Ballistic Missile Defense Update

To: 2012 Space And Missile Defense Conference

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Missile Defense Agency
August 14, 2012

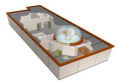
U.S. Ballistic Missile Defense Overview

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	 Aegis BMD 4.0.1/5.0	 Aegis BMD 5.1	 Aegis BMD 5.1
 SM-3 IA	 SM-3 IB	 SM-3 IIA	 SM-3 IIB
 Aegis Ashore 5.0		 Aegis Ashore 5.1	 Aegis Ashore 5.1
 Patriot	 Patriot	 Patriot	 Patriot
 THAAD	 THAAD	 THAAD	 THAAD
 AN/TPY-2 (FBM)	 AN/TPY-2 (FBM)	 Initial PTSS	 PTSS
		 AN/TPY-2 (FBM)	 AN/TPY-2 (FBM)

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

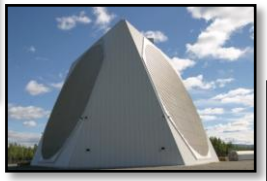
Homeland Defense Upgrades

✓ Fort Greely Missile Field 2

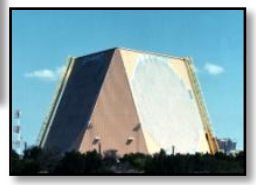
Fylingdales
Radar Upgrade
✓ 2010

Sensor Upgrades

Thule
Radar Upgrade
✓ 2011



Clear
Radar Upgrade
2016



Cod
Radar Upgrade
2017

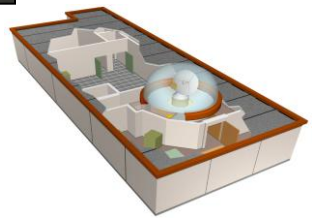
Infrastructure Upgrades

✓ Missile Assembly Building (MAB)

Power Plant

Fire Control Upgrades

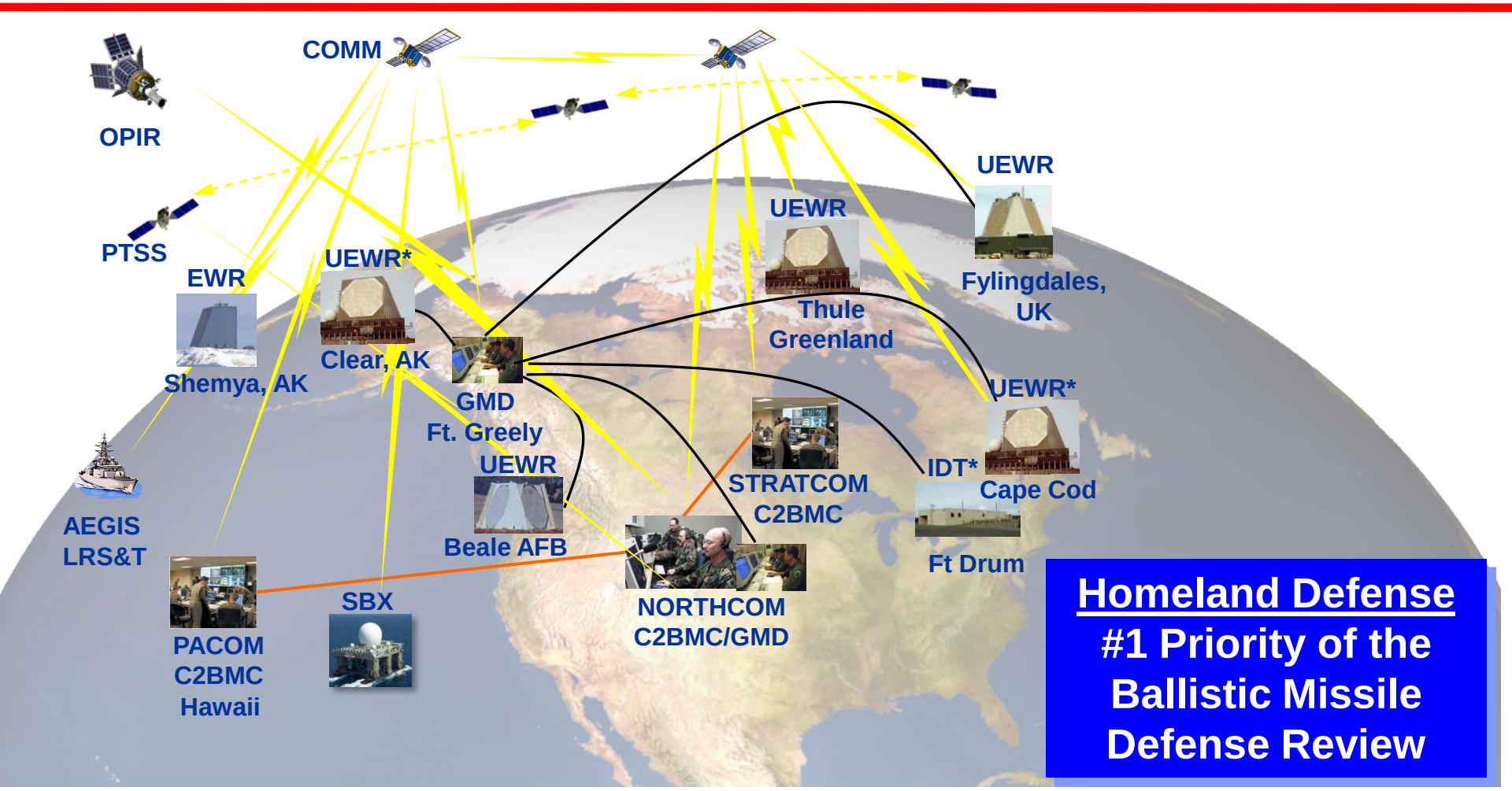
✓ 2nd Fort Greely
Fire Control Node



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

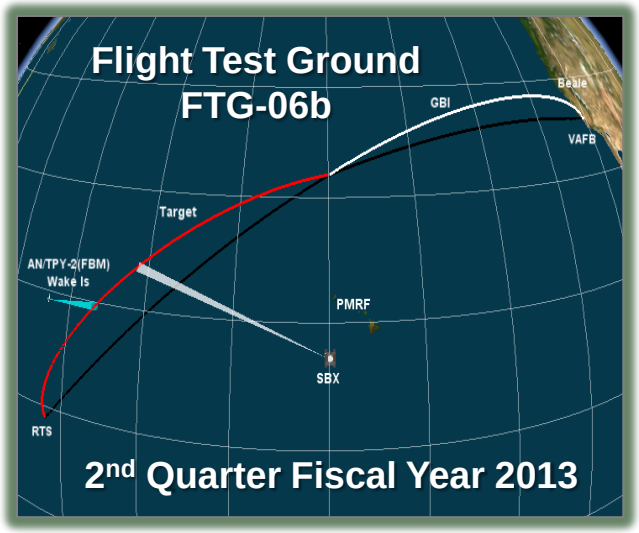
C2BMC = Command, Control And Battle Management Network
EWR = Early Warning Radar

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

UEWR = Upgraded Early Warning Radar
* Future Upgrade

Ground-Based Midcourse Defense Testing

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



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)

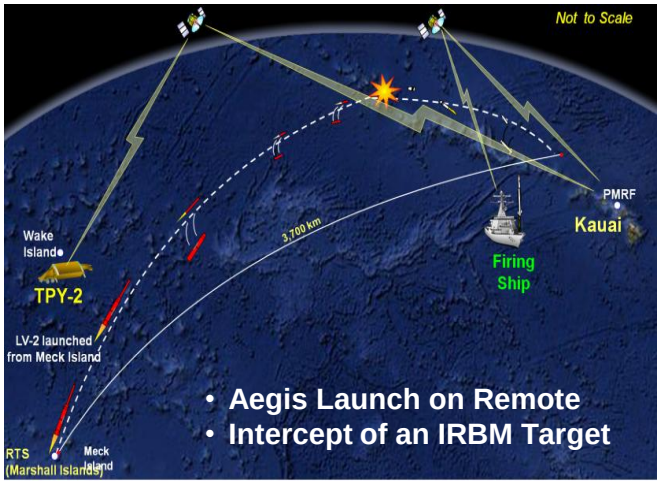
C2BMC AOC
Ramstein

ALTBMD Interim Capability

SM-3
Block IA

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)

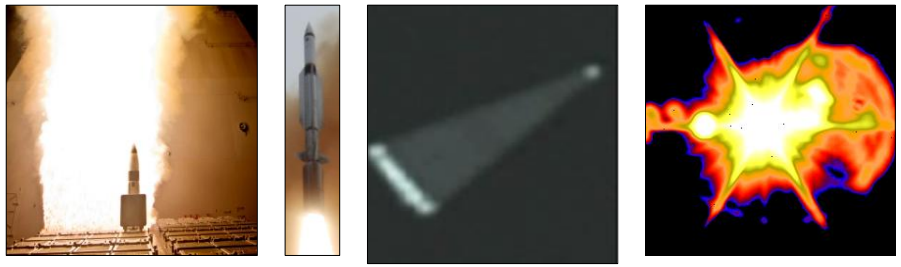
C2BMC Updates

ALTBMD Initial Operational Capability (Lower Tier)

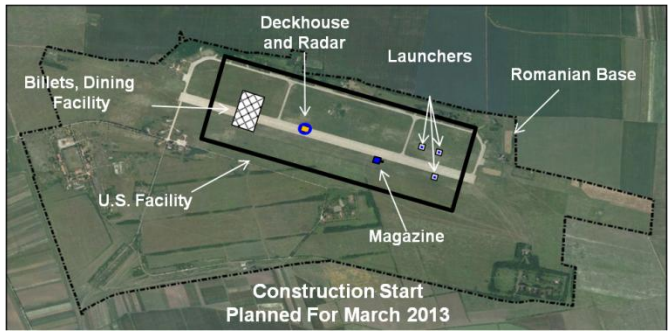
Potential EPAA Surge

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)

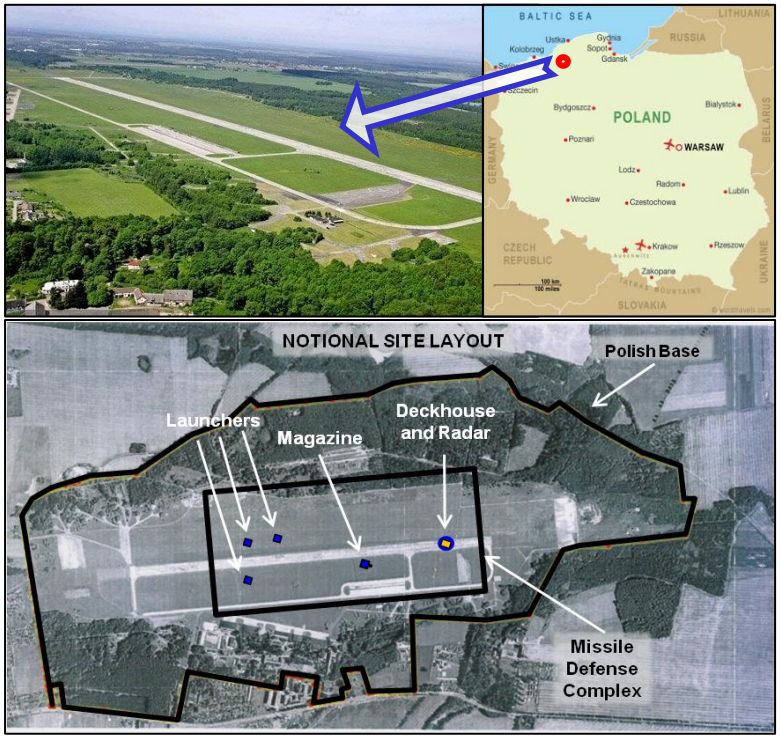
C2BMC Updates

ALTBMD Territorial Missile Defense

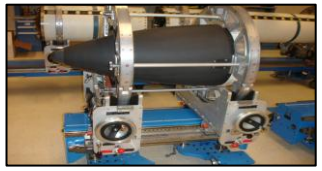
Potential EPAA Surge

THAAD Launch on Remote

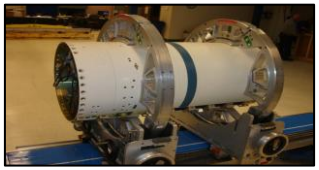
Aegis Ashore Site, Redzikowo Base



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



Nosecone



Third Stage Rocket Motor

Second Stage Rocket Motor

SM-3 IIA Components

SM-3 Block IIA

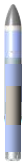
U.S-Japan SM-3 IIB Export Agreement June 2012

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/IIB



SM-3 IIB

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

AN/TPY-2 (FBM)

C2BMC S8.4

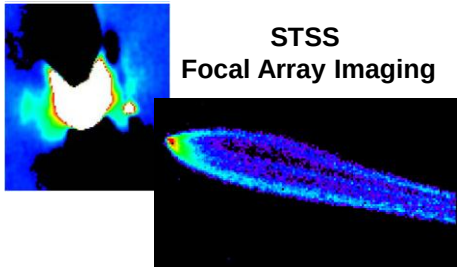
ALTBMD
Territorial Missile Defense

Potential EPAA Surge

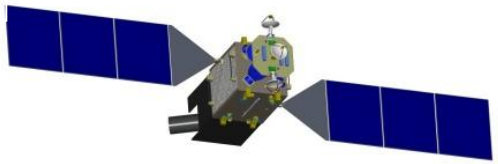
THAAD
Launch on Network

Precision Tracking Space System (PTSS)

- Persistent Overhead Coverage
- Fire Control to BMDS Interceptor Systems



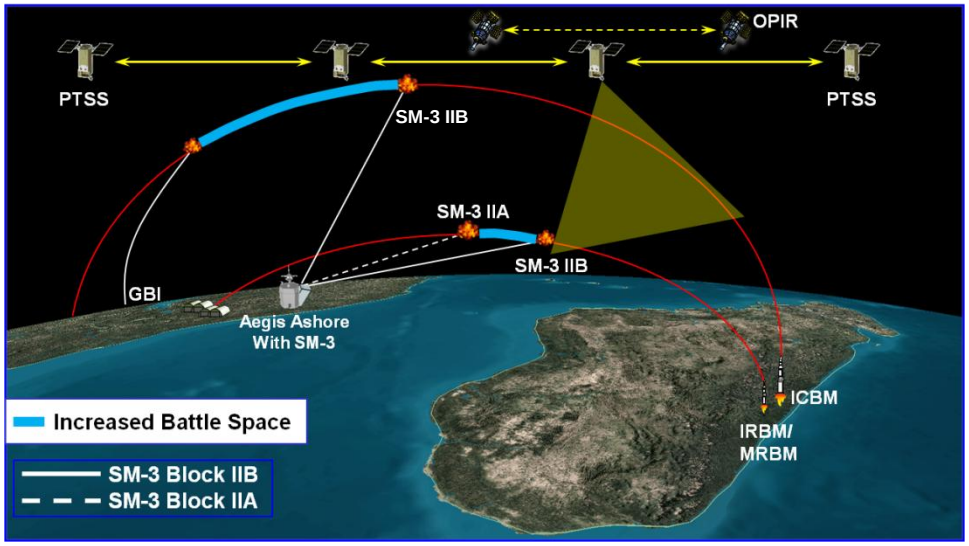
STSS
Focal Array Imaging



STSS – D
Pathfinder Deployed In Space

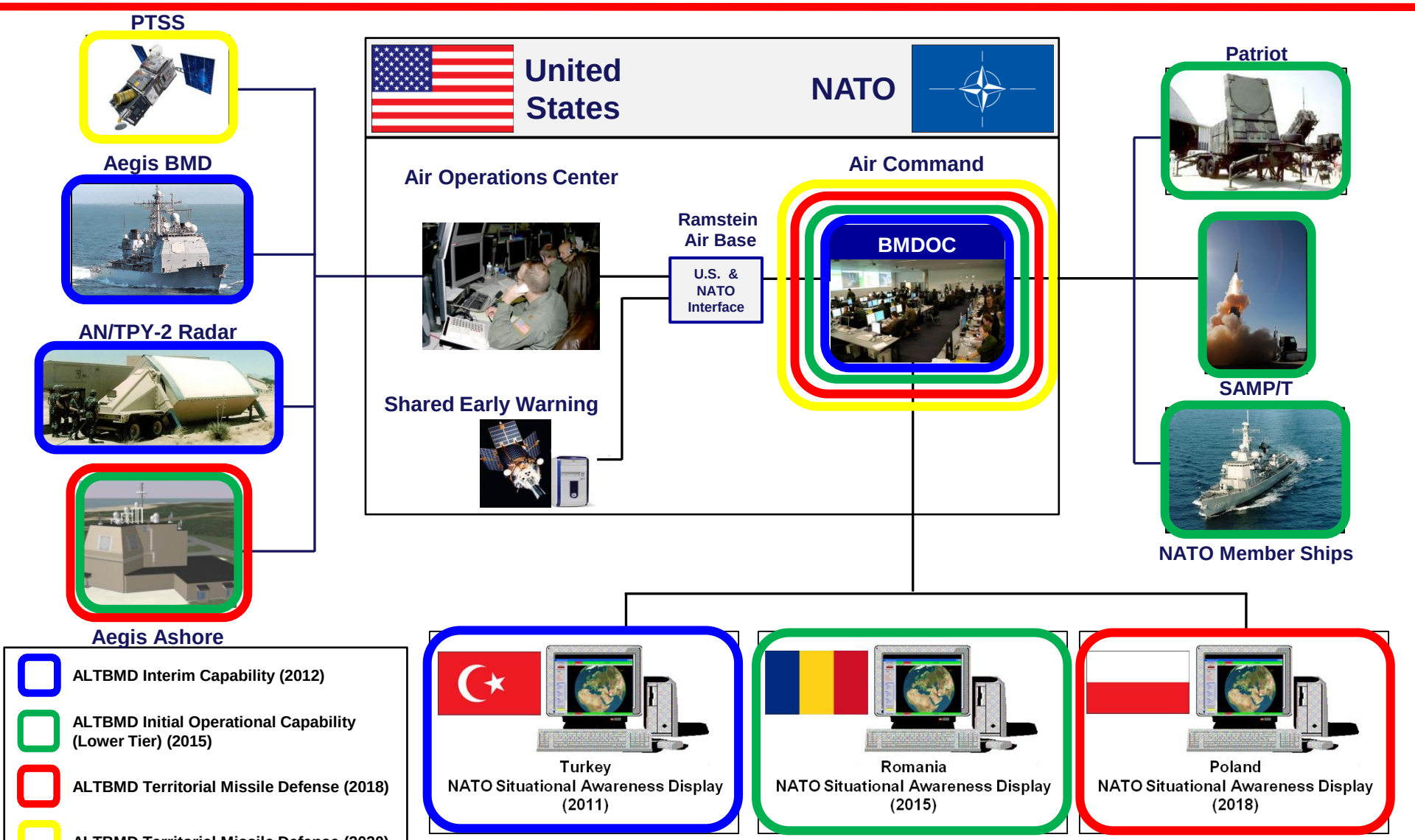
SM-3 BLOCK IIB

Command Control Battle Management and Communications (C2BMC)



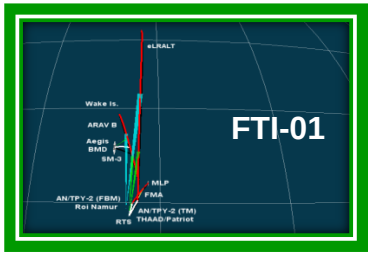
NATO Ballistic Missile Defense

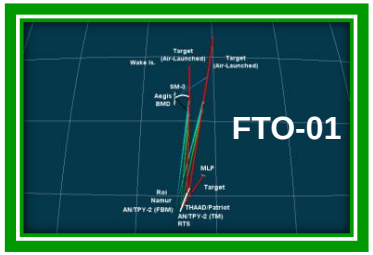
– ALTBMD Interim Capability To Territorial Missile Defense –



Regional Ballistic Missile Defense Testing
– 2012 Through 2014 –

Regional BMDS Tests

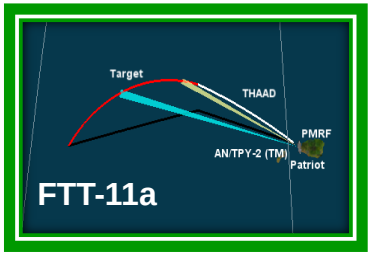




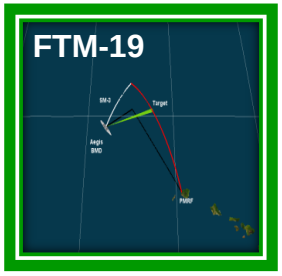
Defeat a raid of up to five near-simultaneous representative threats in an operationally relevant COCOM scenario

THAAD

Exo-engagement of a SRBM with associated objects



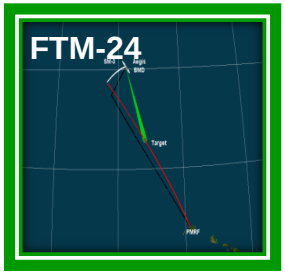
Aegis BMD 4.0.1/SM-3 IB



SRBM Engagement

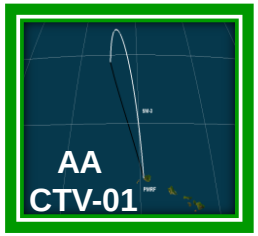
SRBM salvo (2)

SRBM engagement (simultaneous AAW)

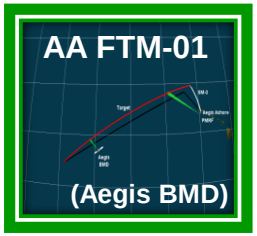


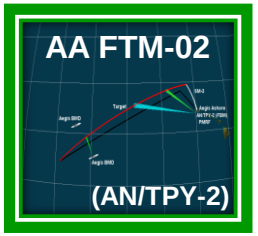
MRBM engagement

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



Controlled test vehicle

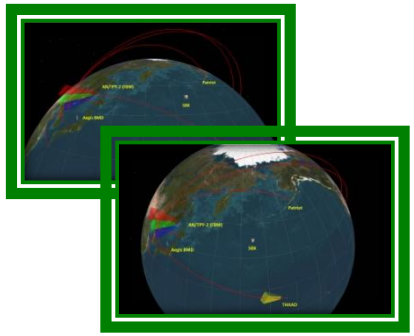




MRBM engagements remote engagement authorized

Aegis 5.1 SM-3 Block IIA propulsion test

Regional Ground Tests

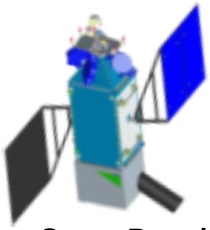


- **18 BMD System-level ground tests FY12-14**
- **Fast Eagle Rapid Response testing supporting technical capability declarations**
- **Integrated HWIL testing supporting COCOMs**
- **Distributed testing using operational BMD systems**

Technology Programs

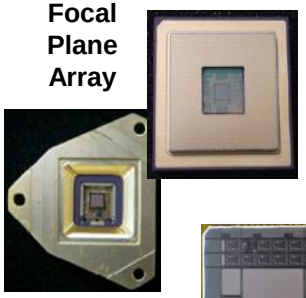
Remote Sensing

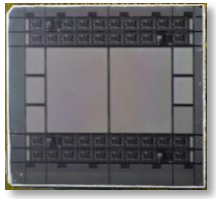
Data Fusion



Space-Based Sensor

Focal Plane Array

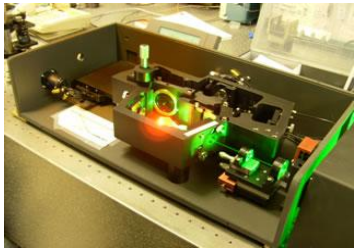




Infrared Detector Material

Image Processor

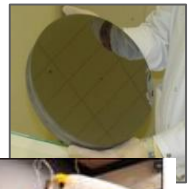
Directed Energy Research

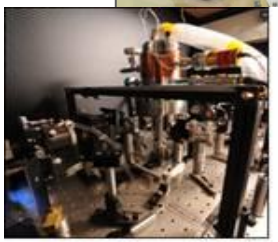


High Energy Laser

High Altitude Characterization

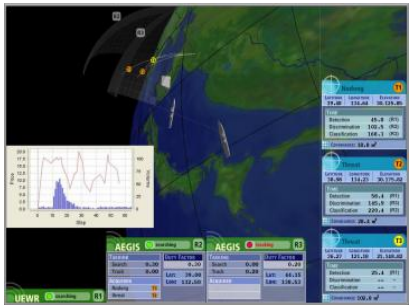
Laser Diodes





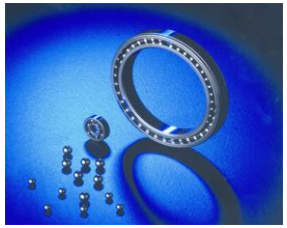
Cryo Laser

Advanced Research

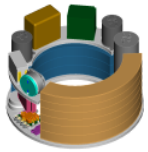


Advanced Algorithms

Housing Structure



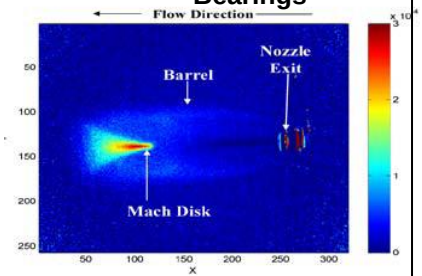
O-Ring and Bearings



Seeker Technology

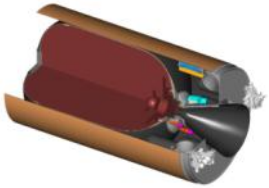
Lightweight Composite

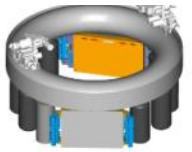
Silicon Carbide Mirrors



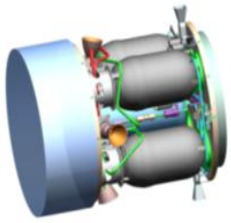
Low-Thrust Plume Signature Modeling

Interceptor Technology

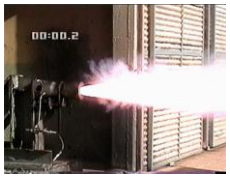




Upper Stage Propulsion & ACS



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

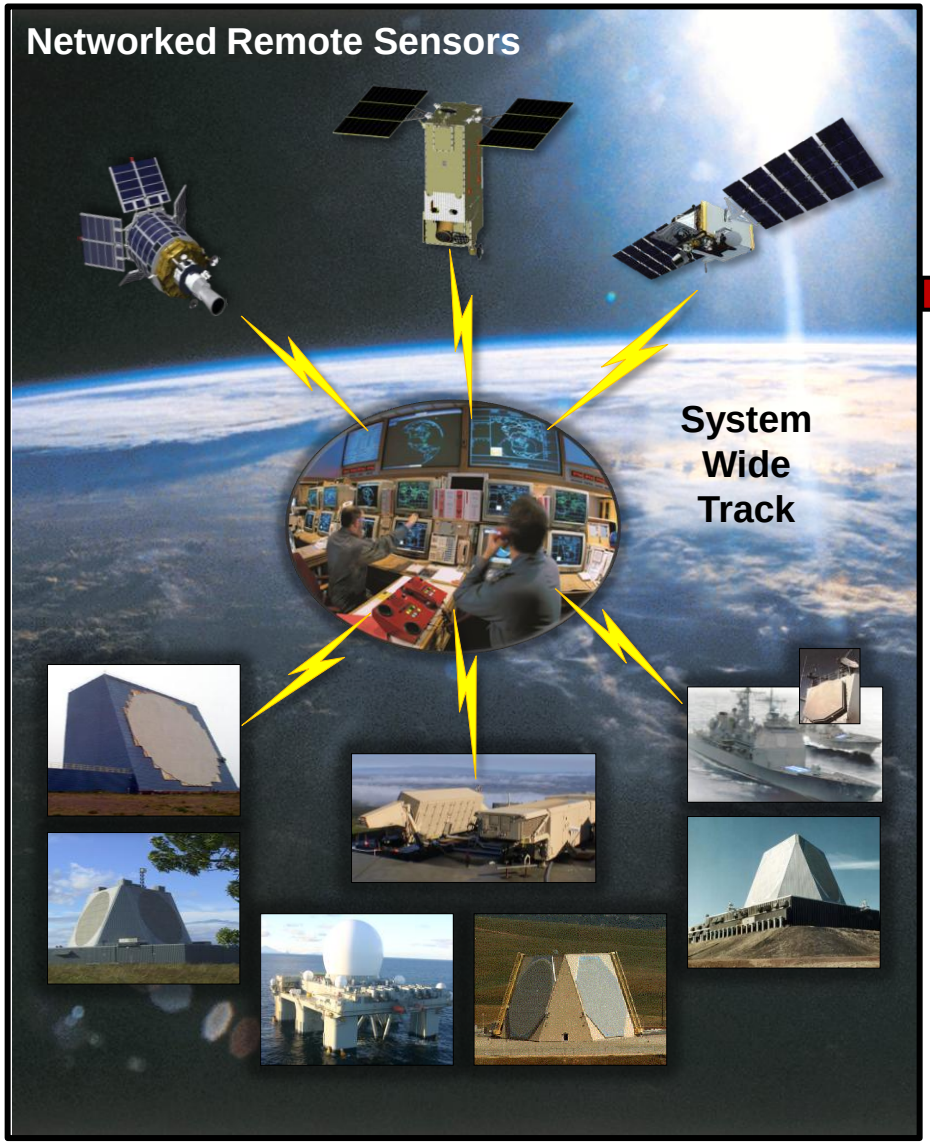
Summary

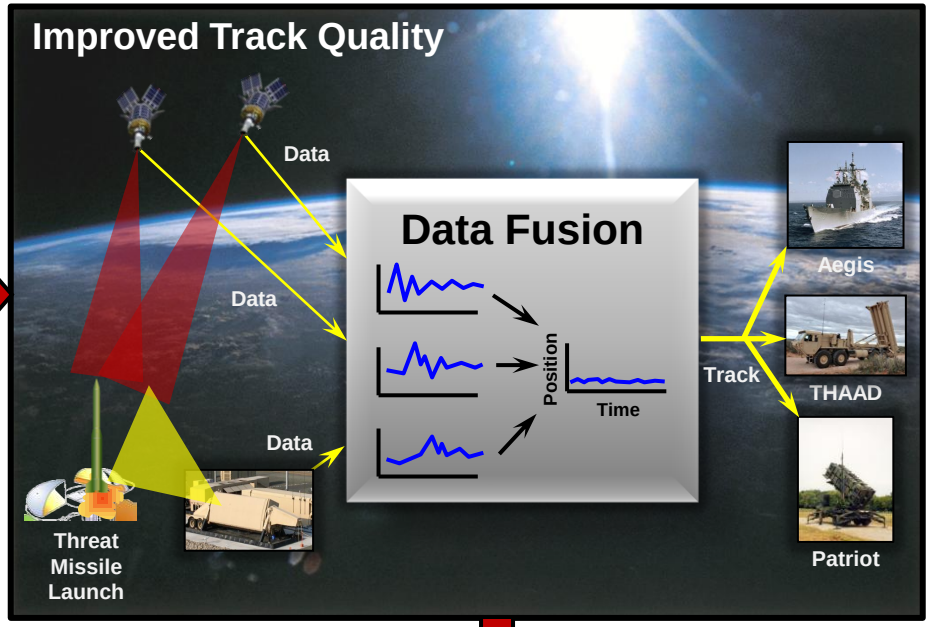
- **Balance of capabilities, requirements, and risks to deter aggression, project power, and protect U.S. and allied interests**
- **Deployment of capabilities on-going to respond to warfighter requirements**
- **Developing, building and using a global C2 and sensor network**
- **Operationally realistic,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

Missile Defense Capability – Globally Deployed

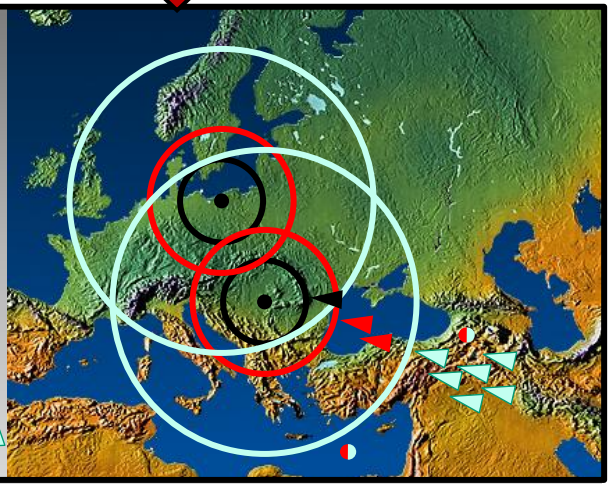
BACKUP

Networked Remote Sensing





- 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

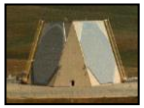
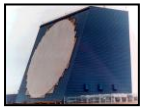
Ground-based Midcourse Defense



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

Sensors



Thule Fylingdales Beale Cobra Dane



AN/TPY-2 (FBM) (2) Japan / Turkey

<u>Aegis SPY-1</u> 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

<u>UEWRs (5)</u>
Clear, AK (2016)
Cape Cod (2017)

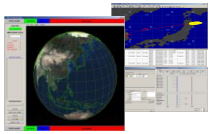
AN/TPY-2 (FBM) (2)

Initial PTSS (2018)

<u>Aegis SPY-1</u>
Ships – 37

C2BMC Lab
(Expanded Sensor Network)

Command, Control, Battle Management & Communications

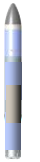


(C2BMC Spiral 6.4)
CENTCOM (2012)

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

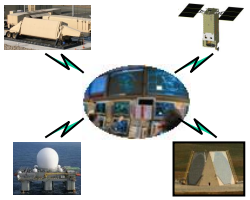
Additional Capability By 2020

FGA Missile Assembly Building Improved Reliability


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

Sensors



Enhanced Discrimination

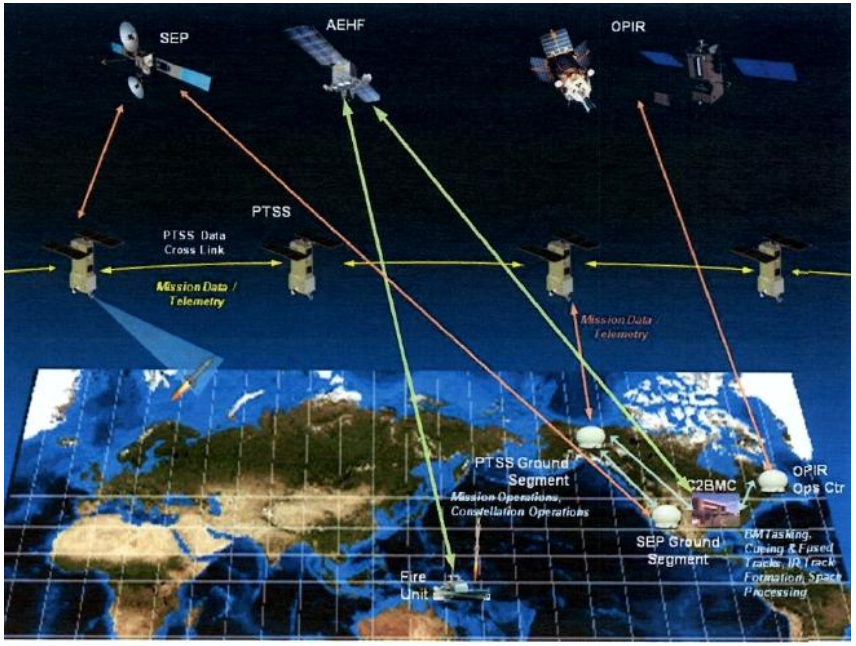
PTSS Constellation (2020)

Command, Control, Battle Management & Communications

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

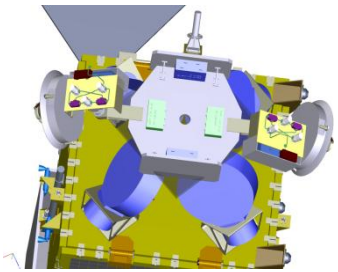
Precision Tracking Space System (PTSS)

- **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**