STATEMENT BY

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BEFORE THE
SENATE ARMED SERVICES COMMITTEE
SUBCOMMITTEE ON
EMERGING THREATS AND CAPABILITIES

ON

"Artificial Intelligence Initiatives"

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Introduction

Good afternoon Madam Chairwoman, Ranking Member, and distinguished Members of the Subcommittee. Thank you for this opportunity to testify before the Subcommittee today on the Department's Artificial Intelligence (AI) Initiatives.

I am Lieutenant General Jack Shanahan, the Director of the Joint Artificial Intelligence Center or JAIC. I have been in my current position for a little over two months. Previously, I served in the Under Secretary of Defense for Intelligence as the Director of the Algorithmic Warfare Cross-Functional Team or Project Maven, the Department's pathfinder project to integrate AI capabilities to augment, accelerate, and automate collection from a variety of manned and unmanned intelligence platforms and sensors.

AI is rapidly changing an ever-expanding range of business and industry. As described in the 2018 National Defense Strategy (NDS), AI is also poised to change the character of warfare. Structurally, we know AI has the potential to be an enabling layer across nearly everything – meaning countless applications in industry and everyday life, while offering the opportunity to positively transform every corner of the Department. We envision innovative concepts that change the way we plan and fight, including improvements in the way we perceive our environment, maintain our equipment, train our men and women, defend our networks, operate our back offices, provide humanitarian aid and respond to disasters; and more. By harnessing the power of AI in defense, we will better support and protect American service members, safeguard our citizens, defend our allies, and improve the effectiveness, affordability, and speed of our operations.

Other nations, particularly strategic competitors such as China and Russia, are making significant investments in AI for military purposes. These investments threaten to erode our technological and operational advantages and destabilize the free and open international order. The Department of Defense, together with our allies and partners, must adopt AI to maintain its strategic position, prevail on future battlefields, and safeguard this order.

Per the NDS, the Department will accelerate the delivery and adoption of AI to expand our military advantages and create a force fit for our time. AI will enhance operational effectiveness, improve readiness, and increase efficiency in the general business practices of the Department. We will make a concerted effort to move AI technologies in a direction that improves our odds of long-term security, peace, and stability through vigorous dialogue and multilateral cooperation on the ethical, safe, and lawful use of AI for national security and establishing new norms for responsible behavior, consistent with the law. The Department's AI transformation will ensure that we maintain the ability to execute our vital mission of protecting the security of our nation, deterring war, and preserving peace.

Establishment of JAIC

Last June, then-Deputy Secretary of Defense Patrick Shanahan directed Mr. Dana Deasy, the Department's Chief Information Officer, to establish the Joint AI Center. This new organization is tasked to accelerate the delivery of AI-enabled capabilities, scale the Department-wide impact of AI, and synchronize the Department's AI activities. In parallel, the Department submitted its first AI Strategy to Congress, an annex to the NDS that captures the integrated set of decisions we are making now to harness AI to advance our security and prosperity. Last month, the Department released an unclassified summary of the classified DoD AI strategy, in support of

the President's Executive Order on AI (*Maintaining American Leadership in Artificial Intelligence*) that calls for greater AI investment, harmonization of standards, and training and workforce development initiatives. The JAIC's missions and functions nest well under the principles and objectives outlined in the AI Executive Order.

The founding of JAIC supports implementation of Section 238 of the FY19 National Defense Authorization Act, this provision directed a joint approach to coordinate the efforts of the Department to develop, mature, and transition AI technologies into operational use. The Department views the requirements of Sec 238 as a strategic opportunity to improve its posture for AI. In fact, we used elements from the language in Sec 238 to help frame the JAIC's roles, missions, and functions. In December 2018, JAIC commissioned a team from the RAND Corporation to support our analysis. The RAND team built its analytical framework, completed initial DoD-wide data collection, and is currently building interview protocols and contact lists for engaging with industry.

As part of this, I will now touch on how we are partnering with the Under Secretary of Defense (USD) Research & Engineering (R&E), the role of the Military Services, the Department's initial focus areas for AI delivery, and how JAIC is supporting whole-of-government efforts in AI.

As the focal point of the DoD AI Strategy, the JAIC was established to provide a common vision, mission, and focus to drive Department-wide AI capability delivery. JAIC will operate across the full AI delivery lifecycle, emphasizing near-term prototyping, execution, and operational adoption to meet current needs. JAIC's work will complement the AI efforts of USD(R&E), which are focused on foundational research, longer-term technology creation, and

innovative concepts. Both JAIC and USD(R&E) will need to collaborate effectively and succeed individually for the DoD to implement its ambitious AI strategy.

The JAIC communicates a consistent message about transforming DoD through AI. This refers to the transformation that happens when you field technology on operationally-relevant timelines, enable frontline men and women to experiment with it based on their own creativity, and ultimately generate new ways of working that solve our most critical challenges and enhance our military strength. As we move to rapidly incorporate AI, those men and women in America's military will remain our enduring source of strength. We will use AI-enabled information, tools, and systems to empower and augment, not replace, those who serve.

To derive maximum value from AI application throughout the Department, JAIC will operate across an end-to-end lifecycle of problem identification, prototyping, integration, scaling, transition, and sustainment. Emphasizing commerciality to the maximum extent practicable, JAIC will partner with the Services and other components across the Joint Force to systematically identify, prioritize, and select new AI mission initiatives. Then JAIC will stand up cross-functional teams that will rapidly execute a sequence of use cases that demonstrate value and spur momentum. We need early, demonstrable wins that show practical results and the art of the possible. Then, we must scale these capabilities across the enterprise. To do this, JAIC is engaging with leading commercial and academic partners for prototypes, and employing standardized processes with respect to areas such as data management, testing and evaluation, assessment of delivered capabilities, and program protection and cybersecurity. Our approach has been directly informed by the Department's AI pathfinder activity, Project Maven, which successfully identified and is beginning to address key challenges with integrating AI into

operations. This program put in place an initial set of data, tools, and infrastructure for AI delivery, as well as initial templates for contracting and acquisition, testing and evaluation, operational assessment, and program protection.

JAIC's early projects serve a dual purpose: to deliver new AI-enabled capabilities to end users, and to help incrementally develop a common foundation that is essential for scaling AI's impact across DoD. This foundation includes shared data, reusable tools, frameworks, libraries, and standards, and AI cloud and edge services. JAIC will work with teams throughout the Department to ensure that they can leverage this foundation to accelerate their progress in a manner that aligns with DoD enterprise cloud adoption. Our enterprise approach for AI and enterprise cloud adoption as outlined in the DoD-wide Cloud Strategy are mutually reinforcing, mutually dependent undertakings. Finally, JAIC will provide ongoing support to the efforts of the Services and other organizations to ensure continuous improvement, assessment, and sustainment of AI systems and solutions across the enterprise.

The AI capability delivery efforts that will go through this lifecycle will fall into two categories: National Mission Initiatives (NMI) and Component Mission Initiatives (CMI). As outlined in the DoD AI Strategy, a NMI is a pressing operational or business reform joint challenge, typically identified from the National Defense Strategy's key operational problems or nominated by a mission owner, and requiring multi-service innovation, coordination, and the parallel introduction of new technology and new operating concepts. NMIs are typically driven by JAIC and are executed by cross-functional teams that comprise both JAIC personnel as well as subject matter specialists from across the Department on a rotational basis. Execution of these projects will be essential for putting in place our initial common foundation.

The second project category is a Component Mission Initiative (CMI), which is a component-level challenge that can be solved through AI. JAIC will work closely with individual components on CMIs to help identify, shape, and accelerate their Component-specific AI deployments through funding support; usage of common foundational tools, libraries, cloud infrastructure; application of best practices; partnerships with industry and academia; and so on. The Component will be responsible for identifying and implementing the organizational structure required to accomplish its project in coordination and partnership with the JAIC.

We will form teams to work with the Services, Components, and Combatant Commands on potential CMIs. Based on initial conversations with all of these stakeholders, I fully expect that we will see rapid growth in the number of CMIs in Fiscal Year 2020. We are in early discussions with the Services, Components, and Combatant Commands on the applicability of AI to help with solutions in areas as diverse as talent management, suicide prevention, preventive medicine, installation and force protection, information operations, operational war planning, and modeling and simulation. Additionally, we intend to identify smart automation initiatives that could provide near-term dividends in terms of increased effectiveness and efficiency for back-office functions.

All of the Services are increasing their levels of investment in AI-related capabilities in near term. The JAIC is already forming strong partnerships with the Services and key Components. For example, the Army established a new AI Task Force that is working closely with the JAIC on predictive maintenance. We are actively engaged in an effort to apply data-driven insights to equipment availability at U.S. Special Operations Command and in the U.S. Air Force in partnership with Defense Innovation Unit (DIU). We are partnering with U.S. Cyber Command

and the National Security Agency to shape a new cyberspace-related mission initiative. These early efforts will better define how we make use of common approaches to data, tools, libraries, architectures, development approaches, and more.

JAIC's focus on near-term AI implementation and adoption complements efforts within the USD (R&E). Organizations such as the Defense Advanced Research Projects Agency (DARPA) are focused on the future or next wave of AI research and longer-term technology creation. When it comes to research for the future versus the ability to apply it now at scale, DoD needs the best of both, and they feed one another – USD(R&E) will feed JAIC with updates on leading-edge AI technologies and concepts, and JAIC will provide R&E insights from operational fielding, user feedback, and data. There is a distinct and shared vision of an enterprise approach promulgated by USD(R&E) and DoD CIO. JAIC is already working with DIU, DARPA, and the Strategic Capabilities Office to improve integration and enhance unity of effort on current and future AI projects.

Further examples of early NMI's include:

- Perception. Improve the speed, completeness, and accuracy of Intelligence, Surveillance, Reconnaissance (ISR) Processing, Exploitation, and Dissemination (PED). Project Maven's efforts are included here.
- Predictive Maintenance (PMx). Provide computational tools to decision makers to help them better forecast, diagnose, and manage maintenance issues to increase availability, improve operational effectiveness, and ensure safety, at reduced cost.

- Humanitarian Assistance/Disaster Relief (HA/DR). Reduce the time associated with search and discovery, resource allocation decisions, and executing rescue and relief operations to save lives and livelihood during disaster operations.
- Cyber Sensemaking. Detect and deter advanced adversarial cyber actors who infiltrate and operate within the DoD Information Network (DoDIN) to increase DoDIN security, safeguard sensitive information, and allow warfighters and engineers to focus on strategic analysis and response.

We selected these initiatives to deliver mission impact at speed, demonstrate the proof of concept for the JAIC operational model, enable rapid learning and iterative process refinement, and build out our library of reusable tools while validating our enterprise cloud architecture. These efforts will benefit us by growing more AI credibility and expertise within the JAIC that will return to the Services and Components to help accelerate and sustain their own AI projects.

For the predictive/preventive maintenance NMI, we are starting with Army and Army Special Operations helicopters (H-60s). There is sufficient data available to train algorithms, there will be defined return on investment criteria, and this project helps address the Secretary's direction to the Services to improve their maintenance readiness rates. We anticipate moving to other airframes and vehicles, to include working with DIU to scale the promising results they have demonstrated using AI for predictive maintenance on other Air Force and Army platforms.

For the humanitarian assistance and disaster relief (HA/DR) NMI, we are already applying lessons learned and reusable tools from Project Maven to field AI capabilities in support of federal responses to events such as wildfires and hurricanes—where DoD plays a supporting role. One of the most important benefits of this NMI is that it is an inspiring, societally-

beneficial, life-saving mission that is not only whole-of-government but whole-of-society. It brings in interagency, state and local governments, non-governmental organizations, allied and partner nations, and more. It offers a unique opportunity to combine DoD efforts with industry and academia in a new type of public-private endeavor to operationalize AI to solve our most challenging problems. Doing this at scale to address disasters on an integrated basis creates the potential to both save lives and livelihood as well as advance common tools, lessons, and partnerships for the benefit of many DoD missions.

We are also in the early problem-framing stage for another substantial NMI in Fiscal Year 2020 that will be much more oriented on the National Defense Strategy and operations against peer and near-peer competitors. At the same time we will be seeking cutting-edge technologies within commercial industry and in DoD organizations such as DARPA that are ready for operational fielding across the Department.

While its primary focus is delivery initiatives such as these, JAIC has an important role in synchronizing DoD AI activities. This avoids duplication and excess cost, fosters sharing of lessons, and establishes a new enterprise approach for translating AI into decisions and impact at scale across the Joint Force. Under the DoD CIO's authorities and as delineated in the JAIC establishment memo, JAIC will coordinate all DoD AI-related projects above $15 million annually. This does not mean that JAIC will control the execution of these projects or the funding for Service- and Component-level AI initiatives. It does mean that we will start to ensure, for example, that they begin to leverage common tools and libraries, manage data using best practices, reflect a common governance framework, adhere to rigorous testing and evaluation methodologies, share lessons learned, and comply with architectural principles and

standards that enable scale. Over time, when properly resourced, JAIC will assume a greater role with regard to Component AI programs.

JAIC will be a key resource for whole-of-government efforts in AI, particularly as we explore as a nation the opportunities and challenges associated not merely with fundamental AI research, but also with translating the technology into decisions and impact in operations. To underscore our focus on ethics, humanitarian considerations, and both short-term and long-term AI safety, JAIC is working closely with the Defense Innovation Board (DIB) to foster a broad dialogue and provide input into the development of AI principles for defense. We are offering our perspective on crucial policy and research and development associated with operationalizing AI today in our engagements with the important work of the National Security Council Staff and the National Science and Technology Council Select Committee on AI. This remains a larger Administration priority. On February 11, 2019, President Trump signed an executive order launching the American AI Initiative, a whole of government strategy for ensuring American leadership in this important field. I want to emphasize the importance of our partnerships with Congress in all areas, but with a particular focus on AI. The establishment of the National Security Commission on Artificial Intelligence in the National Defense Authorization Act for Fiscal Year 2019 is one key example of this partnership, to which JAIC will serve as the DoD liaison element.

The ingredients for JAIC's success include: enterprise cloud adoption; world-class AI talent, particularly in areas that are scarce within DoD today such as data science and data engineering, machine and reinforcement learning, and product management; a workforce that is taking steps to become broadly AI-ready; strong partnerships with the Services, Combatant Commands, and

other key components; a tight two-way integration with the critical work of USD(R&E); and energetic, combined problem-solving enabled by bonds of trust with AI leaders in industry and academia. The final ingredient for success in cultivating and sustaining an "AI Ready" force for the future is culture: specifically, the need to become a more data-centric, computer science-literate, force conversant in the language of AI, and willing and able to operate with a new kind of speed and agility. Finally, an unwavering commitment to ethics and principles. These are the table stakes in AI.

DoD's legacy culture and processes are particularly apparent in the challenges we encounter launching what can only be described as a startup within the Department of Defense. As we do so, we are incorporating lessons learned from other Department activities that resembled startups in how they responded to urgent, compelling requirements across the Department – such as the Intelligence, Surveillance and Reconnaissance Task Force, Joint Improvised Explosive Device Defeat Organization, and Project Maven. As we learned with Project Maven, there is no substitute for simply embarking on an AI project to gain critical hands-on experience, but we also acknowledge the importance of implementing more systemic AI education and training programs across the entire Department, at all levels. The Defense Innovation Board has been particularly helpful in charting a path forward in this area.

All of this requires striking the right balance between top-down pressure and bottom-up innovation. Adding funding and people will not by themselves spark the necessary level of institutional change, at least not until we have a broader and deeper foundation of people – especially within all of the military Services – who understand how to operationalize and accelerate the AI pipeline.

AI will change the character of warfare, which in turn will drive the need for wholesale changes to doctrine, concept development, and tactics, techniques, and procedures. There will be a need for much more experimentation, at every level and in every domain. New operating concepts will depend on a greater understanding of what AI can (and cannot) help achieve. We need to accelerate fielding AI capabilities across the joint force, and as we do so, we must validate, refine, and adapt operating concepts. This includes thinking about entirely new concepts centered on human-machine teaming, as well as the cognitive consequences of the widespread fielding of AI capabilities.

The Joint AI Center will play a critical role in transforming the Department by delivering capability at speed to address key missions; establishing a common foundation for scaling AI's impact across the Joint Force; and facilitating AI plans, policies, and standards, including those that ensure we lead the world in the development of AI solutions that are robust, resilient, ethical, and secure. We will attract and cultivate the expertise of a world-class AI team and an AI-ready workforce.

The speed and scale of technological change required is daunting. However, the Department must embrace it if we are to reap the benefits of continued security and prosperity for the future. Our sustained, systemic approach accompanies a palpable sense of urgency. Ultimately, this needs to extend across our entire department, government, and society.

I look forward to continuing to work with Congress in an ongoing dialogue on our progress in AI adoption, and the ways in which JAIC is being used to accelerate that progress. Thank you for the opportunity to testify this afternoon, and I look forward to your questions.

BIOGRAPHY

UNITED STATES AIR FORCE

LIEUTENANT GENERAL JOHN N.T. "JACK" SHANAHAN

Lt Gen John N.T. “Jack” Shanahan is the Director, Joint Artificial Intelligence Center, Office of the Department of Defense Chief Information Officer, the Pentagon, Arlington, Virginia. General Shanahan is responsible for accelerating the delivery of AI-enabled capabilities, scaling the department-wide impact of AI and synchronizing AI activities to expand joint force advantages.

General Shanahan received his commission in 1984 as a distinguished graduate of the ROTC program at the University of Michigan. He has served in a variety of flying, staff and command assignments, most recently as the Director for Defense Intelligence Warfighter Support, Office of the Under Secretary of Defense for Intelligence, the Pentagon, Arlington, Virginia. He was also the Director of the Algorithmic Warfare Cross-Functional Team (Project Maven), where he led the artificial intelligence pathfinder program charged with accelerating integration of big data, machine learning, and artificial intelligence.

General Shanahan also served as the Commander, 25th Air Force, Joint Base San Antonio-Lackland, Texas, where he led 30,000 personnel in worldwide intelligence, surveillance and reconnaissance operations and also served as the Commander of the Service Cryptologic Component. In this capacity he was responsible to the Director, National Security Agency, and Chief, Central Security Service, as the Air Force's sole authority for matters involving the conduct of cryptologic activities, including the spectrum of missions directly related to both tactical warfighting and national-level operations.

EDUCATION

1984 Bachelor of Science degree in chemistry, with distinction, University of Michigan, Ann Arbor
1990 Distinguished graduate, Squadron Officer School, Maxwell AFB, Ala.
1996 Distinguished graduate, Master of Arts degree in national security and strategic studies, College of Naval Command and Staff, Naval War College, Newport, R.I.
2001 Distinguished graduate, Master of Science degree in national security strategy, National War College, Fort Lesley J. McNair, Washington, D.C.
2006 Program for Senior Executive Fellows, John F. Kennedy School of Government, Harvard University, Cambridge, Mass.
2007 Air Force Senior Leadership Course, Center for Creative Leadership, Greensboro, N.C.
2008 Air Force Enterprise Leadership Seminar, Kenan-Flagler Business School, University of North Carolina at Chapel Hill
2010 Joint Force Air Component Commander Course, Maxwell AFB, Ala.
2011 Senior Joint Information Operations Applications Course, Maxwell AFB, Ala.
2013 Joint Flag Officer Warfighting Course, Maxwell AFB, Ala.

ASSIGNMENTS

1. November 1984 - June 1985, student, undergraduate navigator training, 451st Flying Training Squadron, Mather AFB, Calif.
2. June 1985 - June 1986, student, F-4 Operational Training Course, 308th Tactical Fighter Training Squadron, Homestead AFB, Fla.
3. June 1986 - June 1989, F-4E/G instructor weapons system officer, 90th Tactical Fighter Squadron, Clark Air Base, Philippines
4. June 1989 - February 1991, F-4E instructor weapons system officer and standardization and evaluation flight examiner, 334th Tactical Fighter Squadron, Seymour Johnson AFB, N.C.
5. February 1991 - June 1991, student, F-15E Transition Course, 550th Tactical Fighter Training Squadron, Luke AFB, Ariz.
6. July 1991 - July 1993, F-15E instructor weapons system officer and standardization and evaluation flight examiner, 334th Fighter Squadron, Seymour Johnson AFB, N.C.
7. July 1993 - December 1993, student, F-15E USAF Weapons Instructor Course, Nellis AFB, Nev.
8. December 1993 - July 1995, F-15E Chief of Weapons and Tactics, 334th Fighter Squadron, Seymour Johnson AFB, N.C.
9. July 1995 - June 1996, student, College of Naval Command and Staff, Newport, R.I.
10. September 1996 - September 1997, Theater Battle Management Flight Commander, 607th Combat Operations Squadron, Osan Air Base, South Korea
11. September 1997 - October 1998, operations officer, F-15E Division, USAF Weapons School, Nellis AFB, Nev.
12. October 1998 - July 2000, Commander, USAF Weapons School Support Division, Nellis AFB, Nev.
13. August 2000 - June 2001, student, National War College, Washington, D.C.
14. June 2001 - August 2003, Chief, Regional Exercise Branch, Operations Directorate (J3), Headquarters U.S. Pacific Command, Camp Smith, Hawaii
15. December 2003 - May 2005, Commander, 480th Intelligence Group, Langley AFB, Va.
16. May 2005 - August 2007, senior military assistant to the Assistant Secretary of Defense for International Security Affairs, the Pentagon, Arlington, Va.
17. August 2007 - April 2009, Commander, 505th Command and Control Wing, Hurlburt Field, Fla.
18. April 2009 - March 2011, Commander, 55th Wing, Offutt AFB, Neb.
19. March 2011 - April 2013, Deputy Director for Global Operations (J39), Operations Directorate, Joint Staff, the Pentagon, Arlington, Va.
20. April 2013 - June 2013, Special Assistant to the Deputy Chief of Staff for Intelligence, Surveillance and Reconnaissance, Headquarters U.S. Air Force, Arlington, Va.
21. June 2013 - September 2014, Commander, Air Force Intelligence, Surveillance and Reconnaissance Agency, Joint Base San Antonio-Lackland AFB Texas
22. September 2014 - August 2015, Commander, 25th Air Force, Joint Base San Antonio-Lackland Texas
23. August 2015 - April 2017, Director for Defense Intelligence (Warfighter Support), Office of the Under Secretary of Defense for Intelligence, the Pentagon, Arlington, Va.

24. April 2017-December 2018, Director for Defense Intelligence (Warfighter Support) and Director, Algorithmic Warfare Cross-Functional Team (Project Maven), Office of the Under Secretary of Defense for Intelligence, the Pentagon, Arlington, Va.
25. December 2018 - present, Director, Joint Artificial Intelligence Center, Office of the Department of Defense Chief Information Officer, the Pentagon, Arlington, Va.

SUMMARY OF JOINT ASSIGNMENTS

1. June 2001 - August 2003, Chief, Regional Exercise Branch, Operations Directorate (J3), Headquarters U.S. Pacific Command, Camp Smith, Hawaii, as a lieutenant colonel and colonel
2. May 2005 - August 2007, senior military assistant to the Assistant Secretary of Defense for International Security Affairs, the Pentagon, Arlington, Va., as a colonel
3. March 2011 - April 2013, Deputy Director for Global Operations (J39), Operations Directorate, Joint Staff, the Pentagon, Arlington, Va., as a brigadier general and a major general
4. August 2015 – December 2018, Director for Defense Intelligence (Warfighter Support), the Office of the Under Secretary of Defense for Intelligence, the Pentagon, Arlington, Va., as a lieutenant general
5. December 2018 – present, Director, Joint Artificial Intelligence Center, Office of the Department of Defense Chief Information Officer, the Pentagon, Arlington, Va., as a lieutenant general

BADGES

Master Intelligence Occupational Badge

FLIGHT INFORMATION
Rating: master navigator
Flight hours: more than 2,800
Aircraft flown: F-4D/E/G, F-15E and RC-135

MAJOR AWARDS AND DECORATIONS
Distinguished Service Medal
Defense Superior Service Medal with oak leaf cluster
Legion of Merit with two oak leaf clusters
Defense Meritorious Service Medal
Meritorious Service Medal with two oak leaf clusters
Air Medal
Aerial Achievement Medal with four oak leaf clusters
Air Force Commendation Medal
Combat Readiness Medal with two oak leaf clusters
National Defense Service Medal with bronze star
Southwest Asia Service Medal with bronze star
Global War on Terrorism Service Medal
Korea Defense Service Medal
Kuwait Liberation Medal (government of Kuwait)

OTHER ACHIEVEMENTS
1985 Distinguished graduate, undergraduate navigator training
1993 Top academic graduate and outstanding graduate, F-15E Course, U.S. Air Force Weapons School, Nellis AFB, Nev.
1994 Warrior of the Year, 4th Wing, Seymour Johnson AFB, N.C.
1996 Co-winner, Chairman of the Joint Chiefs of Staff essay contest
1999 Outstanding Instructor Weapons System Officer, F-15E Div., U.S. Air Force Weapons School, Nellis AFB, Nev.
2000 Outstanding Academic Instructor, F-15E Division, U.S. Air Force Weapons School, Nellis AFB, Nev.
2001 Commandant's Award for Excellence in Writing, National War College

EFFECTIVE DATES OF PROMOTION
Second Lieutenant Sept. 2, 1984
First Lieutenant Sept. 2, 1986
Captain Sept. 2, 1988
Major Dec. 1, 1995
Lieutenant Colonel Sept. 1, 1998
Colonel July 1, 2003
Brigadier General June 26, 2009
Major General Sept. 14, 2012
Lieutenant General Aug. 11, 2015

(Current as of December 2018)