ASNE BMD PANEL – C4I EVOLUTION

PEO C4I BMD IPR

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Aegis BMD BMC4I Spiral Evolution

PEO C4I BMD IPR

Sustainment
Reach-Back

Increase BMDS Interoperability

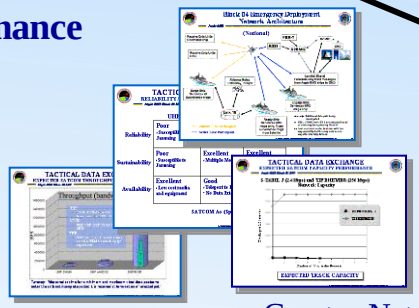
Enhance Battle Management Capability

Increase BMDS Planning Capability

Increase BMDS Fire Control Connectivity

Increased Network Performance

- Higher Bandwidth
- Increased Track Capacity
- Greater Network Architecture flexibility



Mission Critical Tech Refresh

Link-16 based OPIR

Enhanced Correlation

Increased Track Update Rate

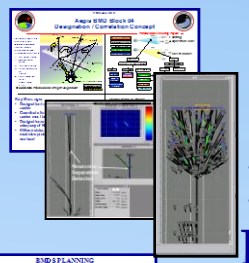
Engage on Remote Sea-Based Terminal

BMD 5.1 / 5.x

Theater Engagement Coordination

Preferred Shooter

Peer-to-Peer



Planning Data Exchange

Multi-Ship Planning

GCCS – MP Automated Data Exchange

Enhanced Launch on TADIL (LoT)

BMD 4.0.1 / 5.0

Launch on TADIL (LoT)

BMD 5.1 Long Range Surveillance & Track (LRS&T)

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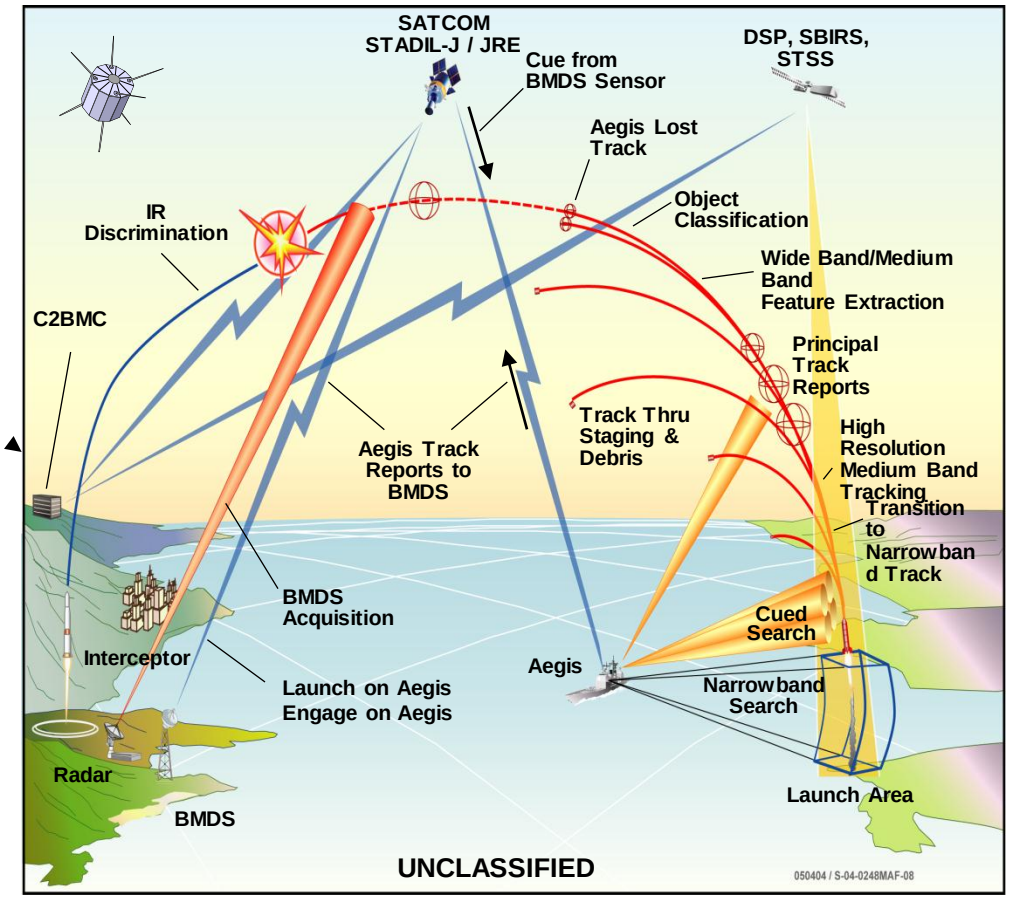

- (U) Forward ship conducts autonomous or directed mission plan for prescribed LAD
- (U) Forward ship conducts autonomous or cued search over LAD
- (U) Forward based Aegis detects and tracks ballistic missile in boost or ballistic phase and provides principal object track and classification data to BMDS via Link 16
  - (U) Once in track, forward ship computes position, velocity covariance and selected ID of threat track(s) as track reports
- (U) Forward ship transmits state and covariance data to other BMDS elements
- (U) BMDS sensor or weapon completes engagement sequence

Forward Based Aegis Provides Track State and Covariance Data to BMDS Elements

BMD 5.1 Engage On Remote (EOR)

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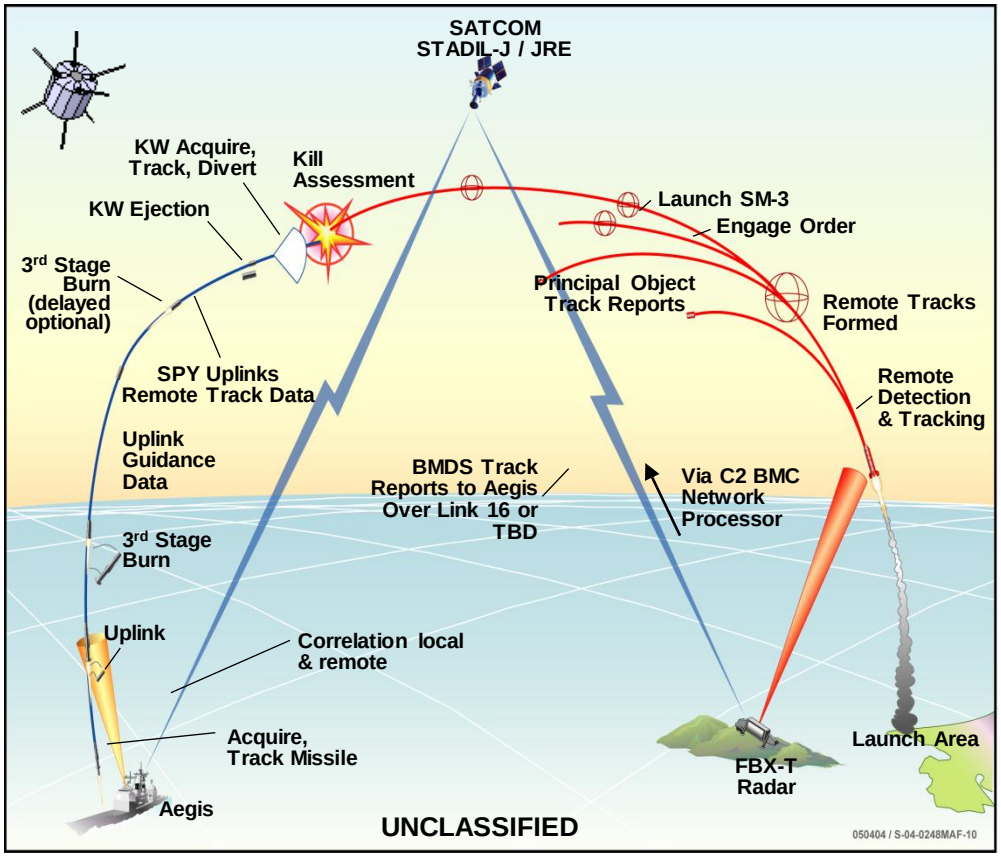


Firing Ship Engages Threat Using Remote Track Data

- Aegis ship conducts autonomous or directed mission plan for prescribed LAD
- Threat is launched and detected
- Forward ship or other BMDS sensor transmits state vector, and track quality (TQ) to firing ship
- Firing ship executes C&D processing to predict launch and impact points, and requests covariance data
- Engagement order is processed:
  - Prelaunch computes fire control solution and recommends time to fire missile
    - Based on EOR FOM
  - WCS sends missile initialization command to VLS
  - Missile is fired and acquired by SPY
  - Ship computes and uplinks 2nd stage midcourse guidance using remote data
  - Ship provides 3rd stage guidance support and handover to missile using remote data
  - Missile provides KW stage track, IR discrimination, eject, divert, and intercept
- Following intercept, firing ship conducts kill assessment for possible subsequent shot

Aegis BMD C4I Capability Evolution

PEO C4I BMD IPR

BMD 3.6.1

SRBM and MRBM Defense
Surveillance Support to BMDS

Long-Range Surveillance and Tracking

Operational Engagement Capability

SM-3: Block I, Block IA

Near Term Sea-Based Terminal

Launch on Remote

Planning Data Exchange - Manual (GCCS-M, ISNS)

OPIR Space Cues (JTT)

Missile Initialization (NAVSSI)

Increased Bandwidth (EHF, ADNS)

Increased Track Capacity (EHF, CDLMS)

Survivable/Protected Comms (EHF)

Network Redundancy (CDLMS)

BMDS Cross-AoR Connectivity (Ship/Shore)

BMD 4.0.1 and BMD 5.0

Enhanced SRBM, MRBM
& Limited IRBM Defense

Improved Capability against Complex Targets
- Object Classification and Discrimination
- Coordinated RF/IR Discrimination
- Threat Update Capability

Increased Battlespace with SM-3: Blk IA & Blk IB
- Improved Engagement Coordination
- Improved Launch on Remote

Planning Data Exchange - Automated (GCCS-M, ISNS)

Receipt of System Calibration Data (GCCS-M, ISNS)

OPIR Space Cues (JTT Updated Interface)

Launch on Remote (CDLMS)

Engagement Coordination (CDLMS)

War Diary (CDLMS)

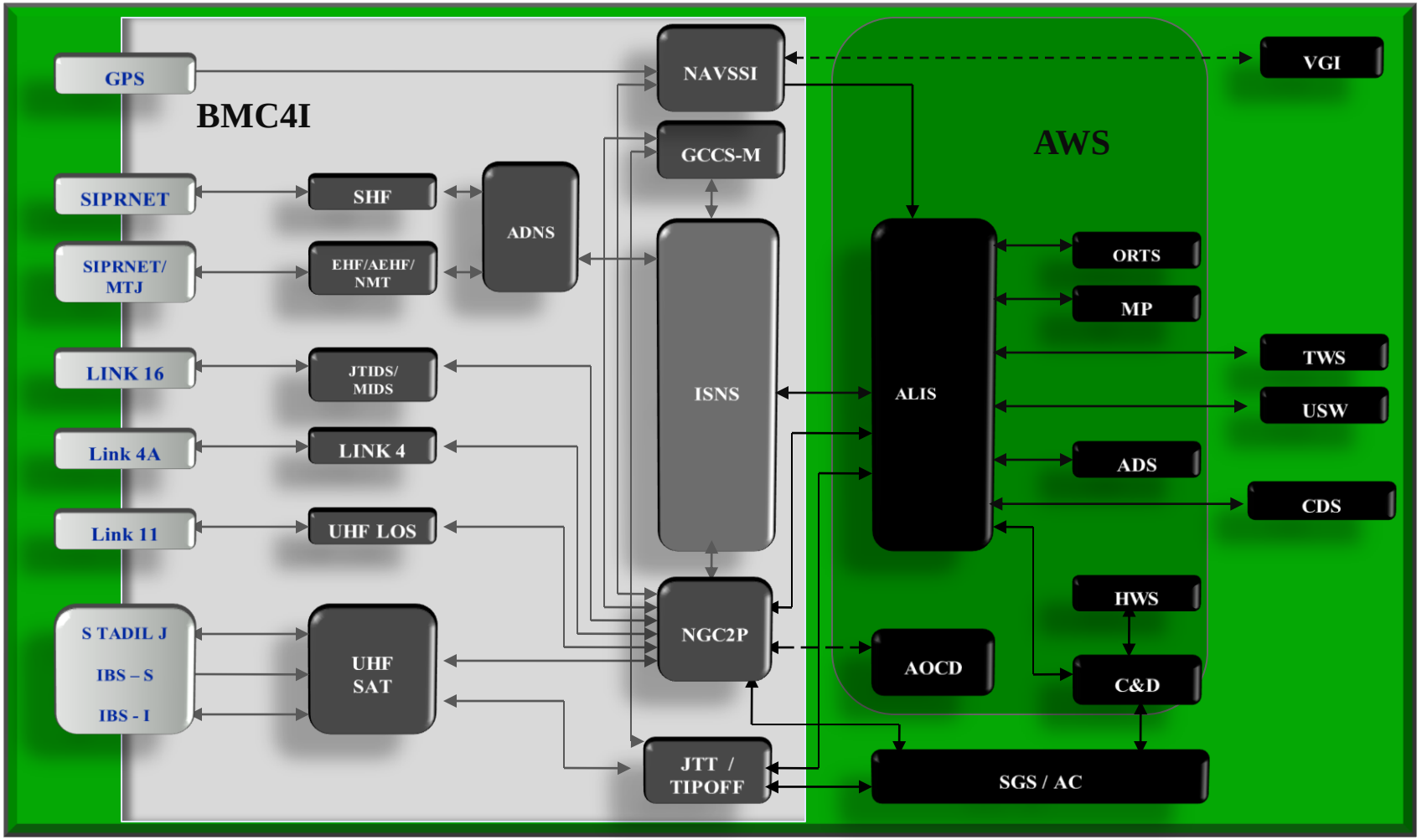
Multiple-Path Deterministic Routing (ADNS)

Increased SATCOM Capacity (NMT, CBSP)

Cross-AoR Redundancy (Ship/Shore)

C4I to AWS Interface

Aegis BMD 5.0 / B/L9 (ACB12)



"Mission Critical" for C4I Systems (1 of 2)

Mission Critical Requirement	*TLR	**ECS	Notes
Probability of Communications Support (Pcs)	X		**The Pcs value (classified) is included within the performance allocations for LRS&T and LoT (under Pssek)**
• C4I Reliability	X		The C4I reliability value (classified) is derived from the Pcs Analysis (uses PEO C4I ORD specifications)
• Redundancy of Communication Paths	X		TLR specifies multiple communications paths (and priority): EHF MTJ, SHF MTJ (MIL), SHF MTJ (COM), UHF STJ
• Automated Failover / Recovery	X		TLR specifies automated failover in priority order, and also recovery over the highest priority path available
• No Single Points of Failure			Part of design trade space, to be assessed against reliability requirement
• Redundant Power Supply			Part of design trade space, to be assessed against reliability requirement
Reliability, Maintainability, and Availability (RMA)			**RMA specifications are defined for the combat system, however they are not allocated/flowed to C4I systems. Reliability for C4I systems is covered as a component of Pcs.**
• MTBCPMCE		X	Mean Time Between Computer Program Mission Critical Events
• MTBEMCE		X	Mean Time Between Equipment Mission Critical Events
• Ao		X	Inherent Availability
• MTTR		X	Mean Time to Repair
• MTBCPMCE		X	Mean Time Between Computer Program Equipment Failures

***C4I Requirement Specified within the PEO C4I BMD Top Level Requirements (TLR)**
****System Requirement Specified within the Aegis BMD Element Capability Specification (ECS)**

"Mission Critical" for C4I Systems (2 of 2)

Mission Critical Requirement	*TLR	**ECS	Notes
Environment / Survivability			
• Grade A Shock		X	Per MIL-STD-901D
• Environmental Vibration		X	Per MIL-STD-167-1A
• EMI / Lightning		X	Per MIL-STD-464
• Rain		X	Per MIL-HDBK-310
• Sea State		X	
• HAENS			BMDS-Level Requirement (MDA Core Standard)
• Transmission Security		X	TRANSEC(anti-jam, frequency hopping)
• Temperature Extremes		X	MIL-STD-210
• Electromagnetic Compatibility		X	EMC, per MIL-STD-461
• RF Transmissions		X	ITU-RP834-3, ITU-RP676-5
Other			
• MAC Layer I, IA Controls		X	Per DoD 8500.2, also DIACAP, IATF
• Physical Security		X	Per DoD 5200.8R
• System Safety		X	Per MIL-STD-882, Aegis BMD ISSMP

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