

Artificial Intelligence and the Future of the United States Air Force

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Artificial Intelligence (AI) is already affecting 21st century life in various ways. With machines and technology now showing ability to “think,” predict, and make decisions just as a real human being would, many tasks are being delegated to AI systems and technology across various industries. The United States Air Force is no exception. As of December 2023, the Air Force had 44 active AI projects, including the Advanced Battle Management System (ABMS), which helps to facilitate decision making processes for combat operations.¹ AI has a legitimate purpose for the Air Force and in the United States Military as a whole: to maintain superiority over key world adversaries, and to ensure the nation is prepared for future conflicts. AI has many capabilities that will undoubtedly help the United States achieve these ends; however, there are also drawbacks and limitations to consider. The purpose of this essay is to discuss AI and how it will affect the United States Air Force—its core missions, operational doctrine, and the challenges that could arise for operational commanders.

Effects of AI on Core Missions

The Enlisted Force Structure describes six Air Force Core Missions: Air Superiority, Intelligence, Surveillance, and Reconnaissance (ISR), Rapid Global Mobility, Global Strike, and Command and Control.² Artificial Intelligence has the capacity to enhance these core missions in various ways. Air Superiority is defined by AFDP 3-01, Counterair, as the "degree of control of the air by one force that permits the conduct of its operations at a given time and place without prohibitive interference from air and missile threats."³ In simple terms, Air Superiority refers to the Air Force's capacity to carry out its mission; it does not necessarily mean that an adversary is incapable of conducting its own operations. Air Superiority will, in theory, be simpler and quicker to achieve as AI becomes a greater part of Air Force operations. The combination of traditional human control of air assets and AI systems will allow greater flexibility for Combatant Commanders as they work to shape the air battlespace environment. Furthermore, artificially intelligent systems will allow commanders to ensure Air Superiority without placing as many Airmen into dangerous situations. A specific Pentagon-level initiative, known as “Replicator,” is already in place to meet these goals.⁴ According to Deputy Defense Secretary

¹ Anastasia Obis, “Air Force’s New Policy Sets Guardrails Around Generative AI,” *Federal News Network*, Dec 15, 2023, <https://federalnewsnetwork.com/artificial-intelligence/2023/12/air-forces-new-policy-sets-guardrails-around-generative-ai/>

² “The Enlisted Force Structure,” *US Air Force*, 16 May 2022, https://www.doctrine.af.mil/Portals/61/documents/Airman_Development/BrownBook.pdf

³ “Counterair Operations,” *Air Force Doctrine Publication 3-01*, 15 June 2023, 2, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-01/3-01-AFDP-COUNTERAIR.pdf

⁴ Joseph Clark, “Defense Innovation Official Says Replicator Initiative Remains On Track,” *DOD News*, Jan 26, 2024, <https://www.defense.gov/News/News-Stories/Article/Article/3657609/defense-innovation-official-says-replicator-initiative-remains-on-track/>

Kathleen Hicks, “Replicator” is a program intended to keep pace with China as a key adversary, with its first iteration focused on fielding thousands of autonomous systems in various domains within the next two years.⁵ Indeed, AI is shaping up to be a primary means to achieve Air Superiority in the near future.

Intelligence, Surveillance, and Reconnaissance (ISR) refers to the combination of many ISR components used to support military operations. This core competency should thrive with the advent of AI systems, as artificial intelligence collection methods will be able to process and filter key intelligence information more quickly than past technologies. The ISR mission closely follows the Intelligence Cycle, which is comprised of five main steps: planning and direction, collection, processing, analysis and production, and dissemination. Traditionally, many Air Force intelligence jobs are focused on the collection phase of the cycle; ensuring collection takes place as it should. With much collection already automated, the rise of AI systems could take on much of the collection phase in the future. Several contract companies serve the US Intelligence Community, including Booz Allen Hamilton. Among other goals, Booz Allen is concerned with developing AI technologies capable of collecting insightful data and automating routine tasks.⁶ This and similar efforts will free up more ISR Airmen to focus on such phases as processing and analysis, consequently affording Airmen greater understanding of the overall intelligence picture and the time required to craft quality intelligence products.

Rapid global mobility is a measure of how quickly and effectively the Air Force (and the US military as a whole) can deploy to any location necessary. This core competency has seen vast improvements since the early 20th Century. The invention of the airplane and the military's subsequent use of aircraft meant that global mobility could be achieved much faster than before. Later, the advent of unmanned aerial vehicles (UAV) meant the Air Force could effectively mobilize without the strict need for a pilot and flight crew for every individual mission. AI will transform global mobility even further, since artificial intelligence will be well suited to help commanders plan for arrival and sustained operations in theater. Essential elements such as timing (knowing when an adversary is least likely to detect arrival), the current order of battle or enemy capabilities, weather conditions, and even legal considerations are all areas which AI systems will likely be utilized to enhance the Air Force's rapid global mobility mission.

The core competency of Global Strike builds upon the premise of Rapid Global Mobility. Without strong mobility, Global Strike is far more difficult to achieve. However, AI technology will transform the Air Force's capacity for Global Strike, since most assets are likely to employ AI in the future, to one degree or another. Additionally, the Air Force must always ensure that any assets used for Global Strike are fully mission capable, just as Airmen must maintain mission readiness. AI is already enhancing this capability, considering Air Force Global Strike Command's partnership with Virtualitics to perform preventive maintenance estimates on assets such as bombers, fighter aircraft, and missile systems.⁷ AI can predict and estimate the level of wear and tear on Air Force assets, allowing timely repair or replacement and

⁵ Ibid.

⁶ “Artificial Intelligence Services,” Booz Allen Hamilton, accessed May 3, 2024, <https://www.boozallen.com/expertise/artificial-intelligence/ai-solutions.html>

⁷ Ireland Degges, “Air Force Extends Partnership With Virtualitics to Advance AI,” *ExecutiveGov*, Nov 15, 2022, <https://executivegov.com/2022/11/air-force-extends-partnership-with-virtualitics-to-advance-ai/>

thereby ensuring the most mission capable force possible. Moreover, AI systems will also help commanders' decisions regarding what to target and when.

How AI will Transform Operational Doctrine

In addition to the Air Force Core Competencies, Artificial Intelligence will also have certain implications for Operational Doctrine. According to the Air Force Primer on Doctrine, doctrine “consists of fundamental principles by which military forces guide their actions in support of national objectives.”⁸ Concisely, doctrine explains what the Air Force collectively believes and endorses while prescribing how certain things should happen. Operationally, there are many categories of Air Force doctrine that AI will affect. The scope of this essay is too narrow to consider every possible way that AI will affect doctrine, but will focus on a few specifics. The next few paragraphs will address the implications of AI for the Operational Doctrines of Counterair, Counterland, Chemical, Biological, Radiological and Nuclear (CBRN), and Legal Support.

Air Force Doctrine Publication (AFDP) 3-01: Counterair discusses the concepts of command and control with regard to airpower. Traditionally, the philosophy for command and control has focused on centralized command, distributed control, and decentralized execution.⁹ Decentralized execution has always allowed for flexibility and innovation in an operational setting.¹⁰ However, with the advent of AI, the Air Force will be able to utilize a centralized execution in certain instances. For example, a remotely piloted aircraft sent to conduct an airstrike may operate primarily under AI technology in the future, allowing for execution from a centralized location. Counterair also discusses the Rules of Engagement, stating that overly strict rules are counterproductive because they can lead to inaction.¹¹ Artificial Intelligence, despite its advantages, also comes with drawbacks that could necessitate stricter ROE. For instance, AI systems will not always be able to consider factors such as weather, international law, or even practicality regarding an operation. Thus, ROE will need to be examined in each specific instance due to AI limitations. AFDP 3-01 also discusses the Theater Air Control System (TACS) and its many components, including the Air Operations Center (AOC) and the Battle Control Center (BCC).¹² Within the BCC, managing data links will likely be made more seamless with AI technology. In intelligence disciplines, for instance, a common problem with legacy data link systems is that, while two integral parts of a process (such as the Intelligence Cycle) flow efficiently and quickly, different systems do not always communicate well with each other. The introduction of AI into the Intelligence Cycle will be proficient in correcting communication gaps and facilitating critical information to the AOC and higher levels. Concisely, the TACS will likely be even more efficient when utilizing AI. Counterair doctrine, in the future, should highlight the positive effects of AI on the TACS construct.

⁸ “A Primer on Doctrine,” Curtis E. Lemay Center For Doctrine Development and Education, accessed May 3, 2024, <https://www.doctrine.af.mil/Portals/61/documents/A%20Primer%20on%20Doctrine.pdf>

⁹ “Counterair Operations,” *Air Force Doctrine Publication 3-01*, 15 June 2023, 8, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-01/3-01-AFDP-COUNTERAIR.pdf

¹⁰ *Ibid.*

¹¹ *Ibid.*, 9.

¹² *Ibid.*, 12-14.

Concerning AFDP 3-03, Counterland, there are two fundamental principles that AI will affect: Close Air Support and Air Interdiction. Close Air Support refers to air assets providing direct support to ground forces in a combat environment, while Air Interdiction is defined as aircraft being used to deny, degrade, or disrupt the goals of enemy forces.¹³ Air Interdiction currently uses a single commander who can exploit and coordinate the forces involved.¹⁴ Artificial Intelligence has the potential to complicate matters. For example, AI could determine that the enemy is prepared to attack, given placement of its armies, assets, resources, and support personnel. However, intelligence reports on the adversary's order of battle could conflict with the prediction of AI--the enemy could be simply fortifying its own position, and when considering other factors, Air Interdiction may be unnecessary or improper. Similarly, when offering Close Air Support, a determination made by Artificial Intelligence cannot always be relied upon; many adversarial assets appear very similar to those of American or allied forces, and the United States cannot afford to attack the wrong target. This is partly caused by "out-group homogeneity bias," which can occur with AI systems when they do not accurately classify objects or entities outside of the majority group that they are assigned to evaluate.¹⁵ Thus, in Counterland operations, Artificial Intelligence will be a very helpful tool; yet it could also necessitate the appointment of a subordinate officer who oversees the contributions of Artificial Intelligence, and reports to the senior commander in charge of Air Interdiction and Close Air Support.

Artificial Intelligence has a key implication for AFDP 3-40, Counter-Weapons of Mass Destruction Operations. In this publication, medical planning is discussed; specifically, that air component medical planners should provide a medical estimate of the identified CBRN (Chemical, Biological, Radiological, and Nuclear) threats in the operational environment.¹⁶ With the advent of AI, it should likely be assumed that CBRN threats of various types already exist. The former Soviet Union, for instance, began researching and testing the viability of weaponized smallpox in the 1970s; by 1990, the USSR had developed a smallpox weapon that was nearly accepted into its military armament.¹⁷ That happened almost 35 years ago, and with the growing prevalence of AI, the notion that an adversary may someday use AI for CBRN related research or development cannot be ruled out. Further, an enemy may not always follow the Law of War or the Law of Armed Conflict, and as AI technologies further develop, it will be important to assume that an adversary is probably using AI to develop, or help develop, CBRN weapons to its advantage.

Another piece of operational doctrine that AI will affect is AFDP 3-84: Legal Support. Specifically, there are five overarching principles of the Law of War: military necessity,

¹³ "Counterland Operations," *Air Force Doctrine Publication 3-03*, 21 Oct 2020, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-03/3-03-AFDP-COUNTERLAND.pdf

¹⁴ "Counterland Operations," *Air Force Doctrine Publication 3-03*, 21 Oct 2020, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-03/3-03-AFDP-COUNTERLAND.pdf

¹⁵ "Bias in AI," Artificial Intelligence Hub, Chapman University, accessed May 3, 2024, chapman.edu/ai/bias-in-ai.aspx

¹⁶ "Counter-Weapons of Mass Destruction Operations," *Air Force Doctrine Publication 3-40*, 20 July 2022, 11, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-40/3-40-AFDP-CCBRN.pdf

¹⁷ Ken Alibek, "Smallpox: A Disease and a Weapon," *International Journal of Infectious Diseases*, 8S2, S4-S5, accessed May 3, 2024, [https://www.ijidonline.com/article/S1201-9712\(04\)00130-4/fulltext](https://www.ijidonline.com/article/S1201-9712(04)00130-4/fulltext)

humanity, proportionality, distinction, and honor.¹⁸ This section shall highlight military necessity and distinction. Military necessity is the principle which justifies the United States to use every means necessary to quickly defeat an enemy, so long as the methods employed do not violate the Law of War itself.¹⁹ Distinction is another important principle, referring to the responsibility of the American military to distinguish between civilians and lawful combatants, and between lawful and unlawful targets.²⁰ AFDP 3-84 states that “judge advocates and paralegals provide commanders assistance in developing legally acceptable plans and orders.”²¹ Although the intent and purpose of this doctrine may not change significantly, AI will add a level of complexity. Judge advocates and paralegals will need to understand the capabilities and limitations of any particular AI system involved in the operation, and advise commanders accordingly, especially concerning military necessity and distinction. To the future AI weapon system, two facilities could appear almost identical; however, one is used by the enemy to stockpile weapons, while the other is a medical facility. The former target is legal under the Law of War, and the latter is not. Therefore, the operational doctrine for Legal Support, moving forward, should highlight the importance of recognizing limitations and imperfections of AI systems in the context of combat operations.

Operational Challenges Caused By AI

War has always been, and always will be, a human endeavor. Although AI technology will aid wartime efforts, AI systems will not fight wars by themselves. Operationally, then, the United States Air Force (and the rest of the DoD) cannot rely so much on AI that the Airmen lack the skills and knowledge critical to any operation, whether it supports war or not. Similar to the concept that “teaching the test” is not a viable model for true learning, the increase of AI in military operations will not allow Airmen to become lazy; by contrast, they must be more focused than ever. Operational level commanders must understand how AI works, calculates, and makes decisions, adding a layer of complexity to armed conflicts that has not existed before. In war, it is important to understand the enemy, but AI will ironically make it necessary for American and allied forces to understand themselves.

Another challenge for operational leaders, again, is that AI decisions and calculations will not always be proper, practical, or even morally sound. AI systems, again, are vulnerable to biases and stereotypes. For example, in Combat Identification (CID), there is a potential for “confirmation bias,” which occurs when the system relies heavily on previously existing beliefs or trends.²² The result may be a missed opportunity for positive identification or, alternatively, a failure to identify new trends or patterns of the adversary. When combined with all other AI principles, considerations, and factors, it may be necessary to have a military commander who concerns himself/herself primarily with AI oversight. Finally, a definite operational challenge

¹⁸ “Department of Defense Law of War Manual,” Office of General Counsel, Last updated July 2023, 50, <https://media.defense.gov/2023/Jul/31/2003271432/-1/-1/0/DOD-LAW-OF-WAR-MANUAL-JUNE-2015-UPDATED-JULY%202023.PDF>

¹⁹ Ibid, 52.

²⁰ Ibid, 62.

²¹ “Legal Support,” *Air Force Doctrine Publication 3-84*, 24 January 2020, 16, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-84/3-84-AFDP-LEGAL-SUPPORT.pdf

²² “Bias in AI,” Artificial Intelligence Hub, Chapman University, accessed May 3, 2024, chapman.edu/ai/bias-in-ai.aspx

concerning AI is the probability of competition. The United Nations University highlighted the militarization of AI systems as having the capacity to cause an “AI arms race” between the United States and its adversaries, similar to the nuclear arms race during the Cold War.²³ Any need for the United States to try to “keep up” with its key adversaries regarding AI could draw attention away from other concerns the military is currently facing, such as recruiting shortfalls and retention issues. As critical as AI will surely become, it is still only a tool; a means to an end. It could never replace the most critical asset the Air Force has: its Airmen. Operational leaders at all levels will be forced to find innovative ways to balance these concerns.

Conclusion

Artificial Intelligence could be one of the biggest developments for the United States Military since the invention of the airplane. The advent of fighter and bomber aircraft allowed the United States greater mobility than it previously had, and military doctrine had to adapt to its existence and use. Similarly, with AI, the Air Force will gain expanded resources to accomplish its operational missions, but there are many considerations and implications regarding AI effect on doctrine. As capabilities develop, the United States Air Force must adapt to these changes in order to remain superior and accomplish its mission to fly, fight and win.

²³ Tshilidzi Marwala, “Militarization of AI Has Severe Implications for Global Security and Warfare,” United Nations University, 24 July 2023, <https://unu.edu/article/militarization-ai-has-severe-implications-global-security-and-warfare>