

THE SIR RICHARD WILLIAMS FOUNDATION INC

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ELECTRONIC WARFARE IN OFFENSIVE AIR OPERATIONS

Ever since military forces started to use the electromagnetic spectrum in support of air operations, opposing forces have attempted to prevent their use through either a hard kill (German attacks on the RAF Chain Home Radar sites during the Battle of Britain) or soft kill (German attempts to disrupt or bend the radio beams (Oboe) used to direct RAF Bomber Command Pathfinder aircraft towards their targets in WWII). Like all aspects of warfare there is no “silver bullet” since countermeasures are usually developed to offset the attack. This is particularly relevant in electronic warfare (EW) since the very use of a portion of the spectrum against operational forces is of itself a training cycle for the target of the emissions.

Because of the size and weight of equipment and the need for human interface with that equipment, early airborne EW systems were developed using multi-crew aircraft. However, these large aircraft were vulnerable to attack particularly with development of Integrated Air Defence Systems (IADS) that integrated surveillance, tracking and guidance radars with the full range of air defence weapons: air defence fighters, Surface to Air Missiles and Anti Aircraft guns. Fielding of IADS resulted in development of aircraft able to operate in a hostile air environment and support strikes against defended targets.

The F105 Wild Weasel used by the USAF over North Vietnam was an early example of the type used to support strike missions through attacks against the IADS including systems such as the SA-2 Ground-to-Air missiles employed by North Vietnam. The Wild Weasel systems were able to detect and analyse electromagnetic signals and direct anti-radiation missiles against missile guidance systems. Accompanying F105 Thunderchief aircraft armed with bombs were used to attack air defence systems pinpointed by the Wild Weasels.

With continued development of EW systems in both weight/size and capability fighter type aircraft are now capable of conducting many of the missions once restricted to large multi-crew aircraft. These missions include passive operations such as Enemy Order of Battle (EOB) analysis, Kill Chain analysis and active operations such as Suppression of Enemy Air Defences (SEAD), Force Protection and Maritime Support as follows:

- a. EOB analysis involves development of detailed information on the location, frequencies and capabilities of possible enemy systems that could diminish the capabilities of friendly systems. Since air defence systems include long (early warning) and short (missile guidance) range systems, EOB analysis requires systems able to monitor as much of the electromagnetic spectrum as possible. Even then physics decrees that the higher the frequency the more accurate the location.
- b. Kill Chain Analysis is the term given to analysis of the electromagnetic spectrum in a hostile environment and disseminating that information electronically to other parties in near real time so that fleeting targets such as mobile SAM sites can be engaged. The aim is to shorten the decision cycle of friendly forces and lengthen the decision cycle of enemy forces: in air force terminology affect OODA (Observe, Orientate, Decide, Act) loop of both friendly (reduce cycle time) and enemy (increase cycle time) forces.

- c. SEAD involves the degradation or defeat of integrated enemy air defence systems thus enabling attack forces to enter defended enemy territory. Hard and soft kills are usually made in combination to degrade IADS capability
- d. Force Protection involves prevention of enemy use of the electromagnetic spectrum to conduct attacks against friendly ground forces. These operations could be used to deny the enemy use of the spectrum to communicate and/or initiate Improvised Explosive Devices (IED).
- e. Maritime Support is the term given to operations to protect the fleet from attack by anti-ship missiles and radar directed gunfire. It involves degradation or defeat of electronic location, targeting and guidance systems.

The EA-18G Growler, the latest Western development of fighter type EW capability, is replacing the EA-6B Prowler in US service. Whereas the Prowler is manned by one pilot and three systems operators the Growler is a two place aircraft developed from the F/A-18F: the EW role is considered too complex at this stage for single pilot operation. It is understood that even with two seats the USN tends to operate the Growler in flights of two or three to provide full EW capability, accuracy and self-protection. The capability and flexibility of the Growler was demonstrated recently when a squadron operating over Iraq in the Force Protection role switched to SEAD over Libya in under 48 hours.

The Growler in the USN is not utilised as an attack fighter. While capable of utilizing guided weapons the USN has separated the two roles apparently because Growler crews are stretched maintaining skills in their primary EW role.

Without fighter type EW systems in the Air Order of Battle the ADF could suffer significant losses during any attempt to operate in contested airspace. If required to operate in contested airspace the ADF would have to rely on allied support.