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The United States Air Force

Artificial Intelligence Annex

to

The Department of Defense Artificial Intelligence Strategy

Artificial intelligence is poised to change how warfare is conducted in the 21st century. The comparative advantage currently enjoyed by the Air Force will either erode or strengthen depending on the manner in which we adopt these technologies.

Unlike previous technological advances, AI has already proliferated into many commercial enterprises and, as such, cannot be governmentally controlled or contained. Just as the commercial sector has rushed to embrace these technologies, our global competitors are overtly accelerating the integration and weaponization of AI as an effective measure to counter our traditional strengths and exploit our perceived weaknesses. This is especially true for our Air Force, where our ability to execute missions across Air, Space, and Cyberspace rely on insights driven by data and information. Depending on the strategic choices we make now, our ability to operate around the globe may be blunted or bolstered by the adoption of—or hardening against—artificial intelligence.

The Air Force is charged to provide the nation with Air and Space Superiority, Global Strike, Rapid Global Mobility, Intelligence, Surveillance, and Reconnaissance, and Command Control. AI is a capability that will underpin our ability to compete, deter, and win across all five of these diverse missions. It is crucial to fielding tomorrow's Air Force faster and smarter, executing multi-domain operations in the high-end fight, confronting threats below the level of open conflict, and partnering with our allies around the globe.

This Annex and associated Appendix serve as the framework for aligning our efforts with the National Defense Strategy and the Department of Defense Artificial Intelligence Strategy as executed by the Joint Artificial Intelligence Center (JAIC). It details the fundamental principles, enabling functions, and objectives necessary to effectively manage, maneuver, and lead in the digital age. Doing so is contingent upon our ability to operationalize AI for support and warfighting operations alike.

Artificial intelligence is not the solution to every problem. Its adoption must be thoughtfully considered in accordance with our ethical, moral, and legal obligations to the Nation. As stewards of this great responsibility, Airmen should execute their assigned missions with a focus on emerging technologies, but also with an understanding that everything we do is a human endeavor.

In this return to great power competition, the United States Air Force will harness and wield the most representative forms of AI across all mission-sets, to better enable outcomes with greater speed and accuracy, while optimizing the abilities of each and every Airman. We do this to best protect and defend our Nation and its vital interests, while always remaining accountable to the American public.

David L. Goldfein
General, USAF
Chief of Staff

Matthew P. Donovan
Acting Secretary of the Air Force

DEFINITION, CONTEXT, AND PURPOSE

Artificial Intelligence (AI) refers to the ability of machines to perform tasks that normally require human intelligence – for example, recognizing patterns, learning from experience, drawing conclusions, making predictions, or taking action – whether digitally or as the smart software behind autonomous physical systems

– Department of Defense AI Strategy, 2018

In September of 2018, in alignment with our National Defense Strategy (NDS), the Department of Defense (DoD) established the Joint Artificial Intelligence Center (JAIC) and released the DoD's AI Strategy. In March, 2019, the Office of the Air Force Chief Scientist (AF/ST), in partnership with the Air Force Research Laboratory (AFRL), published the *Autonomous Horizons: The Way Forward* report. It details thoughtful recommendations towards an autonomous systems (AS) future. These documents and Office of the Secretary of Defense (OSD) directives spurred the need for Service-level AI Annexes to the Department's broader strategy.

In full support of the Presidential Executive Order on Maintaining American Leadership in Artificial Intelligence, this document is the administrative catalyst for the Air Force to ensure AI is a priority when developing budget proposals and planning for the use of funds in future years. It is a framework that implements the Air Force Science and Technology 2030 Strategy and details the principles surrounding the topics of information technology, data, algorithms, people, and partnerships. Further, it describes organizational implementation concepts, technical goals, and objectives to begin planning and execution against. These guiding themes will enable a robust, technologically relevant enterprise. The associated Appendix (held at a different level of document designation) is a baseline organizational guide for AI prioritization and prototyping.

Every Airman in the field, staff member at higher headquarters, or unit working with an industry partner has a responsibility in transforming our five core missions through the use of AI. The Air Force cannot effectively execute missions in today's complex security environment without embracing these technologies and delivering capabilities to our Airmen.

AIR FORCE FOCUS AREAS

"There are a lot of analogies in our history to AI and the changes it will bring, but no corollaries. We've had language, learning, industrial and technological revolutions before . . . but nothing that will so pervasively integrate all aspects of our lives and change everything about the way we interact with one another."

– U.S. Air Force Cross Functional Team on Artificial Intelligence, 2018

The DoD AI Strategy describes four Strategic Focus Areas: 1) Delivering AI-enabled capabilities that address key missions, 2) Partnering with leading private sector technology companies, academia, and global allies, 3) Cultivating a leading AI workforce and, 4) Leading in military ethics and AI safety. The following *Air Force Focus Areas* are written to serve as our guiding principles. They provide scope and

pragmatically support the DoD's Strategic Focus Areas for Air Force enterprise needs by describing the activity, defining associated lines of effort, and the office(s) of principal responsibility.

FOCUS AREA 1: DRIVE DOWN TECHNOLOGICAL BARRIERS TO ENTRY

As the speed and efficiency of the commercial sector continues to outpace the government, an examination of whether we should be the sole developers and consumers of a technology warrants renewed attention. Our current statutory obligations require a demonstrable emphasis on embracing commercial offerings and readying our force for state-of-the-art technological transference. We will take steps to begin building a commercially relevant delivery model, with due regard to supply chain safety, security, and trust. We will partner with top technology providers, both within and outside the federal government, in a more cost effective manner, scale development operations (DevOps) and prototyping, and share lessons learned throughout the total force.

Line of Effort 1: Operate on technology deployment models that fully exploit commercial capabilities (OPRs: AF/CIO, AF/AQ)

Objective 1.1: Employ a hybrid software-, platform-, and infrastructure-as-a-service model
Objective 1.2: Accept commercial standards and drive towards open standards in transition and procurement programs

FOCUS AREA 2: RECOGNIZE AND TREAT DATA AS A STRATEGIC ASSET

Data fuels the development of AI. AI requires a vast and diverse amount of representative data whether derived from an authoritative source or generated through digitizing our daily workflows. In order to train AI algorithms for continuous delivery, we will review our corporate processes and reform underlying critical aspects of agility, such us our key performance parameters (KPPs), principled on government-purpose data rights to ensure we are consistently generating training quality data for algorithmic development. For AI to influence operations, data must be provided to algorithms and archived in near real-time. As such, it is a priority to architect solutions that provide the shortest path between development and operational events. This crucial enabling activity, however, is only valuable if we trust how this data was obtained, generated, and/or trained. Over time, we will further develop means to account for adversarial deception as they attempt to remove any advantage we gain from AI.

Line of Effort 2: Continuously generate training-quality data and securely transport to proper hardware, software, and personnel (OPR: AF/CDO)

Objective 2.1: Set policy and standards for training-quality data
Objective 2.2: Identify, measure, build, and simulate support/operation authoritative data and information
Objective 2.3: Model, digitize, and instrument everyday business workflows
Objective 2.4: Create controlled and searchable data stores for massive training data accessible to anyone with appropriate credentials

FOCUS AREA 3: DEMOCRATIZE ACCESS TO ARTIFICIAL INTELLIGENCE SOLUTIONS

The creation of data and information will not slow in our society. In the midst of this digital revolution, leading developers of AI in the private sector continue to view access to global, cloud-based technologies housing data and openly available AI development platforms as a given obligation to the public. This reality requires that we ensure our access to the millions of publicly available algorithms, many of which can solve the perpetual issues plaguing a number of our core missions and key business processes. Our adversaries will likewise access these same enabling technologies and use them to address their competitive interests. To this end, our responsible use of these technologies and the means for sharing internally generated solutions is a strategic imperative and a necessity to implementing agile acquisition processes.

Line of Effort 3: Develop and field a diverse set of algorithms at risk-appropriate speed and scale (OPRs: AF/CIO, AF/AQ, AFRL)

Objective 3.1: Utilize free and publicly available algorithms
Objective 3.2: Host and provide shareable solutions enterprise-wide
Objective 3.3: Create secure operating environments for DevOps, prototyping algorithms, and ensure that outputs carry full provenance for appropriate use

FOCUS AREA 4: RECRUIT, DEVELOP, UPSKILL, AND CULTIVATE OUR WORKFORCE

As our military continues to integrate the emerging technologies of the digital and information age, we must recognize the reality that we will continue to create, obtain, exchange, and analyze information using computers and technology. The ability to rapidly adapt these technologies to our changing needs will require fluency in the languages that control these machines and an enterprise-wide focus on appreciation for technological development (e.g., the Air Force Computer Language Initiative designed to treat computer programming languages as the functional and objective equivalents of human foreign language aptitude/proficiency). These skills, and the cultural adoption of emerging technologies, remains our biggest challenge to overcome. To mitigate this challenge, we will continue to develop our workforce by providing dynamic, non-traditional, and technologically contemporary career opportunities in an aim to attract, cultivate, and best manage our people, who will always be our greatest asset. AI is not a means to replace people. If used properly, it will augment the workforce by automating repetitive tasks, calculating complex equations, and providing evidence-based information to key decision makers, allowing the Air Force to repurpose the warfighter to focus on more complex tasks which require critical thinking.

Line of Effort 4: Develop people and employ a skilled, educated, and solution oriented workforce (OPR: AF/A1)

Objective 4.1: Develop a technologically well-versed workforce through the computer language initiative and provide multiple modalities for global access to coding/programming education
Objective 4.2: Ensure proper utilization and placement of a digitally talented workforce
Objective 4.3: Design practical policies and incentives that foster talent management and increase recruitment and retention
Objective 4.4: Partner with Joint, industry, and academic partners to foster cross-collaboration for training and tradecraft

FOCUS AREA 5: INCREASE TRANSPARENCY AND COOPERATION WITH INTERNATIONAL, GOVERNMENT, INDUSTRY, AND ACADEMIC PARTNERS

AI and its ethical, moral, and legal use is of concern to our nation and to the entire Federal Government. In order to bridge any divide with non-traditional partners, the Air Force will commit to staying engaged, informed, and accountable through our relationships stemming from AFRL, academia, and various consortia. Our adversaries live in top-down command economies capable of subsuming all data and technologies generated in their markets. We must keep pace with the latest technological trends and look for opportunities to combine efforts with joint, government, industrial, and coalition partners alike. Our model of AI development, procurement, and sharing will be centered on driving down internal redundancy, building a foundation for rapid acquisition processes, sharing with international partners, and openly engaging with the world's greatest minds on the topic.

Line of Effort 5: ENHANCE PUBLIC TRUST BY LEADING DIALOGUE ON AIR FORCE USE OF AI IN ETHICAL, MORAL, AND LEGAL USES (OPR: AF AI CFT, AFRL)

Objective 5.1: Engage in dialogue on the ethical, moral, and legal implications of employing AI in military operations in concert with the Joint AI Center

CONCLUSION

AI is no longer limited to science fiction. It is no longer the exclusive domain of academic conjecture nor the subject of opaque research and development without an actual role in the real world. Expanding upon the AI applications already in use, along with those being envisioned and engineered for the very near future, will cause an exponential transformation of the entire spectrum of human life and experience, from how we conduct our personal affairs to how we manage our industry and public enterprises.

Going forward, those at the forefront of using AI applications to accomplish their personal and organizational pursuits will enjoy significant new opportunities and advantages. The frontrunners will be in control of tools that analyze more information and prescribe more strategies than ever before. Along the way, however, there will be costs. Some will be unexpected and some will be significant, particularly for those who lag behind. In the age of artificial intelligence, second place will be of ever diminishing value.

Technology has always underpinned the changing character of war. For those of us in the military sphere, AI is akin to the development of stealth aircraft and precision guided munitions. The global Air Force Enterprise will embrace all aspects of AI to advance our understanding of the complexity that a data-driven digital age brings to the battlespace.

Everyone is responsible to purposefully consider and attempt to include AI in everything we do. Exploration, prototyping, and collaboration are not only encouraged, but critical to our future. AI is a DoD priority, the Air Force will measure itself by demonstrated use of technology in the digital age, we all have a significant role to play.