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Winning the Invisible Fight: The Need for Spectrum Superiority

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Overview

America's next war will be won or lost first in the Electromagnetic Spectrum (EMS). It is the invisible, essential, and physical foundation of every battlefield—it unifies all the warfighting domains: land, air, sea, space, and cyberspace. In fact, the EMS is the only physical space shared by every warfighter. A space where energy and information is exchanged rather than bullets and bombs, and a weapon that moves at the speed of light, enabling the joint force to achieve asymmetric advantages against any adversary.

Issue

The EMS exists all around us as radiating energy. It appears in everyday life such as the visible light from your lamp to the radio waves coming from your favorite radio station to the Wi-Fi/Bluetooth signals connecting to your smart phone. America's ability to conduct warfighting operations in the EMS is not new. U.S. forces have been employing electronic warfare for over 75 years, using the spectrum to sense, outmaneuver, and engage our adversaries.

The U.S. military conducts electronic warfare to provide situational awareness, protect friendly capabilities, deny adversary capabilities, and create confusion for the enemy. Dominance in the EMS enables precision in our weapon systems and guarantees mission command. When combined, these powerful attributes result in high costs to any adversary. Electronic warfare actions fight *for* control of the EMS to enable our joint force to fight *in* the EMS. For example, a U.S. Navy aircraft "jams" a ground-based air-defense radar, allowing U.S. Air Force bombers to strike a target with much less danger of being shot down.

Although EMS combat occurs at the tactical and operational levels, the investments required to maintain U.S. EMS superiority are ultimately strategic pursuits. EMS superiority [is defined as](#) "the

degree of dominance that permits the conduct of operations at a given time and place without prohibitive interference, while affecting an adversary's ability to do the same." Simply stated, EMS superiority allows U.S. forces to freely sense, protect, manage, and attack without harming friendly forces. Just as air superiority defined the 1991 Gulf War, success in today's warfare has become equally reliant on EMS superiority.

Competitor states, particularly Russia and China, have been watching and learning from U.S. electronic warfare tactics over the last half century. However, both countries perceive our forces' reliance on the spectrum as a point of vulnerability. In addition to organizing, training, and equipping forces to leap ahead in the spectrum, these countries are investing in capabilities to counter U.S. advantages in navigation, communication, and radar. Lieutenant General Hodges, commander of U.S. Army Europe, [described the Russian advances in electronic warfare](#) used in Syria and Ukraine as "eye watering." China has placed priority on EMS dominance and [has held PLA-wide training](#) in complex EMS environments since 2006. Global adversaries' EMS combat technologies are advancing at unnerving speed. America must not allow an overmatch to occur.

Russia and China are organizing, training, and developing counters to U.S. advantages in the EMS...we must act now to maintain EMS superiority.

Russia and China now have dedicated electronic warfare ground forces equipped to exploit weaknesses in sensors, navigation, and communication networks. Both countries find the use of electronic warfare attractive as a non-kinetic and often unattributable form of attack. Absent U.S. investments in dedicated electronic warfare personnel, training, and equipment, Russia and China are likely to meet or exceed U.S. abilities in EMS operations in the next decade. DoD faces risks in a number of areas:

- Acquisition takes too long: New and upgraded equipment regularly reaches U.S. forces a decade after the acquisition was started. Competitor states are leveraging commercial advancements to achieve adequate results on much shorter timelines.
- High-cost, single-purpose systems: The DoD often procures exquisite and expensive electronic warfare hardware for limited purposes while competitors focus resources on upgrading software in existing hardware to be used across a broader range of military operations.

- Disjointed efforts: Some form of electronic warfare is conducted by all the military Services. The DoD fails to unify these efforts, allowing stove-piped training and capability development to continue. This results in a diminished ability for the joint force to organize, train, and equip in electronic warfare for the warfighting combatant commands.
- Attrition in expertise: Electronic warfare experts are being phased out across the military departments, leaving capability (hardware) without a durable cadre (personnel) for understanding and effective employment.

Many current DoD senior leaders retain an outdated view of electronic warfare as mainly defensive, tactical, and enabling. In 2014, the Defense Science Board highlighted the DoD's lack of attention to electronic warfare and recommended a shift to the offense. The Defense Science Board suggested a paradigm shift that places a priority on EMS superiority as the first goal in a combat operation, with all other operations subordinate.

Not only does DoD require a concerted effort to invest in offensive capabilities to offset competitor capabilities, a new electronic warfare strategy must exist to provide a decisive EMS advantage. In the spring of 2016, the Electronic Warfare Executive Committee, co-chaired by the Vice Chairman of the Joint Chiefs of Staff and the Undersecretary of Defense for Acquisition, Technology, and Logistics, began creation of a new strategy that establishes a vision for U.S. electronic warfare. The draft strategy, if signed by the Secretary of Defense, would require the Department to pursue an offensive, collaborative approach to electronic warfare that will seek overmatch versus any potential adversary. It fosters a sense of EMS awareness across the joint force, unifying the warfighters in all domains toward creating confusion in adversary sensors, networks, and decision processes. Through this approach, the United States will create a cost-imposing dilemma for its adversaries: either invest heavily to defend its own reliance on the EMS, or invest heavily to achieve offensive parity.

The draft strategy's vision is to provide agile, adaptive, and integrated electronic warfare to achieve EMS superiority. A Department-wide commitment to this strategy would create a joint force capable of countering and exploiting the evolving threats presented by U.S. competitors.

U.S. advantages in EMS technology and capability, once measured in decades, are now measured in years.

The draft strategy calls for an investment in experts across the joint force, defense labs, and academia with a focus on innovation and protection of critical systems vulnerable to attack. No longer can protection against disruptive EMS attacks be an afterthought in weapon system development; it must be “baked” into the acquisition process. Competitors are leveraging commercially-available technologies to develop inexpensive countermeasures. Readily available software-defined systems now give adversaries the ability to change the threat in a matter of hours rather than months or years. The draft strategy also highlights the EMS as a finite and highly contested space. As the demand for access to the EMS increases on an international level, and reduces the physical space needed for joint forces to test and train, limits must be placed on the expansion of commercial access, e.g. the increasing use of smartphones and wireless systems. The DoD must partner with the commercial sector on solutions to share the spectrum and ensure the viability of spectrum warfighting capabilities.

Recommended Changes

The strategic push to ensure EMS superiority is challenging, but achievable. It starts with acknowledging the need for increased resourcing of electronic warfare across the joint force. Approval of the draft strategy will drive the DoD to organize for EMS superiority, build an environment to train and educate, equip the joint force for EMS superiority, and partner with industry, academia, the interagency, and allies to sustain the lead in electronic warfare. These goals ultimately build a unity of effort, a more offensive electronic warfare posture, and assure America’s competitive advantage in the EMS.

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