broken: Why Games Make Us Better and How They Can Change the World* (New York: The Penguin Press, 2011), 347.

⁶ Herman, Frost, and Kurz, *Wargaming for Leaders*, 25.

⁷ Philip Sabin, *Simulating War* (London: Bloomsbury, 2012), 49.

of PME that could further innovation and adaptation of future iterations. Alongside the discussed limitations of this monograph, the scope of the design process better defines the design approach.

The scope of this monograph's wargame design proposes a proof of concept for a classroom environment to supplement learning on ADO. Therefore, the focus supports achieving specific learning objectives that require only the necessary time and effort from the faculty and students. A wargame that absorbs too much time, whether learning to operate or in execution itself, becomes a burden for anyone with a schedule.⁸ Addressing the given attention span of participants, the wargame model must be efficient and brief but still incorporate mechanics that foster the learning objectives. An instructor manages the attention span of the students with the wargame and needs to use remaining time to exploit synthesis versus exhausting the students.⁹ To supplement a curriculum for the Advanced Military Studies Program (AMSP), the design should format with a seminar environment as the base line. This format could expand to staffs at echelons above brigades, executing iterations in a few hours instead of all-day affairs. The iterative nature of the design lends to episodic scenarios where participants can jump in and out of scenario with default criteria or carry progress forward between episodes for sustained continuity. This serves as a general introduction to the scope of the wargame that this monograph explains in further detail later along with the theory behind the design.

The introduction of this monograph stated the thesis and main purpose, identified the significant gap, and the limitations and scope of the wargame design. The next section covers the literature, doctrine, concepts, and previous wargames researched and their application to the approach of the proposed design.

⁸ McGonigal, *Reality is Broken*, 62.

⁹ Peter Perla, *The Art of Wargaming*, ed. John Curry (Annapolis, MD: The United States Naval Institute, 2011), 503.

Doctrine, Concepts, and Wargames

The research required for this project was two-fold in its requirements: the doctrine and concepts emulated within the wargame mechanics and theory and examples of previous designs. This section describes the literature reviewed, divided into two parts covering doctrine and concepts and wargaming theory and wargames themselves.

ADO are inherently joint, and the key source documentation is drawn from Joint Publication (JP) 3-0. JP 3-0 describes a complex, contested, and strategic environment between globally integrated forces that operate across time, space, and purpose to manage transregional, all-domain, and multifunctional challenges.¹⁰ The domains consists of the land, sea, air, space, cyber, information, electro-magnetic spectrum (EMS), and human factors.¹¹ The future era of conflict features elements that are too pervasive for regional or any single domain to appropriately address alone.¹² The proposed environment requires a more integrated approach in military operations that evolves beyond the current approach and concepts. The US Army is now adopting the approach into its own emerging doctrine and concepts.

By the end of 2018, the US Army released TRADOC Pamphlet (TP) 525-3-1 that described Multi-Domain Operations (MDO), the concept describing the land-centric aspect of ADO. The Pamphlet described the groundwork of the concept and the path for doctrine to follow, primarily focused against the preeminent threats of Russia and China.¹³ The Army is presently updating Army Doctrine Publication (ADP) 3-0 and Field Manual (FM) 3-0 to match the evolving concept of MDO in conjunction with ADO. Similar to JP 3-0, TP 525-3-1 explains the

¹⁰ US Department of Defense, Joint Staff, Joint Publication (JP) 3-0, *Joint Operations* (Washington, DC: Government Publishing Office, 2018), 3.

¹¹ Ibid., 121.

¹² Ibid., 88.

¹³ US Department of the Army, TRADOC Pamphlet (TP) 525-3-1, *The U.S. Army in Multi Domain Operations 2028* (Washington, DC: Government Publishing Office, 2018), 5.

operational environment in relation to all domains across time and space and how the Army intends to operate in order to address the future threats therein. The Army makes a concerted effort with MDO to integrate as an aspect of the joint force, especially with the Air Force.

In October 2020, the Air Force published Air Force Doctrine Publication (AFDP) 3-99, *Department of the Air Force Role in Joint All-Domain Operations (JADO)*. The annex explains how components of the air and space domains support JADO and serves as the basis for the Air Force's emerging doctrine and concepts. Particularly, the annex highlights the Air Force's Joint All-Domain Command and Control (JADC2). The Air Force has focused extensively on JADC2, describing it as the art and science of decision-making to rapidly translate decisions into action, leverage capabilities across all domains with mission partners to achieve operational and informational advantage in both competition and conflict.¹⁴ JADC2 represents a joint approach to command and control that enables efforts across the domains through centralized control and decentralized execution. Alongside the Air Force, the Navy has developed their own approach within the established joint framework.

In January 2017, the Navy released the *Surface Force Strategy, Return to Sea Control*, which presented the concept of Distributed Lethality. Distributed Lethality proposes increased lethality at the tactical level and dispersed but integrated forces at the operational level which meets the needs of the maritime component in joint operations.¹⁵ Distributed Lethality and Distributed Maritime Operations are the concepts leading the Navy into ADO. Alongside the Navy, the Marines have also produced their own approach contributing to ADO.

In June 2018, the Marines released the *Expeditionary Advanced Base Operations (EABO) Handbook*. The EABO concept supports the Navy's concept of Distributed Lethality through

¹⁴ US Air Force, AFDP 3-99, *Role in Joint All-Domain Operations*, 5.

¹⁵ T. S. Rowden, *Surface Force Strategy: Return to Sea Control* (San Diego, CA: Naval Surface Force Pacific Fleet, 2018), 9, accessed October 26, 2020, <https://apps.dtic.mil/sti/pdfs/AD1024229.pdf>.

land-based options integrated with the maritime approach.¹⁶ This concept reoriented the approach of the Marines, integrating much more with the Navy similar to the efforts between the Army and the Air Force. While the Marines are a supplemental but still significant component of the Navy, the emergent Space Force integrates with the Air Force now as its own branch of service.

In August 2020, the Space Force released its space capstone publication on Space Power. The capstone document describes the space domain, space operations, and the full spectrum of military space power and how it integrates in ADO.¹⁷ The doctrine frames a domain that has existed but not in the same capacity until now with the recent creation of the new service. The implementation of the new doctrine is essential to ensuring the ADO framework incorporates all domains as the respective branches understand them. With the identification of the core material for doctrine and concepts of ADO, it is important to also set up the foundation of wargaming material researched.

Wargame design represents a subject obviously subordinate to design, much like architecture or some engineering. The role of games, and more specifically wargames, has developed as a part of society throughout history. The recorded study of wargames and design has been an earnest effort of military organizations and enthusiasts for several hundred years.¹⁸ More recently, professional wargame designers such as Mark Herman, Peter Perla, and Philip Sabin have made sincere efforts towards building, expanding, and developing wargames in the modern era. Mark Herman has designed well known games such as *Gulf Strike* that encompasses

¹⁶ Art Corbett, *Expeditionary Advanced Base Operations (EABO) Handbook* (Quantico, VA: Marine Corps Warfighting Lab, Concepts and Plans Division, June 2018), 6, accessed October 21, 2020, <https://mca-marines.org/wp-content/uploads/Expeditionary-Advanced-Base-Operations-EABO-handbook-1.1.pdf>.

¹⁷ US Space Force, Space Capstone Publication (SCP), *Spacepower* (Schriever Air Force Base, CO: Government Publishing Office, June 2020), 23, accessed October 21, 2020, https://www.spaceforce.mil/Portals/1/Space%20Capstone%20Publication_10%20Aug%202020.pdf.

¹⁸ Perla, *The Art of Wargaming*, 74.

operational warfare in the Persian Gulf across the land, sea, and air domains.¹⁹ Peter Perla's *The Art of Wargaming* covers wargame design in depth, particularly in reference to the US Navy throughout history and going forward.²⁰ *On Wargaming* by Philip Sabin also covers the process and application of wargame design, using simulations to teach at multiple levels.²¹ As in architecture, the difference in designing and building a fortification versus a skyscraper is largely in context. Game designers have equally considerable literature available for the wargame design process.

Wargames and their design largely fall under the greater umbrella of Game Theory and the concepts therein. Raph Koster and Jane McGonigal lay out their approach to game design and game theory which are entirely pertinent to the development of wargames. *A Theory of Fun* and *Reality is Broken* both extensively cover the theory behind how and why people use games and how they use them to learn and adapt.²² Both authors explain dynamics through studies and examples how games contribute in the human dimension and how future development and designs contribute further.²³ Beyond the theories of design, a significant multitude of wargames exist that fueled the research of this monograph.

The research conducted for this monograph consisted of three groups of wargames, tactical, operational, and strategic. The tactical wargames play tested were *Strike*, *Kriegsspiel*, *Fluvius Bellum*, and *Assault, Tactical Combat in Europe: 1985*. These games were tactical in a sense that the decisions made were maneuver focused and thus of a single domain or system, ranging from smaller infantry elements to the battalion and brigade levels. The operational group of games consisted of *Gulf Strike*, *Tunisia*, and *Next War: Poland*. These games encompassed

¹⁹ Mark Herman, *Gulf Strike: Land, Air and Sea Combat in the Persian Gulf* (New York: Victory Games, 1983).

²⁰ Perla, *The Art of Wargaming*, 32.

²¹ Sabin, *Simulating War*, 20.

²² Raph Koster, *A Theory of Fun*, 2nd ed. (Sebastopol, CA: O'Reilly Media, 2013), 38.

²³ McGonigal, *Reality is Broken*, 4.

more domains at a more complex interaction of systems across a longer period. The strategic games include *Hegemony* and *Star Wars: Rebellion*. These games in scope, time, and distance reach beyond the operational framework. One game outside of these groups provided the most up to date and modern results in research, *Assassin's Mace*. Primarily, the Marines are developing *Assassin's Mace* as the initial ADO wargame for joint efforts. Given the proponents, the wargame heavily focuses on the maritime and air domains with some integration from the other domains.²⁴ The efforts put into the development of *Assassin's Mace* are comprehensive with the weight and priority of several agencies behind it. This monograph looks to adapt elements if possible and provide a proof of concept that are adaptable into the future.

This section covered the literature and material reviewed as the foundation of this monograph. It also reviewed the sources on wargame design and game theory. Finally, the section referenced the wargames tested and researched. The next section explains the importance of wargaming theory and why the US Army should continue to employ it for training and leader development.

Wargaming

Wargaming continues to serve as an essential function and tool for military organizations. Wargames simulate processes and consequences based off players' decisions with varying degrees of reality and abstraction. This section explains the importance of wargaming theory as a tool and its application for leader development and education. The section also describes the history and relevance of wargaming.

Wargame theory is critical to leader development and the US Army because it provides a process from which critical decision-making is reduced through abstract mechanics into an

²⁴ Tim Barrick and Mark Gelston, *The Operational Wargame System Game 001: Assassin's Mace—War in the Pacific*, version 1.6 (Quantico, VA: Marine Corps Warfighting Laboratory, November 2020).

iterative process that enables the exploration of failure and rewards learning to make the appropriate decisions. Wargaming theory plays into two key elements, the dynamics of human decisions and game events. The focus between these two major elements is what sets wargaming apart from other models.²⁵ That focus and a relevant threshold of information, ensuring the model is realistic enough to be useful, enables the wargame's application as an iteration of conflict. War is inherently an interaction between humans; a wargame is capable of abstractly reducing existential conflict to a voluntary challenge without dire consequences. The lack of existential consequences allows the participants to explore and practice their decision making. Wargame theory approaches the learning environment intent on specifically capitalizing on failure.²⁶ The iterative nature in wargame theory is a key aspect of Army leader development where in training, a failure should anticipate future growth without negative repercussions. It is important to describe exactly what a wargame is within wargame theory.

A wargame simulates dynamic decision-making in a set environment. The most important function of a wargame is how it teaches understanding and explores dynamics and decisions based on realistic factors.²⁷ A wargame simulates activities and events that can significantly contribute to the training and planning efforts of military professionals. Wargame theory enables the exploration of decisions made within simulated systems that are realistically resource intensive. Outside of the resources required to conduct the wargame design itself, the model can be extremely cost effective and time efficient towards supplementing real world experience. Furthermore, the four elements of a game in wargame theory resonate with the Army environment on many levels.

²⁵ Perla, *The Art of Wargaming*, 44.

²⁶ US Department of the Army, Army Doctrine Publication (ADP) 6-0, *Mission Command: Command and Control of Army Forces* (Washington, DC: Government Publishing Office, 2019), 6-8.

²⁷ Sabin, *Simulating War*, 85.

All games, wargames included, consist of four major elements: a goal, rules, a feedback system, and voluntary participation. In many cases this directly correlates with the Army and even higher with the joint force. The goal is the mission objective, the end state, and/or the point that must be reached to transition to the next phase. The rules are an abstraction of reality, such as the standards, regulations, policy, rules of engagement, limitations, and constraints that require execution and conduct.²⁸ This can even go as far as abstractly representing resource limitations and shortfalls that restrict an action within the simulation, such as movement due to logistics or the number of actions taken due to the set time frame for each turn. The feedback system is the measure of progress towards achieving the goal. Whether a score, points, or progress bar, the feedback system is much like the metrics used by the Army to determine its progress, which helps communicate the achievability of the objective.²⁹ Voluntary participation translates on massive scale from wargame to war. In many ways, this element is the will of the participants, the understanding that the dynamics are inherently tied to the decisions and willingness to voluntarily continue of each side involved. Given the understanding of what a wargame consists of and how it reflects reality, the relevance of wargame theory is of significant concern to the US Army.

Wargaming theory is relevant to the US Army because of the developmental impacts it has on participants. Within the simulated reality reflected in a wargame, participants make decisions that inevitably train and condition for real-life situations based on calculating (and learning to calculate) odds that achieve a desired outcome. The desired outcome might even take several iterations or practice to achieve. This competitive teaching tool conditions the player to assess the environment and aspire to adapt mechanics towards achieving successful outcomes.³⁰ History has also demonstrated the effectiveness and relevance of Wargaming theory.

²⁸ McGonigal, *Reality is Broken*, 21.

²⁹ Ibid.

³⁰ Koster, *A Theory of Fun*, 86.

The development of wargames has similarly risen alongside warfare. From chess to *Koenigspiel* in 1664 to *Kriegspiel* in the 1800s, wargames progressed from the abstract games of princes to the extremely detailed exercises within the first command and general staff college.³¹ The support of *Kriegspiel* within the Prussian command and general staff college is at the very root of the wargaming process tied within the US Army's current Military Decision-Making Process system. Wargaming in America did not take greater prominence until closer to the end of World War II where it also became a tool for operations research. Wargaming provided an alternate approach to research beyond quantitative or qualitative methodologies used at the time.³² Researchers found that by incorporating available data into parameters and mechanics, they could test theoretical approaches and demonstrate probable outcomes and effects capable of translating to real execution. Military planners and researchers have embraced wargame theory as an approach to contemporary and future problems throughout history and today.

Throughout American history, the US Navy has been a major proponent of wargame theory and its implementation in planning and education. With the founding of the Naval War College, the Navy used wargaming theory as a tool to enable the transformation of the naval officer, supplementing an education on the naval art of warfare in the late 1800s.³³ The application of wargame theory allowed instructors to help students visualize and understand the maritime operating environment and develop their decision-making capabilities within that framework. The Navy in the 1920s would go as far as to describe that the principles of their wargame were the backbone of their profession and essential to their education.³⁴ The US also historically employed wargaming theory at the strategic levels.

³¹ Perla, *The Art of Wargaming*, 74, 95.

³² Ibid., 292.

³³ Ibid., 142.

³⁴ Ibid., 160.

In the 1980s, when President Reagan announced his Strategic Defense Initiative, the US government wanted to know how much defense is necessary to make a difference in the enemy's offensive planning and separately how will the enemy respond. Both questions were addressed with separate designs in the Pentagon that addressed possible futures regarding superpower nuclear warfare.³⁵ Importantly, the wargame designs produced important determinations that were not based purely on numbers and calculations of weapon systems, but on the assumptions and decisions made between either side of participants. The wargame informed the participants with insights into not only what decisions were available, but also the dynamics, second and third order effects, and consequences for both teams. This shows the significant capabilities of wargame theory and design and what it has to offer leaders in their development and education.

This section explained the importance of wargaming theory, what is a wargame, the relevance of wargame theory. The section continued by reviewing some of the history of wargame design and when wargame theory has contributed to the successful development of leaders and efforts in America. The next section proposes how wargame design can approach ADO and provide a proof of concept for leader development and education.

Wargaming All Domain Operations

Wargame design, still a derivative of design, is an art and a science. The art in wargame design incorporates the nearly unlimited complexities of war into an abstract model simple enough to play in a short period of time, yet subtle enough to enable the participants' learning and understanding.³⁶ This section consists of three major parts regarding wargaming ADO. The first part explains how to approach ADO's key elements in wargame design. The second part addresses a proof of concept for a wargame model that enables leader development for ADO. The third part explains wargaming in relation to operational art and campaigning. The proposed proof

³⁵ Herman, Frost, and Kurz, *Wargaming for Leaders*, 52.

³⁶ Sabin, *Simulating War*, 127.

of concept, *Theatrum Belli* strives to emulate reality between multiple participants while emphasizing the meta objective of the wargame, specifically, leader development and education in ADO. The in-game objectives of the participants is established within the scenarios and by the default objective of ADO, to force a return to competition from conflict on favorable terms.³⁷

ADO serves as the frame for reality from which the wargame design tries to recreate and emulate. By building the setting, rules, and mechanics around the core concepts of ADO, the participants are immersed within a framework that inherently shapes their decision-making process and how they interact with what is presented by the wargame and with one another. The operational environment described in ADO is a fundamental place to begin with the setting for the wargame.

The concept of ADO describes an operational environment within which the character of war adapts to the emerging cultural and technological shifts. ADO describes the operational environment as contested in all domains, in an increasingly complex environment, across increasingly lethal and expanded battlefields, where adversaries challenge the assurance of US deterrence.³⁸ Technological advancements have enabled global engagement in the information, cyber, space, and EMS domains. The expansion within domains grants stand-off at the strategic, operational, and tactical levels that adversaries use to their advantage over time against the US. Along with the advancement of technology, the cultural shift towards urbanization creates an increasingly complex physical, virtual, and human environment. The sheer density of modern and future urbanization provides complexities for adversaries to harness and disrupt against US capabilities. The expansion of domains and complexity of urbanization supports the third characteristic of the operational environment, the extension of engagements across time and space. Adversaries use anti-access and area denial strategies through various means that disrupt

³⁷ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 17.

³⁸ *Ibid.*, 6.

the political status quo and exploit alliances while avoiding conventional conflict, the strengths of the US.³⁹ The key characteristics of ADO's operational environment frame the setting for the educational wargame.

The wargame should demonstrate all of the key characteristics of ADO in some manner. By introducing a map with geographic properties, the participants become anchored to its features. Determination of the geographic space should seek to leverage all of the domains as much as possible. Using the MDO framework as seen in figure 1, space is readily labeled and identified across multiple domains. More specifically, space is labeled according to time and space by capabilities and effects across the levels of warfare.⁴⁰ *Theatrum Belli* integrates the MDO framework along with the incorporation of other joint elements. Some domains may not have physical representation on the map but it is important to allocate some visual component to where the domains of space, cyber, information, and EMS are represented, much like the Continuum of Geographic Space in figure 1. The MDO framework provides a general understanding of relative distances and how they can be associated within the geographic space on the map. It is important to note that the MDO framework is a US perspective and that the adversarial forces in game should adjust their own respective ranges according to the enemy descriptions provided in TP 525-3-1. To go along with the concept of space as it is portrayed within the model another key mechanic is the matter of time and how it is measured in game.

³⁹ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 6.

⁴⁰ Ibid., 8.

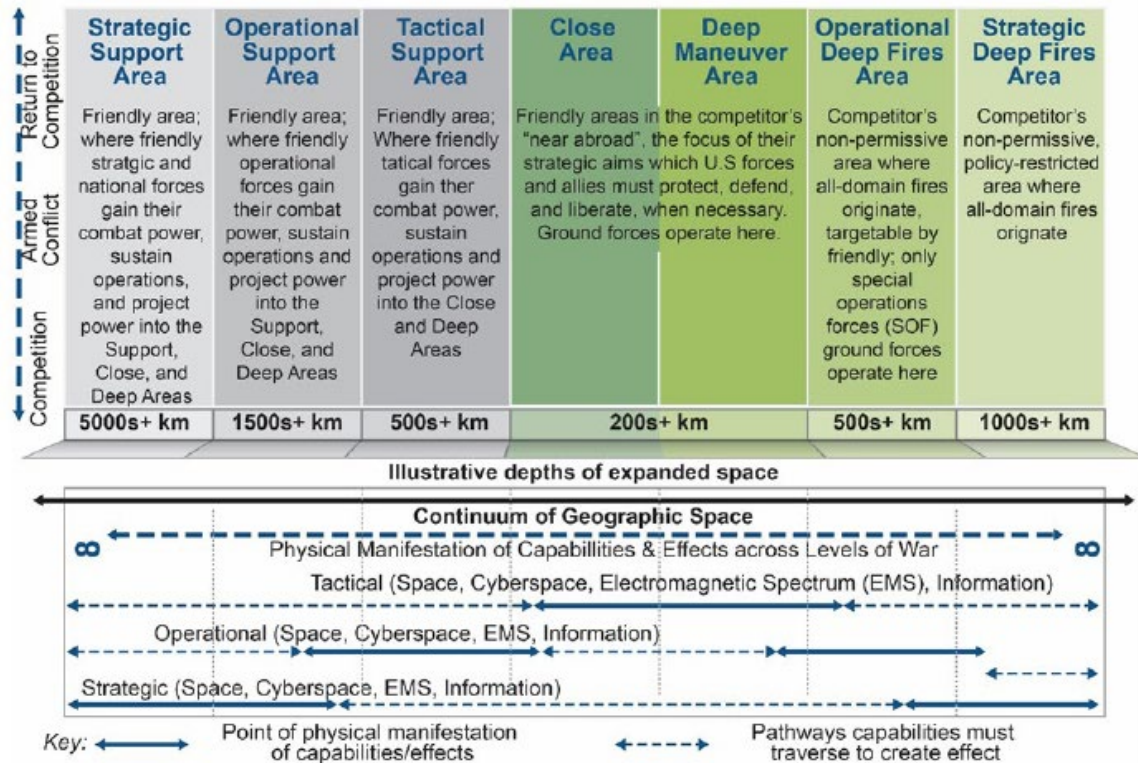


Figure 1. MDO Framework. US Department of the Army, TRADOC Pamphlet (TP) 525-3-1, *The U.S. Army in Multi Domain Operations 2028* (Washington, DC: Government Publishing Office, 2018), 6.

Establishing the framework of time is crucial to the participants' understanding of how mechanics demonstrate the execution and impacts of respective decisions made. Given the complexity of ADO and the overlapping domains, the period allocated for decisions and consequences is largely dependent upon the participants and their command level. Decision and targeting cycles set the precedent for the progression of time in game. For example, a Joint Forces Command may have a 24-hour planning cycle to include targeting. Joint doctrine does not necessarily hold to a rigid sequence or time constraints, but the framework abstractly manages the flow of time, ideally to a more accurate and realistic degree.⁴¹ For simplicity, each player may receive an equal amount of in-game time for execution, however, to appropriately convey the strengths and weakness of the opposing teams, some participants may be given the ability to plan

⁴¹ US Department of Defense, Joint Staff, Joint Publication (JP) 3-60, *Joint Targeting* (Washington, DC: Government Printing Office, 2013), II-3.

and execute more actions in one domain over another.⁴² An example is the Russian or Chinese capability of responding rapidly within the information or cyber domain relative to the US.⁴³ Instead of alternating turn by turn between participants, planned and executed decisions should be done simultaneously to emphasize the competing and enduring nature of the operational environment. To incorporate JADC2, participants should be able to plan their actions out over time with degrees of flexibility when capabilities allow but also consider allowing conditions-based triggers in planning and execution.⁴⁴ Before exploring the actions and decisions available to players within the operating environment further, it is important to determine what the participants themselves consist of and are able to operate within the setting.

The design must involve at least two sides to meet the criteria of a wargame. One side would be the US and its allied partners. The task organization and assets available to the US and allies should incorporate all domains, primarily listing the physical assets that are represented within the geographic space. *Assassin's Mace* uses predominantly naval and air assets in its model but has the ability to scale between operational and tactical maps.⁴⁵ The proof of concept suggested in this monograph involves proportionally more land-based assets versus a higher portion of naval and air assets. Given that the ADO concept is primarily for echelons above brigades, the smallest represented unit should be no lower than a brigade. Figure 2 provides an example of the land-based units present in *Theatrum Belli*. Capabilities do not need to be so specific, but the rules should allocate effects and ranges to each localized capability represented in the geographic space by domain. For example, a maneuver brigade has marginal EMS capability that can influence within the deep maneuver area.

⁴² Sabin, *Simulating War*, 179.

⁴³ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 11.

⁴⁴ US Air Force, AFDP 3-99, *Role in Joint All-Domain Operations*, 7.

⁴⁵ Barrick and Gelston, *The Operational Wargame System Game 001: Assassin's Mace*, 3.

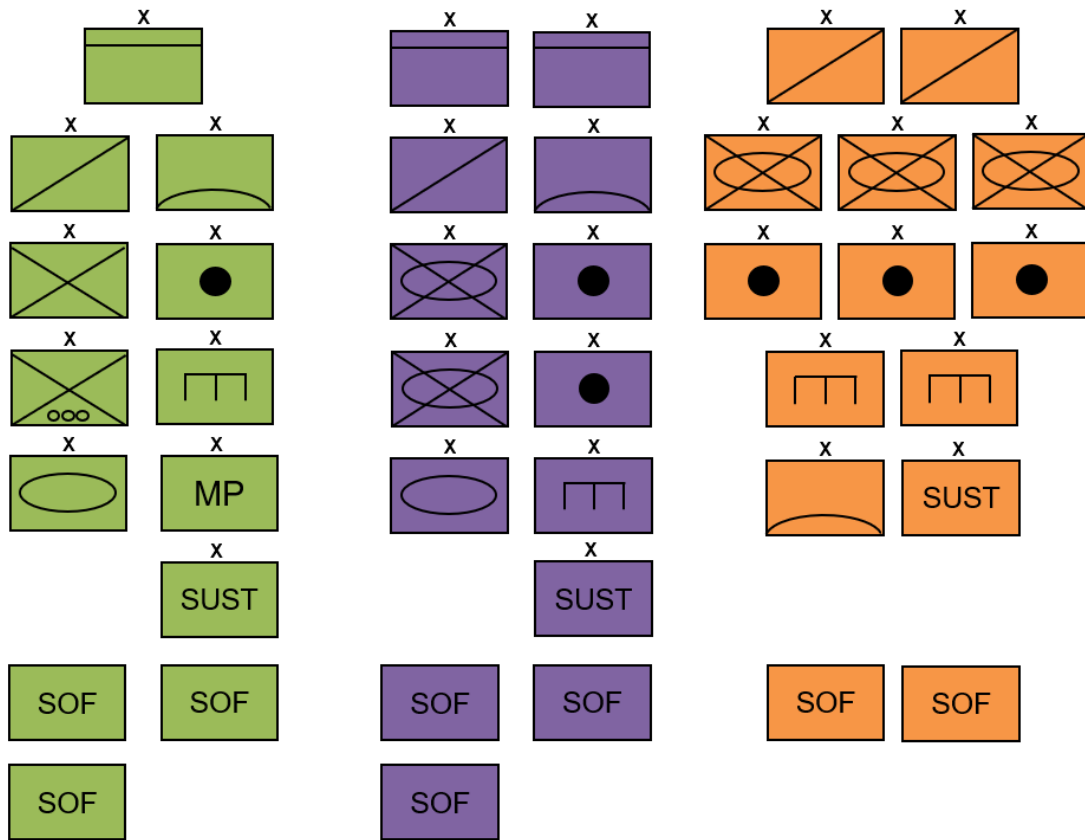


Figure 2. An Example of the Land Forces Present in *Theatrum Belli*. Created by the author.

Elements that range outside of the geographic space or cannot be represented, such as air assets based outside the region or space power assets that only have so much time on station can be represented elsewhere. An example design for some of the domains that exceed the geographic representation is in figure 3. In this space, participants can allocate cards or tokens standing for available assets into 24-hour periods each turn for execution. Given the complexity of employing assets within each different domain, not all assets would be available to the same degree. Cyber assets may not be readily available in some scenarios whereas strategic bombing capability may be available multiple times within a 24-hour period. This briefly covers the design approach to the US and allied forces and how they are arranged within the wargame, followed by the adversarial forces.

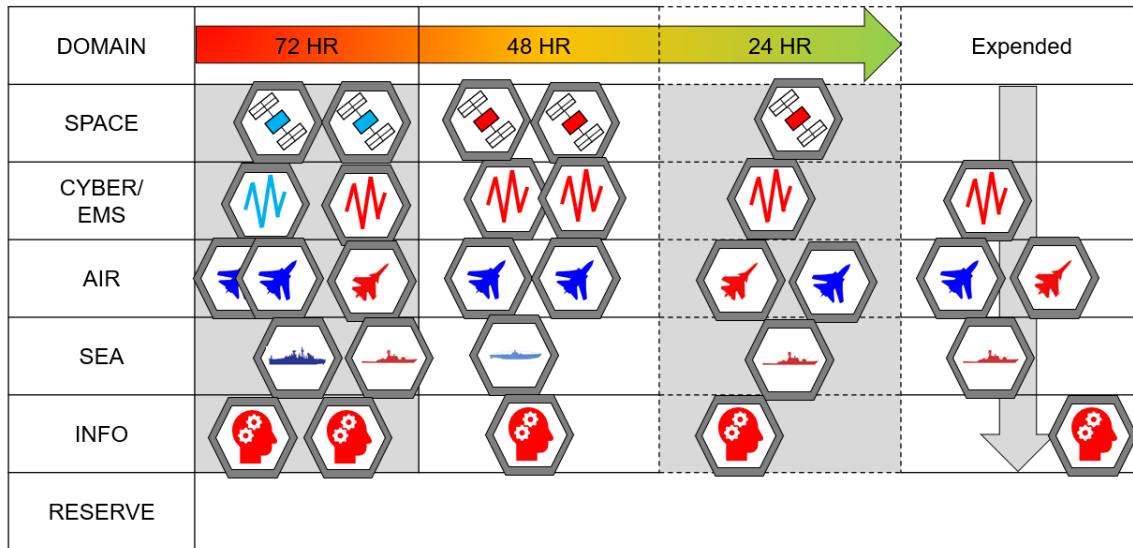


Figure 3. Domain Asset Allocation Space. Created by the author.

Using TP 525-3-1 as reference, at a minimum the opposing sides should consist of either a Russian or Chinese modeled force. *Theatrum, Belli* uses a Russian template for the opposing side. The design builds the strengths and vulnerabilities of the Russian force per the descriptions provided in TP 525-3-1. This means the Russians have a force bolstered with unconventional, information, and cyber capabilities that seek to destabilize US conventional capabilities prior to escalating to a *fait accompli* attack with conventional forces.⁴⁶ Towards developing the more realistically accurate model, the forces are inherently asymmetrical, allowing participants to see the dilemmas presented to both sides within ADO. Ideally, the design supports building the Chinese template as well to allow participants to exercise adversarial force against the allied forces in a given scenario. The adversarial forces should reinforce the military problems posed within ADO.

The ADO concept addresses an overarching military problem that encompasses a subset of problems posed specifically by China and Russia. The overarching military problem concerns how the Army supports the joint capability to compete beneath the threshold of conflict against China and Russia by penetrating and disintegrating the anti-access and area denial systems. The

⁴⁶ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 11.

Army must then also prepare and execute armed conflict, consolidating gains, and then return to competition.⁴⁷ The overarching problem encapsulates the five multi-domain problems that ADO as an operational-level concept answers.⁴⁸ The five problems, referenced in figure 4, manifest as to how the Army (1) competes, (2) penetrates, (3) disintegrates, (4) exploits, and (5) re-competes versus contemporary and future threats posed by Russia and China. ADO establishes a threshold between competition and conflict. In conflict, the Army must penetrate and disintegrate anti-access and area denial systems, enabling the exploitation of maneuver space, and allowing ground forces to consolidate gains.⁴⁹ Given the military problems of the ADO concept, the wargame should reflect the adversaries accurately for players to understand why the problems inherently exist.

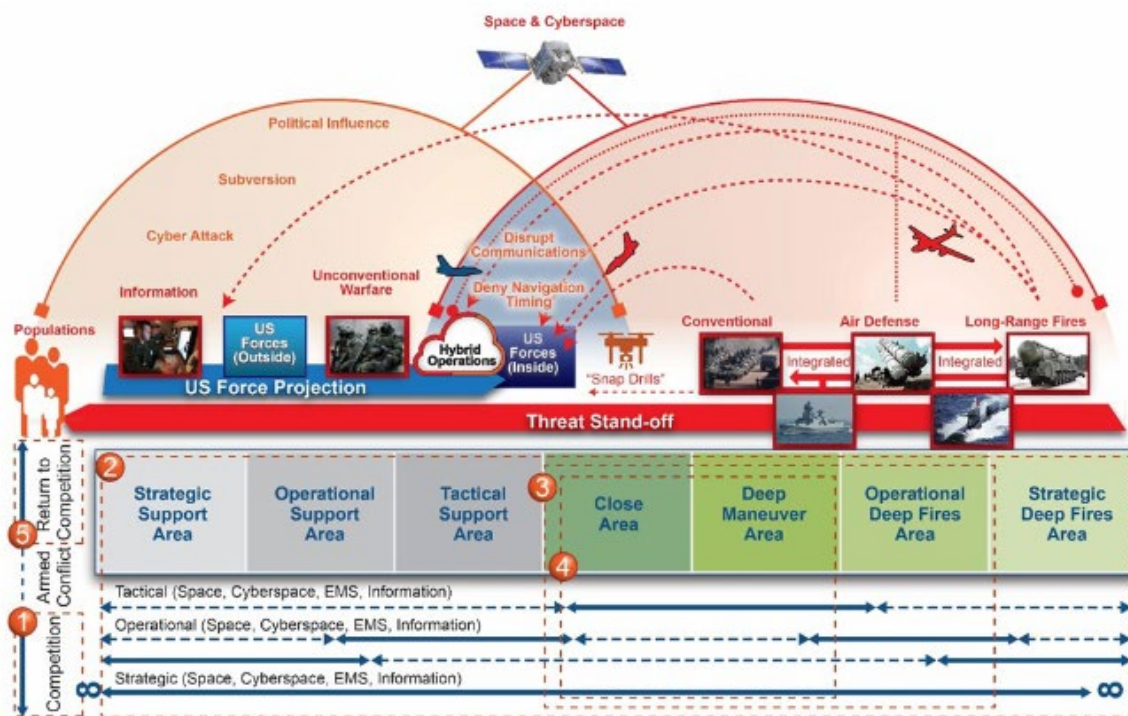


Figure 4. The Military Problems of Highlighted Across the MDO Framework. US Department of the Army, TRADOC Pamphlet (TP) 525-3-1, *The U.S. Army in Multi Domain Operations 2028* (Washington, DC: Government Publishing Office, 2018), 16.

⁴⁷ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 15.

⁴⁸ Ibid., 24.

⁴⁹ Ibid., 16.

The wargame design reverse engineers the framing of the military problem in ADO to ensure the adversarial forces emulate their counter parts in reality and challenge the concepts of ADO. The adversary must mechanically have the capability within the game to destabilize the region and leverage advantages in spite of the US. The adversary should have mechanics that degrade and disrupt the information, cyber, and human domains to a point of disadvantage for the US and its allies in game. The adversaries should have anti-access and area denial systems in depth that prevent US strategic and operational maneuver. The adversarial forces should also have forces that deny freedom of maneuver and protect strategic and operational objectives in the close and deep maneuver areas. Finally, the enemy needs to have means to degrade the US' ability to consolidate gains and attempt to prevent sustainable outcomes.⁵⁰ As these problems are not likely to occur simultaneously, both the allies and the adversaries should have force organizations that are appropriately dictated according to the scenario. With the relative establishment of the operational environment within the wargame, it is important to lay out how the tenets of ADO facilitate the conduct of the wargame.

The three tenets of ADO enable integration with the Joint Force and are just as foundational to the wargame's systems as in reality. The three tenets are calibrated force posture, multi-domain formations, and convergence.⁵¹ The tenet of calibrated force posture has much to do with what has been discussed already in the constituent makeup of the US and allied forces. The Marines' EABO and Navy's Distributed Lethality build into and support the Army's calibrated force posture and the wargame can incorporate both aspects into the arrangement of forces. For the most part, the wargame framework builds calibrated force posture into the setup of the scenario, placing more on the participant to learn and understand the assets available and then the decision on how to employ them. The US participant may have either the forward presence

⁵⁰ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 16.

⁵¹ *Ibid.*, 17.

forces, the expeditionary forces or both along with a prescribed number of national-level capabilities. The sub tenet of authorities also compliments the Air Force's JADC2 concept, attributed in the wargame through the relative ease which the participants manage air assets. The next tenet of ADO built into the wargame is multi-domain formations.

Multi-domain formations are the collection of capacity, capability, and resilience necessary to execute ADO. Capacity represents the maximum extent to which a formation can perform. A multi-domain formation should have the capacity to conduct independent maneuver, employ cross-domain fires, and maximize human potential. This capacity includes advanced protection systems, reduced signatures, redundant networks and systems of sustainment, reconnaissance, and air defense. While capacity indicates a finite resource, capability is a matter of competence and ability to execute. A formation must have the capability to employ to the extent of its capacity. The combination of capability and capacity in multi-domain formations creates resiliency and endurance required of the land component in ADO as the adversary seeks to disrupt and fragment US and allied advantages.⁵² Given the importance multi-domain formations in the Army of the ADO concept, the wargame should emulate how capability and capacity represent an organization's resilience throughout an operation.

Down to the lowest represented units in the wargame, the proof of concept should emulate units capable of conducting independent maneuver, employing cross-domain fires, and maximize human potential.⁵³ To represent this, the wargame must portray units equipped with robust capabilities as options. These capabilities are traits that count as initially present which an adversarial capability or effect could remove or influence, allowing the participants to understand the difference between a fully capable unit and otherwise. More importantly, it influences participant decision-making, prioritizing protecting those capabilities versus risking a plan

⁵² US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 19.

⁵³ Ibid.

without and understanding the second and third order effects of those decisions. Demonstrating maximizing human potential is more difficult to convey in abstract terms. To demonstrate to the participants the impact of human potential, the proof of concept could use a randomized factor that the participant must evaluate and weight out before making a decision that results in failure because the human potential was not appropriately addressed prior to execution.⁵⁴ See figure 5 for an example of what a unit token may appear as in *Theatrum Belli* to accurately reflect a multi-domain formation. The next and final tenet of ADO addressed within the wargame design is convergence.

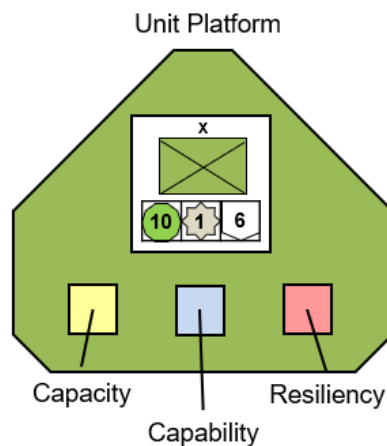


Figure 5. Example Unit Platform Demonstrating How to Represent a Multi-Domain Formation. Created by the author.

Convergence is the third tenet of ADO and represents the integration of the capabilities in all domains rapidly and continuously to optimize effects and overcome the adversary with an overwhelming offensive enabled by mission command and disciplined initiative. While some aspects are shown through physical representation in the game, other aspects the wargame design abstracts are processes or events. Therefore, convergence is a state that US forces must achieve using the first two tenets to synchronize effects within decisive spaces against the vulnerabilities

⁵⁴ Sabin, *Simulating War*, 176.

of an enemy's systems.⁵⁵ This tenet is core to the design of the wargame in that it represents a state or condition that the participant wants to achieve to be successful in ADO. The wargame design should then largely revolve around making decisions to synchronize effects in all of the domains against the other participant and the system should then correspond with feedback that relates to success. In its most abstract, the entire wargame could be reduced to a more simplistic game that focused entirely upon planning and synchronizing effects that gave points in a feedback system to determine which participant was able to decide how to synchronize these effects. However, such a simplistic approach lacks the inherent complexity that comes inherent to ADO and also wargames, as the environment and the adversaries therein have simultaneous efforts and complexities that should have a realistic influence upon one another's ability to effectively win. With the major tenets of ADO described in context of the wargame design, it is important to address how a curriculum implements the model for the development and education of leaders.

Wargames are excellent tools to enable and supplement leader development and education. When designed for a specific audience and purpose, the designer can tailor the wargame to best suit the environment. In the case of a proof of concept for testing and development in AMSP where instruction occurs in seminars and enables reflection and further study, the designer accounts for the duration of participation within the model. The instructors and trainers responsible for the curriculum are like clients for the wargame designer in this example.⁵⁶ The participants, the students, of the wargame assume respective teams, the US and allies versus the adversarial forces, Russian in the case of the base line scenario. Forming and making decisions becomes a collaborative effort, a key part for learning and taking full advantage of wargames.

⁵⁵ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 20.

⁵⁶ Herman, Frost, and Kurz, *Wargaming for Leaders*, 25.

Collaboration is a key function and benefit of wargaming with teams and crucial to the Army organization. To achieve collaboration, participants must cooperate, coordinate, and cocreate. Cooperation requires a team act purposefully to a common goal. Much like having a shared purpose and understanding in the Army. Coordination in the sense of wargame design is the synchronization of efforts and sharing resources. If the team in the seminar is set up by function and domain, their respective actions must synchronize to achieve the domain-synergy inherent to the concept of ADO. The aspect of cocreation is a generative act and what sets collaboration apart from other group activities. Collaboration becomes about creating something that would have been impossible alone.⁵⁷ The Army and the staff concept, so much of the core to AMSP curriculum is about collaborative effort as a team. Therefore, no one domain or single member of the team is able to create the domain-synergy required to achieve convergence in ADO and the wargame design should make that extensively clear within its mechanics to reinforce the learning objective.

The designer should frame the execution of the wargame within a reasonably allotted time as previously discussed and to do so, establish sessions of play. Each session consists of three turns. The wargame's three turns break down in a specific fashion to capture specific responses that enable learning for the students while the instructors understand the framework and what should occur in line with the learning objectives. The first turn is a response to the established scenario.⁵⁸ Since moves and actions occur simultaneously, the second and third turns are decisions and reactions to the consequences induced by the competing participants' actions. The layout of each turn describes how a player makes decisions and how those decisions are carried out.

⁵⁷ McGonigal, *Reality is Broken*, 268.

⁵⁸ Herman, Frost, and Kurz, *Wargaming for Leaders*, 31.

A turn consists of each team of participants planning on what is occurring within each domain in which they have executable assets. Once participants set their plans into the next turn, the participants execute actions simultaneously. Some actions should take more in game time or resources to execute to account for the abstraction of complexity and resource intensive efforts. The cost associated with these actions may differ between the two forces, demonstrating asymmetry within the domains. Reinforcing simplicity, the rules should supply a series of options for the participants to decide upon within each turn. Figure 6 provides an example of a turn sequence from *Assassin's Mace*. This list of options is robust enough to exercise each domain in the wargame design but still not too much to overwhelm the participants. Within a turn of the wargame when forces meet within their maneuver space or effects are executed against a target, resolution inevitably occurs. The approach and intent of this wargame should simplify resolution as much as possible. Still, the determining factor, in this example, dice rolling, should scale to show the participants how decisions can stack and compound the effects in order to achieve success. This stacking effect reinforces the core concept of how synchronizing domains in ADO leads to success.

PHASE	SEGMENT	NOTES
1. Planning		Player Planning
2. Movement	2.A Naval Movement	Move naval units
	2.B. Air Patrols & Strike Prep	Place Air Patrols (CAP, MPRA, Interdiction, CAS) Prep Strike Air Missions
	2.C. Ground Movement	Move ground units including RSO&I, airborne, air assault, amphibious
3. IO/Cyber – Counter ISR & Force Protection		Place & Resolve IO/Cyber for ISR/FP
4. Theater ISR & Local Detections		-Place & Resolve Theater ISR -Resolve Local Detections by Hex (Subs, Radars, Air, Ships, SOF)
5. Combat	5.A Air-to-Air Combat (Simultaneous Effects)	Alternate by hex – Resolve all air to air and surface to air combat
	5.B Surface & Strike Combat (Sequential Effects) (Can Support with IO/Cyber & HQs/SOF) [Choose one action each combat impulse]	Alternate combat by target hex: - o Torpedo Attack - o Missile Strike - o Air Strike - o Complex Strike (Air, SEAD, Missile) - o Ground Combat (plus CAS)
6. Regeneration	6. 6.A. Reset IO/Cyber Tokens	Remove IO/Cyber
	6.B. Reset HQ & Fires Units	
	6.C. Remove Status Markers	Remove RSO&I, Suppression, & Assaults
	6.D. Repair Ports & Airfields	Roll for port and airfield repair
	6.E. Regenerate SOF & Air	Roll for SOF & Air regeneration
	6.F. Resupply Missiles	Roll for missile resupply
	6.G. Advance Round Marker	Note upcoming reinforcements
7. Assessment		Facilitated assessment

Figure 6. Example Turn Sequence. Tim Barrick and Mark Gelston, *The Operational Wargame System Game 001: Assassin's Mace–War in the Pacific*, version 1.6 (Quantico, VA: Marine Corps Warfighting Laboratory, November 2020), 14.

The design must balance incorporating the realistic complexity of ADO and warfare while still presenting those concepts in abstractions that are simple and easy for students that may have no significant wargaming experience. The proposed proof of concept should be simple enough to not exceed 100 tokens if possible, between both sides combined to reduce the burden of bookkeeping and allow the seminar to focus on decisions and processes within the system.⁵⁹

⁵⁹ Sabin, *Simulating War*, 66.

The designer and future adaptations must bear simplicity in mind to prevent the realistic complexities from rendering the wargame too time and effort intensive for use in the learning environment. Along with the seminar session approach to timing, the designer can likewise tailor the scenarios to a modular and adaptable approach.

Given the session approach, breaking scenarios into episodes and modules allows instructors to adapt different aspects into the wargame. Therefore, *Theatrum Belli* should involve a baseline scenario from which to test and adapt, upon which instructors can incorporate expansion modules. The instructors can expand scenarios as time allows within the curriculum in support of learning objectives. The baseline scenario should build off the phasing inherent to ADO, transitioning from competition to conflict, followed by penetrating, disintegrating, and exploiting the opposition, to return to a favorable state of competition..⁶⁰ The suggested base line scenario should then break into four episodes. The first episode is the transition from competition to conflict after a conventional attack from adversarial forces. The second episode is the penetration efforts of the US and allies against the adversarial forces. The third episode would be the disintegration efforts of the US and allies against the adversarial forces. To conclude the scenario, the fourth and final episode consists of the US exploiting the adversarial forces and returning to a favorable state of competition. Figure 7 superimposes the episodic break down of the wargame design over the MDO framework. The first episode of the scenario begins with the US and allied forces opposed to the Russian force where the forces begin in competition.

⁶⁰ US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 25.

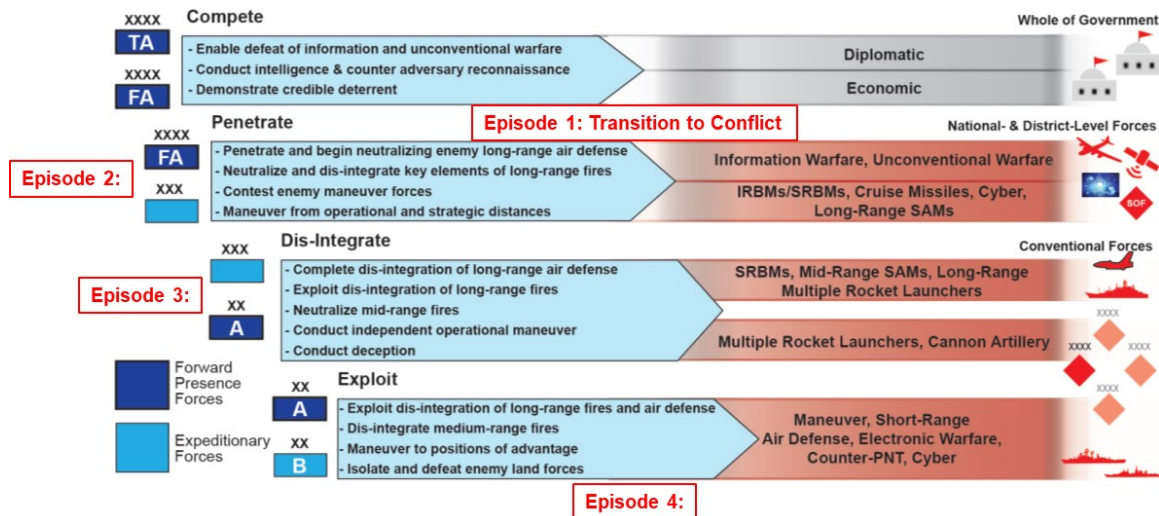


Figure 7. Episodic Framework overlaid the MDO Solutions. US Department of the Army, TRADOC (TP) Pamphlet 525-3-1, *The U.S. Army in Multi Domain Operations 2028* (Washington, DC: Government Publishing Office, 2018), 26.

As an example of an episode, the first episode begins with the strategic context of the scenario in an abstract prompt where the Russian role transitions to conflict against a forward staged force of US and allies. The Russian forces have the initiative, and the US and allied forces respond only with the forward staged forces available. Not only do the Russians have the initiative in maneuver, but also in a weighted advantage to prove a *fait accompli*. The US participants must react as they transition to conflict, trying to prevent the initial Russian objectives. The feedback system here relates to objectives established within each episode of the scenario. The US and allies should score victory points for retaining forces and holding key terrain and objectives identified within the scenario. The Russian forces score victory points for seizing key objectives with a scaled value dependent upon how quickly the Russian forces are successful, simulating the desired speed associated with the *fait accompli*. After the three turns are complete, the episode concludes. The episodes are not meant to play out the scenario to completion but achieve the learning objectives within the time allotted.

The episodic nature means that little bookkeeping or management is required at the end of each session. This allows the instructor to transition to reflection and synthesis with the students, reviewing the effectiveness of decisions made within the system. The instructor can

repeat the episode as many times as needed or progress within the scenario. Each episode should have preset positions for each team on the geographic space and a starter selection of assets available for each domain. The proposed design avoids continuity issues from episode to episode. The base line scenario assumes that the US forces achieve the conditions necessary to transition to the next episode and begin with the approximate assets available per the ADO concept. Instructors could offset the scenario to convey a different position from the base line, providing variable situations for the participants. In addition to the ADO tenets within each episode, the scenario also includes the elements of operational art built in to reinforce the scenario's operational character.

Elements of Operational Art:		
- End state and conditions	- Centers of Gravity	- Decisive Points
- Lines of operation/lines of effort	- Operational Reach	- Basing
- Tempo	- Phasing	- Culmination
- Risk		

Figure 8. Elements of Operational Art. US Department of the Army, Army Doctrine Publication (ADP) 3-0, *Operations* (Washington, DC: Government Publishing Office, 2019), 2-6.

The base line scenario should include a scene setting for each team that breaks down the operation by the elements of operational art. Adjustments are then provided for each episode and some elements of operational art apply more so than others in certain cases. The end state and conditions detail the goals for the respective teams. These goals are asymmetrical, and the instructors may consider that neither side needs to share their objectives with their opponents outside of what is already provided in the scenario. The center of gravity provided in the scenario for each force draws from the ADO concept but is also adjusted within the wargame to provide an initial idea of what to attack or seek to destabilize initially.⁶¹ The contiguous arrangement of forces oriented towards their respective objectives demonstrate the lines of operation for each team. The turn sequence order suggests a line of effort across the domains that given the time

⁶¹ US Department of the Army, Army Doctrine Publication (ADP) 3-0, *Operations* (Washington, DC: Government Publishing Office, 2019), 2-6.

frame of each turn may seem entirely simultaneous but the resolution of effects demonstrate the stacking effect mentioned previously that emulates (if successful) convergence. Tempo within the scenario is set to a degree for each team to convey the agility of each force. As mentioned earlier, Russian forces can act rapidly within the information and cyber domains, allowing their team to execute more actions within the game. The episodes already break the campaign down into phases within the ADO concept but it is important to note that the adversary's portion of the scenario should be asymmetrical, like the end state and conditions.

As the participants become familiar with the rules of the wargame and the ranges and capabilities of forces, much like a leader learns from real world experience, the participants should begin to grasp their own relative operational reach within the game and where they are likely to culminate. Basing and lines of communication should exist as a reinforcing element to the independent maneuvering capability inherent to multi-domain formations.⁶² The rule set and scenario directly incorporates elements of operational art to supplement the development of the students, enabling a framework that they become more familiar with after each iteration.

This section proposed a way to wargame the concept of ADO as a leader development and education tool. This monograph demonstrated how to integrate an ADO wargame into a curriculum and how the design can be modified to accommodate a seminar in AMSP. Furthermore, it explained how the elements of operational art and campaigning are intrinsically built in to supplement the learning objectives. The concluding section describes how the wargame design produced some observations and recommendations for future efforts and development.

Conclusion

This monograph explained how a wargame can develop and educate leaders for the US Army's role in ADO. The study provides a foundation for leaders interested in ADO and

⁶² US Army, TP 525-3-1, *The U.S. Army in Multi Domain Operations 2028*, 19.

developing and educating through wargames. The design can facilitate a curriculum, enhancing learning and engagement through collaborative efforts in a dynamic decision-making model. The design and proof of concept suggests that a wargame can emulate different aspects of ADO throughout episodes to support a seminar's learning session and synthesis. Along with the concept of ADO, wargame design can seamlessly integrate the elements of operational art and campaigning into the model to supplement learning at AMSP.

The proof of concept suggested by this monograph is not only achievable, but can be further developed, play tested, and effectively used at AMSP. The first draft of *Theatrum Belli* is incorporated in Appendix A of this monograph. It contains the base line scenario as described previously with four episodes for each phase of conflict in ADO. The proof of concept also provides the draft rules set, table of contents for game pieces, diagrams of game pieces and associated cards, sample scenario map and game mats, and a quick reference sheet. Appendix A also contains significant material explaining each mechanic and the reason behind design choices made to inform future designers that may seek to improve upon the model for further use. Several draft modules were included for future incorporation such as the Chinese forces module and the Competition module. These expansions allow *Theatrum Belli* to test initially unexplored aspects of the available base line scenario with either an alternate force or outside of conflict in ADO. Throughout playtesting and the design process, the designer found that the project successfully captured some key elements of ADO.

During research, playtesting, development, and review, the designer made several key observations pertinent to leader development and ADO. Wargames can be effective tools as long as they are appropriately framed towards the objective. Much like in the design process, improperly framing can yield incorrect conclusions. Teaching the wrong conclusions due to a blatantly inaccurate model can cause more trouble than the wargame is worth. Another observation arose even in the short duration of research of future and emerging aspects of the ADO concept. Persistent updating and review of the model ensures it performs as intended. The

concept of updating becomes even more pertinent in a model that addresses future concepts such as the future developments of ADO. While the proposed wargame has some predictive aspects to it, future modules must account for new innovations that may invalidate the assumptions written into the base line scenario. A significant observation concerned continuous balance between the simplification of the model and the extensive complexities of ADO. Wargames can demonstrate the concept of convergence and decisive space in execution very well. Sequenced mechanics and game play can set up the players' decisions to visually demonstrate what synchronizing effects across space and time may appear as. The only underlying issue regarding convergence is that the abstractions gloss over the sincere amount of effort at echelon required to streamline the authorities for the process. With further testing and development, a mechanic could emulate the difficulties and friction of authorities managing assets across domains.

Research and development provided other observations that concern the difficulties inherent to wargame design and where it also did not capture some elements of ADO initially. As the wargame design process introduces more mechanics and more complexity, it is imperative to continue to reframe and review the overall system to ensure that an appropriate balance is maintained within the model itself. While trying to accurately portray ADO, the wargame design can struggle to prioritize what complexities need to be present for the sake of accuracy and what abstractions can occur to enable better game play. The struggle is subtle in the design of the wargame but becomes more readily apparent in execution when the mechanics seem either too burdensome in one case or too simple in another. Another difficulty is balancing the domain representation within space and time. *Assassin's Mace* covers mostly maritime and air aspects with minimal land components represented on the map. In the proposed design of this monograph, the land domain takes higher priority and the air and maritime components become far more abstract as the distance and time involved scale significantly. Further testing should decide if variable time is required if the scenario adopts more physical representation of maritime assets.

Future research can explore several recommendations that may improve the proposal of this monograph. This monograph only considered an analog wargame design. It is possible to consider a digital format or hybridization. A game such as *Command: Modern Operations* provides a visualization with simulation aspects, using the analog format to set the conditions under which the simulation is executed. Additionally, some future aspects were not considered in the scenario that require development and testing to include the use of future weapons systems and the benefits and drawbacks of implementing artificial intelligence. The basic framework should enable participants to test futuristic systems for either the US and allies or the adversarial forces, exploring decisions made and how they could work within ADO to achieve convergence. Given the prospects of futures testing and learning, further development and expansion of the proof of concept could find use on a broader platform. Much like how the Marines, Air Force, and Navy are applying *Assassin's Mace* in PME, *Theatrum Belli* could serve as the start point for the Army's ADO wargame that is standardized across Training and Doctrine Command, Force Command, and Army Futures Command.⁶³ Continued development towards producing a standardized wargame design for the Army wide could help facilitate the next generation of leaders' education in ADO.

There is no substitute to reality and firsthand experience. In the same vein, war is expensive in all regards and with every degree removed, the emulation of war costs less but is less immersive. A wargame emulates war by using a game with abstract mechanics to explore the dynamics between humans in competition to achieve a goal. As a tool for education, a wargame's abstractions can still capture the essence of a concept and the players can explore their decisions and more importantly their failures. In real war, the cost and experience of failure can be extreme, if not fatal. Instead, failure in a wargame should anticipate learning and growth.

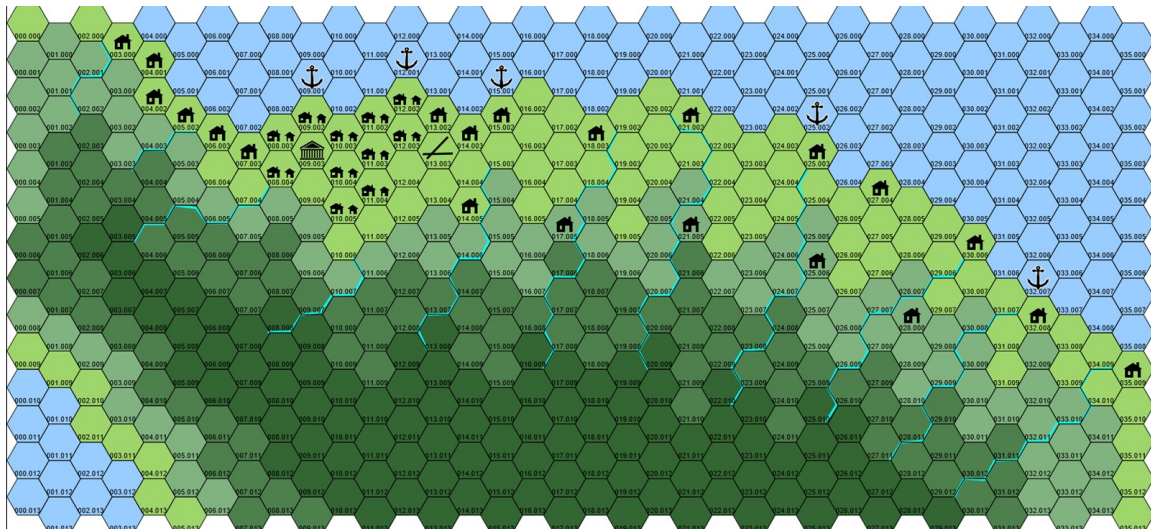
⁶³ Staff, Wargaming Division, "An Invigorated Approach to Wargaming," 21.

Appendix A

Theatrum Belli

Game Pieces and Parts	
Piece	Quantity/ Sets
Map	1
Example Standard Sync Mat	1
Asset Token Sheet	1
Player Packet	3
Example Episode Packet	1
Example Continuous Operations Scenario	1
IDP blocks	14
4-sided dice	2
6-sided dice	2
8-sided dice	2
10-sided dice	2
12-sided dice	2
20-sided dice	2

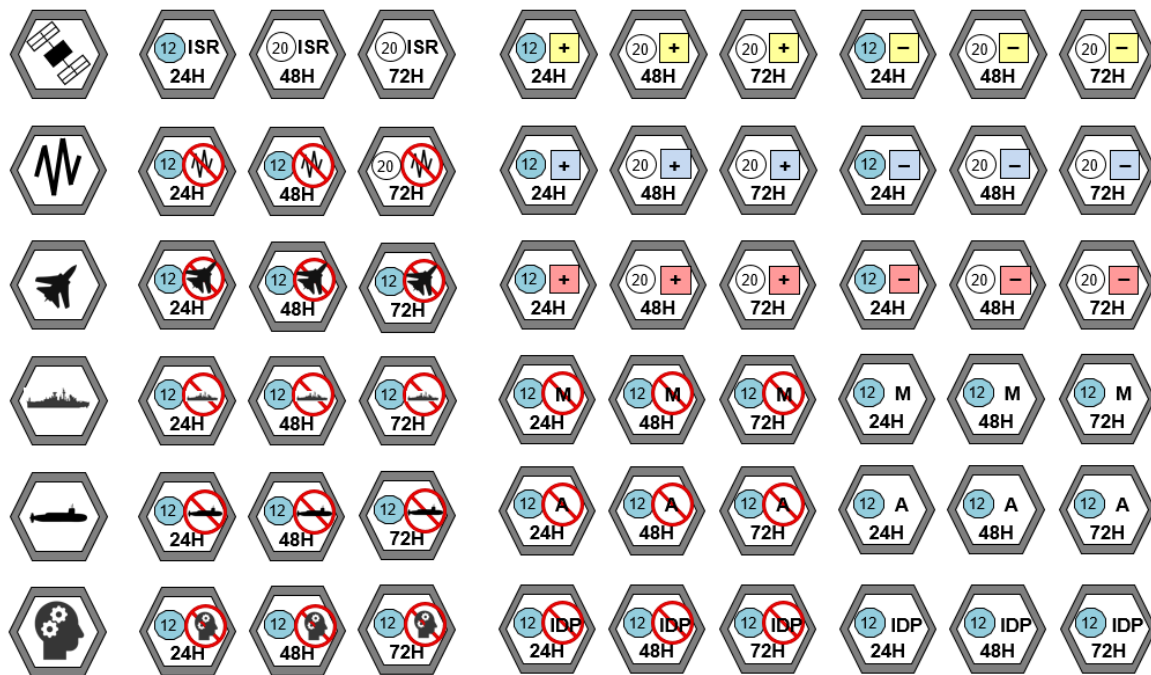
Player Packet and Pieces (1/player)	
Piece	Sets
Sequence of Play Reference Sheet	1
Terrain Reference Sheet	1
Order of Battle and Game Reference Sheet	1
Unit Action Sheet	1
Player Sync Mat	1
Player Planning Sheet	1
Player Unit Platforms	14
Player Units Blocks	14
Asset Tokens	54



Play Map. Created by author.

DOMAIN	72 HR	48 HR	24 HR	Expend
SPACE				
CYBER/ EMS				
AIR				
SEA				
INFO				
RESERVE				

Example Sync Mat. Created by author.



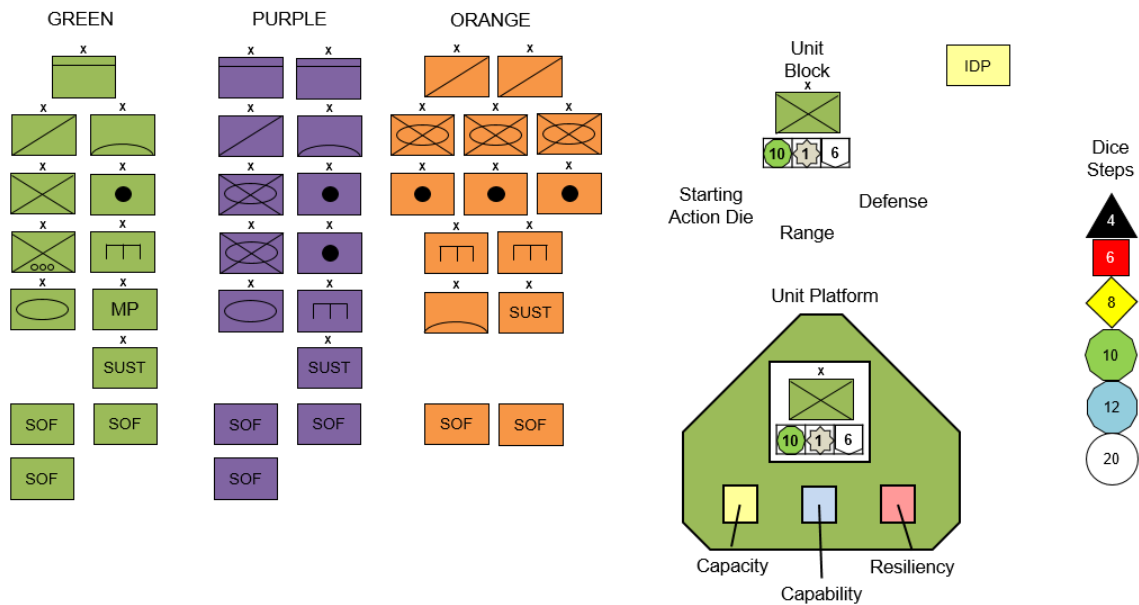
Asset Tokens. Created by author.

Phase	Segment	Notes
1. Planning		Players mark down current locations of all units and then write down all intended movement destinations for each unit. Players plan and allocate assets to the sync mat.
2. Movement		Move ground units simultaneously. All units have 4 movement points.
3. ISR		Determine local ISR effectiveness. Each unit rolls equal to or above the defense value of adjacent enemy units. Any adjacent friendly units to the target increase the step by 1.
4. Space		Resolve space effects.
5. Cyber/EMS		Resolve cyber/EMS effects.
6. Air		Resolve air assets.
7. Sea		Resolve sea assets.
8. Information		Resolve info assets.
9. Ground Actions	9.A. Plan ground actions	Players plan ground actions on the planning sheet, writing down the target unit for each action. If a unit may execute different actions, the plan must dictate which action.
	9.A. Verify mutual support and IDP influence.	Verify units within mutual support range (4 hexes). A unit within mutual support increases one step. Any unit adjacent to an IDP block decreases one step.
	9.B. Ground actions.	Declare and resolve ground actions simultaneously. All units execute actions at their starting status.
10. Regeneration and Reconsolidation	10.A. Verify logistics.	Verify that each unit is within supply range. Any unit not in supply range loses a block of the unit owner's choice. Exclude SOF.
	10.B. Allocate resupply.	Attempt to resupply the SUST unit. Roll a 4 and higher once to generate a block of choice and allocate it to the SUST unit. Return any SOF to play four hexes away from enemy units.
	10.C. Transition Sync Mat.	Move all assets on the sync mat one step to the right.
	10.D. Reset Unit Detection Status	All identified units are stood back up and no longer visible to opposing players.
11. Assessment		Assess victory conditions.

Sequence of Play Reference Sheet. Created by author.

	Terrain	Effect		Terrain	Effect
	Open	No effect to movement. Movement costs .5 for armored and mechanized units.		Small settlement	Movement costs 1.5. Reduce Space by one. Increase Cyber/EMS by one. Reduce Air by one. Reduce Sea by one. Increase Info by one. Decrease actions by one.
	Jungle	Movement costs 1.5. Reduce Space by one. Reduce Air by one. Reduce Sea by one. Reduce ISR by one. Decrease actions by one.		Urban settlement	Movement costs 2. Reduce Space by two. Increase Cyber/EMS by two. Reduce Air by one. Reduce Sea by one. Increase Info by two. Reduce ISR by one. Decrease actions by two.
	Jungle foothills	Movement costs 2. Reduce Space by two. Reduce Air by one. Reduce Sea effects by one. Reduce ISR by two. Decrease actions by two.		Capitol	Movement costs 2. Reduce Space by two. Increase Cyber/EMS by two. Reduce Air by one. Reduce Sea by one. Increase Info by three. Reduce ISR by one. Decrease actions by two.
	Jungle mountains	Movement costs 3. Reduce Space by two. Reduce Air by one. Reduce Sea effects by one. Reduce ISR by two. Decrease actions by two.		Airfield	Movement costs 1.5. Increase Cyber/EMS by one.
	Coastal water	No movement allowed.		Port	Units inside ports cannot perform actions.
				River	Movement costs 1 additional to cross a river.

Terrain Reference Sheet. Created by author.



Order of Battle and Game Piece Reference. Created by author.

Action		Action	
	Command: Select another friendly unit in range. On a roll of 6 and higher, the selected unit may move or act again.		Air Defense: Roll a 3 and higher. If successful, all enemy Air assets that target friendly units within range of this unit are reduced by two steps. If this unit is present and not located in a port on the first turn, this action is in effect. Halve the range of this action if this unit moved.
	Recon: Select two enemy units in range. Roll higher than the target enemy's defense value. If successful, recon identifies the target enemy.		Mobility: Roll a 5 and higher. If successful, friendly units in range cross rivers without penalty.
	Maneuver: Select an enemy unit in range. Roll higher than the target enemy's defense value. If successful, the target must withdraw, the attacker removes a block of their choice, and this unit may move up to the range of the action.		Survivability: Select a friendly unit in range. Roll a 5 and higher. If successful, the target increases its defense value by 1.
	Maneuver: Select an enemy unit in range. Roll higher than the target enemy's defense value. If successful, the target must withdraw, the attacker removes a block of their choice, and this unit may move up to the range of the action.		Security: Roll a 5 and higher. If successful, IDP units within range do not hinder friendly units.
	Maneuver: Select an enemy unit in range. Roll higher than the target enemy's defense value. If successful, the target must withdraw, the attacker removes a block of their choice, and this unit may move up to the range of the action.		Stability: Target an IDP unit. Roll a 4 and higher. If successful, remove the IDP unit.
	Long range fires: Select an enemy unit in range. Roll higher than the target enemy's defense value. If successful, the target loses Capacity or Resiliency. Executing this action reveals the unit.		Resupply: Select a friendly unit in range. Roll a 5 and higher. If successful, transfer any one block between the target and this unit. This action may be executed up to three times per turn and with different targets. This action may be executed only once if this unit moved this turn.
			Recon: (See previous)
			Disrupt: Select an enemy unit in range. Roll higher than the target enemy's defense value. If successful, the target loses Capacity or Resiliency.
			Enable: Select an IDP in range. Roll a 7 or higher to move the IDP one hex.

Unit Action Reference Sheet. Created by author.

ISR	Attempt to detect any targeted, single enemy unit like the ISR action.	A	Increase the die size of the targeted unit on a roll of 8 or higher.
	Attempt to remove an enemy CYBER/EMS asset from the enemy sync mat on a roll of 8 or higher.		Reduce the die size of the targeted unit on a roll of 8 or higher.
	Attempt to negate any active (24H) enemy AIR asset from the enemy sync mat on a roll of 8 or higher.	IDP	Create an IDP unit within the targeted urban hex on a roll of 8 or higher.
	Attempt to remove an enemy NAVAL asset from the enemy sync mat on a roll of 8 or higher.		Remove an IDP unit within the targeted hex on a roll of 8 or higher.
	Attempt to remove an enemy SUBMARINE asset from the enemy sync mat on a roll of 8 or higher.		Generate the indicated element on a roll of 8 or higher.
	Attempt to remove an enemy INFO asset from the enemy sync mat on a roll of 8 or higher.		Remove the indicated element on a roll of 8 or higher.
M	Provide a unit with two extra movement points OR negate the  effect on a unit on a roll of 8 or higher.		
	Reduce the movement points of a unit to 0.		

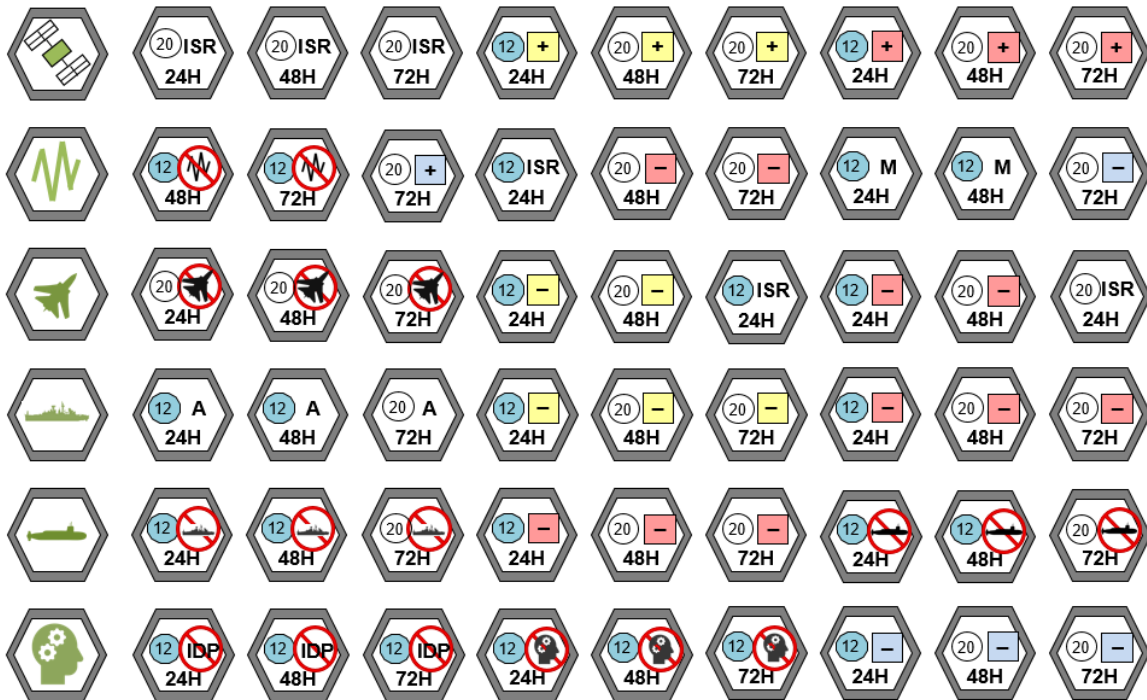
Asset Action Reference Sheet. Created by author.

DOMAIN	72 HR	48 HR	24 HR	Expend
SPACE (3)				
CYBER/EMS (3)				
AIR (5)				
SEA (5)				
INFO (2)				
RESERVE				

GREEN Sync Mat. Created by author.

	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
					Current	Move to	Target(s)

GREEN Planning Sheet. Created by author.



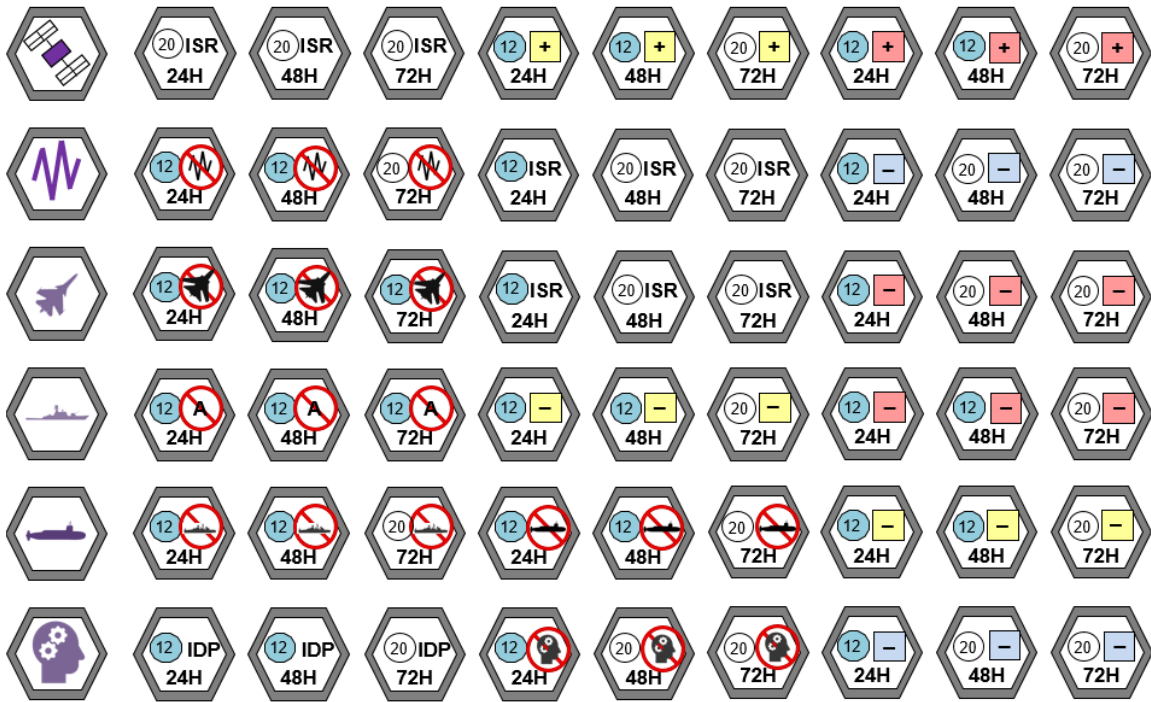
GREEN Asset Tokens. Created by author.

DOMAIN	72 HR	48 HR	24 HR	Expend
SPACE (4)				
CYBER/ EMS (4)				
AIR (4)				
SEA (2)				
INFO (4)				
RESERVE				

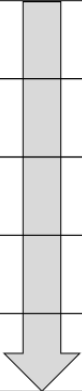
GREEN Sync Mat. Created by author.

	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)

GREEN Planning Sheet. Created by author.



GREEN Asset Tokens. Created by author.

DOMAIN	72 HR	48 HR	24 HR	Expended
SPACE (3)				
CYBER/EMS (3)				
AIR (4)				
SEA (4)				
INFO (4)				
RESERVE				

GREEN Sync Mat. Created by author.

	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)
	Current	Move to	Target(s)		Current	Move to	Target(s)

GREEN Planning Sheet. Created by author.

GREEN Asset Tokens. Created by author.

Episode 1 Victory Conditions:

- GREEN: Control the capitol in turn 5 (10vp); Every block retained (2vp each) by turn 5.
- PURPLE: Control the capitol (10vp) and airfield (10vp) in turn 5.
- FA Conditions: PURPLE controls the capitol, airfield, 17.005, and 18.003.

Episode 2 Victory Conditions:

- GREEN: Enemy artillery units (5vp ea) and air defense unit (5vp) reduced by two steps on turn 10. Control 21.005 by turn 10 (5vp).
- PURPLE: Control the capitol (10vp), airfield (5vp) and 17.005 by turn 10 (5vp).
- FA Conditions: PURPLE controls 21.002 and 21.005.

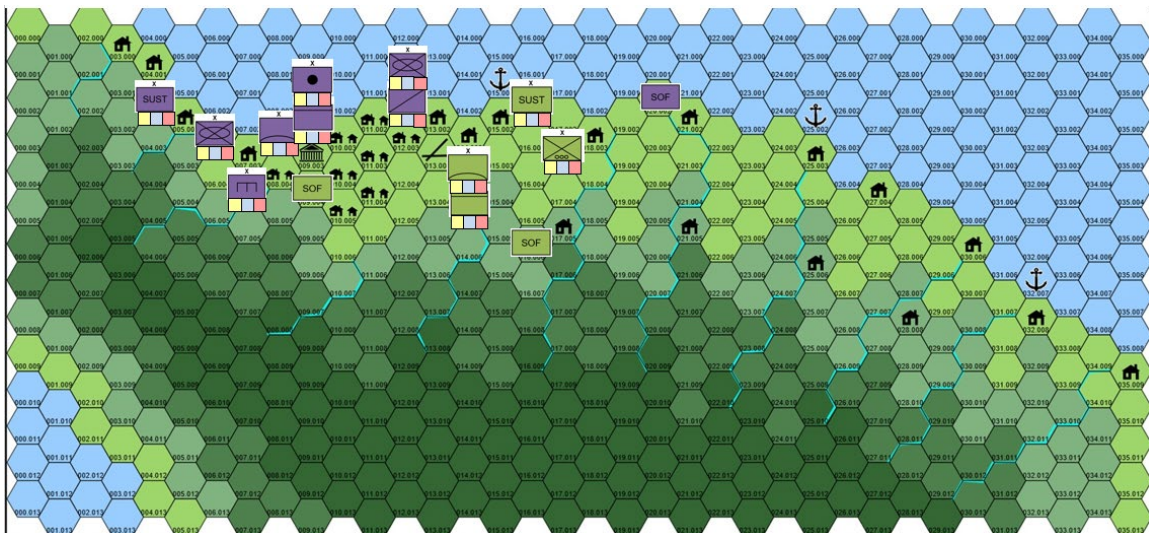
Episode 3 Victory Conditions:

- GREEN: Enemy command units (5vp ea), artillery units (5vp ea), and air defense unit (5vp) reduced by two steps on turn 5. Control 21.005 by turn 5 (5vp).
- PURPLE: Enemy command unit (5vp) reduced by two steps on turn 5. Control the capitol (10vp), airfield (5vp), and 21.002 (5vp) by turn 5.
- FA Conditions: PURPLE controls 25.003 and 25.006.

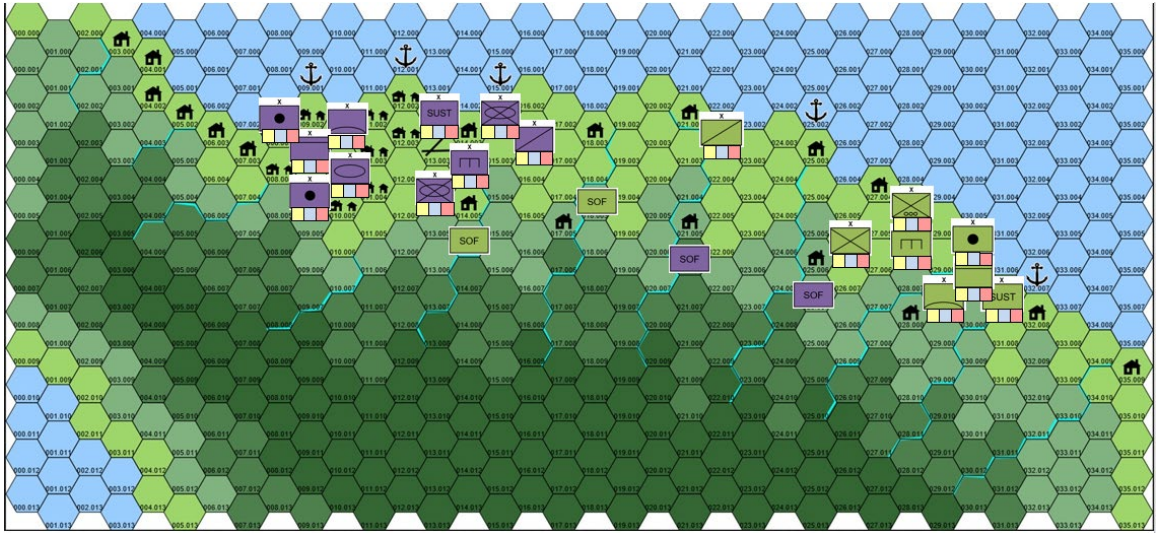
Episode 4 Victory Conditions:

- GREEN: Control capitol (15vp) and airfield (10vp) by turn 20.
- PURPLE: Control the capitol (15vp) and airfield (10vp) by turn 20.

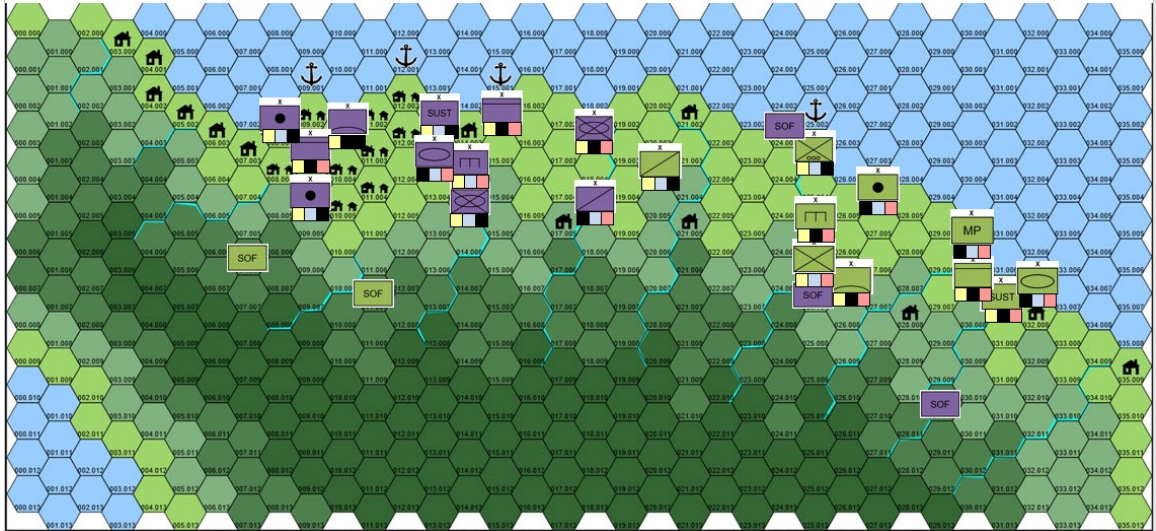
Example Continuous Operations Scenario. Created by author.



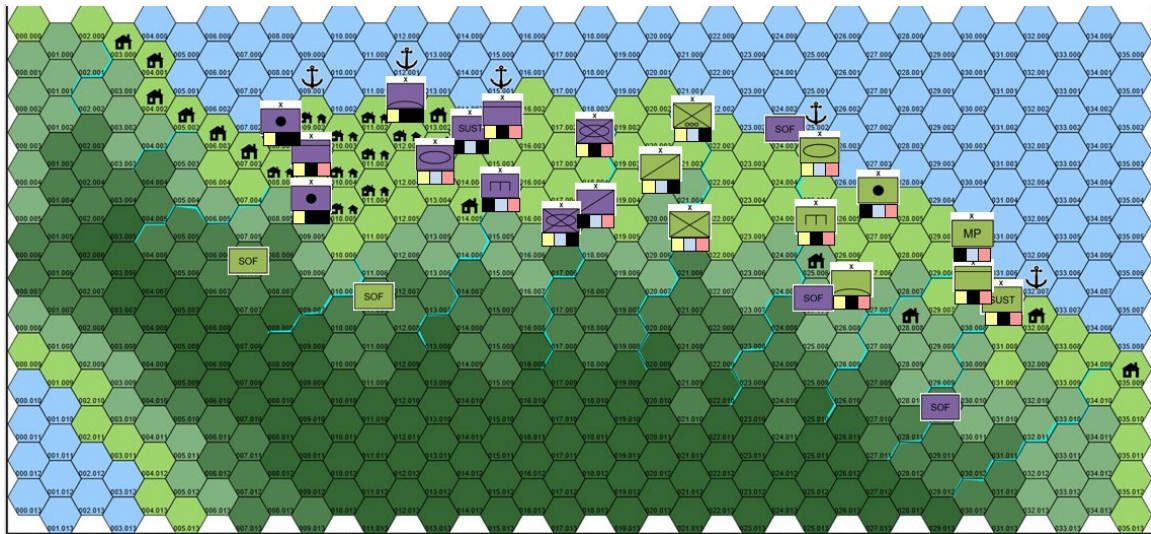
Episode 1 Starting Positions. Created by author.



Episode 2 Starting Positions. Created by author.



Episode 3 Starting Positions. Created by author.



Episode 4 Starting Positions. Created by author.

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