NDIA State of IAMD Symposium

Navy IAMD Capabilities

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PEO IWS

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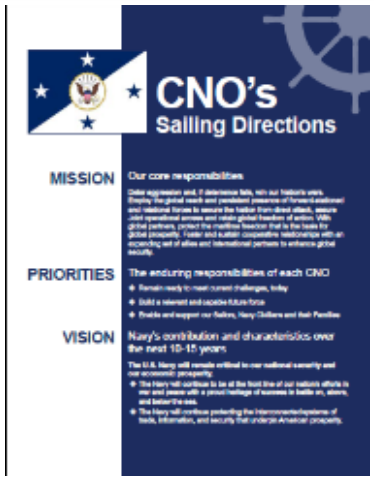
BLUF

- **The Navy is evolving IAMD from Air Defense and Ballistic Missile Defense Capabilities**
  - **BMD 3.6 Initial Capability against SRBM/MRBM deployed with limited AAW capability**
  - **BMD 4.0.1 next generation capability added defense against some IRBMs with improved discrimination in both the RF and IR domains**
  - **AEGIS Baseline 8 deployed Open Architecture with Technical Data Collection capabilities, but focused primarily on Air Defense**
  - **AEGIS Baseline 9 deploys IAMD capability balancing radar resources to conduct both Air Defense and BMD with an IAMD Mode along with NIFC-CA**
  - **Future Development will deploy advanced sensors and integrated Softkill and Hardkill**

Combatant Commander Demand for Navy IAMD Capability / Capacity is Increasing

CNO Sailing Directions



- Warfighting First
- Operate Forward
- Be Ready

"We will deliver credible capability for deterrence, sea control, and power projection to deter or contain conflict and fight and win wars."

"We will address economic change by being effective and efficient. We will innovate to:

- **Use *new technologies* and operating concepts to sharpen our warfighting advantage *against evolving threats***
- ***Operate forward* at strategic maritime crossroads**
- ***Sustain our fleet capability* through effective maintenance, *timely modernization*, and sustained production of proven ships and aircraft**
- **Provide our Sailors *confidence in their equipment* and in their *own skills.*"**

IAMD Provides Significant Advantages To A Forward Deployed Surface Navy

Rapidly Evolving Missions Drive Navy Capability Advancements

Operational Environment

Humanitarian Assistance

Short and Medium Range Ballistic Missiles

Persistent ISR

Complex Threats Employing Advanced Technology in Challenging Environments

Sub-Sonic Anti-Air & Anti-Surface Missiles

Simultaneous Raids Across Multiple Mission Areas

Intermediate Range Ballistic Missiles

Anti-Piracy

Small Boat Attacks

Cyber Warfare

Super-Sonic Anti-Air & Anti-Surface Missiles

Disaster Relief

Torpedoes

Anti-Ship Ballistic Missiles

Advanced Super-Sonic Anti-Air & Anti-Ship Missiles

Mines

Stealth Under-Sea

Capability Advancements

Integrated AAW & Situational Awareness

Area Air Defense In Clutter Environments

High Data Rate Battle Group Networks

Over Land Defense

Improved Self-Defense

Integrated Air and Missile Defense

Space Based BMD Tracking

Enhanced Shipboard Sensors (Radar + ES/EA)

Cyber Defense

UAV Integration

Engage Long Range Ballistic Missiles

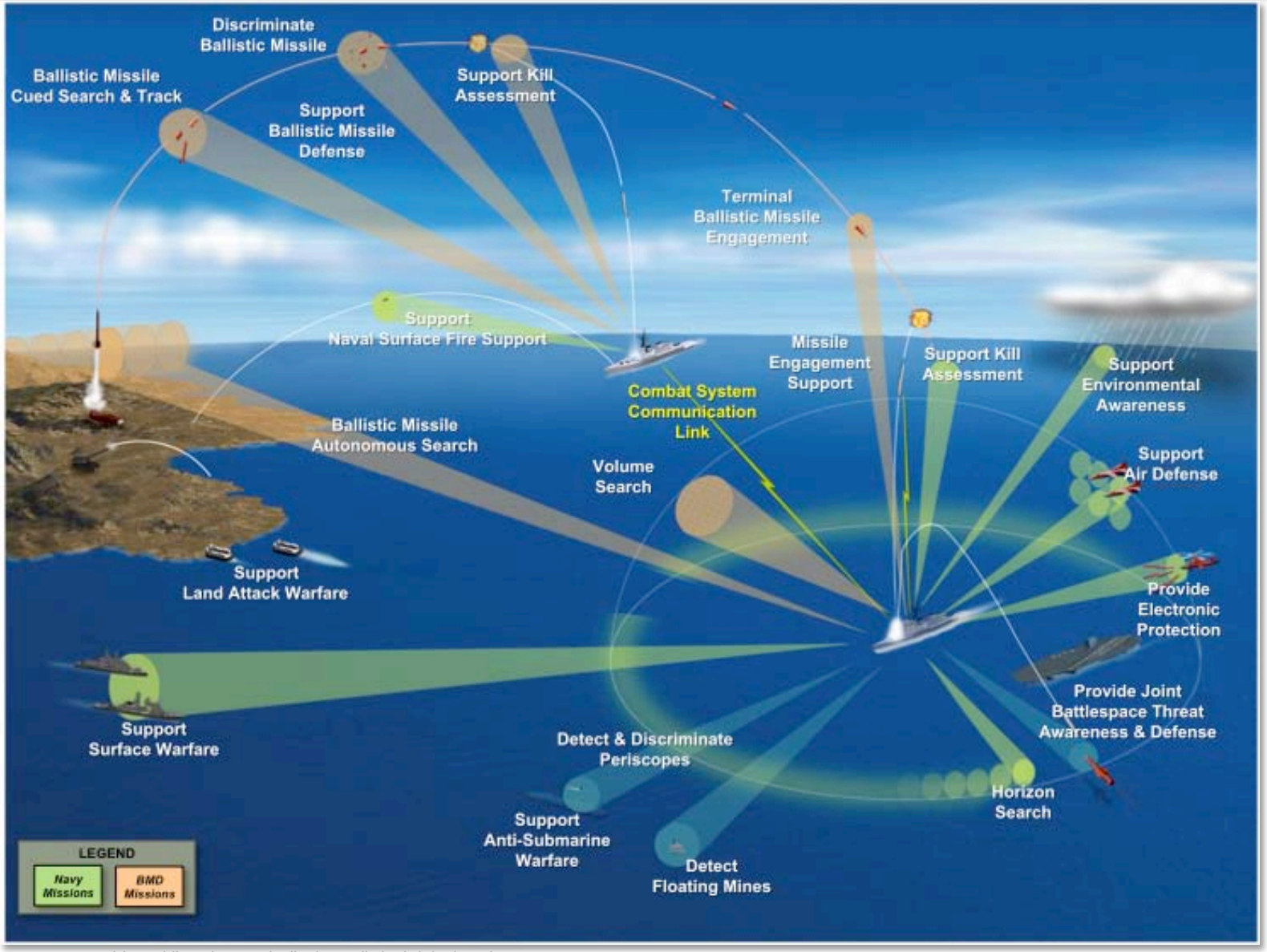
Multi-Ship Resource Coordination

Rail Guns

Directed Energy

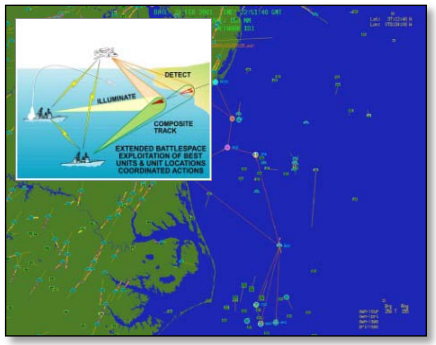
IAMD is a Core Navy Mission Driving Capability Enhancements

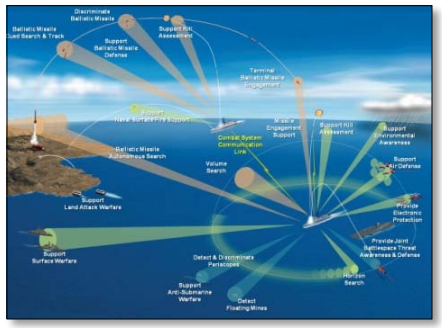
Mobile, Persistent, Multi-Mission Surface Force



Navy Technical and Operational Architecture

- **Navy surface forces operate in a regional joint networked environment with joint and coalition forces**
  - *Link 16* – Joint operations, situational awareness, BMD
  - *Cooperative Engagement Capability* – Integrated surface force tracking and engagement network, Navy IFC
- **Surface combatant force foundation is Multi-mission operations**
  - Area Air Defense, Ballistic Missile Defense, Under Sea, Surface, Strike, Naval Gunfire Support
  - Driven by COCOM requirements to operate forward
- **Strategy of Advanced Capability Builds provides incremental warfighting improvements for countering evolving threats with new capability**
  - Network based COTS computing environments enable rapid insertion of new capabilities to meet threat drivers
  - COTS allows for faster upgrades and reduces combat system variants





Navy Architectures Enable Effective Use of BMDS Networked Sensor Capability

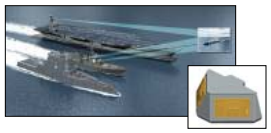
Current Systems	*Future Capability*
Individual on-board mission systems (AAW, BMD, USW, etc.)	Increased integration of off-board mission systems
Ships with AAW focus Or BMD focus	Integrated AAW and BMD
Rotating Radars On Carriers	Phased arrays on carriers
Improved SPY-1 variants on CGs and DDGs	Advanced phased array technology
Independent hard kill and soft kill systems	Integrated hard kill & soft kill
CM/decoys for soft kill	Addition of electronic attack for soft kill
Organic and Cued BMD Engagements	Persistent Space BMD IR Tracking
Extended battlespace Through EOR using SPY-equipped ships and AEGIS Ashore	More flexible EOR expanding to other Navy/BMDS sensors

AN/TPY-2

SBX

SPY-1 MMSP Upgrade

AMDR-S



SEWIP

PTSS

NIFC-CA SBT SM-3 Blk IIA

AEGIS Ashore

Pushing the IAMD Mission Forward

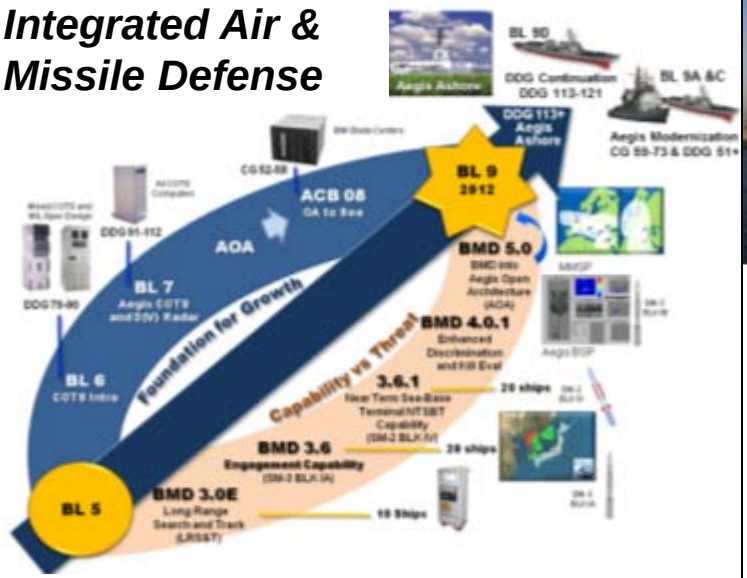
Improved Mission Capability

Enabling Developments

Force Integration

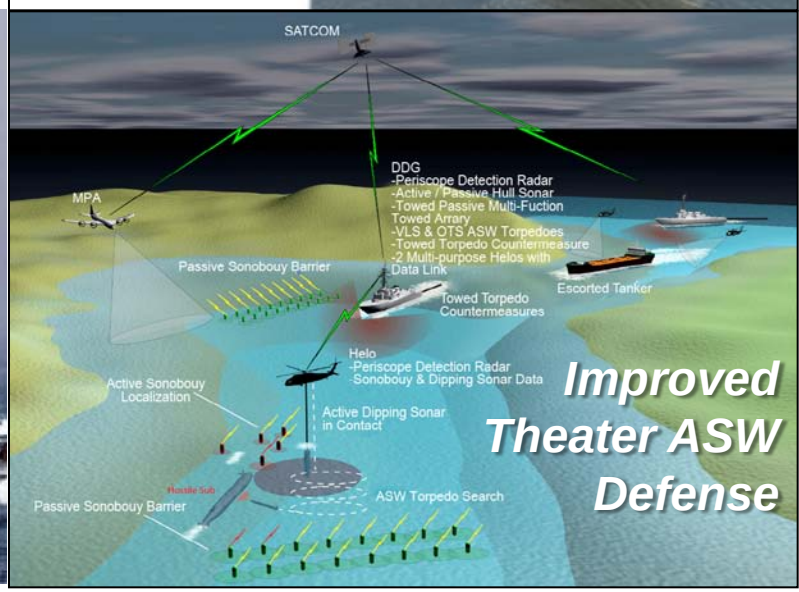
Advanced Technologies

Integrated Air & Missile Defense



Improved Large Deck Self- Defense

Improved Small Boat Defense



Improved Theater ASW Defense

Enabling Developments
AEGIS Baseline 9 Combat System Upgrade

Improved Mission Capability

Enabling Developments

Force Integration

Advanced Technologies

AEGIS Baseline 9 (BL 9)			
Air Defense Cruiser	IAMD DDG	New Construction IAMD DDG	AEGIS Ashore
			
In-Service Cruisers *(CG 59-64)*	***In-Service Destroyers*** *(DDG 51-78)*	***New Construction Destroyers*** *(DDG 113-118)*	***AEGIS Ashore***
Capability: • *NIFC-CA* • *CEC* • *SM-2,SM-6* • *ESSM* • *No BMD* • *No MMSP*	***Capability:*** • *IAMD* • *CEC* • *BMD 5.0* • *NIFC-CA* • *SM-2, SM-6, ESSM* • *SM-3 Blk IA,IB* • *CEC Interoperability Mods* • *Link 16 Model 5* • *IFF Mode 4*		***Capability:*** • *BMD only* • *BMD 5.0/5.0 CU* • *SM-3 Blk IA,IB* • *Remote Launcher Mods*
Conducting Integration & Test w/ Tactical Builds	***Conducting integration & Test with Tactical Builds***	***Detailed Design in-progress***	***Detailed Design in-progress***

Network Based COTS Combat Systems

- *In-Service DDG/CG Upgrade*
- *New Construction DDG*
- *AEGIS Ashore*

- *Integrated Air Def & BMD*
- *Enhanced BMD*
- *Improved Networking*
- *Integrated Fire Control*
- *PAA Phase 2*

Development on Track for Delivery of Near Term Capability

BL 9 Adds DDGs & Land Based AEGIS with BMDS Connectivity

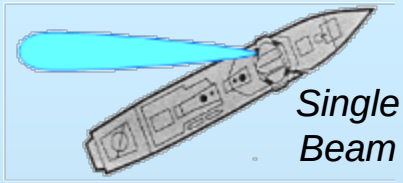
Enabling Developments
Multi-Mission Signal Processor (MMSP) Enables IAMD for SPY-1 Radars

Improved Mission Capability

Enabling Developments

Force Integration

Advanced Technologies

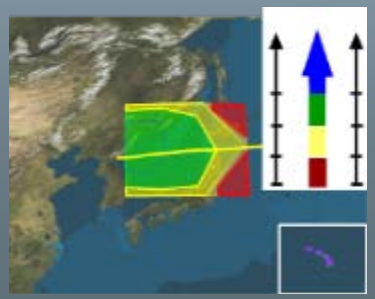


AAW Priority

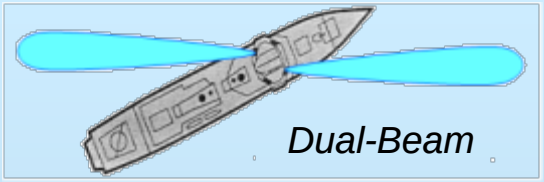
AAW Horizon and Above Horizon is Resource Support Priority

BMD Priority

BMD Sector Coverage is Resource Support Priority

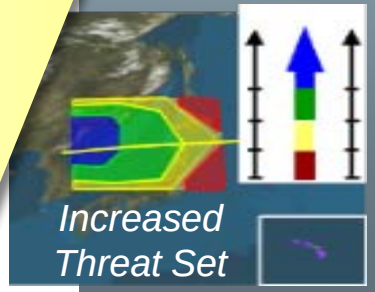


- ✓ Improved Performance in Littoral Environments
- ✓ Improved Performance Against Sea Skimmers
- ✓ Dual-Beam Operation
- ✓ Improved BMD Search
- ✓ Enhanced BMD LRS&T Performance
- ✓ AEGIS BSP Enhanced Range Resolution, Discrimination & Characterization



IAMD Priority

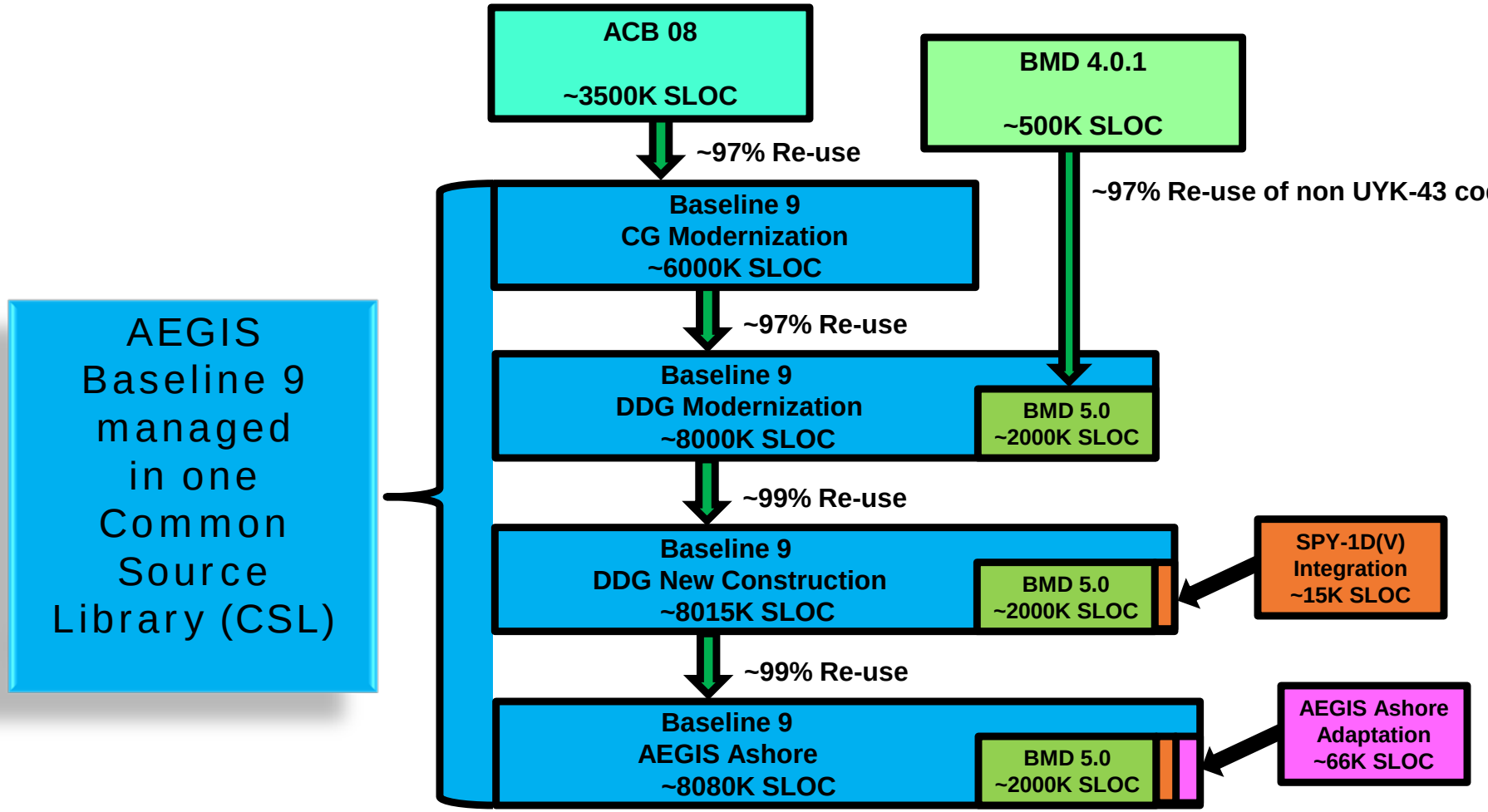
Dynamic Resource Allocation to Maximize BMD While Not Yielding AAW Defense



Increased Threat Set

Real-Time Capability Displays

AEGIS Common Source Library
Percent Code Re-use



AEGIS CSL Process Reduces Time and Cost of Development, Maintenance and Future Upgrades

Force Integration
Force Level Sensor and Weapons Coordination

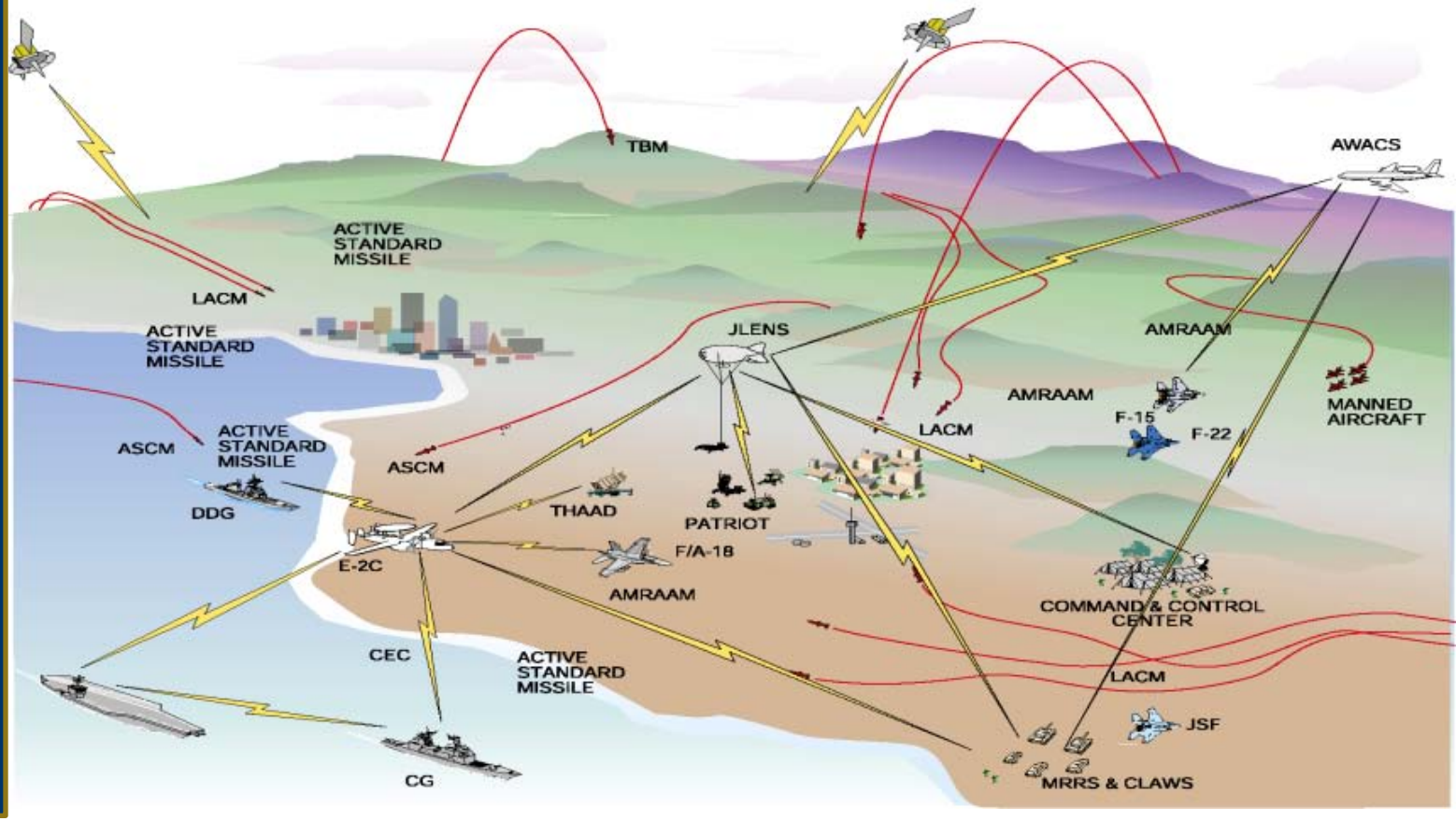
Improved Mission Capability

Enabling Developments

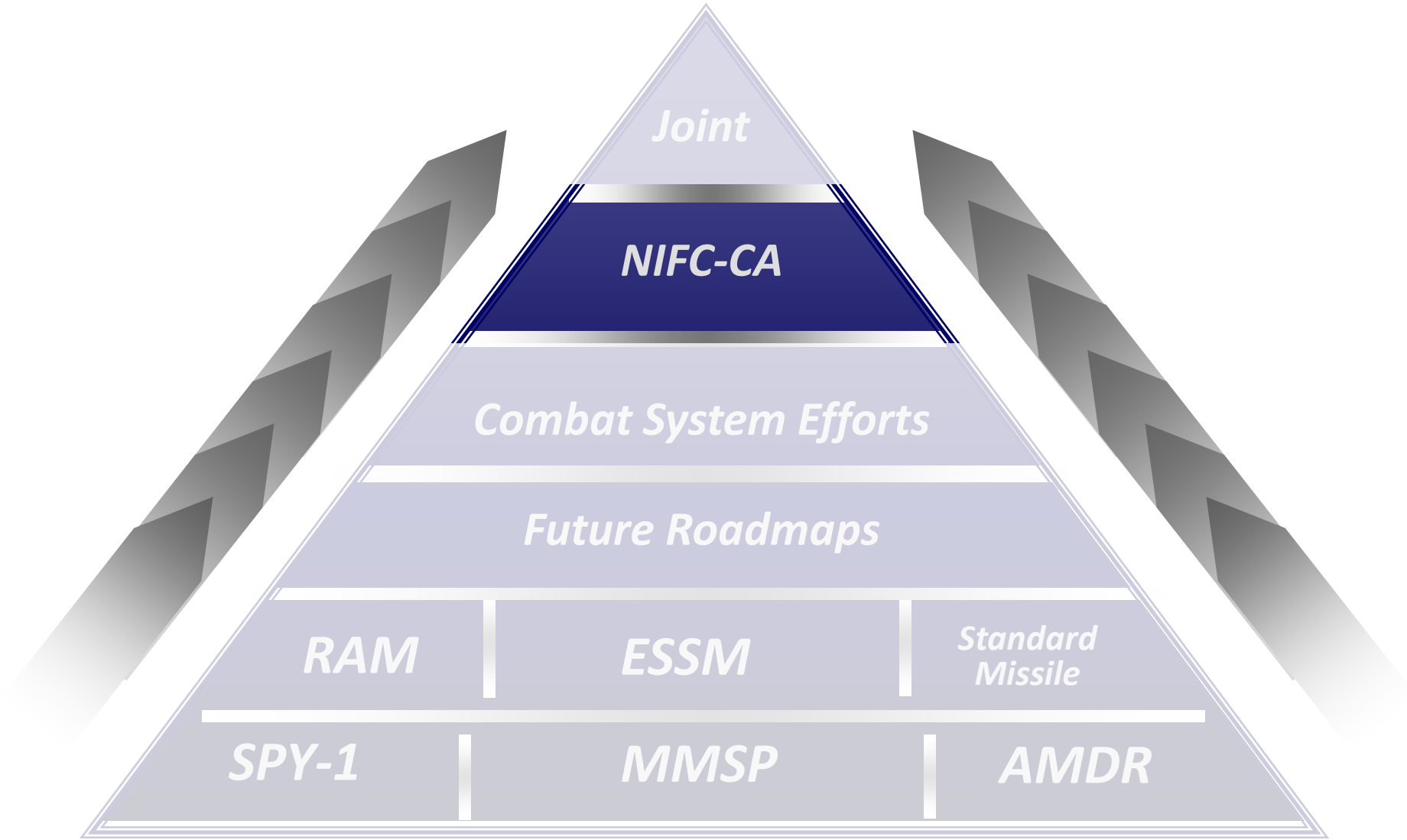
Force Integration

Advanced Technologies

- **Integrated Force Level Kill Chain**
  - **Coordination of Netted Force Operations to Counter Mid-Term Threats**
  - ***AEGIS-to-AEGIS SM-3 Weapons Coordination***
  - ***AEGIS-to-BMDS Weapon Coordination***



Agenda – NIFC-CA



NIFC-CA Kill Chains

- **Provide an Engage On Remote (EOR) and Over The Horizon (OTH) air defense capability, utilizing the full kinematic range of active missiles**
- **Three Kill Chains: Each consists of an active missile, elevated sensor(s), a sensor network, and a weapon control system**

From-The-Sea (FTS)

- E-2D - Advanced Hawkeye
- Cooperative Engagement Capability (CEC)
- AEGIS Weapon System (ACB12)
- Standard Missile (SM-6)
- JLENS (Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System)

From-The-Air (FTA)

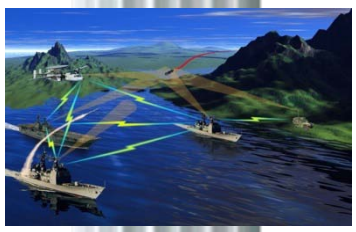
- E-2D - Advanced Hawkeye
- Link 16
- F/A-18E/F
- Advanced Medium Range Air-to-Air Missile (AMRAAM)

From-The-Land (FTL)

- E-2D - Advanced Hawkeye
- JLENS
- Common TACTICAL Network
- Surface Launched Missile (AoA in progress)

NIFC-CA From The Sea Pillars

NIFC-CA FTS



E-2D
- Upgrade Radar & IFF
- Update E-2D/CEC Interface
- Produce E-2D
- Develop E-2D Radar sensor model

JLENS
- Define JLENS/CEC Interface
- Develop demo program concepts and plan
- Provide and maintain JLENS model
- Develop CPG-Lite for HIL/SWIL testing
- Conduct JLENS Demo and develop follow-on test and eval plan

CEC
- Develop E-2D, JLENS, and AEGIS Adaptive Layers
- Develop CEC IFC algorithms and kernel for non-SPY
- Develop/integrate CEC i/f to WSMR FCS Upgrade
- Develop CEC model
- Build P3I Terminal

AEGIS
- Open AEGIS Architecture
- Develop/install WSMR FCS Upgrade for risk reduction
- Define AEGIS/SM-6 i/f
- Define Fire Control algorithms for non-SPY
- Upgrade AEGIS/CEC i/f
- Develop AEGIS model
- Field via AMOD

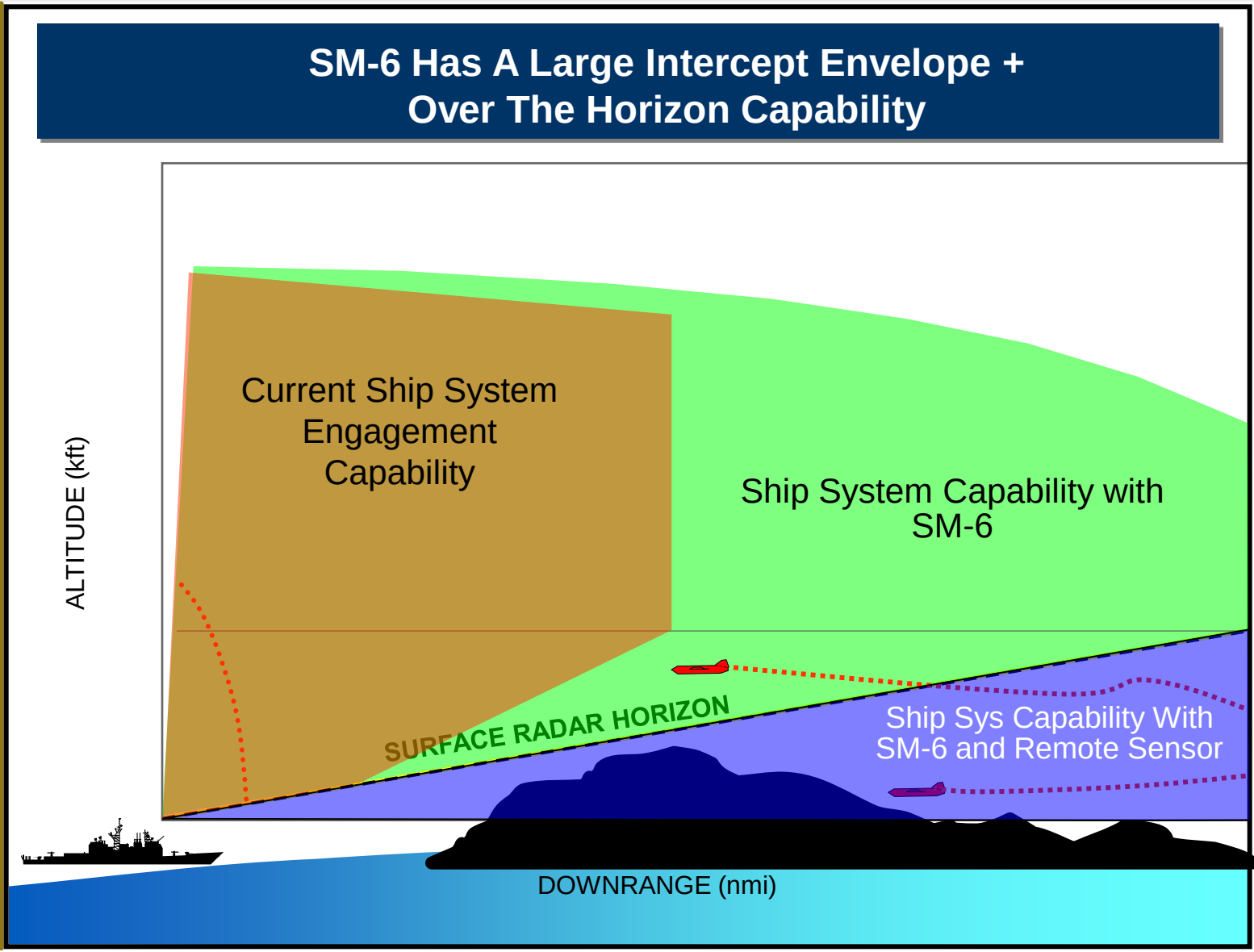
SM-6
- Integrate AMRAAM seeker with BLK-IV airframe
- Define and implement guidance laws
- Define AEGIS/SM-6 interfaces
- Build missiles
- Develop SM-6 6-DoF model

NIFC-CA SEI&T
- Capture pillar requirements and performance and demonstrate SoS capability
- Integrate Pillar Models into a SoS End-to-End Federation to support SoS Analysis
- Conduct SoS performance assessment and validate SoS model
- Plan and execute SoS testing, leveraging pillar test events
- Identify and mitigate SoS risks to support delivery of NIFC-CA capability in 2014

Force Integration
NIFC-CA/SM-6 Extends Battlespace

- *Improved Mission Capability*
- *Enabling Developments*
- ***Force Integration***
- *Advanced Technologies*

SM-6 Has A Large Intercept Envelope + Over The Horizon Capability



Enabling From the Sea

- **Pillar Program Design & Development for NIFC-CA**
  - Missile - Active seeker, extended range engagements
  - Combat System – Use of non-SPY sensor data
  - Sensor Network (CEC) – Integration and transfer of non-SPY sensor data
  - Sensors - Track data from elevated sensor
- **Integration & Testing**
  - Desert Ship upgrade to AEGIS ACB12 configuration
  - Rigorous land-based test series leading to at-sea firing events
  - Pillar Program models federated into System of Systems level tool
  - Test data/SoS Federation verification of NIFC-CA performance

Accelerating Effort for First At-Sea Firing in FY13

NIFC-CA Summary

- SoS design in place
- Pillar Program development /testing on schedule
- SoS test planning in progress
- Joint IFC Demonstration with JLENS planned for FY12

First At-Sea Event in FY13

BLUF

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QUESTIONS?