Air and Missile Defense Radar (AMDR)

“Sea Power to the Hands of Our Sailors”

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AMDR Background

- Maritime Air and Missile Defense Joint Forces (MAMDJF) Analysis of Alternatives (AoA) results:
  - very large phased array radar (SPY +30dB) to be paired with a newly constructed combatant to meet the stressing BMD and cruise missile threats

- The Next-Generation Cruiser Program (CG(X)) was the planned combatant for AMDR,

- 2009 - a Radar/Hull Study was conducted
  - smaller AMDR could be paired with the DDG 51 hull and still meet these IAMD requirements

- USN canceled the CG(X) program, and restarted the DDG 51 shipbuilding program.

- New DDG 51 configuration with AMDR became known as DDG 51 Flight III
AMDR Challenges

Hardware Systems Engineering

- Scalability and Modularity
  - IWS 2.0 partnered with ONR, OSD Title III/ManTech Offices, and Industry in an effort to make AMDR modular, scalable, affordable, and to reduce risk

- Risk reduction Investments:
  - Gallium Nitride (GaN) Power Electronics
    - OSD Title III
      - Conformal Hermetic Coating for Microelectronics
      - GaN on SiC MMIC Production for S and X-band Radar/EW Systems
    - Conducted follow-on ManTech GaN Producibility programs
  - Digital Array Radar (DAR)
    - ONR Future Naval Capability (FNC): Provided an active phased array radar that includes the digital beamforming (DBF) architecture.
  - Affordable Common Radar Architecture (ACRA)
    - ONR FNC: Provided a modular and open combat system interface to integrate with the Product Line Architecture (PLA)
  - Affordable Electronically Scanned Array Technology (AESAT)
    - ONR FNC: Provided electronic components to reduce lifecycle costs in the next-generation active ESA radars
      - Components included: High Power/Efficiency MMICS and RF Power Amplifiers, Low Noise Digital Tx/Rx components, and DBF components

- Open architecture (OA) standards, interfaces, and equipment were implemented into initial design for the radar front-end arrays, electronics and back-end processing
An active, digital radar enables multiple and simultaneous high-fidelity radar beams for a rapid volumetric search.

Implementation of the modular hardware and advancements in R&D achieved the following radar system and performance benefits:

- Eased the Systems Engineering Workload
  - Decreased the complexity of the radar design
- Improved the integration and testing of the radar system
- Active Performance
  - Improved detection sensitivity
  - Improved clutter attenuation
- SS Reliability
  - Improved/Increased Mean Time Between Failure (MTBF)
    - $10^8$ (100 Million) hours
  - Graceful Degradation Performance
- Enables Digital Beamforming (DBF) Architecture

Cost Savings applied to the acquisition program

- Sustainment and Lifecycle costs also decrease
Each RMA measures 2’ x 2’ x 2’
- Each RMA is essentially an individual radar

This common architecture ensures the radar’s extensibility and scalability to other platforms, and their particular mission requirements
- EASR is a derivative of AMDR that will be installed on CVNs and Amphibs

Common and Open front/back-end architectures ensure:
- Low NRE for future radar derivatives (radar scaling)
- Common Logistics, Spares, Manning, and Training
AMDR Benefits

- AMDR-S will acquire and track a target *half the size* and at *twice the range* compared to the AN/SPY-1, providing increased flexibility in ship operating location.
- Ability to react to and provide engagement data for the stressing Very Low Observable/Very Low Observable Flyer (VLO/VLOF) target in a dense clutter environment.
- Capable of operating in natural and man-made environments to meet multi-mission requirements.

AMDR is in development to support robust IAMD (BMD and AAW) Raid Capability.
Apply Product Line Architecture (PLA) principles to create common, open interfaces to enable integration

- Allows future radars the ability to integrate with other combat systems
- Allows the USN to have 3rd party vendors develop and integrate additional capability into the radar and combat system.

Integration of SPY-6 into AEGIS

- Relied on a “modified” B/L 9 ACS and the AEGIS Common Source Library (CSL)
  - Developed new components and new interfaces
- Demonstrated successful simulation of the AAW and BMD Fire Control Loops
- Significant ROI for B/L 10 (ACB-20) for future integration and testing
- Significant reduction of NRE for integration/testing into other combat systems (e.g. SSDS)

Key Elements of Common Development:
- Common Mission Capabilities
- Single Set of Specifications
- Common Program Plans
- Single Set of Processes & Metrics
- Integrated Team Structure
- Enterprise Products
QUESTIONS?
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Backups