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1. REPORT DATE (DD-MM-YYYY) 29-05-2023		2. REPORT TYPE Master's Thesis			3. DATES COVERED (From - To) August 2022 to May 2023	
4. TITLE AND SUBTITLE Decision-Making in the 21st Century: The Need for a Modern Day 'System of Expedients' to Win in War					5a. CONTRACT NUMBER	
					5b. GRANT NUMBER	
					5c. PROGRAM ELEMENT NUMBER	
					5d. PROJECT NUMBER	
6. AUTHOR(S) Arnel P. David Colonel, United States Army					5e. TASK NUMBER	
					5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Joint Forces Staff College-NDU Joint Advanced Warfighting School 7800 Hampton Blvd. Norfolk, VA 23511-1702					8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)					10. SPONSOR/MONITOR'S ACRONYM(S)	
					11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited						
13. SUPPLEMENTARY NOTES						
14. ABSTRACT The world is experiencing a revolutionary change in the character of war. The confluence of time compression, institutional stress, and new modes of battle combine to alter the strategic landscape of the twenty-first century. The critical variable of change is speed. How do the U.S. and partner militaries cultivate sound military judgment and intuition in their senior leader decision-making at an operationally relevant speed while properly leveraging emerging technological tools in this age of digital disruption? A review of scholarship on decision theory, command, gaming, and artificial intelligence illuminate variables that induce a faster rate of digital transformation. An analysis of NATO's Project PROMETHEUS, an effort to develop a modern-day "system of expedients" for command, provides timely recommendations for the DOD to consider. A concluding story combines insights from this study to explain how the U.S. might prevail in the next battle against a peer enemy in the Pacific.						
15. SUBJECT TERMS Command, decision-making, Artificial Intelligence, gaming, NATO, warfighting, wargaming, decision theory						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UNCLASSIFIED UNLIMITED	18. NUMBER OF PAGES 78	19a. NAME OF RESPONSIBLE PERSON	
a. REPORT UNCLASS	b. ABSTRACT UNCLASS	c. THIS PAGE UNCLASS			19b. TELEPHONE NUMBER (Include area code) 757-443-6252	

NATIONAL DEFENSE UNIVERSITY
JOINT FORCES STAFF COLLEGE
JOINT ADVANCED WARFIGHTING SCHOOL



**Decision-Making in the 21st Century:
The Need for a Modern Day 'System of Expedients' to Win in War**

By:

Arnel P. David

Colonel, U.S. Army

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**Decision-Making in the 21st Century:
The Need for a Modern Day 'System of Expedients' to Win in War**

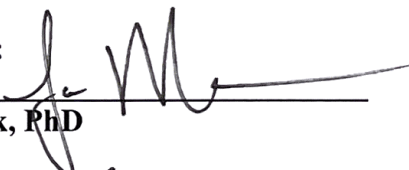
by Arnel P. David

Colonel, U.S. Army

A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning Strategy. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

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Abstract

The world is experiencing a revolutionary change in the character of war. The confluence of time compression, institutional stress, and new modes of battle combine to alter the strategic landscape of the twenty-first century. The critical variable of change is speed. How do the U.S. and partner militaries cultivate sound military judgment and intuition in their senior leader decision-making at an operationally relevant speed while properly leveraging emerging technological tools in this age of digital disruption? A review of scholarship on decision theory, command, gaming, and artificial intelligence illuminate variables that induce a faster rate of digital transformation. An analysis of NATO's Project PROMETHEUS, an effort to develop a modern-day "system of expedients" for command, provides timely recommendations for the DOD to consider. A concluding story combines insights from this study to explain how the U.S. might prevail in the next battle against a peer enemy in the Pacific.

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Acknowledgements

This research was improved and made more relevant for the Department of Defense thanks to the extraordinary support and leadership of the NDU Scholars Board (Dr. Denise Natali and Dr. Tom Lynch) and the research sponsors (SES Leslie Beavers and Mr. Avram Isaacson) from the Office of the Under Secretary of Defense for Intelligence and Security.

A special thanks to colleagues from NATO, especially those in the Allied Rapid Reaction Corps (ARRC), for their generous support and time to review and analyze Project PROMETHEUS. Then-Brig Gen (now Major General) Matthew Van Wagenen was a key source of inspiration and leadership to drive radical change at the ARRC. I am grateful to Serge Da Deppo from the NATO Innovation Hub and Dr. Girish Nandakumar from the Massachusetts Institute of Technology for continuing to partner and support innovative efforts like Project PROMETHEUS. Thanks to Søren Sjøgren from Denmark for his shared passion, interest, and drive to change NATO planning systems.

To my best buddy, Dr. Benjamin Jensen, I am eternally grateful for his support, friendship, and intellectual engagement. He has elevated my thinking and writing over many years. This study has benefited from his help in myriad ways.

Finally, a big thanks to the Joint Advanced Warfighting School (JAWS) faculty. Specifically, Dr. Jon Mikolashek (Research Lead), Dr. Mary Bell (NDU Scholar Lead), Dr. John Manza (Strategy Lead), Colonel Vic Norris (Seminar Lead), and Colonel Carl E. Cooper, Jr. (JAWS Director), all provide an environment where students can read, reflect, and dive into the study of war, strategy, and operational art.

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Decision-making in the 21st Century: The Need for a Modern Day ‘System of Expedients’ to Win in War

EXECUTIVE SUMMARY

This research paper finds that the U.S. military and its allies must fundamentally re-examine how operational senior leaders command and make decisions in combat, to properly incorporate emerging digital technologies and prevail in future war. Reviewing the scholarship on decision theory, command, wargaming, and Artificial Intelligence (A.I.) highlighted variables that digital transformation can induce for a greater rate of decision speed and concision. NATO’s Project PROMETHEUS established that advanced digital technology can best enhance speed for modern combat decision-making if it integrates with the right mix of system and cultural changes. Human and organizational behavior remain the greatest barriers to change. Advanced digital software and analytics work best when applied to improve decentralized wargaming and centralized analysis. Advanced technology and A.I. can improve decision-making and expand human abilities, thereby enabling a modern day “system of expedients” to gain decision advantage and enable a warfighting tempo for America and her coalition partners that battlefield adversaries cannot match.

Methodology. The research focused on speed of combat decision as the dependent variable and the measured outcome in decision-making experimentation. The research evaluated several independent variables for their impact on the speed of decision-making: A.I., process changes, and gaming simulations. Analysis of their interactions with speed of decision-making utilized a process tracing methodology applied to NATO’s Project PROMETHEUS. The researcher supplemented the quantitative data with qualitative interviews focused on the appropriate introduction of digital technology into joint planning and operational environments with command decision-making experts inside and outside the United States Department of Defense and NATO.

Important Highlights.

Key Challenges

- Commanders and staff often misapply information technology or append useful technology into flawed decision-making processes.
- Existing command systems and decision-making processes are slow and mechanistic, causing an erosion of military art and imagination.

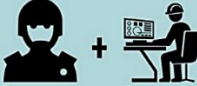
Gaming & A.I.

- A review of competitor nations’ efforts to use gaming and A.I. reveal a collective attempt to gain asymmetric advantages over the U.S.
- The gaming experimentation group, U.K. Fight Club, pioneered a new approach of decentralized gaming and centralized analysis to rapidly collect data that feeds sophisticated machine learning algorithms to increase the speed of learning and decision-making.

NATO Project PROMETHEUS

- Innovating from the ground up led to a series of experiments that induced sustained cultural change in a NATO corps warfighting headquarters.
- A new organic capability to train for, and prosecute war at an increased speed and concision, was developed with a mix of gaming and decision-support software.

Recommendations. The research produced four detailed recommendations as reflected in the chart below. The DOD can profit from increased bottom-up cultural innovation to provoke a rapid rate of digital transformation, leading to an advantageous speed in war.

CATALYTIC COMBINATIONS	DEDUCTIONS	IMPLICATIONS FOR DOD
 Humans + Machines	Machines perform tasks to free humans Humans have more time to think creatively Human-machine collaborations provide unbeatable speed, accuracy, and flexibility	Use experimental units to accelerate capability development and integration
 Operators + Engineers	Embedded users and programmers can immediately exploit feedback for rapid changes End user design focus tailors to warfighter Unplanned insights and solutions emerge	Develop unconventional public-private-partnerships to connect talent and build battle-winning innovations
 Plans + Playbooks	Detailed plans provide useful context, but Routine gaming can produce plays for speed of action Automated readiness states can inform more accurate planning and gaming	Cohere A.I. and gaming applications to achieve greater economies of scale and harness new capability
 Mavericks + Senior Leader Champions	Together these groups can drive behavioral and cultural change -> top-down and bottom-up The narrative and stories told are pivotal for long-term change and stakeholder buy-in	Build incentive structures to grow and support mavericks Invest in storytelling that sells ideas and inspires action
Think Smarter – Decide Better – Act Faster		

In-Progress Research Engagements. These included the following four events. Each one helped refine research analysis and expand applicability of the research. Details of each event are available with the author.

Date	Title	Location	Event/Medium
OCT 22	“How Gaming and AI can Improve Decision-Making”	Paris, France	NATO ACT Conference
NOV 22	“Building Better Warfighters”	Online	Warfighter Podcast
DEC 22	“How AI and Gaming are Changing Military Strategy”	Online	Transitional Matters Podcast
MAR 23	“Revolutionizing the Way We Think About Training: Advanced Training Through Gaming and AI.”	Orlando, Florida	Land Forces Training Summit

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Introduction

“One might say that sovereigns in our time seek only to make great things with men. I should want them to think a little more of making great men; to attach less value to the work and more to the worker, and to remember constantly that a nation cannot long remain strong when each man in it is individually weak [.]”- Alexis de Tocqueville¹

In a presentation at the National Defense University, Major General (Retired) Bradley Gericke warned that large-scale war is not only plausible, but that its return is imminent.² Air Force General Mike Minihan echoed this concern to his entire command with an alarming message, “My gut tells me we will fight in 2025.”³ Leaders at all ranks are pondering the readiness and ability of the Joint Force to fight in a major war and especially the capability of senior military leaders to properly plan and make accurate, timely decisions when required. Many herald the importance of technology and platforms to gain a competitive advantage in the planning and control of modern war. Technology is certainly important, but not the sine qua non of this quest. This research paper finds the U.S. military and its allies urgently need a fundamental re-examination of how leaders *command* and make *decisions* in combat, to properly use emerging technologies and prevail in future war.

The world is experiencing a revolutionary change in the character of war. The confluence of time compression, institutional stress, and new modes of warfare combine to alter the strategic landscape of the twenty-first century. How do the U.S. and partner

¹Alexis de Tocqueville, *Democracy in America*, Translated and Edited by Harvey C. Mansfield and Delba Winthrop (Chicago, IL: The University of Chicago, 2000) 660.

² Bradley T. Gericke (U.S. Army), “Strategy Through the Looking Glass: Imagining to Win,” (Army Strategist Association “Last Lecture,” Washington D.C., February 7, 2023).

³ Thomas Novelty, “A General Warned of an Impending War with China. Airmen Under His Command Say It Was ‘Inappropriate,’” *Military.com*, January 31, 2023, <https://www.military.com/daily-news/2023/01/31/general-warned-of-impending-war-china-airmen-under-his-command-say-it-was-inappropriate.html>.

militaries cultivate sound military judgement and intuition in their senior leader decision-making at an operationally relevant speed while properly leveraging emerging technological tools in this age of digital disruption?

Today, commanders and staff often misapply information technology or append useful technology into flawed decision-making processes.⁴ This research evaluates how an assemblage of decision theory, command approaches, gaming, and artificial intelligence combine to create a modern day “system of expedients” for 3-star commands and below.⁵ It analyzes what is happening today in North Atlantic Treaty Organization (NATO) militaries with respect to planning and execution in modern battle. There is a firm conviction that existing systems and processes are slow and mechanistic, causing an erosion of military art and imagination.

Planners and staffs exist to help commanders make decisions, which often take the form of orders. These orders need to be clear, concise, and short to distribute in a timely fashion. Yet, commanders and staffs tend to create inflexible plans based on the goal of perfection and certainty rather than viability.⁶ Patton’s dictum, “A good plan, violently executed now, is better than a perfect plan next week,” is often evoked but not truly embraced.⁷ Worst still, these ineffective processes take too long.

⁴ Benjamin Jensen, Christopher Whyte, and Scott Cuomo, *Information in War: Military Innovation, Battle Networks, and the Future of Artificial Intelligence* (Washington D.C.: Georgetown University Press, 2022).

⁵ When Moltke the Elder was asked how he does strategy, he replied it was a “system of expedients.” See Arden Bucholz, *Moltke and the German Wars, 1864-1871* (New York, NY: Palgrave, 2001) 3; Daniel Hughes, Ed., *Moltke on the Art of War: Selected Writings* (New York, NY: Ballantine Books, 1993) 47.

⁶ See chapter “Quest for Certainty” in Martin van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985) 264 and Jim Storr, *Something Rotten: Land Command in the 21st Century* (Havant, UK: Howgate Publishing Limited, 2022).

⁷ George S. Patton, *War As I Knew It* (New York, NY: Houghton Mifflin Harcourt Publishing Company), 354.

There are cultural, bureaucratic, and perverse incentive structures causing these dilemmas. Speed of decision and violence of action suffer at the hands of risk averse leaders clinging to dogmatic process and antiquated systems. Many NATO headquarters (to include those of the U.S.), with Napoleonic staff structures and industrial era concepts of bureaucratic management, continue to lead formations little changed since World War II.⁸ Military commanders and staffs consistently reinforce failure by adding more process to planning approaches that lack a balance between deliberate planning that is scrupulously detailed and rapid planning that may lack depth, but is fast, adaptive, and decisive.

This lack of balance permeates NATO planning processes and threatens the Alliance's ability to seize battlefield advantage due to unrealistic timelines that deliver orders to subordinate units barely before the point of execution. Put simply, subordinate units are not only getting the plan late prior to execution, but they also do not even get time to plan themselves. A cognitive dissonance has emerged in NATO headquarters whereas leaders know the process is broke but still align their behavior and practice within it. Whether for career reasons or a belief they can still make it work, an inflated sense of self-confidence develops, and leaders avoid making changes irrespective of blinding flashes of the obvious.⁹

Evidence suggests that while the Department of Defense (DOD) has identified the need to reform and make a digital transformation, there is a danger that the pace of

⁸ Charles T. Cleveland et al., *Military Strategy for the 21st Century: People, Connectivity, and Competition* (New York: Cambria Press, 2018) 148.

⁹ Andrew Hill and Stephen Gerrass "Systems of Denial: Strategic Resistance to Military Innovation," *Naval War College Review*: 2016, Vol. 69: No 1, Article 7.

transformation will fail to occur before the next major war.¹⁰ The nation's warfighters will be unprepared and forced to learn the hard way through the unforgiving crucible of combat unless institutional conditions change to permit more adaptations to flourish from the bottom up – “grassroots innovation.”

Supporting grassroots innovation, the NATO Allied Rapid Reaction Corps (ARRC) funded a series of experiments beginning in 2021 with AI-enabled software, new planning techniques, and modern gaming tools, to demonstrate the early signs of a digital transformation through an initiative called Project PROMETHEUS. While PROMETHEUS offers the opportunity for insight within NATO, there is a dearth of analysis pointing to key lessons and insights for the DOD. Working with NATO, the DOD has an opportunity to lead and build decision-making systems that can respond to the changing character of contemporary war at a pace required today.

Military decision-making and command timelines evolved over epochs and reveal a pattern of increasing strategic compression. The illustration in Figure 1 depicts this change over time. It summarizes insights of separate theorists. The top slant of time and command is derived from writing by former United States Army Generals Gordan Sullivan and James Dubik, using former United States Air Force Colonel, John Boyd's, observe, orient, decide, and act (OODA) decision cycle framework to highlight the importance of information to aid in decision-making.¹¹ Boyd, pioneered the OODA loop

¹⁰ A.J. Steinlage, “Digital Transformation and the DoD,” Harvard University, *Digital Innovation and Transformation* (blog), April 30, 2018, <https://d3.harvard.edu/platform-digit/submission/digital-transformation-and-the-dod/>. Additionally, this was a common theme from those interviewed for this research.

¹¹ For the time and command chart in Gordon R. Sullivan and James M. Dubik, “War in the Information Age,” *Military Review* 74, no. No. 4 (April 1994): 46–62; Ian T. Brown, *A New Conception of War: By John Boyd, The U.S. Marines, and Maneuver Warfare* (Quantico, VA: Marine Corps University Press, 2018).

to emphasize how victory is the result of an entity (either an individual or organization) making appropriate decisions faster than their opponent. The bottom half of the illustration reflects a theory advanced by former US Army General Bob Scales and scholar Alan Beyerchen.¹² They outline how nonlinear societal amplifiers have made war different over time.

In the twenty-first century, Beyerchen proclaims the present amplifiers changing war and command are human and biological. He states, “The fluidity of circumstances, the feedback processes with entrainment, and the general feel of the onset of technological change are more akin to weather systems or biological (and historical) processes than to mechanical structures.”¹³ Sullivan and Dubik shared this view before the turn of the century and forecasted that leaders would be guided by vision and policy rather than by procedure-based rules.¹⁴ They contended that decisions will be decentralized and fast to create advantage. Commanders and their staffs need to master systems of customization, precision, and information to thrive in this emerging environment. It follows then that speed is a critical variable for decision-making in war.

¹² See Robert H. Scales, “Clausewitz and World War IV,” *Armed Forces Journal*, July 1, 2006, <http://armedforcesjournal.com/clausewitz-and-world-war-iv/>; Robert H. Scales, *Scales On War: The Future Of America’s Military At Risk* (Annapolis, MD: Naval Institute Press, 2016).

¹³ Alan Beyerchen, “From Radio to Radar: Interwar Military Adaptation to Technological Change in Germany, the United Kingdom, and the United States,” in *Military Innovation in the Interwar Period*, Ed. Williamson Murray and Allan R. Millett, (New York, NY: Cambridge University Press, 1996), 265–99.

¹⁴ Sullivan and Dubik, “War in the Information Age,” 49.

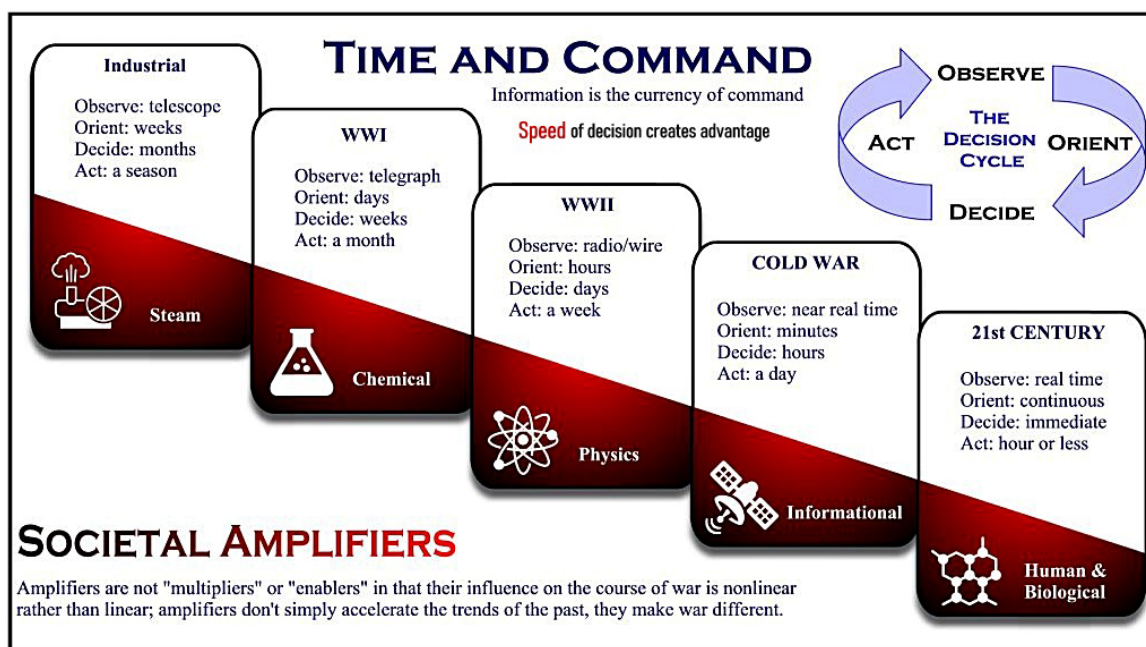


Figure 1. Time and command over epochs. *Source:* Created by author.¹⁵

Methodology

Modern technology is providing ways to identify cause-and-effect relationships in ways not possible before. From information technology software to big data cloud computing and gaming simulations, there are many ways to control for variables that distinguish the effects of certain treatments from those of other factors.

The research focused on the speed of combat decision as the dependent variable and the measured outcome in decision-making experimentation. The research evaluated several independent variables for their impact on the speed of decision-making: A.I., process changes, and gaming simulations. Analysis of their interactions with speed of decision-making utilized a combination of quantitative and qualitative inputs to analyze NATO's Project PROMETHEUS. The logic of this analysis advances in three parts.

¹⁵ Adapted from "Time and Command" chart in Sullivan and Dubik, "War in the Information Age," 44 and societal amplifier summary in Robert H. Scales, "Clausewitz and World War IV," *Armed Forces Journal*, July 1, 2006; and OODA Loop description in Daniel Ford, *A Vision So Noble: John Boyd, the OODA Loop, and America's War on Terror* (Scotts Valley, CA: CreateSpace, 2010).

Part 1 reviews the literature on command and decision theory to highlight a gap in scholarship for military decision-making in combat. It is not only a gap but the current intellectual vector of travel for decision-making requires an urgent course correction to prepare combat leaders for large-scale warfighting.

Part 2 explores the rise of gaming and A.I. to address this gap and outlines how different variables can affect the speed of decision. It also provides a cursory review of competitor nations' efforts in this space.

Part 3 evaluates the NATO Project PROMETHEUS series of experiments to analyze how grassroots innovation helped change organizational culture at a NATO corps and blazed a path to digital transformation. A process tracing methodology from interviews and experimentation data is used to draw inferences for causal analysis. A table shows how the dependent variable of speed was affected by different independent variables during three experiments.

Together, these three parts show implications for future studies and provides recommendations for the DOD to consider. A concluding story combines insights from this research to explain how the U.S. might benefit from the recommended changes to prevail in the next battle against a peer enemy in the Pacific.

Returning to the opening quote. Tocqueville provided a timeless exposition on the spirit and power of a democratic nation. He reminds that a nation cannot long remain strong if its men and women are individually weak, and for command in war, this point is ever more salient. The question arises: do existing systems produce and enable effective combat leadership? Is it producing the likes of Washington, Sherman, Grant, and Patton?

Terms of Reference

Table 1: Key terms defined.

Key Term	Definition	Reference
command	a. "command" includes both the authority vested in an individual who holds a command position and the position itself. b. the exercise of that authority ("commanders command to direct, coordinate, and control military forces."	DOD Directive 5100.01
command system	The command, control, communications, computers, and intelligence (C4I) equipment, facilities, procedures, and personnel essential to a commander in planning, directing, and controlling operations of assigned forces pursuant to the missions assigned.	DOD's <i>Dictionary of Military and Associated Terms</i>
expedient (i.e., system of expedients)	adjective: (a) tending to promote some proposed or desired object; fit or suitable for the purpose; proper under the circumstances, (b) conducive to advantage or interest, and (c) acting in accordance with expediency, or what is advantageous.	Dictionary.com
artificial intelligence (A.I.)	The capability of a machine to perform tasks that would normally require human intervention, such as visual perception, speech recognition, decision-making, and language translation.	Department of Defense
large language model (LLM)	A type of machine learning model that can perform a variety of natural language processing tasks (NLP) on immense amounts of data refined by self-supervised learning.	Techopedia.com

Source: Created by author.

Part 1: Literature Review

Decision-making is the core function of command. How humans make decisions has been the focus in multiple academic disciplines and fields of study. Business management, political science, behavioral economics, psychology, and many other professions study decision-making. Theories abound. The military, however, has clung to an analytical approach built on a theoretical foundation formed in the 1950s and 60s and it has never been battle tested against a peer enemy. Irrespective of technological and scholarly developments, there has been minimal change to military decision-making for several decades. This section reviews decision theory and command. In the end it closes with a summary on the intersection of theory and practice to illuminate a gap within current command systems.

Decision Theory

The roots of modern-day military decision-making hail back to the Prussian Army and Frederick the Great.¹⁶ Major General von Steuben prepared the first “Estimate of the Situation” for General George Washington and the Continental Army.¹⁷ Steuben mastered a planning system from working on the staff of Frederick the Great.¹⁸ This would evolve to become the “applicatory system” in which the Prussians aimed to develop a trainable method for battlefield leadership.¹⁹

¹⁶ Wilson A. Shoffner, “The Military Decision-Making Process: A Time for a Change” (Fort Leavenworth, KS: School of Advanced Military Studies, 2000) 4.

¹⁷ James D. Hittle, *The Military Staff: Its History and Development* (Westport, CT: Greenwood Press, 1975) 178.

¹⁸ Wilson A. Shoffner, *The Military Decision-Making Process: A Time for a Change*, 4-6.

¹⁹ Rex R. Michel, “Historical Development of the Estimate of the Situation, Research Report 1577” (Fort Leavenworth, KS: U.S. Army Research Institute for the Behavioral and Social Sciences, October 1993) 3.

Fast forward to World War II and the sheer scale of mass mobilization required greater detail and written orders but even then, Patton recommended no more than a page and on the back a sketch map to help communicate the plan.²⁰

The U.S. Marine Corps and U.S. Army adopted a highly detailed, linear, and sequential estimate process. This was influenced by the dominant theory of the 1950s: rational choice theory, originating from business, economics, and social science theorists.²¹ Statistical tools helped make optimal decisions after generating and comparing multiple options.

In the 1960s this theory heavily influenced the birth of the current Military Decision-making Process (MDMP) and the Marine Corps Planning Process (MCP). The theoretical underpinnings of rational choice theory came from sterile classrooms with inexperienced students.²² Consequently, the military found this process conveniently helpful given the simplicity and teachable process, taking bits of information to make an ideal decision based on generated options.²³

Critiques of rational choice theory emerged, and new scholarship challenged this analytical approach. The first was Herbert Simon, who won a Nobel Prize for his book *Models of Man*, introducing the theory of *bounded rationality*.²⁴ In this theory, humans are limited in their ability to act rationally due to time, resources, emotion, and the

²⁰ George S. Patton, *War As I Knew It* (New York, NY: Houghton Mifflin Harcourt Publishing Company, 1947) 335.

²¹ Ileitis Parra et al., “Chronological Evolution of the Information-Driven Decision-Making Process (1950-2020),” *Journal of the Knowledge Economy*, March 1, 2022, <https://doi.org/10.1007/s13132-022-00917-y>.

²² Gary Klein, *Sources of Power: How People Make Decisions* (Boston, MA: MIT Press, 1999).

²³ Marinus, “On Decision Making: Maneuverist Paper No. 17,” *Marine Corps Gazette* 106, no. No. 2 (February 2022): 78–82.

²⁴ Herbert A. Simon, *Models of Man: Social and Rational* (New York, NY: Wiley, 1957).

fallibility of the mind. Simon argued that humans do not have time to select the optimum decision but rather choose the best option. He called this *satisficing*.²⁵

Computers were on the rise in the 1960s and aided by game and probability theory developments. All of which did not impact the favored analytical approach in the military. The work of Simon and others did not influence the U.S. military's linear, deliberate, and laborious process. MDMP and similar processes remain ponderous, and the ability to implement decisions will be so slow that "even the most sluggish opponent will outmaneuver" any organization choosing to use it.²⁶

In the 1970s, Daniel Kahneman and Amos Tversky identified three heuristics to consider when making decisions. They were representative, availability, and anchoring biases, leading people to predictable judgment errors.²⁷ The study of decisions and human behavior in this way gave birth to behavioral economics. In the 1980s, researchers began studying decision-making differently based on this new understanding of cognition. Instead of a sterile classroom or laboratory, researchers studied pilots, police officers, firefighters, and warfighters.²⁸ This new field became known as *naturalistic decision-making*.

²⁵ Klein, *Sources of Power: How People Make Decisions*, 20.

²⁶ Mark Cancian, "FMFM 3-1 Command and Staff Action: A Prescription for Failure," 47.

²⁷ Amos Tversky and Daniel Kahneman, "Judgment under Uncertainty: Heuristics and Biases," *Science*, Washington, DC: American Association for the Advancement of Science, September 1974; Daniel Kahneman, *Thinking, Fast and Slow* (New York, NY: Farrar, Straus, and Giroux, 2011).

²⁸ For a comprehensive literature review of naturalistic decision-making see the report of Dr. Robert Hoffman, "Accomplishments of Naturalistic Decision-Making Research and Applications to Emerging Defense Challenges" (Arlington, VA: Office of Naval Research, July 29, 2015).

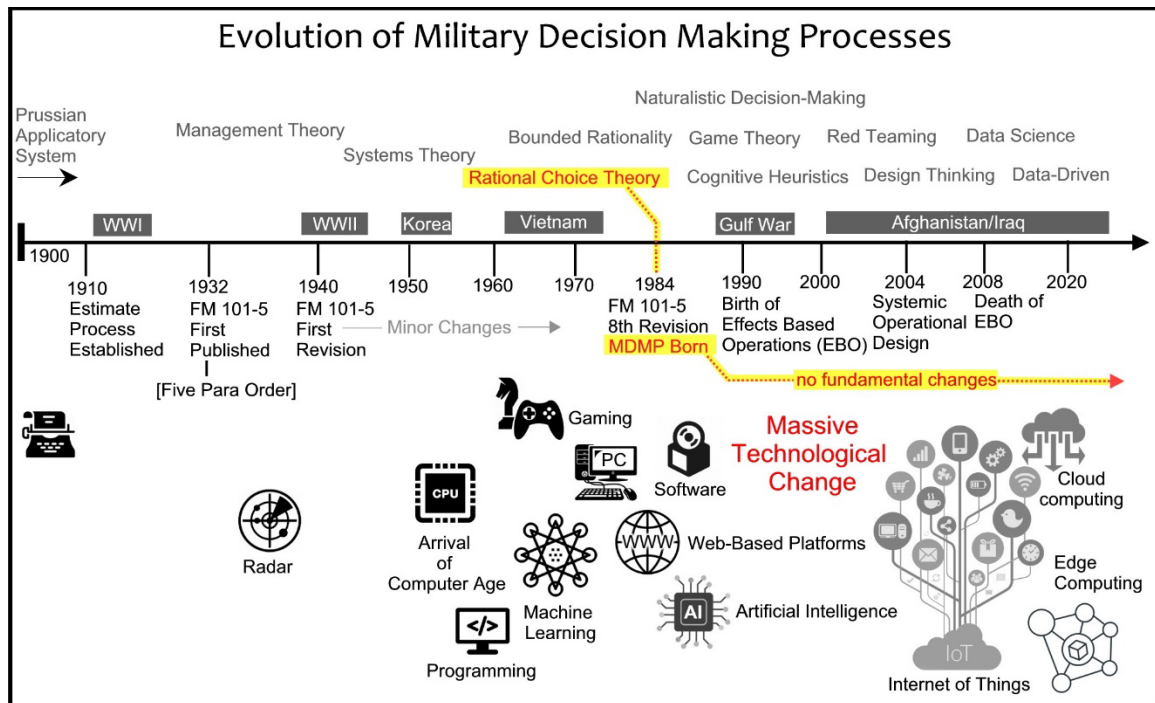


Figure 2. Evolution of U.S. military decision-making timeline. *Source:* Created by author. Adapted from information covered in literature review.

Naturalistic decision-making was a break from the classical (i.e., rational choice) decision-making theory. A leader in this field, Gary Klein, created a process for people making decisions under pressure and with uncertainty called *recognition prime decision-making* (RPD).²⁹ In a seminal article, “Strategies of Decision Making” in *Military Review*, Klein introduces this theory to the U.S. military.³⁰ In difference to rational choice theory, RPD combines intuition with rapid analysis and relies upon a practitioner’s experience to recognize patterns to generate a course of action (COA). The practitioner runs a mental simulation of a possible approach and, if workable, executes it

²⁹ Klein, *Sources of Powers*, 15-31, 99-108.

³⁰ Gary Klein, “Strategies of Decision Making,” *Military Review* 69, no. No. 5 (May 1989): 56–

immediately. The research shows that most experienced practitioners land on a viable COA and typically do not need multiple COAs.³¹

Advocates of maneuver warfare in the U.S. Marine Corps have made the most significant push for adopting the RPD process. The so-called “maneuverists” were at odds with the conventional wisdom which privileged the MDMP and MCPP approach for all things planning. These divergent thinkers “favored an approach that was based on the personal knowledge, judgment, and ingenuity of the commander” over the existing practice, which was overly scientific, slow, and made decisions based on the rational choice process.³²

The nature of decision-making has a symbiotic relationship with the nature and culture of command. Both will have to change together to match changes in society, technology, and the character of war. Like the slow and minimalist change to decision-making processes, command has had a sluggish evolution and, in some cases, gone backward regarding effectiveness and efficiencies.

Command Theory

The literature on command is vast, and few great commanders loom large, like Napoleon, the God of War.³³ His advice was to “Read and reread the campaigns of Alexander, Hannibal, Caesar, Gustavus Adolphus, Turenne, Eugene, and Frederick; take them for your model, that is the only way of becoming a great captain, to obtain the

³¹ Hoffman, “Accomplishments of Naturalistic Decision-Making Research and Applications to Emerging Defense Challenges.”

³² Marinus, “On Decision Making: Maneuverist Paper No. 17,” 78.

³³ Napoleon gets his *nom de guerre* from Carl von Clausewitz in *On War*, Translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984) 583, and see Napoleon argued as the zenith of command in Martin van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985) 62-102 and Anthony King, *Command: The Twenty-First Century General* (Cambridge, UK: Cambridge University Press, 2019) 2-3.

secrets of the art of war.”³⁴ Expressed this way, Napoleon emphasized the importance of the human in command. Even the great master, Carl von Clausewitz, studied Napoleon and, criticizing Bülow (and, to some extent, Jomini), argued against prescriptive systems for command.³⁵

In an essay, Clausewitz once wrote “there must be no conflict between common sense and sound theory since sound theory rested on common sense and genius, or gave them expression.”³⁶ The definition of what Clausewitz meant by terms like *genius* and *fog of war* is still debated today.³⁷ For the latter, it is commonly understood by many that he meant “intuition” and for the former, fog and friction, “uncertainty.”³⁸ It follows then that judgment and mental agility are essential for command.

Martin van Creveld’s landmark book, *Command in War*, was a first of its kind to study command as a system.³⁹ John Keegan came before van Creveld, but his treatment of command was like that of Napoleon. Keegan studied Alexander the Great, the Duke of Wellington, Ulysses. S. Grant, and Adolph Hitler to form castes of leadership types.⁴⁰ Command’s purpose, von Creveld put simply, was to aid in decision-making. Therefore, he identified its function and output. He highlights that command encompasses control and communications to coordinate the direction of forces.⁴¹

³⁴ B.H. Liddell Hart, *Scipio Africanus: Greater Than Napoleon* (London, UK: Da Capo Press, 1926) 248.

³⁵ Peter Paret, “The Genesis of On War,” in *On War* (Princeton, NJ: Princeton University Press, 1984) 3-25.

³⁶ Paret, “The Genesis of On War,” 12.

³⁷ Antulio J. Echevarria II, *Clausewitz and Contemporary War* (Oxford, UK: Oxford University Press, 2007) 29-31 and Jim Storr, *Something Rotten: Land Command in the 21st Century* (Havant, UK: Howgate Publishing Limited, 2022) 27-28.

³⁸ For intuition see Storr, *Something Rotten: Land Command in the 21st Century* and Echevarria II, *Clausewitz and Contemporary War*; For uncertainty debate see Katherine L. Herbig, “Chance and Uncertainty in On War,” *Journal of Strategic Studies* 9 (1986): 95–116.

³⁹ Martin van Creveld, *Command in War* (Cambridge MA: Harvard University Press, 1985).

⁴⁰ John Keegan, *The Mask of Command* (London, UK: Pimlico, 1999).

⁴¹ Martin van Creveld, *Command in War*, 1-16.

Building on van Creveld's command system, Norman Dixon highlights the importance of good decision-making but accentuates the significance of command execution in practice.⁴² He finds the British Army's repeated failures were the result of anti-intellectualism, arrogance, and, most importantly, an inability to adjust to when the situation demanded. Tom Ricks captured a similar legion of failure in U.S. generals.⁴³

Ricks argued the breakdown of command and bad generalship was due to the reluctance of senior civilian and military leaders to relieve generals. Unlike the system established with General George Marshall in the Second World War, the post-9/11 era has been plagued with individual and structural problems. General Anthony Zinni claims the traditional vertically integrated organization model has become obsolete.⁴⁴ It is networks and "participatory leadership" that are required for modern command.⁴⁵

General Stanley McChrystal shares this view and calls for a "team of teams" approach.⁴⁶

After years of combat experience leading special operations forces, McChrystal explored the evolution of command from Maxwell Taylor's work on efficiency in the industrial age to modern-day complexity in fighting adaptive enemies. One of his principal arguments is that commanders need to power down and build "shared consciousness." His popular thesis was for organizations to operate like a web of networks with commanders serving as a central node.⁴⁷

⁴² Norman F. Dixon, *On the Psychology of Military Incompetence* (New York: Basic Books, 1976).

⁴³ Thomas E. Ricks, *The Generals: American Military Commanders from World War II to Today* (New York: Penguin Press, 2012).

⁴⁴ Anthony Zinni and Tony Koltz, *Leading the Charge: Leadership Lessons From the Battlefield to the Boardroom* (London: Palgrave Macmillan, 2009) 51, .

⁴⁵ King, *Command: The Twenty-First Century General*, 9.

⁴⁶ Stanley McChrystal et al., *Team of Teams: New Rules of Engagement for a Complex World* (New York: Penguin Press, 2015).

⁴⁷ McChrystal et al., *Team of Teams*, 265-266.

Eitan Shamir and Anthony King build on McChrystal's thesis and emphasize command is a collaborative effort.⁴⁸ Specifically, King argues the increasing complexity and demands of commanders make it more of a "collective command" over an individualistic practice.⁴⁹ Sir Lawrence Freedman's review of King's book questions this premise of individual or collective.⁵⁰ He claims this is a false choice, and it is unclear why there is any real difference since a commander can delegate authority and empower others if he chooses to do so.

Freedman added his book, *Command*, to the subject literature and simply defines command as authoritative orders. Moreover, there is only one commander. He argues that commanders should not take for granted their authority and need to build trust and leverage informal networks to employ systems effectively.⁵¹ The failure to deploy command systems effectively is studied comprehensively by Dr. Jim Storr.

In *Something Rotten*, Storr takes a contrarian view to King and many others on command. Storr makes three simple propositions: (1) modern headquarters are too big, (2) the orders they produce are too long, and (3) they take too long to produce them. His decades-long research found unanimous agreement from interviews and surveys of senior and middle-ranking officers. Moreover, Storr also finds that information technology worsens command systems' ability to manage, sort, and analyze information. This same

⁴⁸ Eitan Shamir, *Transforming Command: The Pursuit of Mission Command in the British and Israeli Armies* (Stanford, CA: Stanford University Press, 2011); King, *Command: The Twenty-First Century General*.

⁴⁹ King, *Command: The Twenty-First Century General*, 18.

⁵⁰ Lawrence Freedman, "Command: Individual or Collective? A Review of Anthony King's *Command: The Twenty-First-Century General*," *International Journal of Politics, Culture, and Society*. Volume 33 (2020) 105-111.

⁵¹ Lawrence Freedman, *Command: The Politics of Military Operations from Korea to Ukraine* (New York: Oxford University Press, 2022) 515.

finding was identified twenty-five years ago in a NATO workshop on *The Human in Command*.

Canadian Brigadier General Stanley Cherrie warned, “our modern computer tools—Excel spreadsheets, PowerPoint presentations, and so on—have caused this unreasonable desire for perfection...it is now out of control in our army, where it ties our combat unit staffs in knots.”⁵² With little to no change in decades, there is indeed *Something Rotten* with command in the twenty-first century, as Jim Storr suggests.⁵³

The Intersection of Theory and Practice

This final segment of this section will thresh the grist from the chaff to identify a key gap in current command and decision-making processes. For decision theory and ideal decision-making processes, it is less of a challenge of choice as it is about balance. The current dominant method of rational choice theory and its associated planning processes (e.g., MDMP and MCPP) have stayed the same since the 1960s. The naturalistic decision-making process with RPD shows promise but has failed to gain full adoption by any institution in the military. Commanders and staff need the ability to think and plan, fast and slow. Cognitive psychologists categorized these two corresponding parts of the brain as system 1 and system 2.⁵⁴

⁵² Stanley Cherrie, “The Human in Command: A Personal View,” in *The Human in Command: Exploring the Modern Military Experience* (New York, NY: Kluwer Academic/Plenum Publishers, 2000) 27.

⁵³ Storr, *Something Rotten: Land Command in the 21st Century* and for similar line thinking see Søren Sjøgren, “What Military Commanders Do and How They Do It: Executive Decision Making in the Context of Standardised Planning Processes and Doctrine,” *Scandinavian Journal of Military Studies* 5, no. 1 (November 15, 2022): 379–97.

⁵⁴ Daniel Kahneman, *Thinking, Fast and Slow* (New York, NY: Farrar, Straus, and Giroux, 2011) 19.

Kahneman defined System 1 as the mode of thinking that is fast, intuitive, effortless, and instinctive. System 2 is the rational, slow, analytical, and effortful.⁵⁵

Howard Margolis, however, found there is not a clean and separable line between intuitive and analytical thinking. Quoting F. Scott Fitzgerald, Jon Lewis Gaddis agrees with Margolis and reminds, “The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.”⁵⁶

Military professionals need a rational and deliberate process to think and analyze all the necessary factors and details of a campaign plan. Equally, they need the ability to make decisions intuitively and fight at a speed of relevance with flexibility against a thinking enemy who always gets a vote in the conduct of battle. The closest adoption of a naturalistic decision-making process and RPD system came from the US Marine Corps maneuverists. They warned of effortful and useless synchronization matrices that attempted to account for everything, between heaven and earth, in a phased operation that would entail hundreds, if not thousands, of variables.

The sunken cost of investing and building comprehensive plans results in units routinely fighting their plan rather than fighting the enemy in a rapidly changing environment. Patton warned of this tendency when he advised, “one does not plan and then try to make circumstances fit those plans. One tries to make plans fit the circumstances.”⁵⁷ This links to the challenges of modern-day command systems. Large

⁵⁵ Daniel Kahneman, *Thinking, Fast and Slow*, 19-30.

⁵⁶ F. Scott Fitzgerald quote in John Lewis Gaddis, *On Grand Strategy* (New York, NY: Penguin Press, 2018) 20-21.

⁵⁷ George S. Patton, *War As I Knew It* (New York, NY: Houghton Mifflin Harcourt Publishing Company, 1947) 116.

staffs with attendant processes and information systems get consumed with product development, sacrificing speed for perfection.

The fundamental challenge with this singular approach is that it betrays the nature of how humans predominantly think and decide 90 percent of the time. This is especially true for decisions made in uncertain, dynamic, and time-constrained environments. These are the situations military professionals routinely encounter in and out of combat. Thus, this intuitive decision-making method requires experience and begs the question: how do military leaders expand their base of experience outside of combat to hone intuition and military judgment?

In his seminal book, *On War*, Clausewitz pointed out *coup d'oeil* the “the rapid recognition of a truth,” was the marvel of great leaders.⁵⁸ Many scholars of Clausewitz view this French term as intuitive insight or understanding. Historically, this is gained through combat experience, but today, those conditions can be manufactured in highly accurate games and simulations. A key gap in military command systems is a rapid decision-making process to test leader’s *coup d'oeil* under time compressed situations.

In sum, decision processes and command approaches have been primarily concerned with mastering a linear, reductive, and unnatural process that is slow, cumbersome, and unsuitable in an age of strategic compression. Time and, more importantly, tempo are dominant parameters in war. They both suffer with current methods and the poor integration of information technology limits human performance. The thousands of hours spent on spreadsheets and PowerPoint slides steal valuable time from commanders and staffs at all levels. The faith placed in software and analytical

⁵⁸ Antulio J. Echevarria II, *Clausewitz & Contemporary War* (Oxford, UK: Oxford University Press, 2007), 29.

process is misplaced and neglects the most powerful processor on the planet: the human mind. Mattis reminds that these six inches between one's ears are the most important element on any battlefield.⁵⁹ Are there biological ways to improve the human mind and hone military intuition? The next section explores how A.I. and gaming address this question.

⁵⁹ Frank Miniter, "The Surprising Thing About Gen. 'Mad Dog' Mattis That Could Add A Manly Dose To American Culture," *Forbes*, December 5, 2016, <https://www.forbes.com/sites/frankminiter/2016/12/05/the-surprising-thing-about-gen-mad-dog-mattis-that-could-add-a-manly-dose-to-american-culture/>.

Part 2: The Rise of A.I. and Gaming

“The power of advanced algorithmic warfare systems is now so great that it equates to having tactical nuclear weapons against an adversary with only conventional ones.”

—Alex Karp⁶⁰

There is an understandable hype about A.I. and machine learning. It has enabled health professionals to diagnose more accurately conditions such as heart disease and cancer, transformed banking and finance sectors, and enabled self-driving vehicles.⁶¹ The benefits seem limitless and A.I. will change the character of war though not in ways most imagine.⁶² True, A.I. is helping militaries with predictive maintenance, drone surveillance management, and the compression of kill chains.⁶³ Yet, despite the promise of A.I., military bureaucracy, organizational culture, and the human factor, limit its full transformational potential.⁶⁴

⁶⁰ David Ignatius, “How the Algorithm Tipped the Balance in Ukraine,” *Washington Post*, December 19, 2022, <https://www.washingtonpost.com/opinions/2022/12/19/palantir-algorithm-data-ukraine-war/>.

⁶¹ Robert J. H. Miller et al., “Mitigating Bias in Deep Learning for Diagnosis of Coronary Artery Disease from Myocardial Perfusion SPECT Images,” *European Journal of Nuclear Medicine and Molecular Imaging* 50, no. 2 (January 1, 2023): 387–97, <https://doi.org/10.1007/s00259-022-05972-w>; Ananya Singh et al., “Direct Risk Assessment From Myocardial Perfusion Imaging Using Explainable Deep Learning,” *JACC: Cardiovascular Imaging* 0, no. 0 (n.d.), <https://doi.org/10.1016/j.jcmg.2022.07.017>; Nicholas Otieno, “The Future of Role of AI in Finance,” *World Finance*, February 1, 2022, <https://www.worldfinance.com/markets/the-future-role-of-ai-in-finance>.

⁶² Jensen, Whyte, and Cuomo, *Information in War: Military Innovation, Battle Networks, and the Future of Artificial Intelligence*; Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order* (New York, NY: Harper Business, 2018).

⁶³ Eric McCoy, “Sustainment Revolution: Implications of Artificial Intelligence for Army Sustainment,” www.army.mil, July 22, 2020, https://www.army.mil/article/237343/sustainment_revolution_implications_of_artificial_intelligence_for_army_sustainment; Felicity Jones, “Project Maven: Machine Learning in the Military Target Selection Process,” *Harvard Technology and Operations Management* (blog), November 13, 2018, <https://d3.harvard.edu/platform-rctom/submission/project-maven-machine-learning-in-the-military-target-selection-process/>; Christian Brose, *The Kill Chain: Defending America in the Future of High-Tech Warfare* (New York, NY: Hachette Books, 2020).

⁶⁴ Changes to defense policy are shifting to overcome some of these challenges with Michael C. Horowitz leading as the director of the DOD’s Emerging Capabilities Office. See the recent policy change in Office of the Under Secretary of Defense for Policy, “DOD Directive 3000.09 Autonomy in Weapon Systems” (Washington D.C.: Department of Defense, January 25, 2023), accessed January 31, 2023, <https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodd/300009p.pdf>; and Michael C Horowitz

Equally on the rise, gaming technology has the propensity to change the way militaries train for and simulate warfare. Thousands of military gamers are working to upend traditional models of training, education, and analysis in government and defense organizations.⁶⁵ If the last century was defined by the power of motion pictures and the moving image, the twenty-first century replaces these linear media experiences with the interactive power of gaming. Games generate powerful stories, experiences, and most importantly, data. There is enormous potential in gaming through the unfettered collection of learning data, which can feed into A.I. applications.

The combination of gaming and A.I. technologies can address the issues of command and decision-making highlighted in the introduction, with a focus on 3-star general officer level headquarters and below. These are the warfighting units that will have to keep pace with an information flow that is real-time and saturated. Commanders and their staffs will have to apply networked automation to effectively train for and fight future battles.⁶⁶ This will be the scope of this section and begins with debunking strong myths, followed by a cursory review of adversary efforts, and closes with a theory of how to integrate these technologies for strategic effect.

and Erik Lin-Greenberg, "Algorithms and Influence Artificial Intelligence and Crisis Decision-Making," *International Studies Quarterly* 66, no. 4 (December 1, 2022): sqac069, <https://doi.org/10.1093/isq/sqac069>; Michael C. Horowitz, "Artificial Intelligence, International Competition, and the Balance of Power," Texas National Security Review, May 15, 2018, <https://tnsr.org/2018/05/artificial-intelligence-international-competition-and-the-balance-of-power/>.

⁶⁵ Nicholas Moran and Arnel P. David, "Why Gamers Will Win the Next War," *Modern War Institute*, June 30, 2022, <https://mwi.usma.edu/why-gamers-will-win-the-next-war/>.

⁶⁶ Richard Hart Sinnreich, "Variables and Constants: How the Battle Command of Tomorrow Will Differ (or Not) from Today's," in *Battle of Cognition* (Westport, CT: Praeger Security International, 2008) 29.

Myth Busting

Senior military leaders need to have realistic expectations for A.I. and gaming. To put things into context it is worth noting this phenomenon of combining operational games with strategic decision exercises and system A.I. agents is not new.⁶⁷ These methodologies have been around since the 1980s.⁶⁸ What is new and powerful is the advancement of large language models (LLM). Billions of dollars of investment are going into LLM research and development.⁶⁹ These are deep learning algorithms which can recognize, summarize, translate, predict, and generate text and other content based on knowledge gained from large datasets.⁷⁰ The popular ChatGPT-3 (generative pre-trained transformer, third generation) is one of these LLM technologies by OpenAI.⁷¹

The future of LLM technologies is unknown but they are currently bounded by specific use cases and tasks. They can be trained to answer questions from massive datasets and perform faster than humans and their cognition, but they are still unable to penetrate the fog of war.⁷² There are generals who believe there is a possibility that A.I. applications can simulate all possible courses of action for battles and provide the best

⁶⁷ Paul K. Davis et al., *Analytic War Gaming with the RAND Strategy Assessment System (RSAS)* (Santa Monica, CA: RAND Corporation, 1987).

⁶⁸ Paul K. Davis, *Game-Structured Analysis as a Framework for Defense Planning* (Santa Monica, CA: RAND Corporation, 1985); Paul K. Davis, Steven C. Bankes, and James P. Kahan, *A New Methodology for Modeling National Command Level Decisionmaking in War Games and Simulations* (Santa Monica, CA: RAND Corporation, 1986).

⁶⁹ Eric Schmidt, “The Importance of Winning AI Strategic Competition” (San Francisco Symposium, Redwood City, CA, May 11, 2022), <https://www.youtube.com/watch?v=7XqQZf09O-U&list=LL&index=2>.

⁷⁰ Angie Lee, “What Are Large Language Models Used For and Why Are They Important?,” *NVIDIA Blog* (blog), January 26, 2023, <https://blogs.nvidia.com/blog/2023/01/26/what-are-large-language-models-used-for/>.

⁷¹ Henry A. Kissinger, Eric Schmidt, and Daniel Huttenlocher, *The Age of AI and Our Human Future* (New York, NY: Little, Brown and Company, 2021); “OpenAI,” OpenAI, accessed January 31, 2023, <https://openai.com/>.

⁷² Bill Owens and Ed Offley, *Lifting the Fog of War* (Baltimore, MD: The John Hopkins University Press, 2001); Jensen, Whyte, and Cuomo, *Information in War: Military Innovation, Battle Networks, and the Future of Artificial Intelligence*.

choices against a thinking adversary.⁷³ Unlike chess and the game of Go, the battlefield is replete with variables and no algorithm or intelligent machine can account for what exactly a thinking adversary might do, let alone exercise human-like judgment. Smoke, explosive debris, and other non-predictable patterns on battlefields will disrupt learning models.⁷⁴ Most A.I. applications perform bounded tasks in a controlled environment and are unable to scale to commander-driven problem framing and rapid decision-making that involves complex problem sets. Searching for A.I. solutions to solve these types of tasks throws sand in the gears of transformational progress. Lead A.I. researchers warn of this pursuit.

In *The Myth of Artificial Intelligence*, Erik J. Larson warns the path to artificial general intelligence (AGI) is currently non-existent and worse, consequences of chasing this myth “tends to extinguish the very culture of invention necessary for real progress.”⁷⁵ Judea Pearl supports this claim, and his “ladder of causation” shows machines are unable to bridge from associating data points to knowledge of the causal structure of the real world. In other words, machines are unable to achieve humanlike intelligence and should be viewed as an enabler.⁷⁶ Similar to electricity and the combustion engine, A.I. and gaming are “enabling” technologies which can both be used to create organizational change.⁷⁷

⁷³ Interviews with U.S. Army and U.S. Marine Corps officers, October 2022, Quantico, VA. Names are withheld to protect the privacy of actively serving officers.

⁷⁴ Slack conversation with U.S. Space Force officer, 28 January 2023. Name is withheld to protect the privacy of an actively serving officer.

⁷⁵ Erik J. Larson, *The Myth of Artificial Intelligence: Why Computers Can't Think the Way We Do* (Cambridge, MA: The Belknap Press of Harvard University Press, 2021) 3.

⁷⁶ Kissinger, Schmidt, and Huttenlocher, *The Age of AI and Our Human Future*.

⁷⁷ Horowitz, “Artificial Intelligence, International Competition, and the Balance of Power.”

Gaming is key to enabling and complementing A.I. applications because it can provide large data sets to train algorithms.⁷⁸ This can lead to improved decision-support tools that free up time and space for commanders, at echelon, to focus on generating novel and creative approaches. This is where human-machine partnerships can make a profound departure from previous experience.⁷⁹ Consequently, the military needs to overcome myths associated with gaming technology to unlock its full potential. Most military professionals consider (war)gaming the activity that is used to conduct course of action analysis and dismiss the value of commercially available digital and analog games.⁸⁰ A government report finds the DOD's gaming resources are misaligned, lack coherence for gaming activities, and ineffectively manage gaming data.⁸¹

There is a strong stigma that games are for entertainment and *play*.⁸² Leaders view play as the opposite of work, but leading psychologists claim the opposite of play is,

⁷⁸ Benjamin Jensen, Scott Cuomo, and Chris Whyte, "Wargaming with Athena: How to Make Militaries Smarter, Faster, and More Efficient with Artificial Intelligence," *War on the Rocks*, June 5, 2018, <https://warontherocks.com/2018/06/wargaming-with-athena-how-to-make-militaries-smarter-faster-and-more-efficient-with-artificial-intelligence/>; Benjamin Jensen, "Welcome to Fight Club: Wargaming the Future," *War on the Rocks*, January 4, 2019, <https://warontherocks.com/2019/01/welcome-to-fight-club-wargaming-the-future/>; Jon Hawkes, "Executive Orders: Increasing Wargaming's Acceptance and Accessibility," *Janes International Defence Review*, December 2021.

⁷⁹ Kissinger, Schmidt, and Huttenlocher, *The Age of AI and Our Human Future*, 25.

⁸⁰ Center for Army Lessons Learned, "How to Master Wargaming: Commander and Staff Guide to Improving Course of Action Analysis" (Fort Leavenworth, KS: U.S. Army Combined Arms Center, 2020), <https://api.army.mil/e2/c/downloads/2023/01/31/bf65892d/20-06-how-to-master-wargaming-public.pdf>; Sebastian Joon Bae and Paul M. Kearney, "Use Wargaming to Sharpen the Tactical Edge," *The RAND Blog Commentary* (blog), March 8, 2021, <https://www.rand.org/blog/2021/03/use-wargaming-to-sharpen-the-tactical-edge.html>.

⁸¹ Cary Russell, "Defense Analysis: Additional Actions Could Enhance DOD's Wargaming," A report to the Committee on Armed Services, House of Representatives (Washington D.C.: Government Accountability Office, April 24, 2023), <https://www.gao.gov/assets/gao-23-105351.pdf>.

⁸² There is a large body of literature on this subject. See Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (London, UK: Routledge & Kegan Paul Ltd, 1949); Alexander Lambrow, "The Seriousness of Play: Johan Huizinga and Carl Schmitt on Play and the Political," *Games and Culture* 16, no. 7 (2021): 820–34.

depression.⁸³ Games evoke positive emotion and sharpen the mind.⁸⁴ The United States Intelligence Advanced Research Projects Activity (IARPA) has researched how gaming can mitigate cognitive biases that affect decision-making and intelligence analysis.⁸⁵ Studies show that games-based learning increases a gamer's capacity for *sensemaking*.⁸⁶

To benefit from gaming and A.I. the military must overcome these myths and breakdown the most formidable barrier to change, which is culture. Traditional mindsets and existing ways of working run counter to those needed to obtain a transformational change. If the U.S. military and her allies want to create advantage in this digitally disruptive era, they will need to nurture methods that enable humans and machines to work better together rather than in isolation. Competitor nations are making a strong attempt to do just that.

Competitor Approaches to A.I. and Gaming

The Chinese government wants to “lead the world” in A.I. by 2030.⁸⁷ President Putin claims the nation that leads in A.I. “will be the ruler of the world.”⁸⁸ In 2018,

⁸³ Jane McGonigal, *Reality Is Broken* (London, UK: Random House, 2011) 15.

⁸⁴ Brian Burke, *Gamify: How Gamification Motivates People to Do Extraordinary Things* (Brookline, MA: Bibliomotion, Inc., 2014) 9-29.

⁸⁵ Intelligence Advanced Research Projects Agency, “IARPA - Sirius,” Office of the Director of National Intelligence, Sirius Research Program, accessed January 18, 2023, <https://www.iarpa.gov/index.php/research-programs/sirius/baa/questions?highlight=WyJidXQiLCJzb21liwiaW4iLCJidXQgc29tZSIsImJldCBzb21lIGluIiwic29tZSBpbjJd>.

⁸⁶ Kristan J. Wheaton, “Teaching Strategic Intelligence Through Games,” *International Journal of Intelligence and Counterintelligence* 24, no. 2 (March 9, 2011): 367–82; Kristan J. Wheaton and Melonie K. Richey, “Game-Based Learning and Intelligence Analysis: Current Trends and Future Prospects,” *E-International Relations*, August 7, 2013, <https://www.e-ir.info/2013/08/07/game-based-learning-and-intelligence-analysis-current-trends-and-future-prospects/>.

⁸⁷ Graham Webster et al., “China’s Plan to ‘Lead’ in AI: Purpose, Prospects, and Problems,” *New America*, accessed January 16, 2023, <http://newamerica.org/cybersecurity-initiative/blog/chinas-plan-lead-ai-purpose-prospects-and-problems/>.

⁸⁸ James Vincent, “Putin Says the Nation That Leads in AI ‘Will Be the Ruler of the World,’” *The Verge*, September 4, 2017, <https://www.theverge.com/2017/9/4/16251226/russia-ai-putin-rule-the-world>.

Russia built a wargaming center to train generals for large-scale combat operations.⁸⁹ They used high-tech command simulators that integrate A.I. built from friendly and enemy force data.⁹⁰ The focus on general officers neglected lower level leadership as evidenced by their poor performance in the Ukraine.⁹¹ While Russia attempts to improve in this space, China is taking a more holistic approach.

In difference to the West, China is less bureaucratic with its approach. They merge statecraft, warcraft, and all aspects of society to pursue the ends of the state (i.e., the Chinese Communist Party).⁹² The investment in A.I. combined with growth in the gaming industry, is driving massive change in China.⁹³ The U.S. National Security Commission on A.I. acknowledged China as a strategic competitor in A.I. where it is leading the world in several areas.⁹⁴ One of which is “intelligentized war,” where China seeks to use algorithmic warfare to improve logistics, procurement, and training.⁹⁵

⁸⁹ Aleksandr Kruglov, “A Center for War Games Has Been Created for Generals. There They Can Train to Deploy a Battle Front or to Conduct a Major-Scale Military Operation,” *Izvestiya Online*, July 31, 2018; P.A. Dul’nev, A.P. Kolesnichenko, and A.V. Kotov, “A Promising Set of Programs for Modeling an Operation. Development and Improvement Experiences,” *Vestnik Akademii Voennykh Nauk (Journal of the Academy of Military Science)*, 2018, 31; Russian unattributed commentary, “Russian General Staff Academy Gets a Multimedia War Game Center,” *Lenta.ru*, March 24, 2017.

⁹⁰ Department of Information and Mass Communications, “General Staff Military Academy Graduating Students Participated in Command and Staff Wargame,” *Russian Federation Defence Ministry*, April 10, 2017; Kruglov, “A Center for War Games Has Been Created for Generals. There They Can Train to Deploy a Battle Front or to Conduct a Major-Scale Military Operation.”

⁹¹ Jake Epstein, “Putin’s Troops Are Performing ‘So Poorly’ in Ukraine Right Now That Many Russian Volunteers Are Refusing to Go into Combat,” *Business Insider*, September 20, 2022, <https://www.businessinsider.com/putins-troops-fight-ukraine-so-poorly-russian-volunteers-refuse-combat-2022-9>; Brian Frydenborg, “The Depth and Breadth of Russia’s Losing,” *Small Wars Journal*, January 16, 2023, <https://smallwarsjournal.com/jrnl/art/depth-and-breadth-russias-losing>.

⁹² Mark McNeilly, *Sun Tzu and the Art of Modern Warfare* (New York, NY: Oxford University Press, 2001) 5-10.

⁹³ For a collective review of A.I. and gaming efforts in China see Steffi Noël, “Artificial Intelligence in China’s Video Games: Opportunities for Businesses?,” Daxue Consulting - Market Research China, July 31, 2019, <https://daxueconsulting.com/artificial-intelligence-video-games-china/>.

⁹⁴ Eric Schmidt et al., “National Security Commission on Artificial Intelligence” (National Security Commission on Artificial Intelligence, April 22, 2021), <https://www.nscai.gov/>.

⁹⁵ Sara Hsu, “China and Artificial Intelligence,” *The Diplomat*, April 2021, <https://thediplomat.com/2021/04/china-and-artificial-intelligence/>.

Chinese generals once worried about the lack of combat experience of their soldiers as compared to their U.S. counterparts.⁹⁶ However, they are now developing new ways to train warfighters based on lessons from commercial gaming.⁹⁷ The A.I. defeat of the world's best *Starcraft* players is a harbinger of what is to come with increasingly more complex games training bots to partner with and assist humans.⁹⁸

DeepMind's A.I. bot, AlphaStar, developed its behavior from a deep neural network of algorithms conducting supervised learning of large data sets. In a two-week period, AlphaStar was able to play previously trained agents to gain the equivalent of 200 years of practice.⁹⁹ AlphaStar was able to make quick tactical decisions and employed novel strategies in heated battles against professional players. The implications of this capability are far reaching.¹⁰⁰

Mastered properly, the Chinese could off-set U.S. advantages of combat experience through human and machine collaboration. Taking this approach, China can “leapfrog” to new concepts and capabilities that are superior, cheaper, and asymmetric while the U.S. continues to invest in fewer, expensive, and exquisite platforms.¹⁰¹ The

⁹⁶ Timothy R. Heath, “China’s Military Has No Combat Experience: Does It Matter?,” RAND, *The RAND Blog Commentary* (blog), November 27, 2018, <https://www.rand.org/blog/2018/11/chinas-military-has-no-combat-experience-does-it-matter.html>; Elsa Kania, “Battlefield Singularity” (Washington D.C.: Center for a New American Security, November 2017), 28, <https://www.cnas.org/publications/reports/battlefield-singularity-artificial-intelligence-military-revolution-and-chinas-future-military-power>.

⁹⁷ Noël, “Artificial Intelligence in China’s Video Games.”

⁹⁸ Timothy B. Lee, “An AI Crushed Two Human Pros at StarCraft—but It Wasn’t a Fair Fight,” *Ars Technica*, January 30, 2019, <https://arstechnica.com/gaming/2019/01/an-ai-crushed-two-human-pros-at-starcraft-but-it-wasnt-a-fair-fight/>.

⁹⁹ Timothy Lee, “An AI Crushed Two Human Pros at StarCraft.”

¹⁰⁰ For another example of this capability, learn about developments with Meta A.I.’s Cicero playing and winning the game *Diplomacy* see Pranshu Verma, “Meta’s New AI Is Skilled at a Ruthless, Power-Seeking Game,” *Washington Post*, December 12, 2022, <https://www.washingtonpost.com/technology/2022/12/01/meta-diplomacy-ai-cicero/>; Gary Marcus and Ernest Davis, “What Does Meta AI’s Diplomacy-Winning Cicero Mean for AI?,” Substack newsletter, *The Road to AI We Can Trust* (blog), November 25, 2022, <https://garymarcus.substack.com/p/what-does-meta-ais-diplomacy-winning>.

¹⁰¹ Christian Brose, *The Kill Chain: Defending America in the Future of High-Tech Warfare*.

key difference is the willingness to trust algorithms and employ them in ways the West has yet to consider. The Chinese can train their leaders with AI-enabled bots to establish trust and gain assistance with decision-making, for greater speed and precision. The question is whether they will be empowered to do so with a military culture that is overly hierarchical and controlling.¹⁰² In the West, a bottom-up approach, empowering leaders to experiment with gaming and A.I., could lead to a war-winning system.

Integrating A.I. and Gaming from the Bottom-Up

“Because Joint Force operations increasingly rely on data-driven technologies and integration of diverse data sources, the Department will implement institutional reforms that integrate our data, software, and artificial intelligence efforts and speed their delivery to the warfighter.” —2022 National Defense Strategy¹⁰³

The *National Security Commission on Artificial Intelligence* warn the U.S. armed forces’ “competitive military-technical advantage could be lost within the next decade if they do not accelerate the adoption of A.I. across their missions.”¹⁰⁴ The key to adoption will be marrying top-down leadership with bottom-up innovation to scale relevant A.I. applications across the Joint Force. One way to do this rapidly is to play games.

In the United Kingdom, a small group of military officers created a wargaming experimentation group called “UK Fight Club” to play test and integrate commercial games into military use.¹⁰⁵ They discovered with this effort that there is untapped gaming

¹⁰² Taco C. R. van Someren and Shuhua van Someren-Wang, “Chinese Culture, Strategy, and Innovation,” in *Innovative China: Innovation Race Between East and West* (Berlin, Heidelberg: Springer Berlin Heidelberg, 2013), 27–56, https://doi.org/10.1007/978-3-642-36237-8_2; Ben Lowsen, “A Comparison of Chinese and American Military Culture,” *The Diplomat* (blog), June 16, 2016, <https://thediplomat.com/2016/06/a-comparison-of-chinese-and-american-military-culture/>.

¹⁰³ *2022 National Defense Strategy of the United States of America* (Washington D.C.: Department of Defense, October 2022) 19.

¹⁰⁴ Schmidt et al., *National Security Commission on Artificial Intelligence*, 9.

¹⁰⁵ Hawkes, “Executive Orders: Increasing Wargaming’s Acceptance and Accessibility.”

talent, unexploited gaming data, and underappreciated gaming methods within defense and government.

The generations of youth entering the military have a 21st century mindset and are commonly referred to as “digital natives.”¹⁰⁶ Many of them are gamers. Their mastery of digital technology and pre-military educational experiences need to inform changes to the future learning environment or risk squandering resident intellectual capacity.¹⁰⁷ UK Fight Club gave gamers a platform to engage and discuss warfare across the entire spectrum of conflict and competition.¹⁰⁸ Talented participants cultivated a safe-to-fail environment where gaming innovations thrived and new ways to fight were discovered.¹⁰⁹ The UK Fight Club effort was unearthing creative and critical thinking modern-day Ender Wigginses inside and outside the government.¹¹⁰ Equally valuable was the data they were generating.

Data is the new oil for A.I.¹¹¹ Games generate thousands of lines of code which can be used for machine learning algorithms and analysis. Andrew Elliott of the Defence, Science, and Technology Laboratory (Dstl) and cofounder of UK Fight Club developed

¹⁰⁶ Liston Bailey, “Digital Natives, Media and Learning: Implications for the Future of Army Training,” *Military Review*, May 27, 2016, <https://www.armyupress.army.mil/Journals/Military-Review/Online-Exclusive/2016-Online-Exclusive-Articles/Digital-Natives-Media-and-Learning/>.

¹⁰⁷ Patricia Boyd, “Bloggging in the Classroom: Using Technologies to Promote Learner-Centered Pedagogies,” *Researcher: An Interdisciplinary Journal* 26, no. 3 (Fall 2013): 85–113.

¹⁰⁸ Hawkes, “Executive Orders: Increasing Wargaming’s Acceptance and Accessibility.”

¹⁰⁹ Mad Scientist Laboratory, “UK Fight Club – Gaming the Future Army,” *The Convergence*, 2020, <https://madsciblog.tradoc.army.mil/255-the-convergence-uk-fight-club-gaming-the-future-army/>; Oli Elliott, “UK Fight Club: Iron Sharpens Iron” *Wavell Room*, August 27, 2020, <https://wavellroom.com/2020/08/27/uk-fight-club-iron-sharpens-iron/>.

¹¹⁰ TECOM Warfighting Club, “How Ender Wiggins Became a MEU Commander,” *Marine Corps Gazette*, Observation Post, July 2019; Susan F. Bryant and Andrew Harrison, “Finding Ender: Exploring the Intersections of Creativity, Innovation, and Talent Management in the U.S. Armed Forces,” *Strategic Perspectives* (Washington D.C.: Institute for National Strategic Studies, May 2019), <https://inss.ndu.edu/Media/News/Article/1852580/finding-ender-exploring-the-intersections-of-creativity-innovation-and-talent-m/>.

¹¹¹ Kiran Bhageshpur, “Data Is The New Oil -- And That’s A Good Thing,” *Forbes*, Innovation, November 15, 2019, <https://www.forbes.com/sites/forbestechcouncil/2019/11/15/data-is-the-new-oil-and-thats-a-good-thing/>.

decentralized gaming and centralized analysis to aggregate and cohere large data sets for better analysis.¹¹² Early insights from one of the game instances, *Combat Mission*, showed civilian gamers with no military experience outperforming military professionals with decades of experience.¹¹³ This is addressing a knowledge gap in how training and analytical wargaming can combine to answer operational challenges abroad.

A mixed-method approach to gaming is yielding new insights and unlocking different ways to prepare commanders for combat. Instead of executing wargames to simply compare courses of action, leaders at all levels can use games to gain repeated practice against a thinking enemy. Field exercises and large-scale simulations are invaluable for confirming training outcomes, but they take time and are resource intensive. It does not allow for iterative experimental learning and worse, is usually highly scripted with predictable outcomes.¹¹⁴

The UK Fight Club model was adopted at the NATO Allied Rapid Reaction Corps (ARRC). The corps leadership recognized the talent within its ranks and empowered a group of officers to experiment and integrate games into the corps planning system. The illustration below reflects the different games brought to bear for generating A.I. applications that improve the efficacy of warfighting across all dimensions.¹¹⁵

¹¹² Hawkes, “Executive Orders: Increasing Wargaming’s Acceptance and Accessibility.”

¹¹³ Moran and David, “Why Gamers Will Win the Next War.”

¹¹⁴ This was a strong sentiment and consensus gathered from interviews conducted with NATO officers from the United Kingdom, Italy, Denmark, and the United States, March 2023. Names are withheld to protect the privacy of actively serving officers.

¹¹⁵ For another effort to game and simulate across domains with A.I. see Greg Kuperman, “Gamebreaker,” *DARPA Research* (blog), accessed January 31, 2023, <https://www.darpa.mil/program/gamebreaker>.



Figure 3. Mixed-method approach to gaming. *Source:* Created by author. Adapted from the Fight Club International methodology and the University of Oxford Artificial Intelligence Programme course diagram.

The success of this bottom-up gaming effort led to the initiation of Project PROMETHEUS. Lieutenant General Sir Edward Smyth-Osbourne and other senior leaders in the NATO ARRC were concerned with the speed and efficacy of corps warfighting at scale against a peer enemy. They set out to capitalize on the momentum of the gaming experimentation to digitally transform the rhythm and operating culture of the entire corps. The next section unpacks this effort and provides analysis of their experimentation.

Part 3: Project PROMETHEUS

Greek mythology portrays a story of the Titan, Prometheus, who defied Zeus and brought fire to humankind.¹¹⁶ It was through this heroic act that enabled humans and civilizations to flourish. Centuries later in Mary Shelley's book, *Frankenstein; or, The Modern Prometheus*, the lore of human ingenuity continued with the creation of a sapient creature by the scientist Victor Frankenstein.¹¹⁷ Together, these stories signify the human condition and are "a testament to the inherent and seemingly inexhaustible creative spirit in human beings."¹¹⁸ They are stories about the expansion of human powers and reflect present-day challenges. The Promethean myth is one of astonishing innovation by individuals. This story served as the inspiration to deliver "digital fire" to the NATO ARRC, despite immense challenges.¹¹⁹

Change in any bureaucracy is hard but "change in NATO is nearly impossible."¹²⁰ A study finds the traditional forces and systems that drive change in a multinational alliance are insufficient and too slow.¹²¹ One head of state declared NATO is becoming brain-dead.¹²² A comment directed at geopolitical tensions between states, but equally applicable to the military domain. A strong desire to change exists at all levels, but ways

¹¹⁶ Aeschylus, *Aeschylus' Prometheus Bound and the Seven Against Thebes* (Philadelphia, PA: David McKay, 1897).

¹¹⁷ Mary Shelley, *Frankenstein; or, the Modern Prometheus* (New York, NY: Everyman's Library, 1992).

¹¹⁸ Larson, *The Myth of Artificial Intelligence: Why Computers Can't Think the Way We Do*, 238.

¹¹⁹ Digital fire refers to A.I. and machine learning software, discussed in Interview with U.S. Army NATO Staff Officer, January 25, 2023. Name withheld to protect the privacy of an actively serving officer.

¹²⁰ Robert W. Komer, *Bureaucracy Does Its Thing: Institutional Constraints on U.S.-GVN Performance in Vietnam* (Santa Monica, CA: RAND Corporation, 1972); Interview with Italian NATO Officer, February 1, 2023.

¹²¹ Simona R. Soare, "Innovation as Adaptation: NATO and Emerging Technologies," *George Marshall Fund* (blog), June 11, 2021, <https://www.gmfus.org/news/innovation-adaptation-nato-and-emerging-technologies>.

¹²² James Dobbins, "Is NATO Brain Dead?," *The RAND Blog Commentary* (blog), December 3, 2019, <https://www.rand.org/blog/2019/12/is-nato-brain-dead.html>.

in which to change is unclear. For the NATO ARRC, a land headquarters focused on corps warfighting, one British officer warned this corps declared readiness and an ability to fight, but it was predicated on testing that was conducted in the imaginary land of “*Narnia*.”¹²³ In other words, the combat readiness evaluation (CREVAL), which validates a corps’ ability to serve at high readiness, was based on fantasy and unrealistic conditions.

This was a hotly debated issue for the corps commander and staff leadership. The standards for a NATO CREVAL provided a capability baseline, but this outdated benchmark seemed inadequate for real-world application. In 2021, a decision was made to pursue change and “harvest the best and brightest talent” within the headquarters to “tackle the most vexing challenges facing the ARRC and NATO.”¹²⁴ A small tiger team was assembled to (1) identify the principal pain points associated with planning and decision-making, followed by a (2) survey of technologies, process, and systems to help remedy identified concerns, and finally, (3) create and execute experiments to digitally transform and automate corps systems.

Pain Points

The central challenge for the corps was speed. Orders to direct subordinate units for operations were too long, spanning over a thousand pages. This was the result of a slow, long, and overly mechanistic process which demanded tremendous detail during a 3-week corps planning process. There was little time for critical and creative thinking

¹²³ “Narnia” reference comes from the fantasy story by C.S. Lewis, *The Chronicles of Narnia* (New York, NY: HarperCollins Publishers, 2014); quote from an *Interview with British NATO Officer*, 2023.

¹²⁴ Sir Edward Smyth-Osbourne cover letter in “Project PROMETHEUS Experimentation Report” (Gloucester, United Kingdom: NATO Allied Rapid Reaction Corps, May 7, 2021).

with large amounts of time devoted to using numerous analytical tools for filtering and listing information.¹²⁵ Little time was dedicated to wargaming and when it was conducted, opinions trumped physics and science. These behaviors carried over into simulations of the corps in combat.

The combination of meetings, workflow, and information technology caused “paralysis by analysis” in the staff. The corps was unable to timely process fragmentary orders for subordinate units at the point of execution. For example, a river crossing with corps and division assets requires tremendous coordination and control measures to prevent fratricide, suppress the enemy, and sequence force flow. The unit representatives playing as response cells in the simulation were forced to cross rivers without any corps guidance. In real life this would be deadly, but the CREVAL checklist only required fragmentary order creation. The efficacy and timing of the order was not evaluated.

The tiger team framed all these pain points into a problem diagnosis for the corps commander. They concluded that a command and planning system which was deliberate, linear, and slow had to transform to one that was rapid, iterative, and adaptive in combat. A new system was needed. The illustration in figure 4 reflects this finding.

¹²⁵ For more on this analytical tool dilemma see Nicholas Krohley, “Integrating Civil Affairs – An Outsider’s View,” *Eunomia Journal*, September 18, 2019, <https://www.civilaffairsassoc.org/post/2019/09/18/integrating-civil-affairs-an-outsider-s-view>; Stefan Muehlich and Nicholas Krohley, “NATO CIMIC & US Civil Affairs Doctrinal Review & Comparative Assessment” (The Hague, Netherlands: NATO CIMIC Centre of Excellence, June 2020), <https://www.cimic-coe.org/resources/ccoe-publications/nato-cimic-us-ca-doctrinal-review-and-comparative-assessment.pdf>; and “Chapter 4, Civil Reconnaissance: Understanding the Playing Field,” Arnel P. David, Sean A. Acosta, and Nicholas Krohley, *Warrior Diplomats: Civil Affairs Forces on the Front Lines* (Amherst, NY: Cambria Press, 2023).

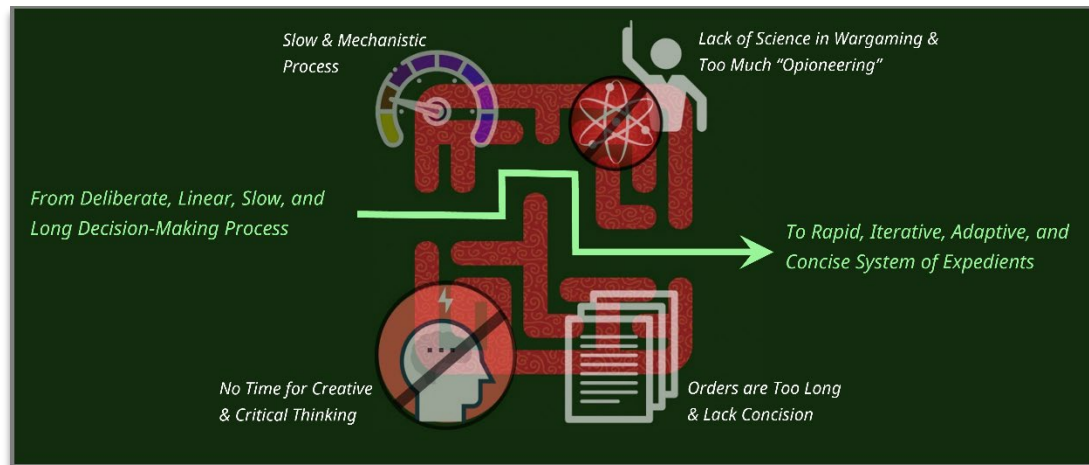


Figure 4. Pain points in NATO planning system. *Source:* Created by author for NATO Innovation Day in Gloucester, England in June 2021.

System of Expedients

The small tiger team was a mix of Danish, German, Norwegian, British, and Canadian officers led by a U.S. lieutenant colonel. They proposed to the corps commander a modern day “system of expedients” focused on three areas to improve upon: (1) planning approaches, (2) wargaming, and (3) decision-support tools. The team chose this approach to mirror the past when a similar period of accelerated technological change occurred in the 19th century. Helmuth von Moltke the Elder transformed the Prussian Army to successfully adapt amidst revolutionary change and he called his strategic approach a “system of expedients.”¹²⁶

Growing up in Denmark and later joining the Prussian Army, Moltke cultivated a fascination for art and classical music which gave him an appreciation for qualities that informed his planning and leadership-style throughout his life. These qualities were clarity, depth, and grace.¹²⁷ The ARRC tiger team used these qualities alongside the focus

¹²⁶ Bucholz, *Moltke and the German Wars, 1864-1871*, 3.

¹²⁷ Bucholz, 30.

areas to cull out the most important aspects of the system to test and change. This is reflected in figure 5.

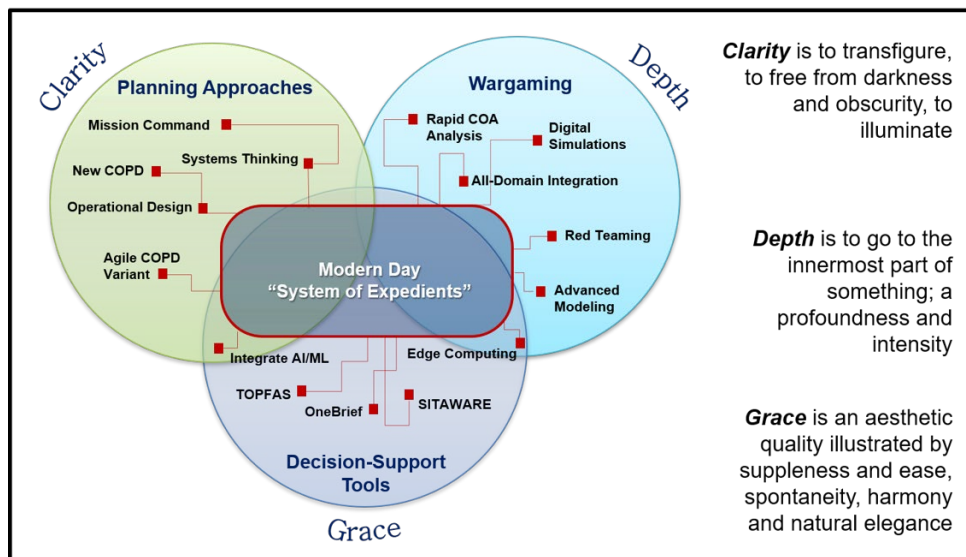


Figure 5 Illustration of Project PROMETHEUS concept. *Source:* Created by author to pitch experimentation concept to UK corps commander.

The tiger team briefed the command leadership to obtain approval and funding for a series of experiments, grouped together to create Project PROMETHEUS. They planned the sequence of experiments to test the components of a new system but to also drive cultural and organizational behavioral change, little by little.

Series of Experiments

Project PROMETHEUS was broken into three experiments designed as “planning crucibles.” These events would be purposefully time compressed and spanned over a few days, but they simulated realistic conditions. The first crucible introduced design thinking, *Next War: Poland* wargame, and an A.I. enabled planning software called *Onebrief*. Overall, this initial crucible was deemed a success by the command.

PROMETHEUS demonstrated the possibility of compressing a three-week corps planning process to three days. The participants claimed the combination of tools and a new approach saved time, optimized resources, and ultimately freed humans to do more creative and collaborative things, leading to gains in quality, clarity, and the overall output of corps planning.

The second crucible validated these findings further and homed in on the analytical tools within the *Onebrief* and gaming software. A greater emphasis on data management found that existing NATO systems fall short of aggregating information in a useful and meaningful way. Specifically, this crucible found a need for routine collection and exploitation of friendly force data and readiness “start states” for real-world contingency planning and execution. The same would apply to threat data as well. There is no reason to not have data collected over time to be updated and interrogated when crises arise.

The last crucible was more ambitious with the experimentation. The aim of this last evolution was to test the seams of planning and decision-making between future and current operations (i.e., J35 to J3). The final crucible applied a mix-method approach to gaming and analysis throughout the planning process. Digital and manual gaming methods examined the battlefield across multiple domains in new ways. There was simulations of reconnaissance fighting at the tactical level all the way up to the opening phases of deep battle at the operational level with hypersonic missiles. The insights were value added and improved decision-making.¹²⁸ Table 2 shows a causal analysis of how

¹²⁸ This was the consensus of those NATO personnel interviewed who participated in Project PROMETHEUS, March 2023.

different independent variables affected the outcome of the experiments with respect to the speed of decisions and the release of orders.

Table 2. Project PROMETHEUS IV-DV causal analysis

Experiment	Independent Variables			Dependent Variable	Normal Time Required
	Planning	Gaming	Decision Support	Speed	
Crucible 1 G5 (Future Plans)	Design process (U.S.) methodology	Next War: Poland system	Onebrief software	CDR's Planning Guidance in 8 hours	3-5 Days
Crucible 2 G35 (Future Ops)	NATO abbreviated planning process	Matrix game with WarPaths	Onebrief software/ Sitaware	Plan in 2 days & fragmentary order in 30 min	Plan in 3 x weeks, FRAGO in 6-8 hours
Crucible 3 G3 (Current Ops)	NATO abbreviated planning process	Operational Wargame System	Onebrief software	FRAGO in 10-15 minutes	2-3 hours

Source: Created by author from process tracing interviews with NATO personnel.

In the end, a new system was invented for the corps to conduct routine planning and fighting crucibles throughout the year for continual improvement in command and joint warfighting. Figure 6 is a conceptual illustration of this system. The last crucible was observed by numerous stakeholders across the UK and NATO. The NATO Allied Command Transformation's Innovation Hub attended to determine if there was wider applicability for the experimentation across the alliance. Scalability and programming remain a challenge for bottom-up innovations such as PROMETHEUS but with increased senior leader buy-in, a chance for sustained momentum remains.

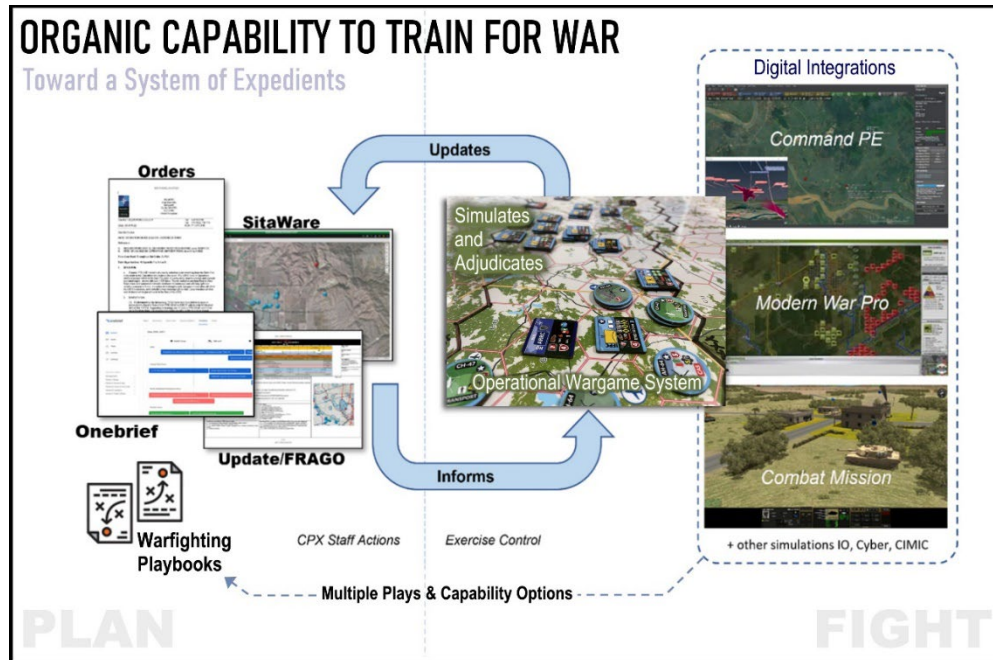


Figure 6. New NATO system innovation for warfighting. *Source:* Created by author and U.S. Army major at the NATO ARRC.

Despite having senior leader champions, danger remains for these disruptive innovations. They must outlive the protagonists who breathe life into them and require disruptive mavericks to sustain momentum. They must avert the strong inertia of organizations spinning back to the status quo. Luckily, there was enough talent left over from the tiger team to continue the PROMETHEUS effort after many personnel changes. The project borne new initiatives, some of which reached the highest levels of his Majesty's government. Parts of the tiger team were brought to the UK Secretary of State for Defence's office to help plan and simulate a special project on Ukraine. Nevertheless, the Promethean myth continues to inspire human ingenuity, courage, and change. There are several key lessons and recommendations for the DOD.

Recommendations: The Power of Catalytic Combinations

*“The future is already here. It’s just not evenly distributed yet.” -William Gibson*¹²⁹

There are several powerful combinations of ideas that made Project PROMETHEUS a success. Collectively, these ideas proved to be a catalyst for driving organizational and digital transformation. The overarching aim of PROMETHEUS was behavioral and cultural change within NATO. The DOD can benefit from the lessons of this allied project and use them to inform ongoing innovation efforts. The sense of urgency to change is becoming more abundantly clear. The Covid-19 pandemic, War in Ukraine, and the A.I. race are driving unprecedented technological change and adoption. Satya Nadella, Microsoft CEO, proclaimed, “We’ve seen two years’ worth of digital transformation in two months.”¹³⁰

The DOD has numerous programs scheduled to deliver in the next five to twenty years.¹³¹ The problem with these timelines is the challenge of the PRC committing significant resources to dominate in this arena of decision-making today. China aims to have an advantage over the U.S. military in the coming years.¹³² The DOD can induce an aggressive rate of digital transformation, convert more ideas into capabilities, and better

¹²⁹ As quoted on page 1 of Chief of Staff of the US Army Strategic Studies Group, “The Character of Warfare 2030 to 2050: Technological Change, the International System, and the State” (Department of the Army, July 2016).

¹³⁰ Jared Spataro, “2 Years of Digital Transformation in 2 Months,” *Microsoft Malaysia News Center* (blog), May 4, 2020, <https://news.microsoft.com/en-my/2020/05/04/2-years-of-digital-transformation-in-2-months/>.

¹³¹ Interview with U.S. Joint Staff J6 planners on Joint All-Domain Command and Control (JADC2) and other service programs, 7 February 2023.

¹³² Thomas Lynch III, *Strategic Assessment 2020: Into a New Era of Great Power Competition* (Washington D.C.: NDU Press, 2020) 107-108, 115-116, 140-149, 320; Schmidt et al., “National Security Commission on Artificial Intelligence.”

calibrate technologies for institutional fit by unlocking the power of the following combinations.

A. Humans and Machines

The system developed by the NATO ARRC was more than cutting-edge technology. Instead, it was a group of automations and processes designed to save time. It was an effective and efficient use of information technology to match a modified planning process. The time savings increased speed and enabled greater collaboration. Thinking improved and planning outputs were of greater quality. Humans improved with the help of intelligent systems, and trust was starting to form between the two.

Garry Kasparov found that human creativity was more pronounced with the help of a computer partner.¹³³ Machines can be programmed to sort and process large volumes of information. They can *see* better than humans to recognize patterns and analyze faces, imagery, and other visuals faster and more accurately.¹³⁴ Humans bring the capacity of creativity and intuition. Humans, supported by machines and software, are operating at unprecedented speed and tenacity. Human-machine collaborations provide an unbeatable combination of speed, accuracy, and flexibility in the face of ever-changing battlefield conditions.

The DOD must prepare warfighters for this aspect of future war. Experimentation in general, and experimentation units in particular, can accelerate the capability development of human and machine warfighting systems. Today, concepts struggle to

¹³³ G. K. Kasparov and Mig Greengard, *Deep Thinking: Where Machine Intelligence Ends and Human Creativity Begins*, First edition (New York: PublicAffairs, an imprint of Perseus Books, LLC, 2017) 234.

¹³⁴ Schmidt, "The Importance of Winning AI Strategic Competition."

test, integrate, and field capabilities that are truly innovative. That is, capabilities that result from a fundamental change to the way organizations operate and integrate technology.¹³⁵

This innovation challenge is apparent with the recent struggle to resource and field multidomain task force organizations in the U.S. Army.¹³⁶ The current processes and systems must keep pace with the operational demands of a fast-changing environment. In the past, experimentation units helped build battle-winning capability. Take the example of the 11th Air Assault Division (Test).

The air cavalry's development in Vietnam resulted from rigorous testing, integration, and experimentation.¹³⁷ The zenith of air mobility was the "combat air assault" attack phase, where cavalry troops could quickly displace from less critical situations to concentrate mass at critical points of need. This approach was validated early in the war with the air cavalry providing rapid relief to Khe Sanh Combat Base marines.¹³⁸ Today, this experimentation unit is the 1st Cavalry Division, and it gave birth to air assault operations which are still in use by the most elite units in the U.S. military. The DOD might emulate that historical precedent to build human and machine experimentation units rapidly. The next recommendation discusses the type of talent needed to succeed.

¹³⁵ For a thorough definition and distinction between modernization and innovation see Christian Brose, *The Kill Chain: Defending America in the Future of High-Tech Warfare*, (New York: Hachette Books, 2020).

¹³⁶ United States Government Accountability Office, "Future Warfare: Army Is Preparing for Cyber and Electronic Warfare Threats, but Needs to Fully Assess the Staffing, Equipping, and Training of New Organizations," Available via: <https://www.gao.gov/products/GAO-19-570>, (Accessed 11 October 2022).

¹³⁷ John J. Tolson, *Airmobility, 1961-1971*, Vietnam Studies (Washington: Department of the Army, 1973).

¹³⁸ Joseph E. Abodeely, "Air Cavalry and the Significance of Operation Pegasus," Available via: <https://war-stories.com/pdf/svn-joe-abodeely-air-cav-and-significance-of-op-pegasus-2012.pdf>, (Accessed 11 October 2022).

B. Operators and Engineers

The engagement between software engineers and end users (operators) in Project PROMETHEUS contributed to iterative changes that proved mutually meaningful for the military organization and technology companies involved. For the *Onebrief* software, the feedback that recommended programming changes to improve functionality or errors happened overnight. This iteration increased buy-in from the users and simultaneously incentivized cooperation to enhance the customization of the software. For the wargaming techniques, Dstl scientists were on hand to explain the significance of the combat calculations. This additional context provided a deeper understanding and appreciation for modern wargaming techniques.

This combination of engineers and operators mirrors the sources of innovation and inventions that exploded onto the scene in Silicon Valley from the 1970s and early 1980s. In *Troublemakers*, Leslie Berlin tells the story of Atari, Apple, Xerox PARC, and others, who pioneered technologies that changed the world.¹³⁹ They adopted technologies from the DOD and university laboratories, but it was the powerful combination of talented engineers and visionaries who became an incredible force to drive innovative change. Does DOD talent management marry up the right mix of operators and engineers?

The U.S. DOD might benefit from courting tech start-up companies with software engineers and technologically savvy talent who may be willing to work on national security challenges. New public-private partnerships might be established with operational units to create incubators for innovation in deployed operational settings. This

¹³⁹ Leslie Berlin, *Troublemakers: Silicon Valley's Coming of Age*, (New York: Simon & Schuster, 2017).

approach might provide an environment attracting engineers and operators who can collide to attack the most complex challenges in a worldwide laboratory.

C. Plans and Playbooks

General (and former president) Dwight D. Eisenhower reminds us that plans by themselves are worthless, but the process of planning, is indeed, valuable.¹⁴⁰ By going through the planning, commanders and staff gain a fuller understanding of the problem and what range of options might be possible for a solution. In this way, a plan and planning, orient action. It is in the execution with the fog and friction of war where a set of plays (i.e., a playbook) may complement planning and support military intuition.

A playbook comes from expanded experience gained from playing lots of games. This playbook can be supercharged further with A.I. applications combining information feeds to update enemy situations, weather, friendly force readiness, and other factors. Project PROMETHEUS simulated a handful of potential plays with physics-based gaming engines. The plan's fidelity improved, and an additional array of plays made the plan more adaptive. The USAF is building a system to scale this playbook mentality further.

The Air Force Research Laboratory (AFRL) has hosted WARTECH Summits to transition the most advanced technologies into warfighting capability. One of their projects, *Fight Tonight*, is a “theater-scale, multidomain planning capability for rapid generation and exploration of plans options and plausible futures, empowering planners

¹⁴⁰ William M. Blair, “President Draws Planning Moral: Recalls Army Days to Show Value of Preparedness in Time of Crisis,” *New York Times*, November 15, 1957, 4, Column 3.

to deliver the best possible plan within the constraints of a highly dynamic conflict against peer adversaries.”¹⁴¹ The illustration in figure 7 depicts this concept.

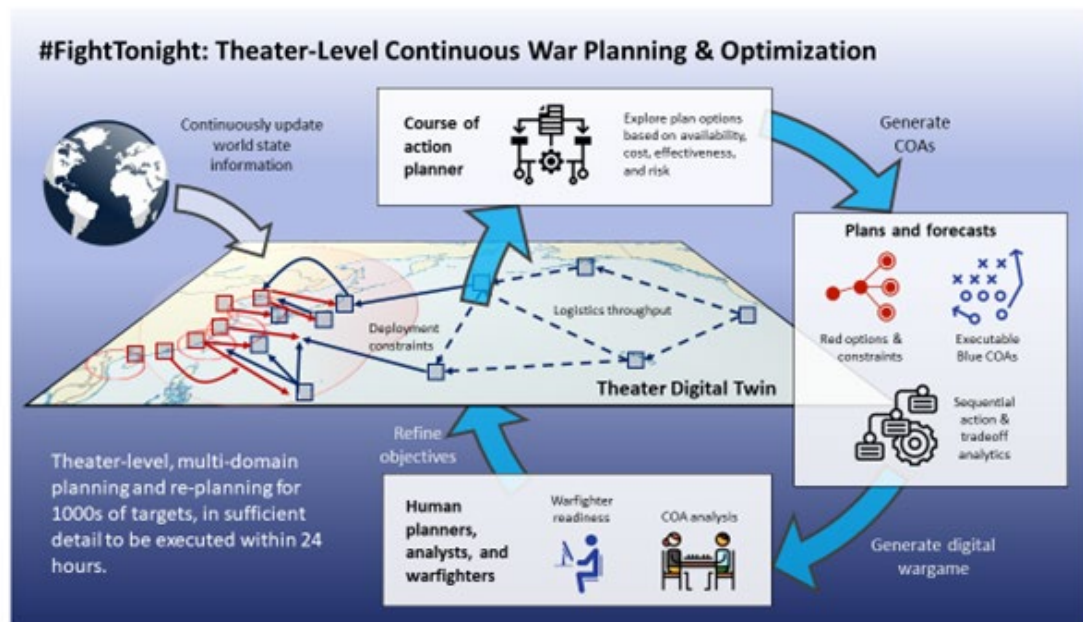


Figure 7. Fight Tonight Concept. *Source:* AFRL

The PROMETHEUS system and the *Fight Tonight* concept are separate projects in different countries but have strikingly similar aims. The DOD might benefit from cohering these separate but comparable projects for greater resource sharing and output management.

D. Mavericks and Senior Leader Champions

Literature is abundant on military innovation. There is a common debate in which scholars argue about the conditions in which militaries institute innovative change. Posen observed two catalysts, (1) military defeat and (2) civilian intervention, force the military

¹⁴¹ Leslie Heck and Patrick Foose, “WARTECH 2.0 Summit Expands Transformational Potential,” *ONE AFRL / TWO SERVICES* (blog), December 7, 2021, <https://www.afrl.af.mil/News/Article/2864595/wartech-20-summit-expands-transformational-potential/http%3A%2F%2Fwww.afrl.af.mil%2FNews%2FArticle-Display%2FArticle%2F2864595%2Fwartech-20-summit-expands-transformational-potential%2F>.

to adapt in peacetime. Allan Millet’s study of the interwar period of innovation lends credence to this “civilian intervention” claim and top-down approach. Rosen believes senior military officers see an acute change in the strategic environment and create new promotion pathways for junior officers to meet this new way of war in a bottom-up approach.

Benjamin Jensen examines periods of doctrinal change with his theoretical framework of *incubators* and *advocacy networks*. In examining the post-Vietnam era of AirLand Battle and the counterinsurgency movement of the past decades, Jensen finds incubators – such as study groups and experimentation efforts - and advocacy networks helped usher in lasting change.

A common thread through all the military innovation theories is the requirement for “mavericks.” These individuals have special talent and skills, but most importantly, the self-determination and drive to pursue change. In the case of Project PROMETHEUS, a group of mavericks were supported by senior leader champions who provided critical support and resources to deliver meaningful change. The combination of these groups accelerated technological adoption, but the stories that emanated from their interaction amplified behavioral and cultural change.

There was a substantial investment in capturing the findings of each experiment to communicate the outputs to the entire staff and senior leadership. These efforts ranged from 1-page storyboards to short 5-minute videos designed to describe what was changing visually and to build excitement and more buy-in across the staff.

The DOD might examine how it incentivizes creative and innovative mavericks to collaborate under senior leader supervision. Equally important, innovation programs must

invest in how they tell their story and the stories of people creating change. In this vein, a short story in the conclusion synthesizes these recommendations and weaves in ideas from this research to project what a system of expedients might look like in the future.

CATALYTIC COMBINATIONS	DEDUCTIONS	IMPLICATIONS FOR DOD
 Humans + Machines	Machines perform tasks to free humans Humans have more time to think creatively Human-machine collaborations provide unbeatable speed, accuracy, and flexibility	Use experimental units to accelerate capability development and integration
 Operators + Engineers	Embedded users and programmers can immediately exploit feedback for rapid changes End user design focus tailors to warfighter Unplanned insights and solutions emerge	Develop unconventional public-private-partnerships to connect talent and build battle-winning innovations
 Plans + Playbooks	Detailed plans provide useful context, but Routine gaming can produce plays for speed of action Automated readiness states can inform more accurate planning and gaming	Cohere A.I. and gaming applications to achieve greater economies of scale and harness new capability
 Mavericks + Senior Leader Champions	Together these groups can drive behavioral and cultural change -> top-down and bottom-up The narrative and stories told are pivotal for long-term change and stakeholder buy-in	Build incentive structures to grow and support mavericks Invest in storytelling that sells ideas and inspires action
Think Smarter – Decide Better – Act Faster		

Figure 8. Table of Recommendations. *Source:* Created by author.

Conclusion: Winning the Next Battle in the Pacific

It is 2040. You are Lieutenant Colonel Jessica “Coco” Russell. You are a career Cross-Domain Battle Coordinator, formerly known as an Air Battle Manager. The speaker in your sleep pod goes off, “Ma’am, you are needed in combat control!” You are on board the USS BARACK OBAMA (LLC-20), a modern command and control flag ship that replaced the USS BLUE RIDGE (LLC-19) in the Pacific Fleet in 2035. Your ship is the command platform for Combined Joint Task Force South China Sea (CJTFS), which was activated to constrain expanding PRC activity in the Southern Philippines. This ship has three unmanned ships in the task force, making it difficult to determine which has human operators. As you get dressed, you reflect on your career that led you to this point.



Figure 9 A.I. generated ship image.
Source: Created by author using Midjourney.

You were reluctant to select this field over being a pilot, but you foresaw their extinction with the rise of pilotless aircraft. They are less expensive, have no G-force tolerance limitations, and are a whole lot less diva-like. Your career field now has primacy in the USAF but also across the Joint Force. The investment in cognitive and biological enhancements to improve your mental agility is unmatched by any other service. Your broadening assignment with U.S. Special Operations Command exposed you to SOFWERX and their experimentation with A.I. and bots which gave you a deeper appreciation for the changing character of war. It was becoming increasingly faster, more lethal, and more robotic. This experience led you to compete for and get selected to the elite Joint Advanced Warfighting School (JAWS).

Most of your assignments were on the West coast so this was a nice change of pace to move to Virginia Beach. Upon in-processing JAWS you saw a flyer for Fight Club, a wargaming experimentation group seeking to test different gaming technologies and techniques to improve decision-making. You joined and in the first weeks you were fighting in different games hosted on a 10G government cloud. The initial games on your smartphone and laptop were challenging. You applied yourself and fought hard but remained consistently at the bottom of multiple leader boards. This ignited a fire in your belly and while many of your classmates were spending extra time perfecting essays and PowerPoint presentations, you clocked over 1,000 hours in gaming. The data driven games provided routine feedback for your personal virtual assistant, which operates as a digital teammate and makes you feel superhuman.

The biofeedback and analysis from games facilitated a tailored training program for both your mind and body. Your virtual assistant monitored diet, exercise, sleep, and study habits. You knew just how far you can push yourself and you did so at every

opportunity. You're a warfighter, a true professional who knows the cost of bad leadership. You **snap back to the present** and enter combat control on the ship. A dynamic situation which you prepared for your whole life, is now unfolding before you.

Your team is a mix of humans and intelligent systems. The CJTFSCS commander is inbound and only minutes away. The watch officer, Army Major Ron Forney, updates you, "ma'am, JARVIS picked up an irregular pattern in the PRC's force posture. They look like they are preparing to attack our Marine task force in Palawan." JARVIS, which stands for Joint Assisted Recollection of Virtual Intelligence System, is an A.I. large language model built on a massive neural network. It has ingested large data sets, like the gaming data from *Fight Club* and other joint wargames, to train its algorithms.

You quickly understand the changing dynamics and begin to generate options. "JARVIS conduct an analysis of water tables, terrain, weather, and other pertinent factors to assess likely attack angles of PRC combat systems. Execute a million Monte Carlo simulation runs for a tight variance of possibilities." You tell Forney to "run *FightTonight* software to analyze the readiness posture of friendly forces and generate task organization options for the defense of Palawan."

Admiral Medrano enters the joint operations center, and it only takes seconds for him to make sense of what is happening. A hologram in the center of the room is populating a rich picture of the combat situation and options. You tell the admiral, "Sir, an attack is imminent, and we will need to prepare for a fight." He nods his head and orders you, "Copy, Coco.... well... go ahead and call the fight." You answer in the affirmative with service acculturation, "Aye, aye, sir!"



Figure 10. A.I. Generated images of (left) fictional character, "Coco" and (right) fictional digital A.I. system, "JARVIS." Source: Created by author using Midjourney.

You command JARVIS to "conduct a critical factor analysis of the most likely enemy command and control locations." In only thirty seconds, JARVIS responds, "there is a 95% probability the PRC is commanding their bot fleet from Mount Bud Dajo on the island of Jolo." You realize this is the first blow needed to dislocate control of the

systems before they go full autonomous and therefore, you issue attack orders to your team, “activate containers ABLE, BAKER, CHARLIE, and DAGGER...launch drone squadrons one through nine in counter air patrol and EW mode on the southern side of Jolo. JARVIS, on my mark fire one Dark Eagle hypersonic missile and three Block V Tomahawks at a randomized cadence covering Mount Bud Dajo.” You wait for the containers, hidden in plain sight around various ports in the Philippines, to launch their drones into the air and you give the final order, “JARVIS, Fire for Effect!”

This backcasting story sounds like science fiction, but many of the technologies required to make this a reality are present today. They could be the result of the proposed catalytic combinations. Gaming and A.I. can improve decision-making and expand human abilities. They can enable a modern-day “system of expedients” to gain decision advantage and drive a tempo U.S. adversaries cannot match.

Winning wars start from the bottom up and warfighters must be part of the solution to build battle-winning capability. The success of the Allied Rapid Reaction Corps with Project PROMETHEUS is a glimmer of grassroots innovation that drove transformative digital change in NATO. The DOD could do worse than to reap lessons from its allies and partners to lead a revolution in ways organizations take on command and make better decisions faster. Given the current trajectory of intellectual inquiry, there is no reason to believe this will happen without significant changes.

The theorists mentioned in the introduction prophesized significant changes to the character of war with time and command (figure 1). As early as the 1970s, Boyd pushed for military leaders to make decisions faster than their adversaries to create an advantage in battle or risk losing a war.¹⁴² In the 1990s, Generals Sullivan and Dubik identified the need for systematic changes to decide faster in the 21st-century.¹⁴³ Consequently, the

¹⁴² John R. Boyd, “Destruction and Creation” (U.S. Army Command and General Staff College, 1976); Brown, *A New Conception of War: By John Boyd, The U.S. Marines, and Maneuver Warfare*; Ford, *A Vision So Noble: John Boyd, the OODA Loop, and America’s War on Terror*.

¹⁴³ Sullivan and Dubik, “War in the Information Age.”

command system to deliver decisions at a relevant speed has yet to mature. The Project PROMETHEUS experimentation proves it is possible with the right mix of system and cultural changes. Yet, human and organizational behavior remain the greatest barriers to change.

Dr. Beyerchen identified the human and biological amplifiers driving changes in society, but these changes fail to penetrate the resilient bureaucratic systems in Western militaries.¹⁴⁴ There is a yawning gap in existing command systems with the absence of a credible and rapid decision-making process to fight a peer threat. A revolutionary change is not only necessary, but it is also compulsory for victory in future wars. The renewed urgency over a possible fight with the PRC presents a ripe opportunity for radical change. Leaders at all levels must seize it.

¹⁴⁴ Scales, “Clausewitz and World War IV”; Beyerchen, “From Radio to Radar: Interwar Military Adaptation to Technological Change in Germany, the United Kingdom, and the United States.”

Appendix 1: Acronyms and Abbreviations Unpacked

These acronyms and terms are embedded in illustrations but are unpacked and explained in this appendix. The links to software and companies are provided below for informational purposes only as they were used during Project PROMETHEUS. It does not constitute an endorsement or approval for continued government use.

CIMIC: Civil military cooperation forces. It is commonly used in NATO and the United Nations.

COA: Course of action

Combat Mission PE: Commercial computer simulation from Slitherine Games focused on tactical combined arms maneuver for land forces. The “PE” stands for Professional Edition; an exclusive version for government customers to extract gaming data for analysis. For more information: <https://www.fightclubinternational.org/combat-mission>

Command PE: Commercial computer simulation from Matrix Games designed to simulate cross domain maneuver at multiple levels. The “PE” stands for Professional Edition; an exclusive version for government customers to extract gaming data for analysis. For more information: <https://pro.matrixgames.com/game/command-professional-edition>

COPD: Comprehensive Operational Planning Directive. For more information: <https://publicintelligence.net/nato-copd/>

IO: Information operations

Modern War Pro: This is a modified version of the commercially available *Flashpoint Campaigns: Red Storm* by Matrix Games. This is a tactical wargame for ground combat operations. The “Pro” stands for professional edition for government use. For more information: <https://www.matrixgames.com/game/flashpoint-campaigns-southern-storm>

Onebrief: Planning and presentation software. For more information: <https://onebrief.com/>

SitaWare: Battle management software by Systematic. For more information: <https://www.systematicinc.com/>

TOPFAS: Tool for Operations Planning Functional Area Services. For more information: <https://dnbl.ncia.nato.int/nciaservicecatalogue/Lists/NATO%20Software%20Tools%20List/AllItems.aspx>

WarPaths: An online wargaming and decision support platform designed to elevate an organization’s strategic thought on pressing political and military challenges. For more information: <https://warpaths.io/>

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