

NDIA State of IAMD Symposium



Navy IAMD Capabilities

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PEO IWS

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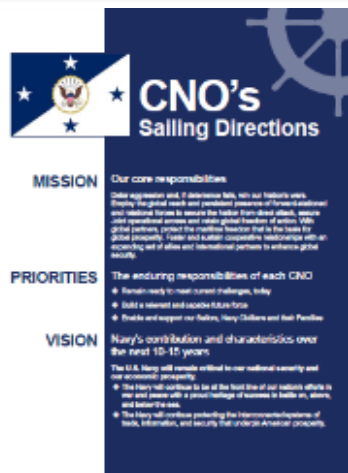
BLUF

- ◆ **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

Super-Sonic Anti-Air & Anti-Surface Missiles

Anti-Piracy

Small Boat Attacks

Cyber Warfare

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

Over Land Defense
Improved Self-Defense

Space Based BMD Tracking
Enhanced Shipboard Sensors (Radar + ES/EA)

Cyber Defense

Multi-Ship Resource Coordination

Rail Guns
Directed Energy

High Data Rate Battle Group Networks

Integrated Air and Missile Defense

UAV Integration

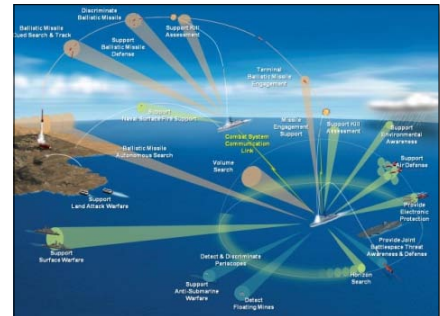
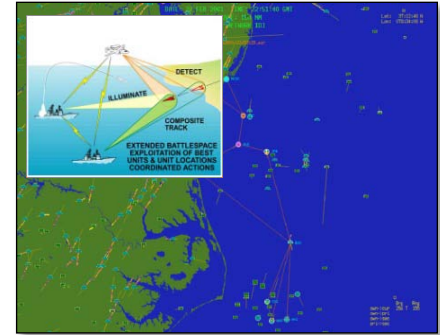
IAMD is a Core Navy Mission Driving Capability Enhancements





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

Individual on-board mission systems (AAW, BMD, USW, etc.)

Ships with AAW focus
Or BMD focus

Rotating Radars
On Carriers

Improved SPY-1 variants
on CGs and DDGs

Independent hard kill
and soft kill systems

CM/decoys for
soft kill

Organic and Cued BMD
Engagements

Extended battlespace
Through EOR using
SPY-equipped ships and
AEGIS Ashore



Future Capability

Increased integration
of off-board
mission systems

Integrated AAW and
BMD

Phased arrays on
carriers

Advanced phased
array technology

Integrated hard kill
& soft kill

Addition of electronic
attack for soft kill

Persistent Space BMD
IR Tracking

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 BIK IIA



AEGIS
Ashore





Pushing the IAMD Mission Forward

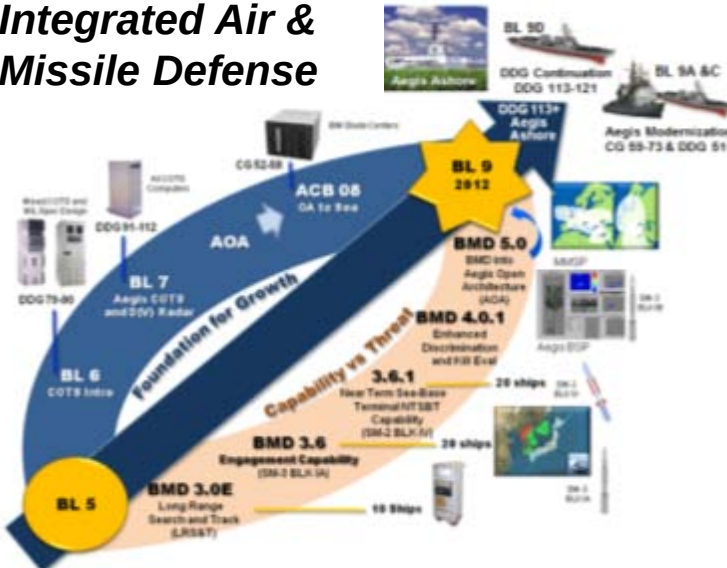
Improved Mission Capability

Enabling Developments

Force Integration

Advanced Technologies

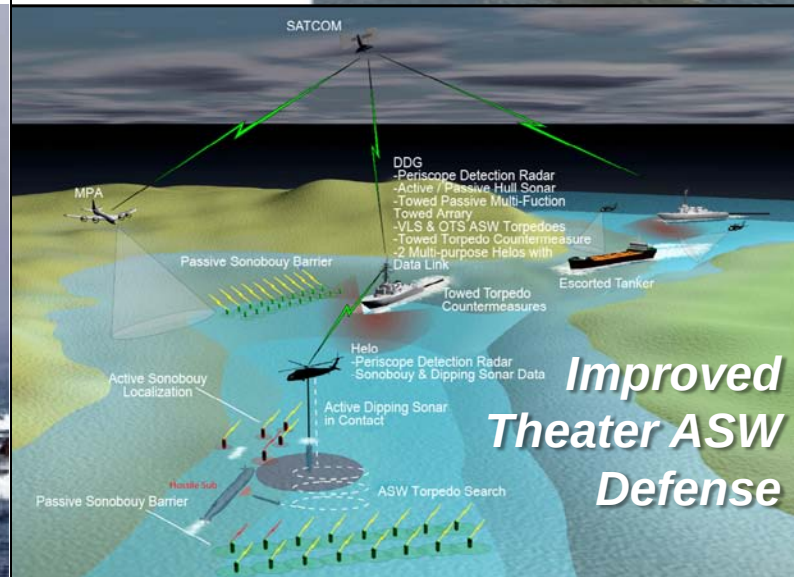
Integrated Air & Missile Defense



Improved Small Boat Defense



Improved Large Deck Self-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)

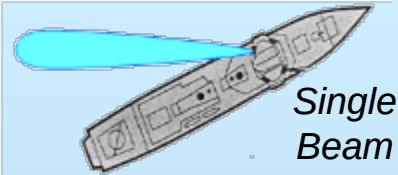
Enables IAMD for SPY-1 Radars

Improved
Mission
Capability

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Single
Beam

AAW Priority

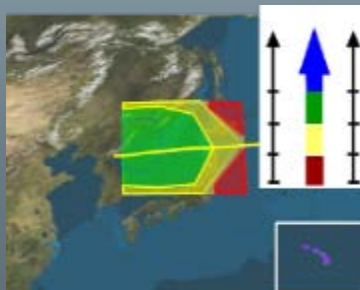


AAW Horizon and Above
Horizon is Resource
Support Priority

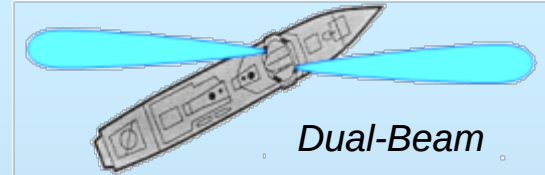
BMD Priority



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

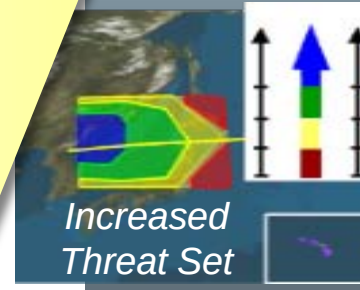


Dual-Beam

IAMD Priority



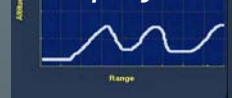
Dynamic Resource
Allocation to Maximize
BMD While Not Yielding
AAW Defense



Increased
Threat Set

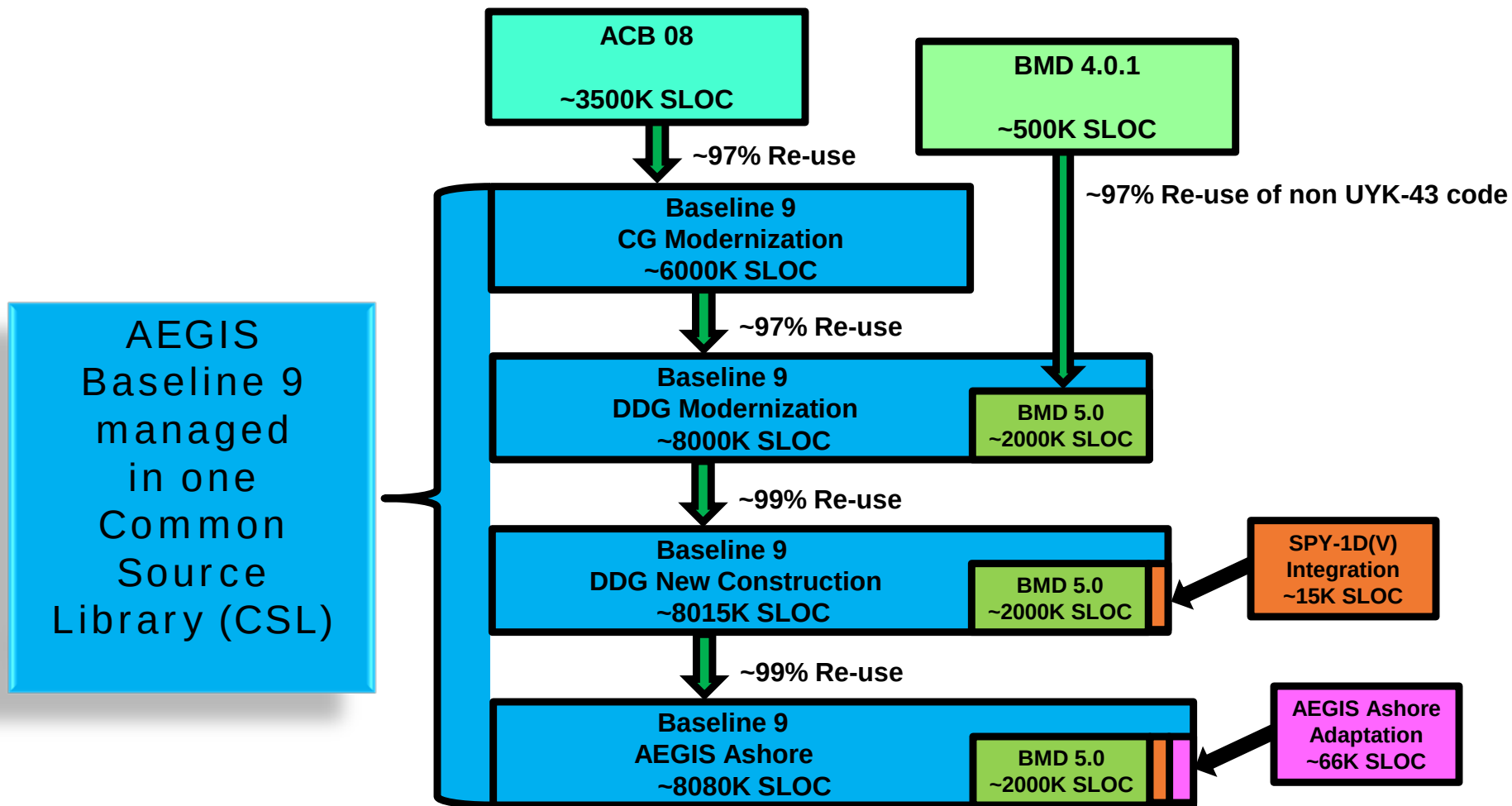


Real Time
Capability
Displays





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

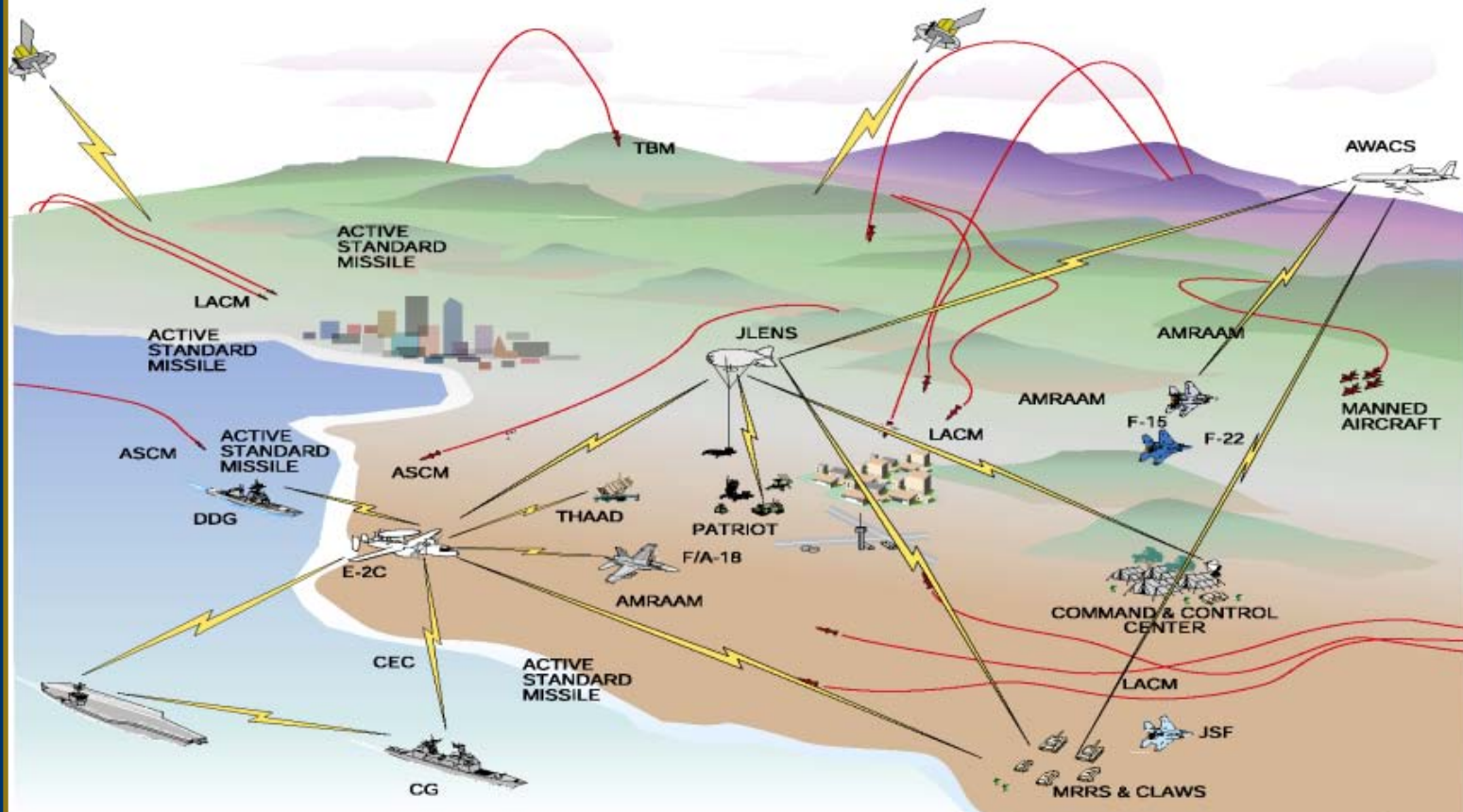
Improved
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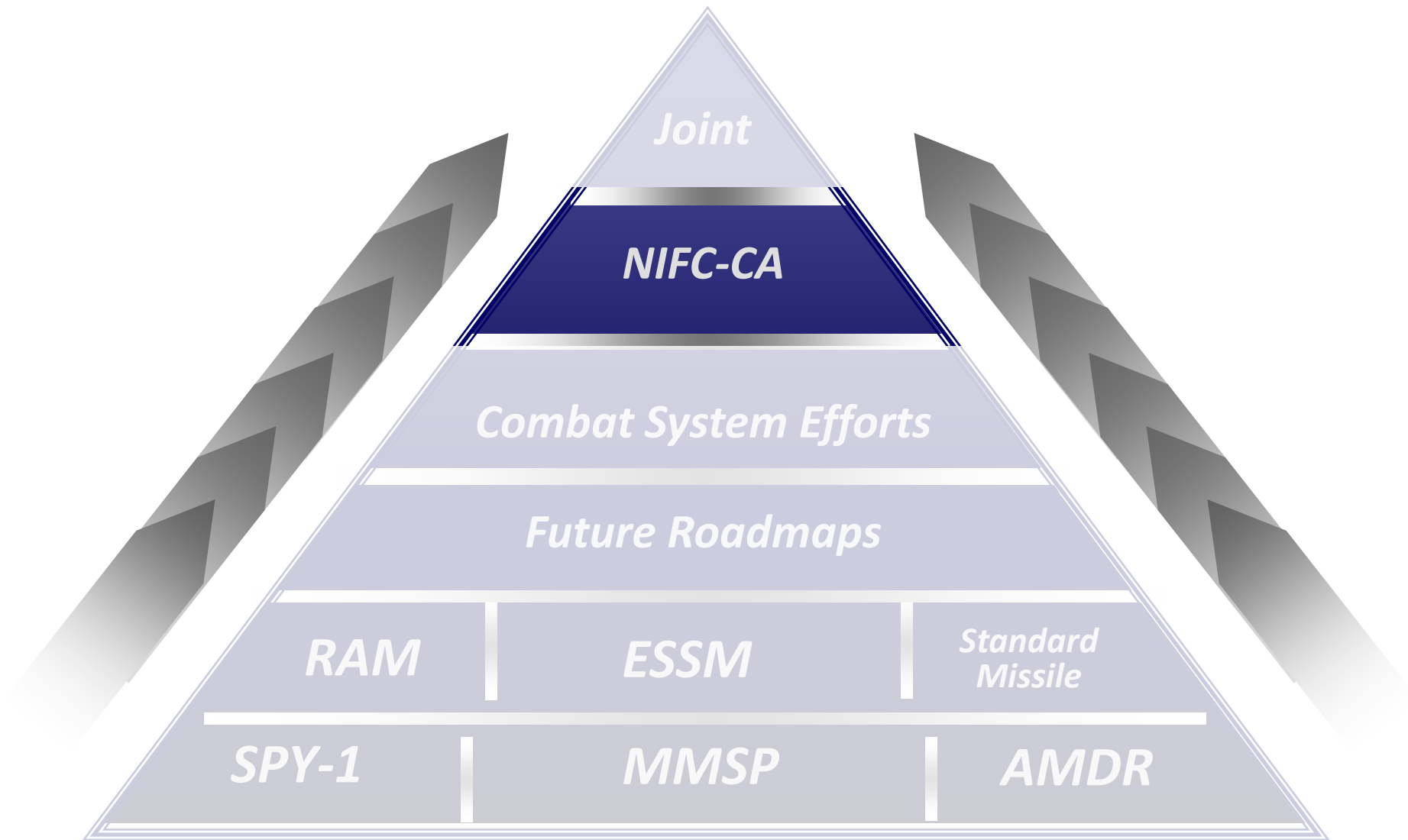
Advanced
Technologies

- ◆ 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



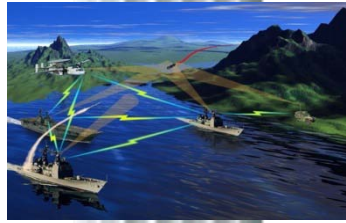
E-2D

- 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

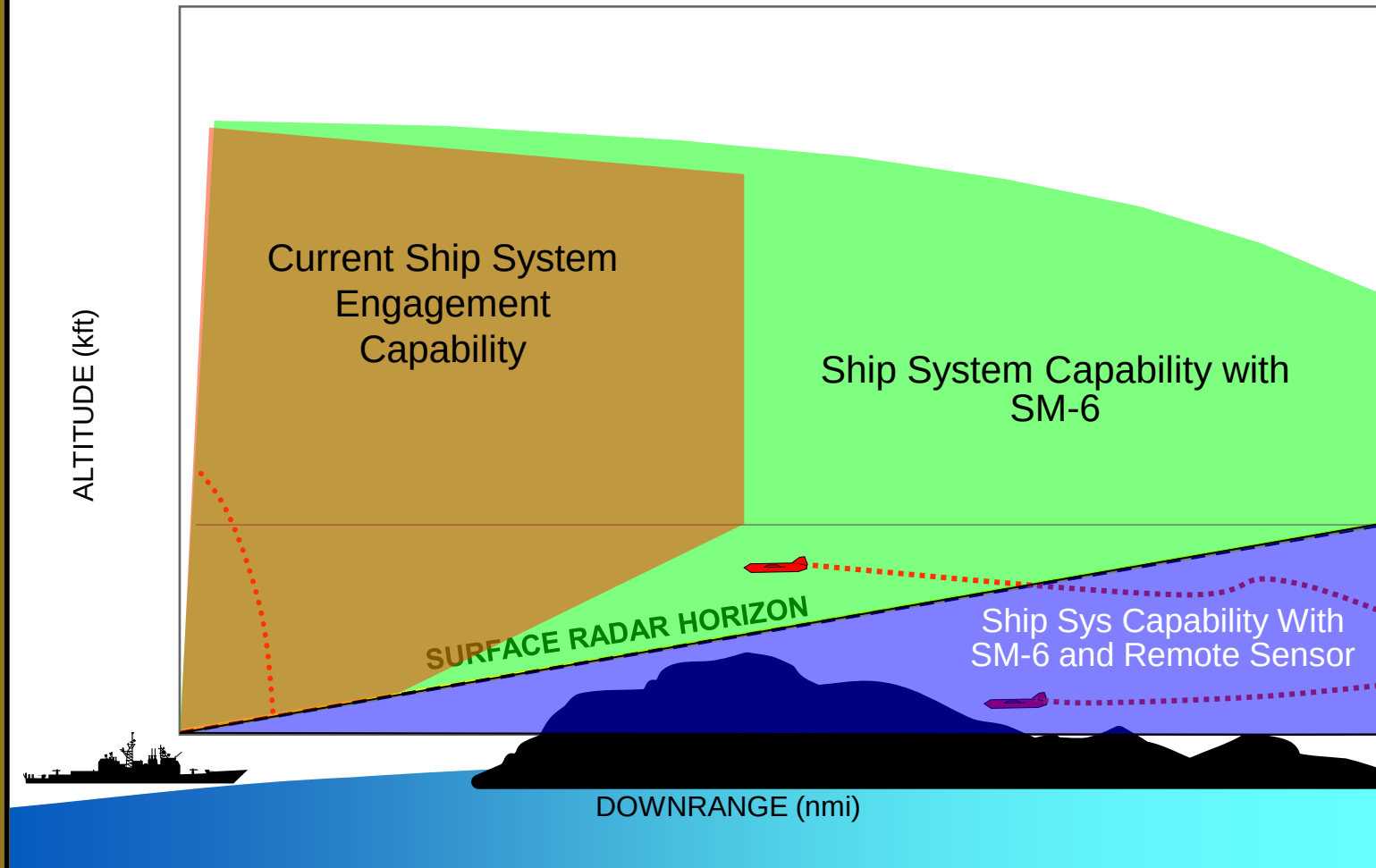
*Improved
Mission
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*Enabling
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*Force
Integration*

*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?