UNITED STATES ARTIFICIAL INTELLIGENCE POLICY: BUILDING TOWARD A SIXTH-GENERATION MILITARY AND LETHAL AUTONOMOUS WEAPON SYSTEMS

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A research study submitted to Johns Hopkins University in conformity with the requirements for the degree of Master of Arts in Global Security Studies

Baltimore, Maryland
December 2021

Abstract

The United States has entered a new period of great power competition. Rising powers in Russia and China form a complex triad at the head of the global power structure. Recent technological advancements in artificial intelligence further complicate this fluid international dynamic. Scholars, politicians and senior military officers have realized the incorporation of artificial intelligence is the genesis of a novel revolution in military affairs with the capacity to alter the strategic balance of power. The United States, encumbered by twenty years of counterinsurgency in the Middle East and hampered by a long-term artificial intelligence strategy that only extends to 2025, is ill-prepared to enter this "sixth-generation" of military capability in order to secure its strategic interests. This artificial intelligence enabled force will be defined by semi-autonomous and autonomous systems including lethal autonomous weapon systems. The first state actor to develop and field these weapons will obtain a strategic advantage over its competitors in this new era. While the US currently possesses an advantage in artificial intelligence, it is rapidly closing due to a lack of forward thinking and focused investment policy. This is a policy paper designed to address this gap. The Chinese military modernization model from the mid-1990s suggests a potential pathway for future US policies. While there are differences in government structure between the two nations, particularly the role and power of the communist party in government, several of the underlying principles can be applied within the framework of the US system. Therefore, the United States can ensure artificial intelligence primacy by developing sound investment policies, a focused technology development program and new concepts of operations designed to maximize new capabilities as they become available.

Primary Reviewer and Advisor: Dr. Sarah Clark

Secondary Reviewer: Dr. Jason Ridler

Acknowledgements

I would like to thank my family and friends who supported me on this journey over the last two years. I especially would like to thank those who sacrificed their own time as I asked for advice and guidance, sometimes well into the evening. Finally, I would like to express my gratitude to Dr. Clark for her guidance on this project.

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List of Abbreviations

A2/AD – Anti-Access/Area Denial

AGI – General Artificial Intelligence

AI – Artificial Intelligence

AO – Area of Operations

ASDAI – Assistant Secretary of Defense for Artificial Intelligence

ASI – Artificial Super Intelligence

C4I – Command, Control, Communications, Computers and Intelligence

CCP – Chinese Communist Party

CCW – UN Convention on Certain Conventional Weapons

COA – Course of Action

CONOPS – Concept of Operations

CSBA – Center for Strategic and Budgetary Assessments

CY – Calendar Year

DARPA – Defense Advanced Research Projects Agency

DIU – Defense Innovation Unit

DIUx – Defense Innovation Unit Experimental

DoD – US Department of Defense

EM – Electromagnetic

EUR – European Union Euro

FY – Fiscal Year

GAO – US Government Accountability Office

GDP – Gross Domestic Product

JAIC – Joint Artificial Intelligence Center

LAWS – Lethal Autonomous Weapon(s) System

MITL – Man-in-the-Loop

ML – Machine Learning

MOTL – Man-on-the-Loop

MTR – Military Technological Revolution

NSCAI – National Security Commission on Artificial Intelligence

OODA – Observe, Orient, Decide, Act

R&D – Research and Development

RMA – Revolution in Military Affairs

STEM – Science, Technology, Engineering, Mathematics

USD – US Dollar

Introduction

In November 2015, the United States government discovered a new element to 21st century great power competition. Russian state media produced what is now widely believed to be an intentional classified leak of a thermonuclear capable lethal autonomous weapons system (LAWS).[1] This submarine, named "Status-6," relies entirely on artificial intelligence (AI) for its operation and does not require any human input, eliminating the vulnerabilities possessed by current unmanned technology. The development of this platform shocked military and political leaders worldwide. RAND Corporation assesses this new system, along with future developments, could upset the balance of strategic nuclear deterrence that existed throughout the Cold War by 2040.[2] More importantly, the creation of an autonomous system with lethal capabilities on a strategic scale represented the first step in a new generation of warfare, one defined by AI assisted or enabled capabilities. At that time, the US did not have a comprehensive AI policy.[3] It would not be until 2018 that the US government established several agencies and organizations exclusively dedicated to the study and development of artificial intelligence and its potential military uses. By this time, China was already pursuing AI related technology and incorporating it into their future military plans.[4] Chinese state-media and senior Chinese Communist Party (CCP) officials, to include President Xi Jinping, detailed Chinese aspirations in data transmission and AI. These developments drastically affected the strategic landscape of the early 21st century, providing China a pathway to become the world's premier power in AI. US

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[1] Edward Geist and Andrew J. Lohn, "Security 2040: How Might Artificial Intelligence Affect the Risk of Nuclear War," *RAND Corporation* (2018): 2-3, https://www.rand.org/pubs/perspectives/PE296.html.
[2] Geist and Lohn, 22.
[3] Michael C. Horowitz, Gregory C. Allen, Elsa B. Kania, and Paul Scharre, "Strategic Competition in an Era of Artificial Intelligence," *Center for New American Studies* (July 2018): 9, https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNAS-Strategic-Competition-in-an-Era-of-AI-July-2018_v2.pdf?mtime=20180716122000&focal=none.
[4] Horowitz et al., 12.

military and political leadership, focused on two decades of war in the Middle East, were ill-prepared for a technological revolution of the battlespace and strategic environment. Now, the United States faces a precarious situation. As China and Russia continue their global rise, with Chinese military capabilities in Asia reaching peer-status relative to their US counterparts, the US must embrace the arrival of the AI era.[5] The ability of the US to rapidly adapt to the changing strategic landscape, develop new AI capabilities, and utilize those capabilities to achieve a military built for 21st century great power competition will have a direct effect on the ability of the US to defend its strategic interests worldwide. This ability will define a novel "sixth generation" military, fully integrated with AI and autonomous weapon systems that will change not only the speed at which decisions are made but the fabric of the Clausewitzian principles of warfare that have defined interstate conflict since the 1800s.

This is a policy paper designed to address these important issues and lack of artificial intelligence policy beyond 2025. After providing background on key concepts, this study conducts an overview on current US policy along with coming US and adversary AI advancements. Then, it will suggest a set of policy recommendations for consideration in a long-term AI strategy modeled after the successful Chinese military modernization framework, accounting for differences in the system of government. These recommendations are followed by an extensive data analysis and policy discussion before concluding the US must adopt a policy of primacy in the global AI race in order to secure US strategic interests worldwide.

[5] Thomas G. Mahnken, "Forging the Tools of 21st Century Great Power Competition," *Center for Strategic and Budgetary Assessments* (2020): 1-7, https://csbaonline.org/research/publications/forging-the-tools-of-21st-century-great-power-competition/publication/1.

Background

Key Concepts

Artificial intelligence represents a coming revolution in military affairs (RMA) with ramifications that extend well beyond simple military utility. The civilian world will also be drastically affected by AI developments. Therefore, it is important to understand a number of concepts associated with this novel technology. The term "artificial intelligence" rose from a Dartmouth conference in 1956 when the idea was first postulated and is defined as any "artificial system developed in computer software, physical hardware, or other context that solves tasks requiring human-like perception, cognition, planning, learning, communication, or physical action."[6] Since then, Hollywood science fiction has driven much of the debate regarding AI and lethal autonomous weapons systems. Films such as *Terminator* (1984), *IRobot* (2004) and *War Games* (1986) gave the public images of killer robots and computer systems where sentient AI threatens human existence. Over the last twenty years, yesterday's science fiction has become conceptual reality with expected demonstrability in 2025.[7]

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[6] Danielle C. Tarraf et al, "The Department of Defense Posture for Artificial Intelligence: Assessment and Recommendations," *RAND Corporation* (2019): 2, https://www.rand.org/t/RR4229.; Congress.gov, "Text - H.R.5515 - 115th Congress (2017-2018): John S. McCain National Defense Authorization Act for Fiscal Year 2019," August 13, 2018, https://www.congress.gov/bill/115th-congress/house-bill/5515/text.
[7] John W. Brock, "Why the United States Must Adopt Lethal Autonomous Weapons Systems," *US Army Command and General Staff College* (2017).

Development of AI is occurring in a three-stage process. Each stage is defined by the level of autonomy possessed by the system. Figure 1 shows how each particular wave is defined according to the US Government Accountability Office (GAO).

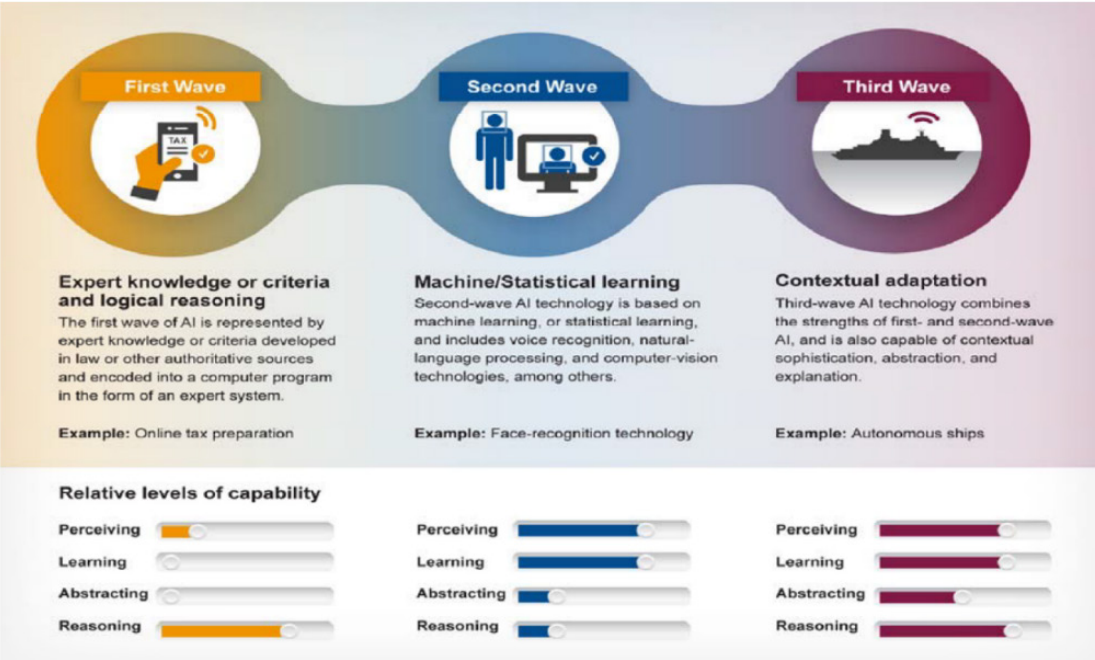

Figure 1: Course of AI Development
(Source: US Government Accountability Office, 2018)

First wave AI is readily apparent in the lives of everyday Americans. Software programs utilizing basic data recognition, patterns and predictive analytics are staples of wave 1 AI systems. Wave 2 represents the current level of AI development. At this stage, machine learning (ML) is possible. ML, the process of using codes and algorithms to "teach" machines basic and advanced human tasks, is a major milestone in AI.[8] From here, more advanced capabilities, such as voice and facial recognition, augmented intelligence and semi-autonomous functions become possible.[9] The latter of these is the building block to fully autonomous capability. This

[8] István Szabaföldi, "Artificial Intelligence in Military Applications – Opportunities and Challenges," *Technical Sciences* (2021): 158, doi: 10.2478/raft-2021-0022.
[9] Szabaföldi, 158-160.; Forrest Morgan et al., "Military Applications of Artificial Intelligence: Ethical Concerns in an Uncertain World," *RAND Corporation* (2020): 9-11, https://www.rand.org/pubs/research_reports/RR3139-1.html.

technology requires no human input and can come in several varieties that are merely software dependent. These varieties include man-in-the-loop (MITL), man-on-the-loop (MOTL) and fully autonomous systems.[10]

MITL systems insert human operators into their functionality. These systems can best be described as semi-autonomous. Semi-autonomous systems are capable of basic functions without human input but require a human operator to maximize their effectiveness. MOTL systems are a second generation of this technology. Rather than requiring human input, MOTL systems are capable of fully autonomous operation. However, a human operator may interrupt the system at any point to change a pre-programmed course of action (COA). Finally, fully autonomous systems do not require any level of human input and are capable of fully independent operation including changing COAs. The capability of fully autonomous systems is limited only by the capability of the controlling AI.

The form of AI required for full autonomous operation is general artificial intelligence (AGI). Theoreticially, AGI has the ability to observe-orient-decide-and act (OODA) with human or super-human levels of perception and awareness.[11] Another form of this technology is a variant of AGI referred to as artificial super intelligence (ASI). ASI represents the epitome of software capability. Superior to humans by almost every objective measure, an ASI represents a computer system that may be described as sentient.[12] It is the potential of these AI levels that makes the introduction of AI into military affairs a transformational development.

[10] Morgan et al., "Military Applications of Artificial Intelligence," 11-12.
[11] Szabaföldi, "Artificial Intelligence in Military Applications," 158-159.
[12] Szabaföldi, 158.

Unlike natural evolution in military technology, a RMA truly changes all that comes after it.[13] This paper argues there have only been two RMAs in history: the development of gunpowder and the development of nuclear weapons. There is an enormity of academic debate regarding RMAs and that discussion lies beyond the scope of this research. For clarity, this paper defines an RMA as a tangible novel development in weapons technology that forces changes in military concepts of operations (CONOPS) at the strategic, operational and tactical levels with corresponding changes in the political landscape.[14] This study argues that coming advances in AI are the beginning of a third RMA.

A byproduct of RMAs are military technical revolutions (MTRs). Like RMAs, there is a wealth of academic debate regarding MTRs. For this research, MTRs are defined as the adaptation of force structure and technology to meet the demands of the strategic picture as shown in Figure 2 and suggests a causal relationship.[15]

Figure 2: RMAs and Corresponding MTRs

[13] Benjamin M. Jensen, "The Role of Ideas in Defense Planning: Revisiting the Revolution in Military Affairs," *Defence Studies* 18, no. 3 (September 2018): 302–03, doi:10.1080/14702436.2018.1497928.; Robert M. Tomes, "Revolution in Military Affairs – A History," *Military Review* (September October 2000): 99.

[14] Throughout this thesis, the term "tactical level" is used to define a limited, local and isolated event. Such a term is not intended to apply the same definition to the potential effects of such an event. The term "operational level" is similar to tactical level but may not be limited, local and/or isolated. The term "strategic" or "strategic level" will be used to define an event or potential event of national and/or international interest requiring the attention of members of the National Security Council and/or policymakers.

[15] Tomes, 101.

Initially, these transformations took decades before a corresponding MTR developed from an RMA. For example, despite its development in the 9th century, it would take a full 300 years for gunpowder, in the form of artillery, to make its way to the battlefield due to concepts beyond the technological capabilities of the time. Nuclear weapons led to major changes in military technology in the period of less than a decade due to other civil and military technological advancements. Truncated timelines due to rapid transition between the technological development phase and operational fielding of new technologies requires the study and adoption of new policies and CONOPS prior to the completion of the development phase of technology capable of producing a RMA.

Current US Policy

Department of Defense Directive (DoDD) 3000.09 details the current view of the DoD on LAWS. The directive defines a LAWS as a "weapon system[s] that, once activated, can select and engage targets without further intervention by a human operator."[16] Within the concepts previously defined, this is a man-out-of-the-loop or a fully autonomous system. It is imperative to note, however, this is merely a DoD definition. Internationally, there is no accepted LAWS definition. At the Fifth Convention on Certain Conventional Weapons (CCW) in 2017 and again in 2018, the Chinese submitted the following for an internationally recognized definition:

> In our view, LAWS should include but not be limited to the following 5 basic characteristics. The first is lethality, which means sufficient pay load (charge) and for means to be lethal. The second is autonomy, which means absence of human intervention and control during the entire process of executing a task. Thirdly, impossibility for termination, meaning that once started there is no way to terminate the device. Fourthly, indiscriminate effect, meaning that the device will execute the task of killing and maiming regardless of conditions, scenarios and targets. Fifthly evolution, meaning that through interaction with the environment the device can learn autonomously, expand its functions and

[16] Kelley M. Sayler, "Defense Primer: US Policy on Lethal Autonomous Weapons Systems," *Congressional Research Service* (2020), https://sgp.fas.org/crs/natsec/IF11150.pdf.

capabilities in a way exceeding human expectations.[17]

Interestingly, after suggesting this definition, the delegation suggested a ban on LAWS entirely despite Chinese advancements toward such a system.[18] The United States does not support such a proposal and is ardent in its development of LAWS for future AI application.[19] Despite its stated policy regarding LAWS, the US is less rigid in practice than the narrative would suggest. DoDD 3000.09 also states all US weapons systems must be designed in such a manner that "commanders and operators [are allowed] to exercise appropriate levels of human judgment over the use of force."[20] The term "appropriate" is intentionally left vague and can be influenced by a number of variables that cannot be accounted for in a non-combat environment. Mission planning factors, area of operations (AO), enemy order of battle, friendly order of battle and the use of operational and unit level tactics all have the ability to drive the definition of "appropriate." In fact, several current US systems utilize man-on-the-loop technology to apply the OODA concept faster than a human.[21] In an operational environment with limited situational awareness due to advancements in electromagnetic (EM) warfare, hypersonic weapons, and stealth aircraft, the ability for a system to act without a human operator could be the difference between a successful and unsuccessful combat encounter. A problem arises when these systems make mistakes. Such a mistake happened in 1988 when the US guided missile cruiser USS VINCENNES, with its SPY-1 AEGIS radar system operating in a semi-autonomous defense mode, mistakenly identified Iran Air Flight 655 as a hostile aircraft and engaged the Airbus with two SM-2 surface to air missiles, destroying the aircraft and killing its 290 occupants. While the risks associated with tactical level

[17] "2018 Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS)," *United Nations Office at Geneva* (2018).
[18] Morgan et al., "Military Applications of Artificial Intelligence," 72-74.
[19] Sayler, "US Policy on Lethal Autonomous Weapon Systems."
[20] Sayler, "US Policy on Lethal Autonomous Weapon Systems."
[21] Morgan et al., 11-13. Although AI-assisted OODA loop cycles are a new phenomenon, military theory regarding OODA loop cycles has existed since the 1980s.

mistakes of individual systems are easily quantifiable with examples such as the Iran Air incident, they are rare and despite their tragic nature, are generally small in scope.[22] Mistakes made at a strategic level have horrifying potential effects which could be regional or global in nature. To better understand the nature of this potential, policymakers must understand the differences between various types of AI and how they can incorporate into LAWS and the associated strategic problems that arise from each.

A series of Congressional actions in 2018 established the framework for coming US AI strategy. One of these, the John S. McCain National Defense Authorization Act of Fiscal Year (FY) 2019, established the National Security Commission for AI (NSCAI). The stated mission of NSCAI was to "advance the development of [AI], machine learning, and associated technologies to comprehensively address the national security and defense interests of the United States."[23] Furthermore, NSCAI was instructed to "examine AI through [various] lenses" to include national competitiveness, research and development, training, risks, ethics and AI evolution.[24] The end result of this report were several recommendations for US AI policy. Of note, these recommendations encompass a full spectrum of civil/military capabilities and fields in a two-part document. The first part details defense against AI threats from state and non-state actors and ethical and responsible uses for AI. Part two discusses the greater international challenges presented by AI and how the US can maintain competitive advantages.[25] Chapters and sections of note within the report include:

Chapter 1: Emerging Threats in the AI Era

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[22] Greg Myre, "A Brief History of Civilian Planes that have been Shot Down," *National Public Radio* (July 17, 2014), https://www.npr.org/sections/parallels/2014/07/17/332318322/a-brief-history-of-civilian-planes-that-have-been-shot-down.
[23] Eric Schmidt et al., "Final Report: National Security Commission on Artificial Intelligence," *National Security Commission on Artificial Intelligence* (2021): Preface, https://assets.foleon.com/eu-west-2/uploads-7e3kk3/48187/nscai_full_report_digital.04d6b124173c.pdf.
[24] Schmidt et al., Preface.
[25] Schmidt et al., 20.

Chapter 3: AI and Warfare
Chapter 4: Autonomous Weapons Systems and Risks Associated with AI-enabled Warfare
Chapter 9: A Strategy for Competition and Cooperation
Chapter 11: Accelerating AI Innovation
Blueprints for Action[26]

There are several key takeaways from these chapters. First, the Commission assessed the US is "not prepared to defend the US in the coming AI era."[27] Second, NSCAI determined the nature of warfare is shifting and the DoD is "locked in an Industrial Age mentality" where Clausewitzian warfare concepts continue to dominate the battlespace.[28] Chapter 3 warns that the US should not be a spectator to the "AI revolution in military affairs."[29] NSCAI also investigated the concept of LAWS, stating AI has the potential to produce "novel, sophisticated offensive and defensive autonomous capabilities."[30] More importantly, the Commission determined these systems, with certain conditions, can be used in a manner consistent with International Humanitarian Law, specifically in the areas of "distinction, proportionality and accountability."[31] Notably, commissioners did not support a global prohibition on LAWS.[32]

In Part 2, NSCAI concluded AI investment and innovation will drive "critical infrastructure, commerce, transportation, health, education, financial markets, food production, and environmental stability."[33] It was also determined that these metrics could be assessed through objective means such as gross domestic product (GDP), growth/investment of AI talent, K-12 education, and a reorganization/restructuring of budgets and regulations.[34] While comprehensive and detailed, it is important to note that the NSCAI report only details policy recommendations to

[26] Schmidt et al., "Final Report," 18.
[27] Schmidt et al., 45.
[28] Schmidt et al., 77.
[29] Schmidt et al., 77.
[30] Schmidt et al., 91.
[31] Schmidt et al., 92.
[32] Schmidt et al., 97.
[33] Schmidt et al., 159.
[34] Schmidt et al., 162-167.

FY26, or calendar year (CY) 2025. Along with these recommendations, NSCAI suggests specific appropriations, detailed in Appendix E, by chapter. Within the key chapters described previously, NSCAI recommends:

> Chapter 1: A 151 million USD investment over 6 recommendations in FY22.
> Chapter 3: A 122 million USD investment over 5 recommendations in FY22.
> Chapter 9: A 2 million USD investment in FY22.
> Chapter 11: A doubling of the AI R&D budget every year from FY22-26 beginning with 2 billion and ending with a 32 billion USD annual investment by CY25. This is in addition to the establishment of a new technology foundation and other programs totaling 53.5 billion from FY22-26.[35]

AI Development

In 2018, the DoD established the Joint Artificial Intelligence Center (JAIC), whose mandate is to coordinate the development and deployment of DoD-related AI.[36] JAIC was mandated by the DoD to develop a strategy to "accelerate the adoption of AI and the creation of a force fit for our time."[37] This led to a three-pronged approach to AI development. These categories are enterprise, mission-support and operational AI.[38] Enterprise AI encompasses all forms of digitally automated record keeping and organization.[39] These AI systems are prevalent throughout civilian and military industries. Mission-support AI is any system developed to support combat operations.[40] These systems draw on ML to analyze massive amounts of data. When coupled with specific forms of programming, mission-support AI has the capability to gather and analyze massive amounts of data in seconds or minutes what would take a large team of humans days or

[35] Schmidt et al., "Final Report," 729-739.
[36] Joint Artificial Intelligence Center, "About the JAIC – The JAIC Story," *US Department of Defense*, https://www.ai.mil/about.html.
[37] US Department of Defense, "Summary of the 2018 Department of Defense Artificial Intelligence Strategy," *US Department of Defense* (2018): Preface, https://media.defense.gov/2019/Feb/12/2002088963/-1/-1/1/SUMMARY-OF-DOD-AI-STRATEGY.PDF.
[38] Danielle C. Tarraf et al., "The Department of Defense Posture for Artificial Intelligence: Assessment and Recommendations," *RAND Corporation* (2019): 2-5, https://www.rand.org/t/RR4229.
[39] Tarraf, 2.
[40] Tarraf, 2.

weeks to accomplish. After analyzing this data, based on certain entered parameters, the AI could then offer a series of recommendations to human commanders or operators. This concept is referred to as "augmented intelligence."[41] AI assisted decision-making represents an important step in AI-human interaction and is a leap forward in the technology required to develop AGI and ASI. According to Gartner, research and advisory company established in 1979, this advancement is anticipated within the next two to five years.[42] Every year, Gartner produces a "hype cycle" for emerging technologies across the civil/military spectrum which outlines current and oncoming capabilities with a timeline expected for each. Pew Research Center states these hype cycles are widely used and accepted within the technical community.[43] It is also important to note some of these concepts rely on quantum computing, an infant technology with exponentially greater computing power than its binary counterpart.[44] With the addition of quantum computers, policymakers and senior military officers can look at the hype cycle for coming technologies. Hype

[41] Gartner, "Augmented Intelligence," *Gartner*, https://www.gartner.com/en/information-technology/glossary/augmented-intelligence.
[42] Gartner, "Gartner Hype Cycle for Emerging Technologies 2019," *Gartner*, https://www.gartner.com/smarterwithgartner/5-trends-appear-on-the-gartner-hype-cycle-for-emerging-technologies-2019.
[43] Andrea Caumont, "Chart of the Week: The Hype Cycle for Emerging Technologies," *Pew Research Center* (August 15, 2014), https://www.pewresearch.org/fact-tank/2014/08/15/chart-of-the-week-the-hype-cycle-of-emerging-technologies/. Lee Rainie, Pew Director for Internet, Science and Technology research, also stated that Gartner analysts' opinions generally track those of most elite observers and are not generally disputed regarding emerging trends.
[44] Sayler, "Quantum Technology."

cycles for 2019-2021 and the corresponding developments and expected technologies are shown in Figures 3 through 5.

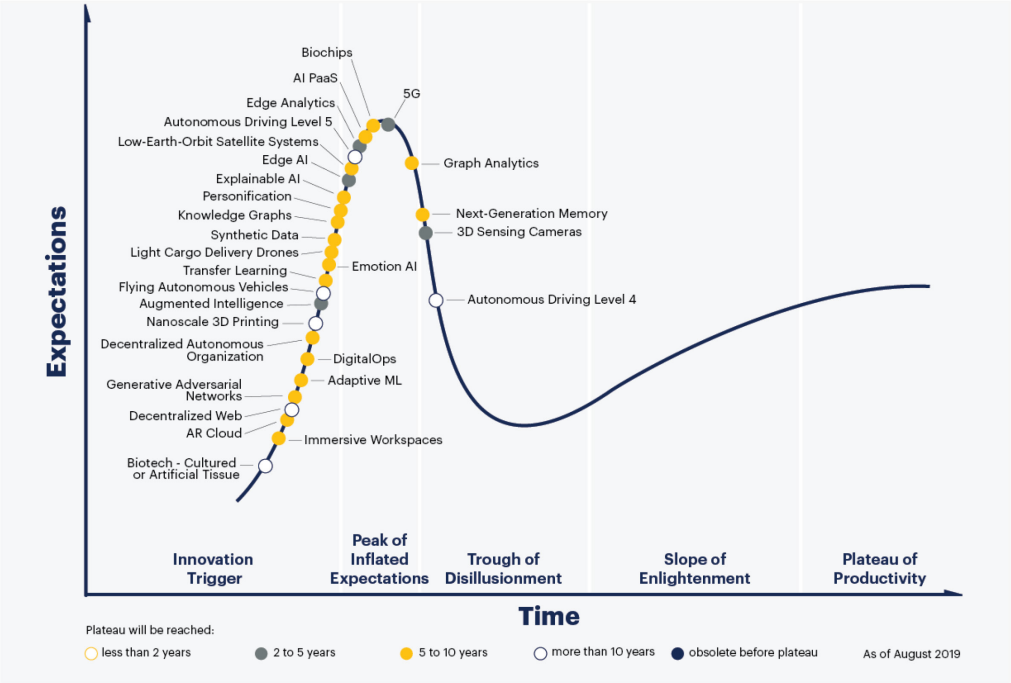

Figure 3: Hype Cycle Emerging Technologies 2019
(Source: Gartner 2019)

Figure 3 from 2019, illustrates various technologies in development during CY19. Several of these advances, including several within the 5-10 year category such as 5G, light cargo delivery drones, low-Earth-orbit satellite systems, and immersive workspaces were fielded within the next year. Additionally, advancements within the less than two year category were all produced, some of them *en masse*. Using 2019 as a baseline, over the next two years, there will be sweeping changes within this graph, illustrated by Figures 4 and 5. It is key to recognize innovation trends in new technologies as a result of AI. The breakthroughs and novel ideas that are emerging from the concept and entering the development phase will be key to understanding

the acquisition timeline of LAWS and what AI automation capabilities will be available at that juncture.

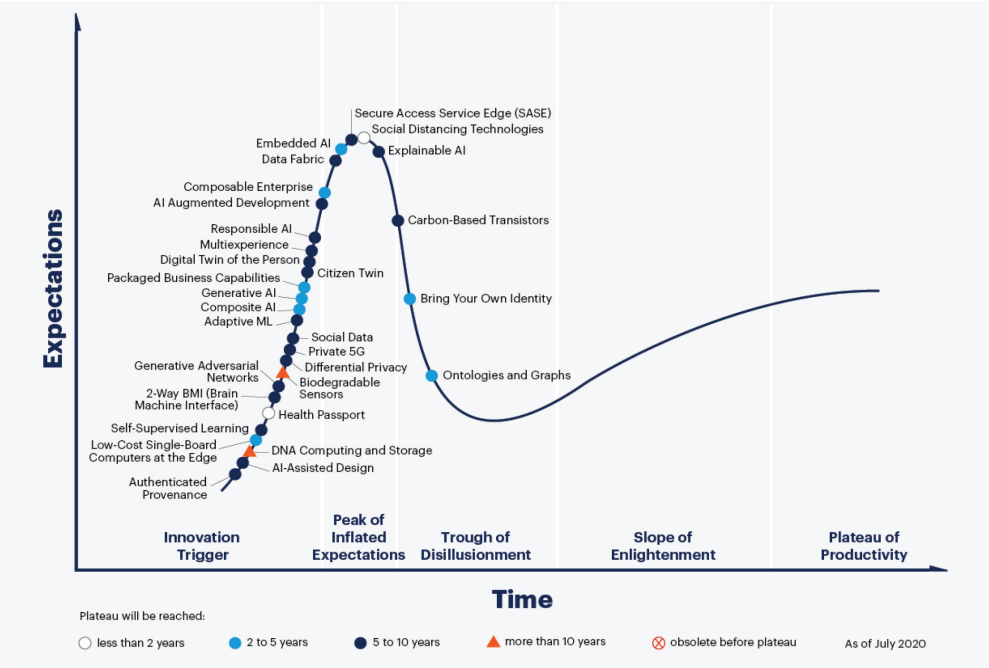

Figure 4: Hype Cycle Emerging Technologies 2020
(Source: Gartner 2020)

Advancing to 2020, important new technologies entering the hype cycle are AI-assisted design, 2-way brain machine interface, digital twin of the person, and AI augmented development. While these are placed within the 5-10 year category, composite AI and generative AI are expected within the next 2-5 years. All of these represent important steps in wave 2 AI development. Many of these capabilities form the foundational pieces for adaptive ML, a requirement for AGI. As shown, within a year, the research, development and production of advanced AI concepts took giant leaps forward. The transition from wave 1 to wave 2 and the conceptualization of basic requirements of wave 3 occurred within a 365-day period. Looking

forward to the 2021 hype cycle, the wave 3 requirements become even more evident as shown in Figure 5.

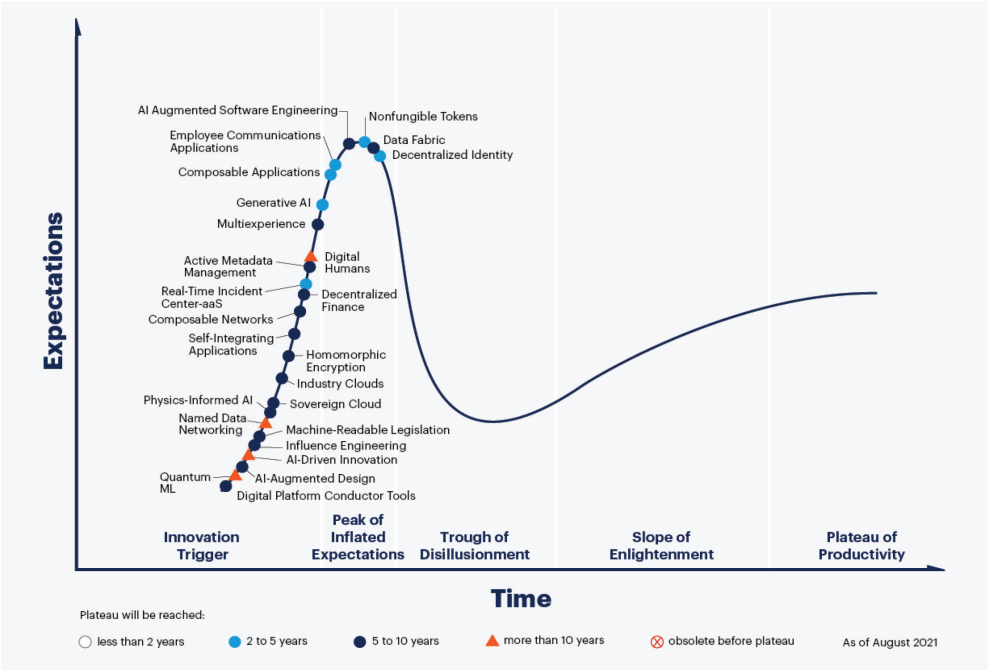

Figure 5: Hype Cycle Emerging Technologies
(Source: Gartner 2021)

Advancing to the current year, while several of the technologies on the 2020 list remain, the expected advances in AI are astounding. Quantum ML, physics-informed AI, and AI-driven innovation are essential elements to AGI and ASI. As tangible quantum technologies reach military markets, the capability of military AI increases exponentially. Another important feature of the 2021 cycle is the addition of digital humans with hardware advancements such as Tesla's humanoid robot.[45] While this advancement in itself, an autonomous robot with the ability to perform basic tasks, is not necessarily revolutionary, the technologies required to make such an advancement in adaptive learning possible are. When paired with more capable AI systems, this

[45] Tesla Incorporated, "Tesla AI Day," Recorded on August 19, 2021, https://www.youtube.com/watch?v=j0z4FweCy4M.

advancement potentially leads to an era where a LAWS is possible in a timeframe sooner than the anticipated 2025 demonstration date by the US Army Command and General Staff College.[46]

US Adversary AI Advancements

With the new era of great power competition, where the US faces robust adversary capabilities in China and Russia, the ability of the US to remain at the forefront of AI innovation, development and fielding is of paramount importance.[47] China, in particular, has begun a research and development (R&D) process focused on leading the world in AI by 2030.[48] While China displayed a hesitancy toward LAWS during recent CCW conferences, it is important to recognize the suggested definition does not preclude development of any autonomous system where MOTL technology is employed.[49] Therefore, the US must account for China developing LAWS with capabilities at the tactical, operational and strategic levels. Furthermore, the Chinese government claims it will grow its AI industry to 130 billion EUR (152 billion USD) and AI related fields to 1.6 trillion EUR (1.86 trillion USD) over the next 10 years, further bolstering the idea the Chinese are serious about the strategic importance of AI and its role in modern civil/military competition.[50]

Russia assumes a path where autonomous vehicles across the sea, air, and land battlespace influences the tactical, operational and strategic picture.[51] Strategic LAWS, such as the Russian Status-6 AI-driven autonomous thermonuclear submarine, represent a dramatic shift

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[46] Brock, "Why the United States Must Adopt Lethal Autonomous Weapons Systems."
[47] US Department of Defense, "Summary of the 2018 National Defense Strategy," *US Department of Defense* (2018), https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf.
[48] Paul Mosur, "Beijing Wants AI to be Made in China by 2030," *The New York Times* (July 20, 2017), https://www.nytimes.com/2017/07/20/business/china-artificial-intelligence.html.
[49] Morgan et al., "Military Applications of Artificial Intelligence," 80.
[50] European Commission, "Digital Transformation Monitor: USA-China-EU Plans for AI: Where do we stand?" *European Union* (July 2018): 4, https://ati.ec.europa.eu/sites/default/files/2020-07/USA-China-EU%20plans%20for%20AI%20-%20where%20do%20we%20stand%20%28v5%29.pdf.
[51] Morgan et al., 83-90.

from MITL to MOTL at the strategic level.[52] The US must conceptualize risks associated with the strategic level of AI-integration. Additionally, the Russian government has invested in agencies similar in scope to that of the United States' Defense Advanced Research Projects Agency (DARPA) whose primary role will be to research and develop AI-integrating military technologies and adapt current systems for their use.[53] However, recent military budget cuts in the Russian Federation will likely curtail significant AI development relative to China and the US. It is assessed, in spite of this fact, the Russians will still develop considerable AI capability given their advancements in the cyber realm without significant indigenous contributions to the field.[54] Nevertheless, the introduction of a nuclear capable autonomous system signals a change in the variables that accounted for the strategic deterrence that existed throughout the Cold War.

In 2018, RAND Corporation completed a series of workshops centered around advancements in AI and their ability to affect the strategic nuclear landscape.[55] The conclusion of these workshops was AI integration into the strategic realm "has significant potential to upset the foundations of nuclear stability and undermine deterrence by the year 2040, especially in the increasingly multipolar strategic environment."[56] In fact, at the strategic level, there are four distinct areas AI and LAWS directly affect. These four areas are "thresholds, escalation management, proliferation and strategic stability."[57] Thresholds refers to the ability to constrain escalation regarding the use of force (ie: transition from non-lethal to lethal or devastating force). Escalation management refers to the ability of humans to affect the decision-making cycle of autonomous systems. As autonomous systems are capable of completing the OODA loop cycle

[52] Geist and Lohn, "Security 2040," 2-4.
[53] Hoadley and Saylor, "Artificial Intelligence and National Security," 25.
[54] Hoadley and Saylor, 26.
[55] Geist and Lohn, 1-22.; Morgan et al., "Military Applications of Artificial Intelligence," 40.
[56] Geist and Lohn, "Security 2040," 22.
[57] Morgan et al., 38-40.

significantly faster than humans, it is conceivable that decisions regarding the escalation of force will be made faster than any supervisory human assessing a MOTL system can effectively regulate. This, in turn, removes humans from the decision cycle and allows AI systems relative autonomy in action, possibly resulting in "flash war."[58] Proliferation concerns the distribution of these systems to outside entities, potentially those with strategic aspirations without the political, military or economic power to otherwise affect those international structures. AI-assisted speech and image processing systems are essential components in "deep fake" technology, which has considerable promise in information warfare at the strategic level.[59] LAWS technology, if proliferated, can present a difficult attribution problem for their actions by state actors and allows non-state actors to potentially upset a volatile multi-polar strategic environment.[60] Finally, strategic stability is the ability of the primary nation states to maintain deterrence, resulting in a stable strategic environment and relative parity among the great powers. Strategic LAWS, such as Status-6, or tactical LAWS with the ability to produce strategic level effects, as in asymmetric warfare, greatly shift the policy conversation regarding LAWS in the future.

As DoDD 3000.09 is set to expire late in 2022 and no stated policy recommendations extending beyond 2025, the United States does not have an adequate long-term AI policy to ensure the security of vital US interests. With a determined adversary in China and new technologies on the horizon, it is essential the US develop a sustainable long-term AI policy focused on maintaining a strategic advantage in a new era of great power competition.

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[58] Morgan et al., "Military Applications of Artificial Intelligence," 39.; "Flash war" is a concept that AI-driven decision-making at machine speeds could lead to violent conflict before human operators could intervene.
[59] Kelley M. Sayler, "Defense Primer: Emerging Technologies," *Congressional Research Service* (2021), https://crsreports.congress.gov/product/pdf/IF/IF11105.
[60] Morgan et al., 40.

Policy Recommendation and Evaluation

Great power competition must be evaluated relative to the capabilities of other great powers. As such, no single capability can be assessed to generate a sustainable absolute advantage. However, the ability to develop AI technologies and apply CONOPS designed for 21st century conflict prior to potential adversaries obtaining the same will generate a temporary strategic advantage across the political/military spectrum. Current public US policies and strategies do not extend beyond CY25. With China poised to become the predominant AI power by 2030, the US, to secure long-term strategic interests, cannot accept the status quo of the AI race. The state of the AI RMA and the ability to seize an initial advantage is approaching an inflection point due to the rapid pace of technological development in the AI field. It is recommended the US adopt a policy focused on US primacy in the AI race, particularly in the research and development of LAWS. The US ability to maintain superiority in this realm will be imperative to national security and the readiness to engage in a 21st century AI-assisted and/or AI-enabled environment.

As LAWS are a future technology still in development, it is impossible to determine the complete impact of LAWS on the strategic environment. This study acknowledges there is no predictive measure of assessing the impact of a future weapon system that will also evolve over several technological generations before realizing its full potential. However, the ability to assess the impact of an evolution in investment policy, technology and CONOPS and how it affects military readiness, political capital, and the strategic environment is well documented.

The paper's recommendations will be modeled on the Chinese military investment strategy from 1990-present. Increases in Chinese defense spending over this period created an unprecedented increase in capability and military power given the time period and offers a

framework for future US AI policies. As global power is measured in relative, vice absolute, terms, the US, at minimum must maintain parity with growing powers in a multi-polar environment. While certain aspects of the Chinese strategy, specifically the element of intellectual property theft, are impractical from a US vantagepoint, those regarding education and monetary investments can be integrated into future US AI policies. This study recommends:

1. Establish a new position of Assistant Secretary of Defense for Artificial Intelligence Policy (ASDAI) directly responsible for the development and integration of AI into the DoD.

2. Direct ASDAI to develop a desired end state for the US military regarding sixth-generation capabilities, updated every ten years.

3. Establish 30-, 15- and 5-year AI goals updated every five years, placing individual agencies such as DARPA, JAIC, Defense Innovation Unit (DIU) and related organizations responsible for a specific level of development. This will allow US policymakers the ability to appropriate funding to each based on a fluid strategic environment to be assessed and updated by ASDAI.

4. Establish a commission for the development and retention of graduate level science, technology, engineering and mathematics (STEM) talent.

5. Establish a strategic planning organization responsible for the study and integration of new AI technologies as they appear at the 15- and 5-year benchmarks to allow for incorporation during the acquisitions process.

Evaluation of these polices must be held against the accomplishments and advancements of US adversaries in the AI field. A policy built upon US primacy in AI should be focused on education and economic investment, initial development of novel AI technologies and the development of new CONOPS to adequately and effectively field new AI capabilities as they become available. The remaining sections of this study focus on an adaptation of the Chinese defense modernization program for future US AI policies and recommendations.

Data

Beginning in the 1990s, the Chinese government undertook a massive social and military modernization program designed to elevate China to the status of a major international power.[61] According to data from the Council on Foreign Relations, in 1990, the defense budget of the Chinese government was 21 billion USD. Between 1990 and 2018, the Chinese defense budget increased to 239 billion USD, an eleven-fold increase. At the same time, the US defense budget rose from 574 billion USD to 634 billion USD with a considerable increase post-2001 for sustained combat operations in Afghanistan and Iraq. This comparison is illustrated in Figure 6.

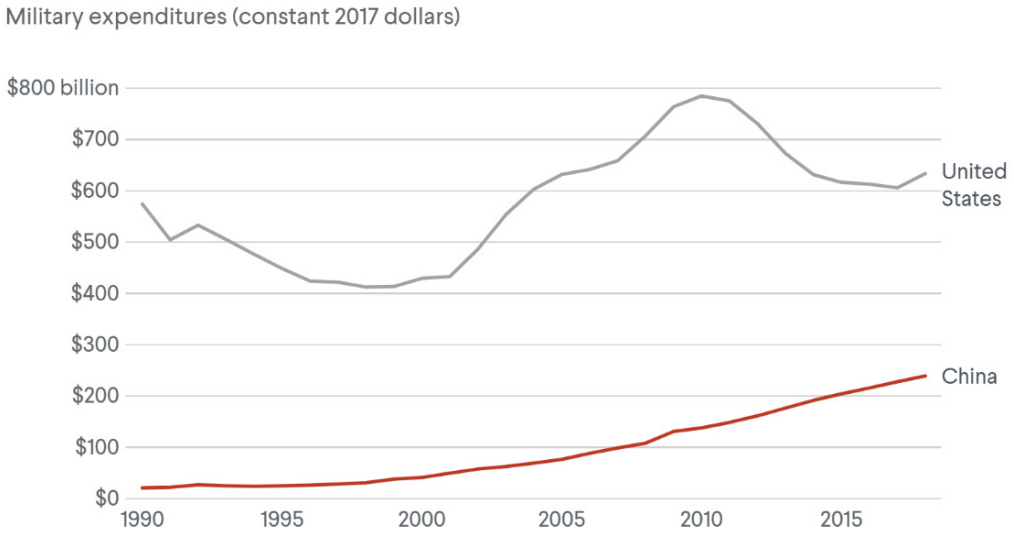

Figure 6: China Defense Spending 1990-2018
(Source: Council on Foreign Relations 2020)

In Beijing alone, between 2004 and 2014, the number of STEM professions nearly doubled from less than 400,000 to 723,000 with close to 75,000 approved patents in 2014.[62] As a result of this education investment, Chinese AI developments skyrocketed. In 1997, Chinese

[61] Lindsey Maizland, "China's Modernizing Military," *Council on Foreign Relations* (February 2020), https://www.cfr.org/backgrounder/chinas-modernizing-military.
[62] Organization for Economic Cooperation and Development (OECD), "Education in China: A Snapshot," *Organization for Economic Cooperation and Development* (2016): 36, https://www.oecd.org/china/Education-in-China-a-snapshot.pdf.

scientists published 1,086 AI-related research papers, or 4.26 percent of global AI research contributions. This number grew to 37,347 AI-related research papers published by Chinese scientists in 2017, or 27.68 percent of global AI research contributions. This number exceeds US AI-related research contributions by over 10,000.[63] This relationship is displayed in Figure 7.

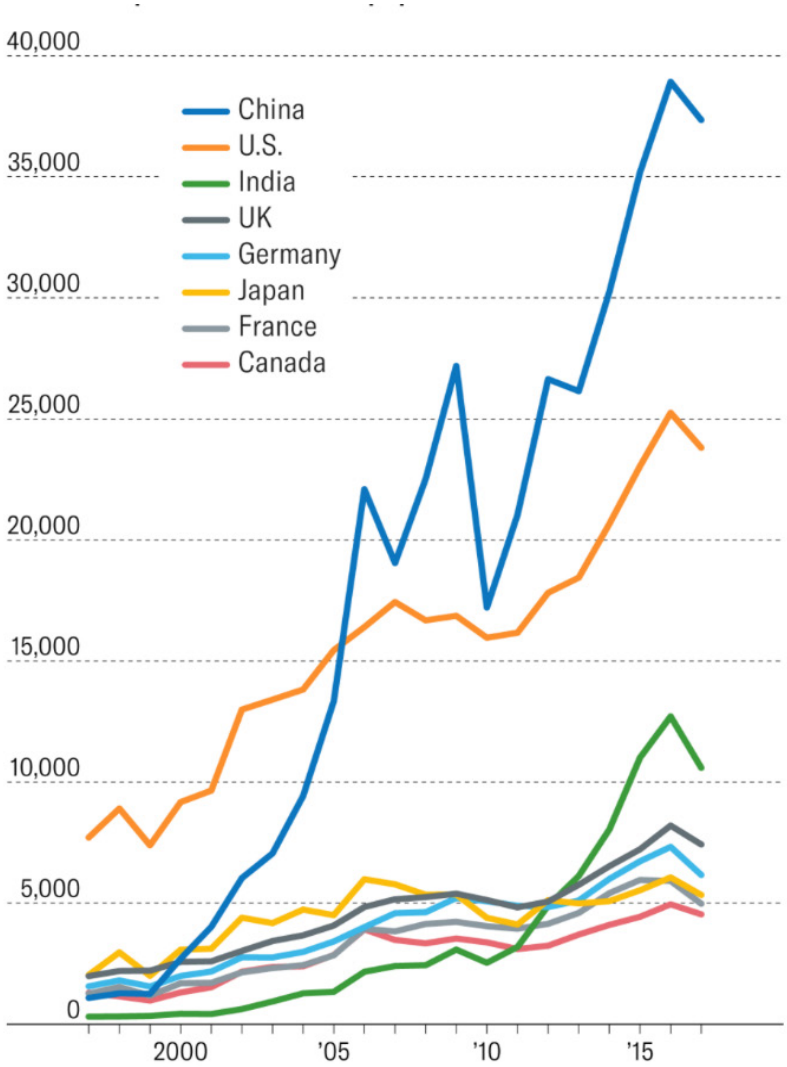

Figure 7: AI Research Papers Produced Annually
(Source: Harvard Business Review 2021)

[63] Daitian Li, Tony W. Tong, and Yangao Xiao, "Is China Emerging as the Global Leader in AI," *Harvard Business Review* (February 2021), https://hbr.org/2021/02/is-china-emerging-as-the-global-leader-in-ai.

In 2018 DIU, the DoD organization responsible for "fielding and scaling commercial technology" for national security and military purposes, published a study on "China's Technology Transfer Strategy."[64] Within the report, a key finding of the DIU was by 2050, the Chinese economy may grow to 150% that of the US in the same timeframe.[65] Also, estimated intellectual property theft out of the US by China is measured at 300 billion USD annually.[66] Along those same lines, nearly 25% of STEM graduates from US universities are Chinese foreign nationals.[67] China is also heavily integrated in US technological innovation. Between 2006 and 2016, DIU estimates Chinese investments in US technology companies at 35 billion USD with a substantial increase in 2015 as shown in Figure 8.[68]

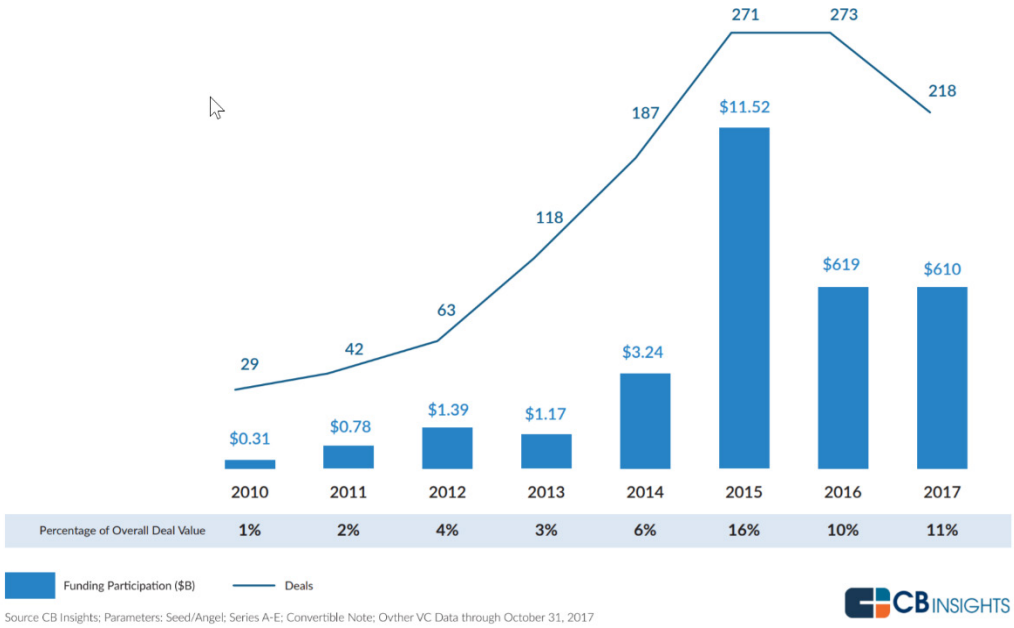

Figure 8: Chinese Participation in US Venture Capital Market 2010-2017 (Source: CB Insights 2018)

[64] Defense Innovation Unit, "Accelerating Commercial Technology for National Security," *US Department of Defense*, https://www.diu.mil/.
[65] Michael Brown and Pavneet Singh, "China's Technology Transfer Strategy," *Defense Innovation Unit Experimental (DIUx)* (2018): 3, https://admin.govexec.com/media/diux_chinatechnologytransferstudy_jan_2018_(1).pdf.
[66] Brown and Singh, 3.
[67] Brown and Singh, 3.
[68] Brown and Singh, 5.

Between 2010 and 2017, Chinese AI investments totaled a mere 1.3 billion USD with only 2.1 percent of Chinese GDP devoted to research and development.[69] Of note, is how quickly this investment climbed between 2015 and 2017. This relationship is shown in Figure 9 along with the number of Chinese venture deals into AI technology.

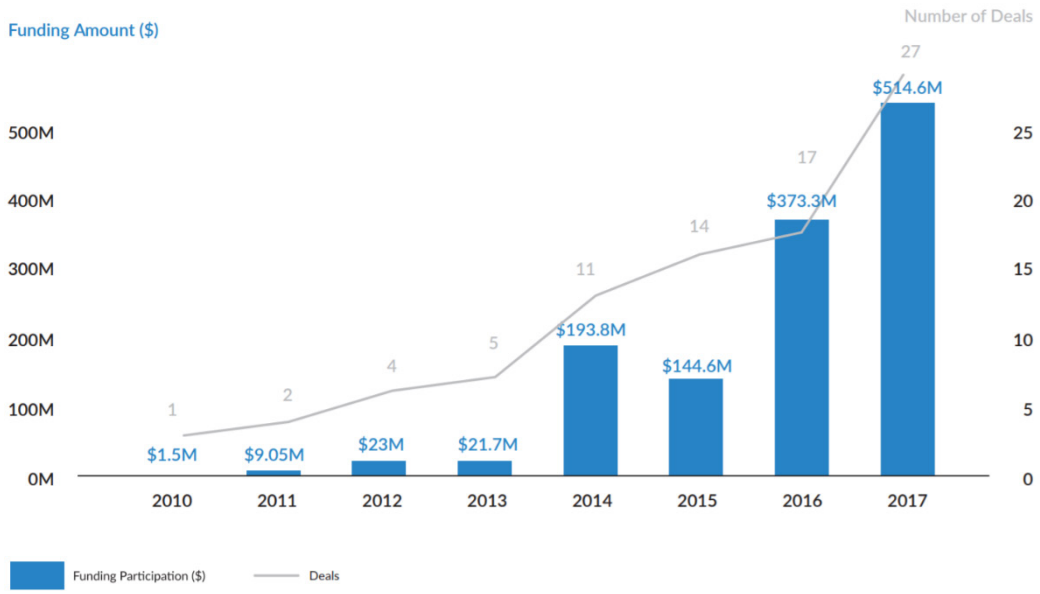

Figure 9: Chinese AI Investments 2010-2017
(Source: DIU 2018)

China's Five-Year Plans included an increase to 2.5 percent of GDP by 2020, roughly 350 billion USD, on research and development.[70] By comparison, the US total spending is roughly 3-4 percent GDP on research and development combined between public and private sectors with NSCAI recommendations of just under 100 billion USD investment over the next five years in AI.[71] Along other innovation lines, in 2015, Chinese patent applications were up 19 percent from 2014 while US patent applications grew only 2 percent.[72] China also produced nearly double the amount of graduates in STEM fields over US counterparts, 1.29 million to 525

[69] Brown and Singh, "Technology Transfer," 7.
[70] Brown and Singh, 13.
[71] Brown and Singh, 13.
[72] Brown and Singh, 13.

thousand.[73] As a sign of how these investments are growing Chinese capability, in 2016, the Chinese introduced the world's fastest supercomputer and displayed several next generation technologies including a quantum communications satellite.[74] DIU concludes their study with a few important findings:

- The US Government does not have a holistic view of how fast this technology transfer is occurring, the level of Chinese investment in US technology, or what technologies we should be protecting.
- The US does not have a comprehensive policy or the tools to address this massive technology transfer to China.
- China is investing in the critical future technologies that will be foundational for future innovations both for commercial and military applications [including] artificial intelligence…[75]

Regarding LAWS, China has already developed a semi-autonomous cruise missile capable of AI-assisted decision-making in flight.[76] Furthermore, in 2017, a military affiliated Chinese university demonstrated an unmanned aerial swarm of over 1,000 aircraft.[77] These advancements can be attributed to a 620 percent increase in Chinese defense spending between 1996 and 2005 and then a tripling of that defense budget between 2007 and 2017.[78] By contrast, US defense spending, as depicted in Figure 6, when adjusted for combat allocation, remained relatively constant. The US DoD budget for 2020 requested four billion USD to research autonomous systems after spending a total of 9.7 billion USD on unmanned and autonomous systems in 2019.[79] This four billion would be complemented by a request of nearly one billion

[73] Brown and Singh, "Technology Transfer," 13.
[74] Brown and Singh, 12.
[75] Brown and Singh, 3-4.
[76] Brown and Singh, 13.
[77] Hoadley and Saylor, "Artificial Intelligence and National Security," 22.
[78] Austin Wyatt, "Charting Great Power Progress Towards a Lethal Autonomous Weapon System Demonstration Point," *Defence Studies* 20, no. 1 (2020): 10, https://doi.org/10.1080/14702436.2019.1698956.; Chris Cornillie, "Finding Artificial Intelligence Money in the Fiscal Year 2020 Budget," *Bloomberg* (March 28, 2019), https://about.bgov.com/news/finding-artificial-intelligence-money-fiscal-2020-budget/.
[79] Wyatt, "Charting Great Power Progress," 10.

USD more from private corporations.[80] This research represented a significant increase from the 1.4 billion USD research request in 2019.[81] However, these numbers and trends do not approach the recommendations set forth by NSCAI regarding AI investment by FY26 and considerably lag planned Chinese investments over the same time period.

Despite limitations, US investments also led to considerable increases in capability. Several US military branches, in conjunction with civilian universities, DARPA and other civilian and military research centers, developed swarm technology and drones, such as DARPA's Gremlin, that can launch from larger aircraft and coordinate with airborne fighter assets.[82] These drones have the ability to engage in offensive swarm tactics, designed to overwhelm defenses while providing low-risk to human operators.[83] These US developments will not go unmatched. Current Chinese investments include an "AI development park" estimated at 2.12 billion USD and an innovation fund of an estimated 14.86 billion was scheduled to begin in 2019.[84]

These increases in capability due to AI-assisted or AI-driven technology require a new generation of CONOPS in order to adequately utilize an evolving force. The Center for Strategic and Budgetary Assessments (CSBA), in conjunction with DARPA, recently developed a new concept of "Mosaic Warfare." Previous military operations were "network centric," requiring massive volumes of data to be collected and analyzed by a commander who could then communicate operational strategy to subordinates.[85] This form of decision making requires high

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[80] Cornille, "Finding Artificial Intelligence Money," in 2020's AI Boom.
[81] Cornille, in AI in the Pentagon's R&D Budget.
[82] Satoru Mori, "US Defense Innovation and Artificial Intelligence," *Asia Pacific Review* 25, no. 2 (2018): 33, https://doi.org/10.1080/13439006.2018.1545488.
[83] Mori, 33.
[84] Wyatt, "Charting Great Power Progress," 11.
[85] Bryan Clark et al., "Mosaic Warfare: Exploiting Artificial Intelligence and Autonomous Systems to Implement Decision Centric Operations," *Center for Strategic and Budgetary Assessments* (2020): iv,

levels of situational awareness to comprehend the full nature of the strategic, operational and perhaps even tactical environment. Modern advancements in electronic warfare are specifically designed to degrade command, control, communications, computers and intelligence (C4I).[86] CSBA recognizes the requirement to shift to an AI-augmented "decision centric" style of warfare.[87] The particulars of decision centric warfare lie outside the boundary of this study. However, the Mosaic model, where an objective is designated by a commander and then AI-enabled systems engage a set of independent "kill chains" at the operational and tactical level is a revolutionary concept in warfare and runs contrary to US warfare doctrine, centered on maneuver and attrition, to present day. When combined with LAWS, the capability of this web increases and potentially can operate in any environment where C4I is degraded or denied as in an anti-access/area-denial (A2/AD) area of operations.[88] CSBA acknowledges that geostrategic advantages held by great power competitors Russia and China in their respective AOs make traditional US warfare an "unsustainable path."[89] Development of a sustained capability to operate in this environment will have a profound impact on the geostrategic balance of power.

Discussion

For the last twenty years, the US was encumbered by conflict in the Middle East. This war, stemming from the September 11, 2001 terrorist attacks, led to considerable financial and human capital investment in counterinsurgency warfare. While the US arguably now possesses one of the most capable forces regarding this type of operation, it did not permit the US military to prepare for potential 21st century conflicts. Continued investment into the attrition style force

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https://csbaonline.org/research/publications/mosaic-warfare-exploiting-artificial-intelligence-and-autonomous-systems-to-implement-decision-centric-operations.

[86] Clark et al., "Mosaic Warfare," 3-4.

[87] Clark et al., 5.

[88] Clark et al., 21-24.

[89] Clark et al., 6-7.

structure of brigade combat teams, carrier and expeditionary strike groups, and fourth-generation fighters did little to change or update legacy strategic capabilities or continue to gap the US relative to its adversaries. Russia, dealing with considerable economic problems since the fall of the Soviet Union, was unable to seize on the strategic opportunity created by US involvement in a "backwards" war in the early 2000s. China, however, sensed an opportunity.

Investment Policy

In the 1990s, China's plan to become a global 21st century power appeared to be nothing more than empty rhetoric. The Chinese military, plush with antiquated technology, did not represent more than a token threat to historical powers in the west or Russia. Between 1990 and 2000, Chinese military defense spending increased from 9.926 billion USD to 22.237 billion USD in 2000. Over the next decade this increased to 105.523 billion USD. From 2010 to 2020, this number rose to 252.304 billion USD.[90] This represents the second largest defense budget in the world behind the US. The advancements during this time in Chinese military technology and capability cannot be overstated. A military described by RAND as a "junkyard army" rife with "outdated equipment…problems with personnel quality, [and] poor training" a mere twenty years ago evolved into a dominant force worth mentioning in the 2017 US National Security Strategy as a great power and peer/near-peer competitor.[91] A shifting paradigm, concentrated around a forward vision and considerable increases in monetary investment, were a catalyst for accomplishing in fifteen years what took the US and other modern militaries at the time sixty

[90] Stockholm International Peace Research Institute (SIPRI), "Military Expenditure Current USD – China," *World Bank*, https://data.worldbank.org/indicator/MS.MIL.XPND.CD?locations=CN.

[91] Michael S. Chase et al., "People's Liberation Army Modernization: Mid-1990s to 2025," In "China's Incomplete Military Transformation: Assessing the Weaknesses of the People's Liberation Army (PLA)," *RAND Corporation* (2015): 13-24, http://www.jstor.org/stable/10.7249/j.ctt13x1fwr.8.; The White House, "The National Security Strategy of the United States of America," *The White House* (2017): 45-47, https://trumpwhitehouse.archives.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

years regarding technology innovation, adaptation and fielding. The current geostrategic balance of power in the Indo-Pacific AO is now driven by the Chinese A2/AD capability prominent there.

Assessing this historical evolution is imperative in assessing the US lack of policy extending beyond 2025. The Chinese modernization program presents strong evidence that dedicated monetary investment into research and development is directly tied to increasing capabilities whether through foreign purchase or indigenous innovation. As scholars, military officers and senior politicians acknowledge the world is undertaking an AI RMA, the US cannot allow the Chinese to gain a substantial advantage in R&D funding for new AI technologies. With the Chinese economy predicted to overtake that of the US through natural growth in the next decade, the Chinese ability to dedicate more investment into the AI regime will increase. This is in addition to the 100 billion USD planned funding shortage the US must overcome in the second half of the 2020s relative to the Chinese or be willing to accept a potential gap in AI capability. The US must overcome this deficiency with a determined vision. This is especially important as certain aspects of the Chinese strategy, such as their ability to steal foreign technologies or rapidly reorient government and private sector tasking, do not apply to the US representative system. Targeted funding into critical technologies along the hype cycle will prevent haphazard spending and allow the US to maintain a competitive advantage. This will be particularly important as the number of Chinese patents and STEM graduates relative to the US continues to grow.

The US must also be able to adjust to Chinese innovation. As these technologies develop, the US must remain a worldwide leader in novel capabilities via “building block” technologies such as ML and quantum computing. Should the US discover foreign scientists developing

capabilities prior to the US, the US must reassess development priorities and not allow the formation of a technology or capability gap. As such, US long-term investment policy should, at minimum, be comparable with any adversary developing AI capabilities. Furthermore, US AI policy cannot be administration driven. Prominent US adversaries achieved near-peer status through US focus in the Middle East and changing administrations who did not develop a comprehensive AI policy until 2018 despite the fact MITL and MOTL systems have existed for decades. In establishing this policy with an outlook to 2025 and adversaries desiring to become world leaders in AI by 2030, the US is forced into a reactionary outlook. Seizing the initiative in the vision for AI development is critical as it will focus future investment, effort and provide a path for AI integration. Establishing a dedicated office under the Secretary of Defense to examine, analyze and prioritize AI investment and production provides an essential element missing from current US AI efforts. This office should be the driving administrative mechanism behind future AI policies and directly responsible for drafting and evaluating 5-, 15- and 30-year plans. Such an office mimics the Chinese hierarchical model and brings all US AI efforts under one central authority. Furthermore, this office should coordinate with DIU and the Department of Education regarding a commission for the retention of advanced level STEM graduates, as well as other talent development and retention programs from the K-post graduate levels to compete with growing Chinese educational investments.

New AI Technologies

The US must have a desired end state for the AI RMA. The Chinese government has produced literature to establish a "world class military" by 2049.[92] Given the current state of

[92] Xi Jinping, "Secure a Decisive Victory in Building a Moderately Prosperous Society in All Respects and Strive for the Great Success of Socialism with Chinese Characteristics for the New Era," Delivered to the 19th National Congress of the Communist Party of China (October 18, 2017), http://www.xinhuanet.com/english/download/Xi_Jinping's_report_at_19th_CPC_National_Congress.pdf.

affairs, this military will have considerable AI integration. The desired strategic end state of the US should be a sixth-generation military with lethal autonomous platforms. The cornerstone of this sixth-generation capability will be the integration of AI throughout the force from administration to strategic decision making and operational conduct and this will be the benchmark of modern militaries by mid-century. Later generations of LAWS should incorporate AGI or ASI. Wave 2 capabilities regarding big data analysis and assessment give human leaders the ability to make decisions based on greater volumes of data than at any time in history. As more of this analysis is delegated to machines, preserving human capital, AI-assisted decision-making lends the ability to make decisions at machine speeds. When this is achieved, military leaders will be able to designate objectives and allow AI to make decisions on how best to execute tasking. This follows CSBA/DARPA's Mosaic warfare model and entirely changes the strategic dynamic of conflict when incorporated with LAWS. As the US continues to develop unmanned vehicles with capability across the sea, air, land and space environments, the ability to incorporate AI will be a determining factor in future assessments regarding a sixth-generation military capability.

The development of a sixth-generation military must be a strategic goal of the United States prior to 2049. This will depend on cooperation across the civil/military spectrum regarding investment and development. As Tesla's AI Day showed, private corporations are at the forefront of AI innovation. US policy must be focused on fostering public/private relationships to complement their efforts. Not only will this be competitive with the Chinese government model, in some aspects, such as external innovative input, may be superior. While the US currently has a policy of non-proliferation of AI technologies to adversary states, it is important to consider the findings of DIU regarding technology transfer. Chinese industrial espionage and intellectual

property theft measures hundreds of billions of dollars annually and saves countless man hours of indigenous R&D. As displayed in the rapid modernization of the Chinese military between 1990 and 2020, the ability to utilize foreign technology and adapt it to Chinese use was a major factor until Chinese indigenous capabilities increased. There is no evidence to suggest the Chinese would not do the same with AI if presented with the opportunity. This is an element of Chinese policy the US cannot replicate as many of the technologies being stolen originate in the US. In conjunction with strict export policies regarding military AI technologies, US primacy in AI is dependent on strict security measures regarding new developments and abilities. This will require a considerable effort and cooperation across the public/private spectrum.

Development of New CONOPS

A critical piece of the Chinese military modernization was the development of the A2/AD concept. Now a staple of Russian and Chinese defense practice, the ability to deny a potential adversary access to an AO renders a strategic, operational and tactical advantage. This same concept is applicable to the AI RMA. At the strategic level, RAND identified four categories of significance for AI: thresholds, escalation management, proliferation and strategic stability.[93] For each of these categories, US CONOPS must include MOTL systems with an eye to the future for LAWS. As the speed of decision-making in warfare increases, along with increasing electronic and EM warfare capacity, the current model of decision-making and action is inadequate. Assessments that the US is not ready for the AI RMA from NSCAI, DIUx and others cannot be discounted. As displayed in the Gartner hype cycles, these technologies are developing at a pace faster than anticipated. As the US and others drive to a LAWS demonstration point, concepts of use and how these systems will integrate must be pre-

[93] Morgan et al., "Military Applications of Artificial Intelligence," 38-40.

orchestrated and not reactive. Any state with the ability to rapidly AI-integrate will have a strategic advantage over a state not possessing this ability. This does not mean AI systems, even in the event of AGI or ASI development, should exist in a fully autonomous environment. Particularly regarding thresholds of conflict and escalation management, those determinations must be reserved for humans. The purpose for this designation is strategic stability. AI-driven strategic LAWS, such as the Russian Status-6, represent a new dynamic in nuclear deterrence. However, this level of integration is inevitable as AI takes a greater role in the geostrategic landscape, regardless of its destabilizing nature. Long-term US policy must account for this evolving dynamic. US primacy is as dependent on the ability to effectively utilize the new capabilities as much as the capabilities themselves. US long-term policy must prioritize the development of new CONOPS to effectively utilize AI advancements as they become available. This will require coordination among the development and operational sectors of the AI industry. As the US does not share the ability of the CCP to influence private entities, ASDAI should have authority to negotiate public/private partnerships for defense related AI projects to include emerging technologies, their capabilities and where they should integrate. In accomplishing this, the US can avoid the missteps of previous RMAs where considerable time was spent post-development determining utilization during the inevitable MTR. These negotiations must happen in the planning phase so these technologies can become baseline systems in new software and platforms. ASDAI must also consider and propose a retrofit of legacy platforms that provide critical functions or consider a planned phase-out of these systems.

Conclusion

The Chinese developed a highly effective model for the modernization of their military, accomplishing in fifteen years what took western militaries decades post World War II to

accomplish. While differences in the Chinese government compared to western democracies allowed for a rapid transition, the model provides a blueprint for a policy regarding the AI RMA. The recommendations of this study attempt to adapt these concepts to future US policy in a manner compatible with a representative system. These recommendations encompass investment policy, new AI advancements and the development of a new concept of operations consistent with 21st century conflict along with the creation of a department within the DoD to coordinate and lead these efforts. The data and assessments of NSCAI, DIU, the Center for a New American Security and other national security and policy experts clearly show current US policies are inadequate and will eventually cede the AI race to US adversaries. US vision must extend beyond 2025 in order to remain competitive in a rapidly changing world with greater AI integration. While the focus of this paper has been military employment of AI and the strategic implications of LAWS, AI integration is occurring all along the civil/military spectrum. Long term US policy must reflect this changing environment. While LAWS are still a weapon of the future, the time to consider their implications is the present. The US must aggressively pursue LAWS and the AI technology that will lead to their generational development. This paper largely concurs with the recommendations of NSCAI regarding policy actions prior to 2025 with aggressive pursuit of DoD AI integration. The creation of a sixth-generation military must be a priority of the US government to retain a strategic advantage and secure worldwide US interests. Based on the data available, it is recommended the US adopt a policy of US primacy in the AI race.

The policy recommendations set forth are designed to allow the US to maintain its current strategic advantage in AI development. This advantage, however, is rapidly closing due to adversary dedication to the AI field. An important limitation of this study is the unclassified

nature of the information. It is understood many of the capabilities of AI-related defense programs and their development, to include LAWS, will be classified. A truly accurate assessment regarding the success of US AI policy must incorporate knowledge of these programs, as well as, the capabilities and investment involved. The author is also limited by the overall breadth of the topic crossing numerous professional and technical fields in the public and private sectors. However, these limitations should not diminish the fact the US faces many challenges relative to its adversaries developing AI. The ability of the US to harness the talent and innovation capability across the civil/military spectrum will be a deciding factor in whether or not the US will maintain a strategic advantage relative to its competitors by mid-century.

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Curriculum Vita

Brandon McNally was born in Yuma, Arizona on October 8th, 1986. His family moved across the country during his early life before settling in Glen Rose, Texas where he graduated from Glen Rose High School in 2005. Following graduation, he attended the United States Naval Academy where he earned his Bachelor of Science in Political Science in 2009. After commissioning, Brandon served twelve years in the US Navy as a fighter pilot and adversary aerial combat instructor, completing a combat tour in 2017 as a part of OPERATION INHERENT RESOLVE.

Brandon left the military in October 2021 and now serves as a military aviation subject matter expert in the defense contracting industry. In addition to his professional career, Brandon is a graduate student at Johns Hopkins University pursuing a graduate degree in Global Security Studies.