EA Challenges in Present and Future OP Scenarios

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Indra



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Introduction

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Why Electronic Attack?

- Modern scenario faces modern IADS and no longer single SAM battery as the thread
- IADS refers to all the means necessary for avoid enemy's airborne penetration to a territory, include air surveillance means, battle management and weapon control
- Air surveillance is the initial function for an air defence system. Radar will detect any aircraft entering IADS's area of coverage and initiate the rest of the functions
- The response from the point of view of air forces:
 - Can not be based only on self-protection
 - EA support is needed
 - Based on multiple networked EA assets



How Integrated Air Defense Systems Work



Battle

Management

Air Survillance

Air surveillance provides the potential threat or target; this decision is effectively finalized through threat evaluation and the

move to engage.



Battle management represents a key transition from identifying a threat to committing against that threat through command decisions

C4I – Command, control, computers and intelligence

Weapons

The role and responsibility of a weapon system informs a decision-maker's selection to ensure a relatively efficient engagement, balanced against the variety of threats that may exist at the same time or in a similar geographic region (such as an IADS' area of responsibility).

Source: The Mitchell Forum/Mitchell Institute





Operational needs



Operational needs, EA role

- The main task of the EA assets is to enable safe access to air forces to these A2/AD areas. The main objective for these Electronic Attack assets is to create a safe bubble for aircrafts.
- SOJ, SIJ, Escort Jamming, Modified Escort Jamming are the capabilities





Main capabilities / characteristic for the EA assets

EA response for modern IADS capabilities

| Coordinated sensors in multiple bands | ES assets for multiple operation bandsFrom very low frequencies to high frequencies |
|---|---|
| Mobile networked systems | Interconnected EA assets coordinated with ES elements Very High Capable networked ESM (CESMO) |
| Very long range detection | Very low frequencies coverageSmart deception jamming against search modes |
| Power control and Low power (LPI) | High sensitivity modesSmart power control not based only in very high J/S ratios |
| Emitter complexity (inter and intra pulse) | Wideband DRFM with smart DRFM techniques CM generation with poor knowledge of the threat characteristics |
| AESA and Smart beam control | Very High ERP for EA |
| Wideband Frequency agility | Wideband Digital Reception for high performance ES function Very High POI for ES function (100% POI) |



Key technologies

- Solid state HPA GaN
- Tx/Rx AESA antenna based on solid stated amplifiers.
- Ultra-wideband Digital Reception for ES and Ultra-wideband DRFM for EA
- Accurate synchronization and location means to enable collaborative techniques
- Smart countermeasures based on real time radar parameters and engagement behaviour (not in pre-knowledge of the system)





ALQ-500 KEY COMPONENTS -







- Signal intelligence collection and powerful ES as one of the main enabler for EA
- Multiband operation as well as high ERP means important SWaP challenges.
- Very Low band operation vs Size & Weight for airborne platform or POD based solution
- Digital AESA
- Combat Cloud tactic and technologies to support real time communication and synchronization.
- Well kwon mature Self-Protection techniques to be coordinated and improved by use of EA means







EW architectures Evolution – Electronic Attack EA

- Dynamic allocation of resources and collaborative tasks through cognitive use of spectrum and mission deployment
- Multiple resource combination, all type of resources, stand in, stand off, manned/unmanned,...
- Synchronization and resources/priorities management, A.I. From collaborative tasks to virtual sensors/actuators with new/additional capabilities
- Cloud, resilient network operation, cybersecurity (secured operation)



Conclusions

- IADS proliferation, its capabilities improvement for these IADS, multi-band and multi-threat, need response from EA capabilities as individual self-protection is no longer enough.
- EA Networked operation is also a must, so interconnected EA assets combat cloud based is necessary.
- Very powerful ES capabilities are essential to support EA. Ultrawideband operation, very high POI, instantaneous geolocation, etc. All these characteristics are enablers for adequate EA.
- Development of assets and means for modern EA is only one aspect of the problem, tactics, training, signal intelligence, and algorithms development is also needed for success.



