



THE ASCENDANCY OF ELECTRONIC WARFARE

The modern battlespace has become technologically complex and the electromagnetic spectrum is being increasingly exploited to improve warfighting capabilities. As a corollary, passive and active protection from Electronic Warfare (EW) have also assumed priority in research and development, especially in the context of air warfare. In fact EW protection has become a key issue in all activities associated with force projection and the operational performance and survivability of combat platforms are largely defined by their Electronic Warfare Self Protection (EWSP) capabilities.

Adequate EWSP capabilities are now considered a mandatory requirement for all ships and aircraft deployed to combat zones. In addition, the land forces also acknowledge the need for robust and effective EW as an essential part of a networked force. EW is becoming an essential requirement, not only to enable the deployment of combat forces, but also in the development of new operational capability. While EW self protection remains a critical platform centric role, EW is emerging as a force-level capability that can achieve mission goals in its own right.

This shift in emphasis is clearly demonstrated by the Joint Strike Fighter (JSF) project that has inextricably factored in organic EW capability as a benchmark for the aircraft's combat survivability and evaluation of its performance spectrum. The EW system for the JSF is being developed by BAE Systems and includes advanced affordable low observable apertures and advanced countermeasure systems. The system was recently flight tested and is reported to be ahead of schedule, once again an indication of the importance being laid in having

the EW suite integrated and operational within the overall development program of the aircraft.

Another development in the concept of operations of air forces has been the gradual but firm acceptance of the critical and equal importance of Electronic Attack (EA) to be used in conjunction with more traditional Electronic Support (ES) measures that form the basis of the self-protection suites of military aircraft. Electronic Attack is the active part of EW that involves jamming radio frequencies, electro-optical sensors and seeker heads with dedicated jammers and Directed Infra-Red Counter Measures (DIRCM). However, successful EA measures require a very high level of technological competence as well as highly developed techniques and tactics in operations. This makes EA an expensive capability



and prone to being calculated on a cost versus capability equation. EA is also not a common capability because such technology may not be available or affordable to all defence forces and even when available, the complexity of operations and maintenance can reduce performance to unsafe and inadequate levels.

The increased necessity to possess good EW capabilities to ensure the survival of costly assets has initiated the convergence of different technology developments. The greatly enhanced lethality of the modern battlespace has led to a quantum jump in the vulnerability of unprotected platforms, leading to the emergence of Uninhabited Aerial Vehicles (UAV) as the preferred airborne surveillance platforms. Currently UAVs are also being evaluated for use as EW platforms to provide greater flexibility in their utilisation than manned platforms. Low complexity UAVs are cheaper to operate but cannot provide good EW support, and the more complex systems that can provide adequate EW capability are likely to be as resource intensive to operate as manned platforms.

Consequently, use of expendable tactical UAVs in ES operations is a concept that is being actively pursued. The concept proposes the use of multiple UAVs in swarms to accurately locate hostile emissions for neutralisation in a time-sensitive manner. While this might seem far-fetched at the moment, the future battlefield will not only witness such concepts in action, but it is more than likely that the strike mission will also be carried out by Uninhabited Combat Aerial Vehicles (UCAV) with kinetic or EA weapon systems. The use of multiple UAVs ameliorates the current anomaly prevalent in single-platform systems that do not provide sufficient accuracy in the location of emitters. The use of multiple networked UAVs will be capable of providing better accuracies of emitter location.

The first step in integrating UAVs into EW missions is to network a manned aircraft with multiple tactical UAVs that can collectively provide accurate location indicators and have the capability to switch roles on command. Essentially this would work as a more advanced version of the hunter-killer operations that were practiced a decade ago. There is much work still to be done in this field and inherent problems still to be addressed. For example, the command and control of mini-UAV formations in a fast changing battlespace by itself will be complicated

in the extreme. Additionally, the collation of data from so many different sources to provide one comprehensive picture will also be a challenge. However, the outcome will be enhanced situational awareness leading to the capability to locate and engage targets accurately and rapidly.

A broad EW capability, that includes both EA and ES, provides deployed forces the intelligence edge that is crucial to successful planning and conduct of even the simplest operation. The need, therefore, is to have 'force level' deployable EW capabilities that bring together the disparate single-service capabilities that in combination will provide the necessary quantum of EW assets and capabilities. This process will have to be ongoing and will involve considerable effort, especially in streamlining joint training and development of operational doctrine.

Irrespective of its expense and the need for a very high indigenous technology base to ensure its effectiveness, the emerging security environment makes it imperative for the ADF to possess adequate strategic and tactical EW capability to ensure success in the battlefield. It is not difficult to imagine that future operations will be won or lost by the control of the electromagnetic spectrum.

Whoever controls the electromagnetic spectrum on the battlefield will win the next war.

– Admiral Sergei Gorschkov
Former Commander-in-Chief, Soviet Navy

If there is a World War Three, the winner will be the side that can best control and manage the electromagnetic spectrum.

– Admiral Thomas H. Moorer, US Navy
Former Chairman of the Joint Chiefs of Staff



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