

Ballistic Missile Defense Update



To: 2012 Space And Missile Defense Conference

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Deputy Director
Missile Defense Agency
August 14, 2012**



U.S. Ballistic Missile Defense Overview

Homeland Defense Today With Upgrades And Enhancements Through 2020



Ground-based Midcourse Defense (GMD)

GMD Fire Control

East Coast Fire Control (2015)

Sea-based Radar

Aegis Long-range Search & Track

AN/TPY-2 (Forward Based)

Early Warning Radars

Phase I: Today's Capability

Phase II: Enhanced Medium-Range Missile Defense (2015 Timeframe)

Phase III: Enhanced Intermediate-Range Missile Defense (2018 Timeframe)

Phase IV: Early Intercept of IRBMs and ICBM (2020 Timeframe)



Aegis BMD 3.6.1 with Standard Missile

SM-3 IA



Patriot



THAAD



AN/TPY-2 (FBM)



Aegis BMD 4.0.1/5.0



SM-3 IB



Aegis Ashore 5.0



Patriot



THAAD



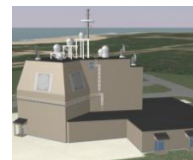
AN/TPY-2 (FBM)



Aegis BMD 5.1



SM-3 IIA



Aegis Ashore 5.1



Patriot



THAAD



AN/TPY-2 (FBM)



Initial PTSS



Aegis BMD 5.1



SM-3 IIB



Aegis Ashore 5.1



Patriot



THAAD



AN/TPY-2 (FBM)

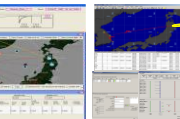
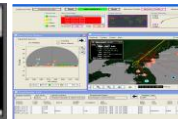
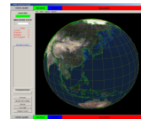


PTSS

Command, Control, Battle Management, and Communications (C2BMC) in 2011 With Coalition Infrastructure And Updates Through 2020



Command, Control, Battle Management and Communications (C2BMC) Consoles



Command, Control, Battle Management and Communications (C2BMC) Displays



Homeland Defense Upgrades

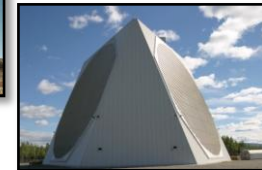
✓ Fort Greely Missile Field 2



Fylingdales
Radar Upgrade
✓ 2010



Thule
Radar Upgrade
✓ 2011



Clear
Radar Upgrade
2016



Cod
Radar Upgrade
2017

Sensor Upgrades

Infrastructure Upgrades



✓ Missile Assembly Building (MAB)



Power Plant



✓ 2nd Fort Greely
Fire Control Node

Fire Control Upgrades

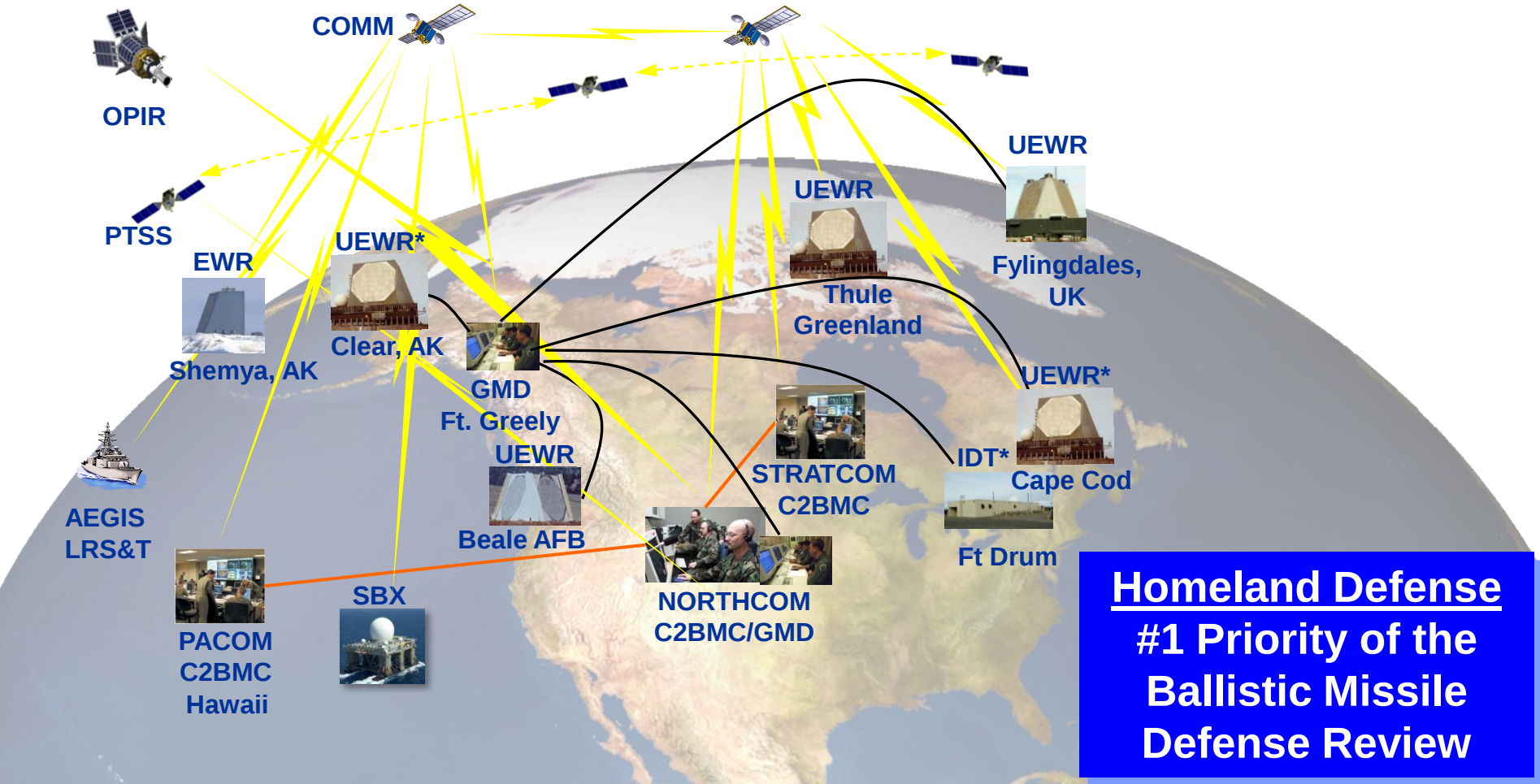


East Coast In-Flight Interceptor
Communications System
Data Terminal (IDT) 2015



Homeland Defense

– Tri-Node Command And Control Architecture –



Homeland Defense
#1 Priority of the
Ballistic Missile
Defense Review

C2BMC = Command, Control And Battle Management Network
EWR = Early Warning Radar

SBX = Sea-based X-Band Radar
OPIR = Overhead Persistent Infrared

UEWR = Upgraded Early Warning Radar
* Future Upgrade



Ground-Based Midcourse Defense Testing

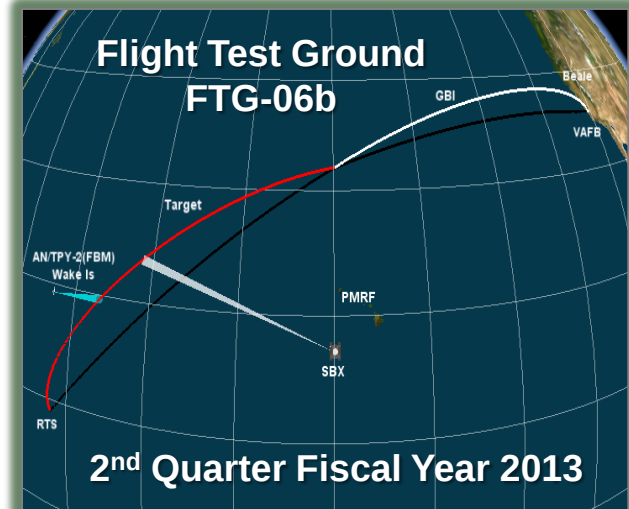
Ground-based Midcourse Defense Control Test Vehicle CTV-01



Ground Based Interceptor (GBI) Exo-atmospheric Kill Vehicle Capability Enhancement (CE-II) Confirmation Flight Test (Interceptor Only)



Flight Test Ground FTG-06b



Ground Based Interceptor (GBI) Exo-atmospheric Kill Vehicle Capability Enhancement (CE-II) Engagement of an IRBM (Return to Intercept)



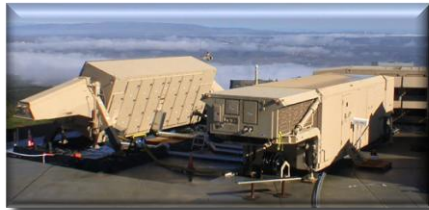
U.S. Regional Missile Defense Capability



Aegis Ballistic Missile Defense



Terminal High Altitude Area Defense



AN/TPY-2 Radars – Forward Based Mode



Command, Control, Battle Management and Communications (C2BMC)

High COCOM Demand – Joint Staff Allocates Critical BMD Capability



Regional Defense

– Command, Control, Battle Management And Communications –





Demand vs. Capability

– Mobile BMD Assets Responding To COCOM Demand –

- Asset deployment in response to proliferating regional ballistic missile threat
 - AN/TPY-2 (Forward Based Mode) deployed globally
 - Upgraded C2BMC assets deployed globally
 - Naval Station Rota, Spain agreement to support operations
- Flexible response
 - Aegis BMD force
 - Terminal High Altitude Area Defense (THAAD)
 - Patriot
- Capability surges supporting COCOMs in response to North East Asia ballistic missile provocations
 - Taepo Dong-2 – July 2006 , April 2009, April 2012
 - Short Range Ballistic Missiles (SRBMs) – July 2006, July 2009
- National/global emergency – 2008 satellite shoot down
 - Capabilities and functions of test agencies and operational COCOMS assembled into a collaborative process for successful execution

**BMDR Recognized Regional Threats – Foundation For EPAA
– Balancing Homeland and Regional Defense Capabilities –**



European Phased Adaptive Approach

– Phase I: Today's Capability –

Phase I: Today's Capability



Aegis BMD 3.6.1 with SM-3 IA



AN/TPY-2 (FBM)



C2BMC AOC
Ramstein

ALTBMd Interim Capability



SM-3
Block IA

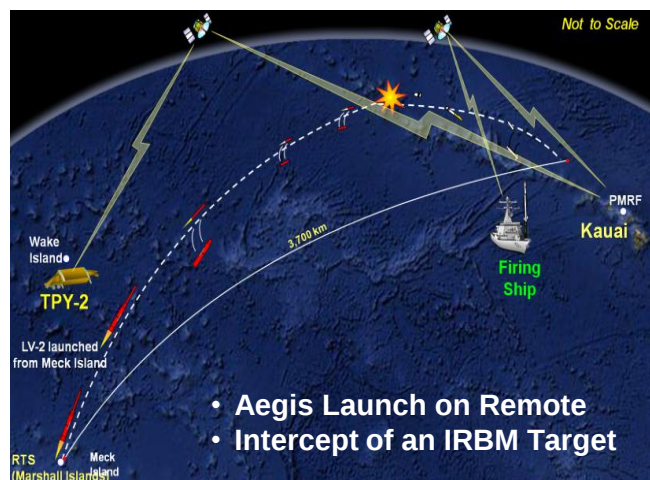


Aegis BMD 3.6.1 with SM-3 Block IA

On Station Since March 2011



Kurecik, Turkey, December 2011



FTM-15, April 2011



Interim BMD Capability Declaration
NATO Summit Chicago
May 2012



European Phased Adaptive Approach

– Phase II: Enhanced Medium-Range Missile Defense (2015 Timeframe) –

Phase II: Enhanced Medium-Range Missile Defense (2015 Timeframe)



Aegis BMD 4.0.1/5.0 with SM-3 IA/IB

IOC 2014



Aegis Ashore 5.0 with SM-3 IB (Romania)

IOC 2015



AN/TPY-2 (FBM)



C2BMC Updates

ALTBM Initial Operational Capability (Lower Tier)

Potential EPAA Surge



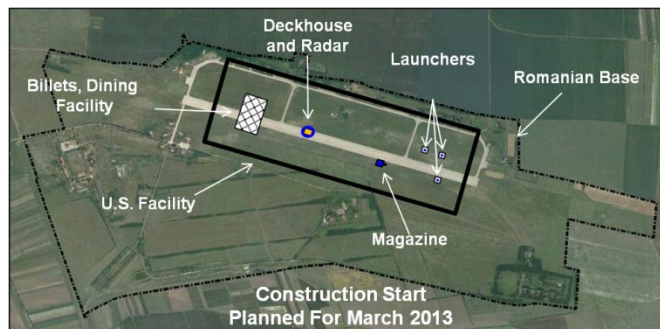
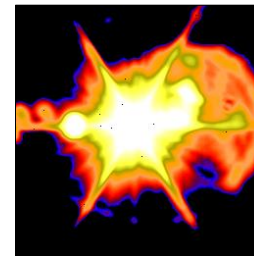
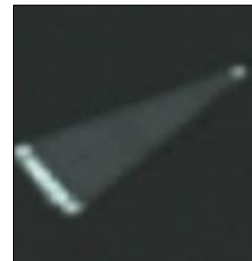
THAAD



MRBM Capable – April 2012
IRBM Design – June 2012



SM-3 IB Intercepts May and June 2012



Aegis Ashore Site – Deveselu, Romania



Romanian Industry Days
June 2012



Implementing Arrangements Signing
June 2012



Moorestown, New Jersey
Deckhouse Manufacturing Facility - June 2012



Aegis Ashore Missile Defense
Testing Complex, Hawaii
Ground Clearing Ongoing



European Phased Adaptive Approach

– Phase III: Enhanced Intermediate-Range Missile Defense (2018 Timeframe) –

Phase III: Enhanced Intermediate-Range Missile Defense (2018 Timeframe)



Aegis BMD 5.1 with SM-3 IA/IB/IIA



Aegis Ashore 5.1 with SM-3 IB/IIA (Poland and Romania)



AN/TPY-2 (FBM)



C2BMC Updates

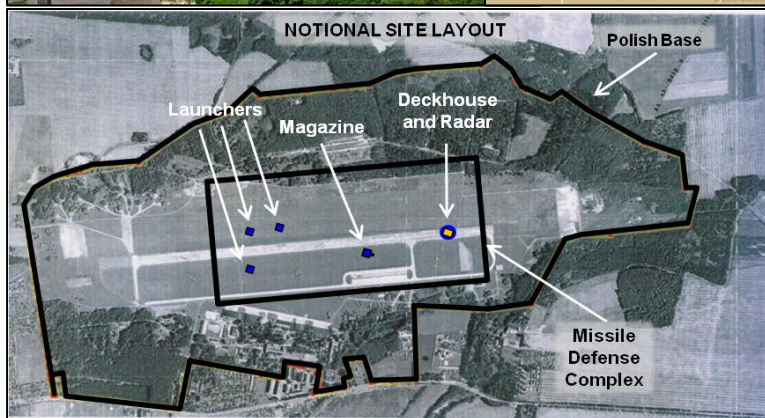
ALTBM
Territorial Missile Defense

Potential EPAA Surge



THAAD Launch on Remote

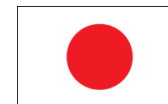
Aegis Ashore Site, Redzikowo Base



U.S.-Poland Bilateral Missile Defense Agreement
Entry Into Force, September 2011



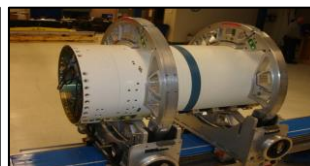
**SM-3
Block
IIA**



U.S.-Japan
SM-3 IIB Export Agreement
June 2012



Nosecone



Third Stage
Rocket Motor



Second Stage
Rocket Motor

SM-3 IIA Components



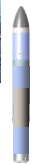
European Phased Adaptive Approach

– Phase IV: Early Intercept of IRBMs and ICBMs (2020 Timeframe) –

Phase IV: Early Intercept of IRBMs and ICBMs (2020 Timeframe)



Aegis BMD 5.1x with SM-3 IA/IB/IIA/IIIB



SM-3 IIB



Aegis Ashore 5.1x with SM-3 IB/IIA/IIIB (two sites)



AN/TPY-2 (FBM)



C2BMC S8.4

ALTBMD
Territorial Missile Defense

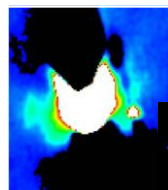
Potential EPAA Surge



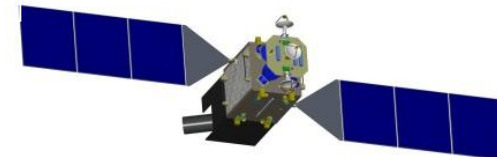
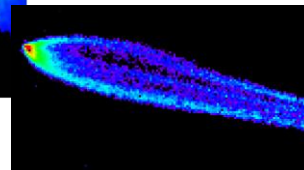
THAAD
Launch on Network

Precision Tracking Space System (PTSS)

- Persistent Overhead Coverage
- Fire Control to BMDS Interceptor Systems



STSS
Focal Array Imaging

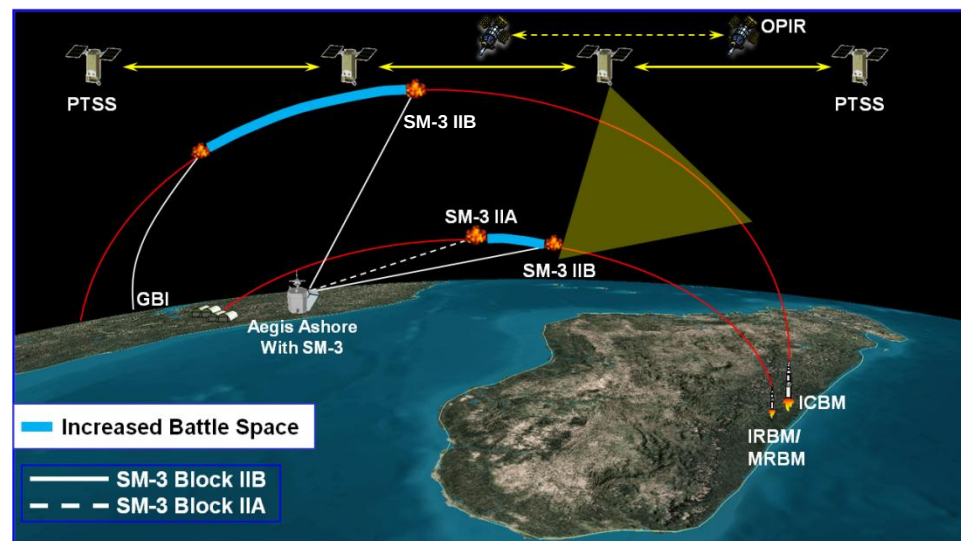


STSS – D
Pathfinder Deployed In Space



**SM-3
BLOCK IIB**

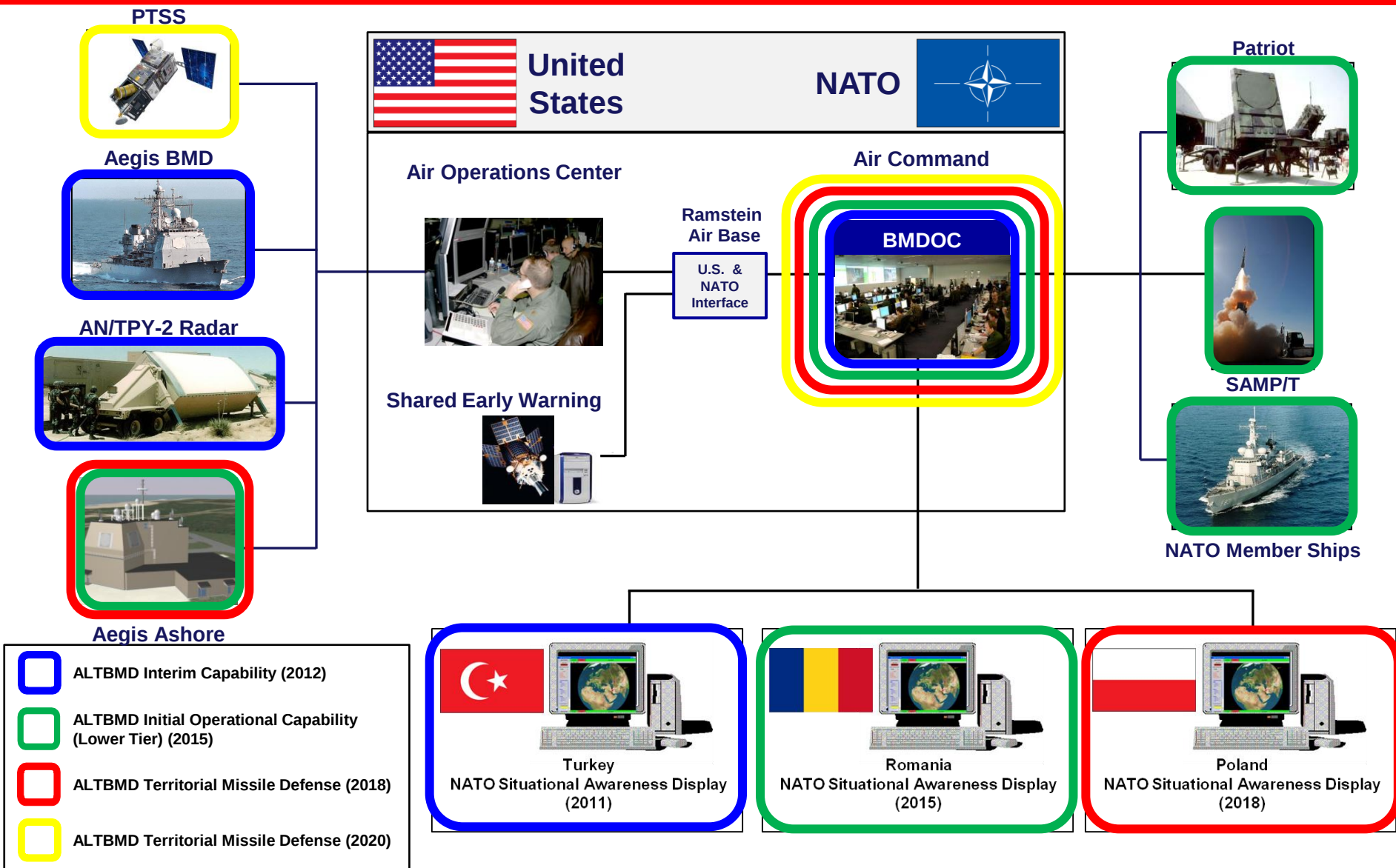
Command Control Battle Management and Communications (C2BMC)





NATO Ballistic Missile Defense

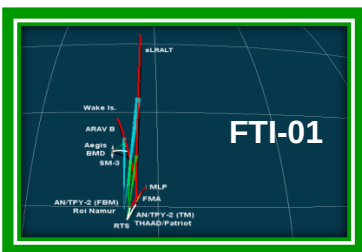
– ALTBMD Interim Capability To Territorial Missile Defense –





Regional Ballistic Missile Defense Testing – 2012 Through 2014 –

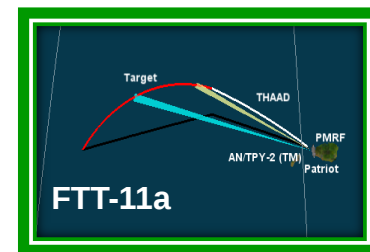
Regional BMDS Tests



Defeat a raid of up to five near-simultaneous representative threats in an operationally relevant COCOM scenario

THAAD

Exo-engagement of a SRBM with associated objects



Aegis BMD 4.0.1/SM-3 IB



SRBM Engagement



SRBM salvo (2)

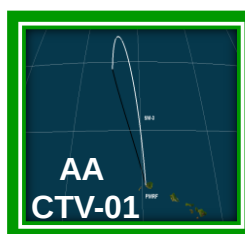


SRBM engagement (simultaneous AAW)

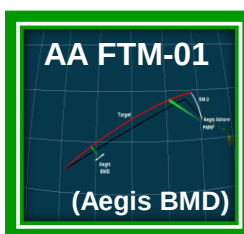


MRBM engagement

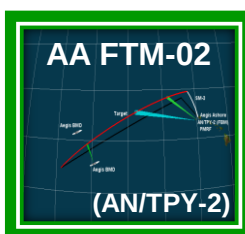
Aegis Ashore, Aegis BMD 5.0/SM-3 IB and SM-3 Block IIA



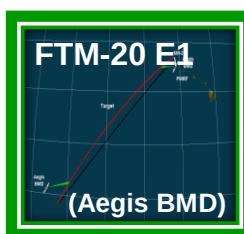
Controlled test vehicle



(Aegis BMD)



(AN/TPY-2)



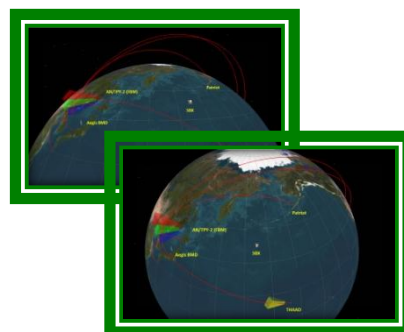
(Aegis BMD)



Aegis 5.1 SM-3 Block IIA propulsion test

MRBM engagements remote engagement authorized

Regional Ground Tests



- 18 BMD System-level ground tests FY12-14
- Fast Eagle Rapid Response testing supporting technical capability declarations
- Integrated HWIL testing supporting COCOMs
- Distributed testing using operational BMD systems

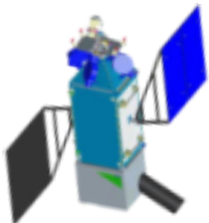


Technology Programs

Remote Sensing

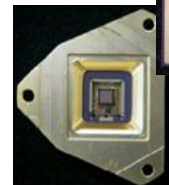


Data Fusion



Space-Based Sensor

Focal Plane Array

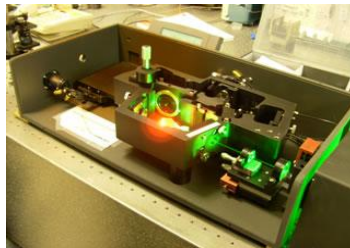


Infrared Detector Material



Image Processor

Directed Energy Research



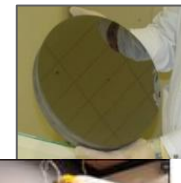
High Energy Laser



High Altitude Characterization



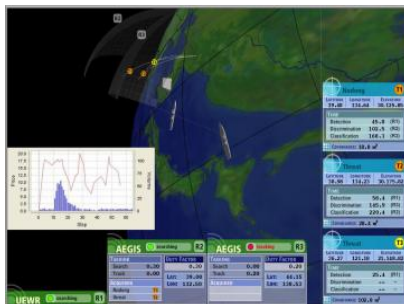
Laser Diodes



Cryo Laser



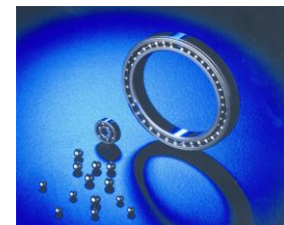
Advanced Research



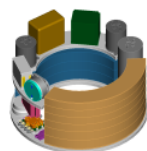
Advanced Algorithms



Housing Structure



O-Ring and Bearings



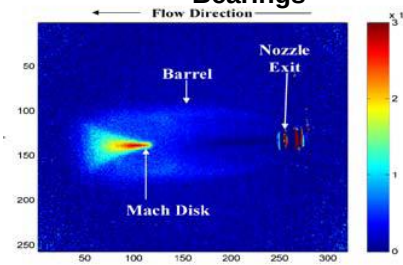
Seeker Technology



Lightweight Composite

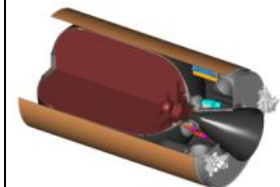


Silicon Carbide Mirrors

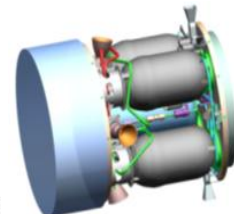


Low-Thrust Plume Signature Modeling

Interceptor Technology



Upper Stage Propulsion & ACS



Liquid Divert & ACS



Solid Divert & ACS





Integrated Air and Missile Defense

– Today To Tomorrow –

- Operational planning
 - Tools to pace the threat
- Decision timelines
 - Real-time data exchange
- Battle space and depth of fire
 - Automated battle management aids
- Interceptor inventory (firepower)
 - Sensor-weapon coordination
- Link architecture
 - Assured connectivity
- Displays
 - Next generation displays for C2BMC
- Tactics, Techniques, and Procedures
 - Pre-planned responses
 - Global guidance, theater application
- Defense design
 - Integrated and cohesive



**Developing, Building and Delivering Capability
for Today's and Tomorrow's Warfighter**



Summary

- **Balance of capabilities, requirements, and risks to deter aggression, project power, and protect U.S. and allied interests**
- **Deployment of capabilities on-going to respond to warfighter requirements**
- **Developing, building and using a global C2 and sensor network**
- **Operationally realistic, integrated testing**
- **Continued cooperation with allies and partners for integrated defense**

Missile Defense Capability – Globally Deployed



BACKUP

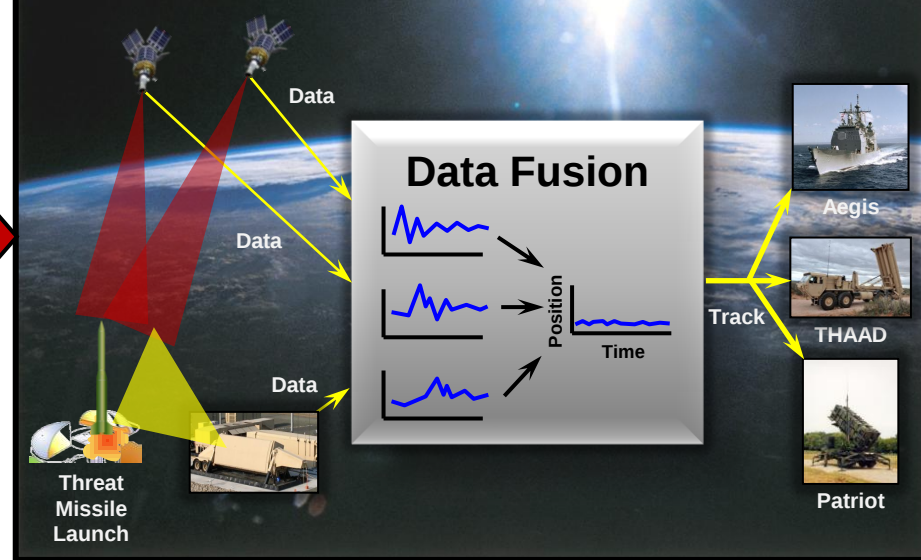


Networked Remote Sensing

Networked Remote Sensors



Improved Track Quality

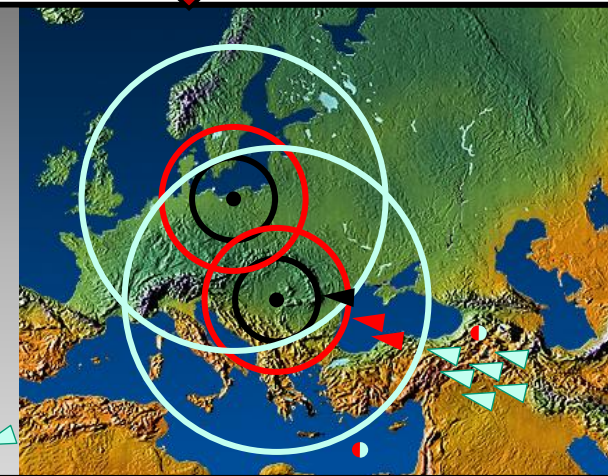


• Expands Battle Space

- Organic
- Launch on Remote
- Engage on Remote
- Remote sensors Aegis ship or AN/TPY-2 radar

• Increases Raid Size Capacity

- 2-10 Times





Homeland Defense Capability

Today's Capability

Ground-based Midcourse Defense



Fort Greely, AK (26) VAFB, CA (4)

Sensors



Thule Fylingdales Beale Cobra Dane

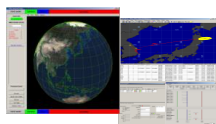


AN/TPY-2 (FBM) (2) Japan / Turkey
Aegis SPY-1 Ships – 23
Sea-Based X-band Radar

Command, Control, Battle Management & Communications



• Fort Greely, AK
• Schriever AFB, CO



(C2BMC Spiral 6.4)
PACOM
NORTHCOM
STRATCOM
EUCOM

Additional Capability 2012 - 2018

Ground-based Midcourse Defense



Missile Field #2 Fort Greely, AK (2012)
FGA Missile Assembly Building Improved Reliability (2012)
East Coast IDT (2015)

Sensors



UEWRs (5) Clear, AK (2016) Cape Cod (2017)
AN/TPY-2 (FBM) (2)
Initial PTSS (2018)

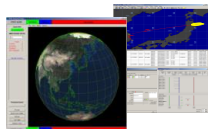


Aegis SPY-1 Ships – 37



C2BMC Lab (Expanded Sensor Network)

Command, Control, Battle Management & Communications



(C2BMC Spiral 6.4) CENTCOM (2012)



(C2BMC Spiral 8.2) (2017)
PACOM
NORTHCOM
STRATCOM
EUCOM
CENTCOM

Additional Capability By 2020

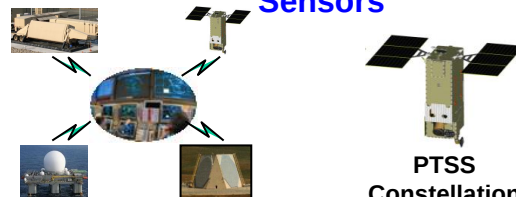


FGA Missile Assembly Building Improved Reliability



Aegis Ashore 5.1 / SM-3 IIB / Sea-based? (Poland) – Interceptors (2020)

Sensors



Enhanced Discrimination



PTSS Constellation (2020)

Command, Control, Battle Management & Communications

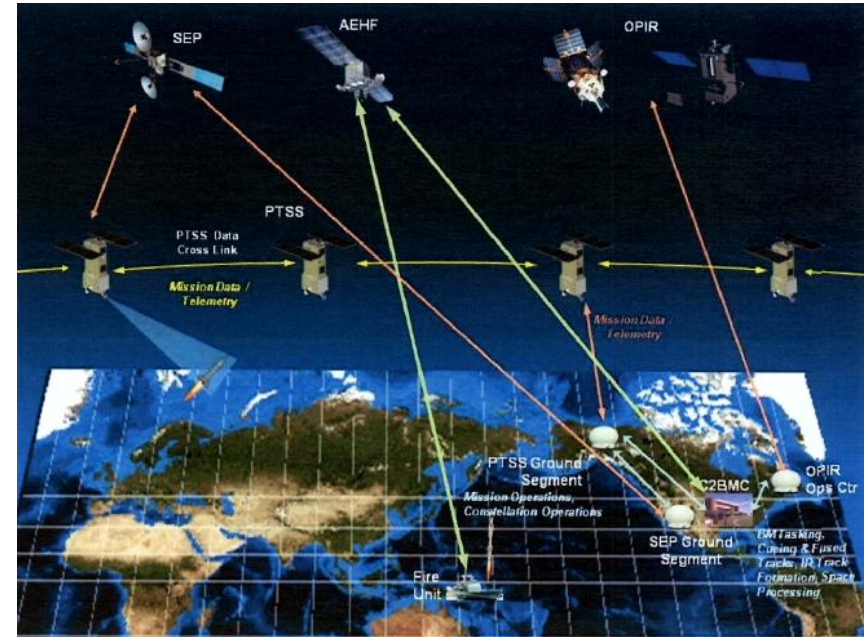


(C2BMC Spiral 8.4) (2020)
PACOM
NORTHCOM
STRATCOM
EUCOM
CENTCOM



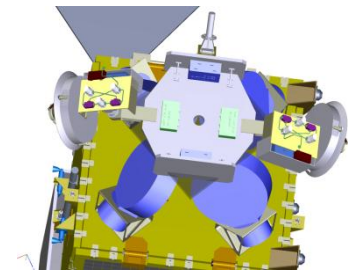
Precision Tracking Space System (PTSS)

- **Purpose:** Augment the BMDS with the processing capability that enables early intercept
 - Fills the midcourse tracking gap
 - PTSS provides persistent overhead coverage of 70% of earth
- **Architecture:** PTSS fills a capability gap without replicating existing functionality
 - Receives a cue from overhead, persistent infrared (OPIR) assets
 - Provides tracking and observation results to C2BMC for forwarding
 - Enables intercept with Aegis BMD and GMD
- **Current Status**
 - Air Force named Lead Service by DEPSECDEF in Jan, 2012
 - CAPE to conduct first fully independent PTSS cost estimate and technical evaluation (ECD: Oct, 2012)
 - MDA to start acquisition preparation for full and open competition to support industry award in FY14



Space Vehicle

- Wet Mass: ~1300 Kg



Optical Payload

- Actively cooled
- 3 color