# Unlocking the Strategic Potential: Artificial Intelligence in Electronic Warfare

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What in the world is Artificial Intelligence (AI)? And what does that have to do with the future of Electronic Warfare (EW)? Is AI changing everything we do? These are some of the questions I had while driving my Tesla to the office. To ignore the presence of AI in my electric car, or the future of our existence would be a mistake. It is well known that Tesla incorporates AI algorithms, specifically convolutional neural networks, recurrent neural networks, and reinforcement learning. Essentially compiling data from multiple sensors, analyzing that data and then making decisions or providing information to an end user to allow decisions to be made at incredible speeds. This process is happening exponentially faster than any human brain can process. So, basically, AI is a machine's ability to perform cognitive functions like a human does.

AI can drive your car, write your term paper, help you create emails with the appropriate tone, so it only stands to reason there are potential military applications as well. Specifically, the integration of AI EW and the potential transformation in capability it provides. While the term "electronic warfare" has been used for a significant period of time, the infusion of AI into this realm is opening new avenues for increased speed and lethality and/or protections.

Electronic warfare, which encompasses a spectrum of activities involved with controlling the electromagnetic spectrum, has traditionally relied on human expertise to detect, exploit, and defend against electronic signals. However, the speed and complexity of modern warfare have outpaced the capabilities of human operators alone. This is where AI steps in, bringing with it an array of advantages that could revolutionize the landscape of EW.

One of the foremost benefits of integrating AI into electronic warfare is the enhanced ability to process and analyze vast volumes of data in real time. In the digital age, the battlefield is flooded with an overwhelming amount of information from various sources, such as communication networks, radar systems, and electronic devices. AI algorithms can swiftly sift through this data to identify patterns, anomalies, and potential threats that might elude human operators. This capability not only increases the accuracy of threat detection but also significantly reduces response times, giving friendly forces a critical edge in rapidly evolving situations.

Here, AI emerges as a force multiplier, enabling more efficient and effective decision-making in the face of complex and dynamic situations. Modern battlespaces generate an overwhelming volume of electronic signals, requiring rapid and accurate identification. AI-driven algorithms excel in sifting through this data, discerning patterns, and identifying information that might go unnoticed in previous scenarios. This empowers military forces to swiftly respond and make critical decisions at a quicker pace.

Additionally, AI has the capacity to adapt and learn from new information, a trait that is particularly advantageous in the realm of EW. Electronic threats and countermeasures are in a constant state of evolution, requiring responsive and flexible strategies. AI-driven systems can quickly adjust their tactics based on changing circumstances, continuously optimizing their

performance without requiring manual intervention. This adaptability is essential in countering sophisticated electronic attacks and staying one step ahead of adversaries.

The fusion of AI and EW also provides commanders with improved decision-making tools at a much more detailed level and faster than historical norms. AI algorithms can analyze various scenarios, considering factors such as terrain, weather, and the capabilities of both friendly and enemy forces. This analysis provides commanders with a comprehensive picture of the battlefield, enabling them to make well-informed decisions that maximize the probability of mission success and minimize potential risks. Additionally, AI-powered simulations can play out different scenarios, allowing military planners to refine their strategies and assess the potential outcomes of different courses of action. The United States performed an exercise earlier this year focused on the Indo-Pacific region incorporating Large-Language Models (LLM) as part of the planning and decision-making process. One exercise member touted the success and speed at which the systems “learned” and became a viable resource in the battlespace. Another example is when target lists were prioritized using data that had been fed into an AI system and was able to consider targeting operations, networks at a faster and more complete battlespace picture than operators alone.

However, it is important to acknowledge that there are some potential roadblocks to complete AI integration. First, Most Department of Defense entities do not have access to the AI technology directly. The majority of organizations performing leading edge AI work are commercial  companies that would have to work or integrate with military systems. This could be hampered by the US budgeting and R&D processes currently in place. Furthermore, the slow pace of these processes in the US allows the very real possibility that the AI technology outpaces incorporation into US Forces. There are also potential ethical and security considerations. As AI systems

take on more responsibilities in detecting and engaging threats, questions arise about the level of human oversight and control. To remain in alignment with the laws of warfare, there will be a man in the loop requirement rather than wholly relying on AI to make decisions on attacks. Anytime there is potential for loss of life, collateral damage or other issues, a human needs to make those conscious informed decisions, AI cannot be left to its own devices. Striking the right balance between autonomous AI decision-making and human intervention is crucial to prevent unintended consequences or situations where machines are left to make life-and-death choices without proper accountability.

Finally, the integration of AI raises concerns about the potential for cyber vulnerabilities. While AI can enhance the speed and accuracy of EW, it also introduces a new vector of attack for malicious actors seeking to manipulate or disrupt AI systems. Safeguarding these systems against cyber threats demands a robust and holistic cybersecurity approach that accounts for both the hardware and software layers of AI-driven EW.

In closing, the potential strategic benefits of integrating artificial intelligence into EW are undeniably significant. AI's ability to process vast amounts of data, adapt to changing conditions, and support decision-making processes has the potential to reshape the landscape of modern warfare. As military forces increasingly rely on technology to maintain an edge in the digital battlespace, responsible development and deployment of AI-powered EW systems will be necessary. Striking the right balance between technological innovation, human oversight, and security measures will determine the extent to which these benefits can be realized without compromising strategic objectives or ethical considerations. The challenges of the US procurement system will also play a key role in AI integration. The transformative power of AI in EW has the potential to be a game changer. The question is:

Will it? How will AI be incorporated into future platforms like the new EC-37B Compass Call and the NexGen Jammer? Will the Army incorporate AI in its effort to drive decision-making down to the battalion level? There is no shortage of questions to explore, but one thing is certain: the EW community must continue to embrace innovative thinking as we understand the future fight will begin and end in the electromagnetic spectrum. AI will play a critical role in this new age of modern warfare.

***About Matt:*** *Matt Thompson is the Senior Analyst for the AOC. He is a former ECMO/EWO flying EA6B's and EA-18G's. He has more than 3000 flight hours and more than 400 carrier arrested landings flying missions in Afghanistan, Iraq and around the world. Recently he participated in an Exchange with Royal Air Force before his retirement from military service.*