

# Ballistic Missile Defense Update



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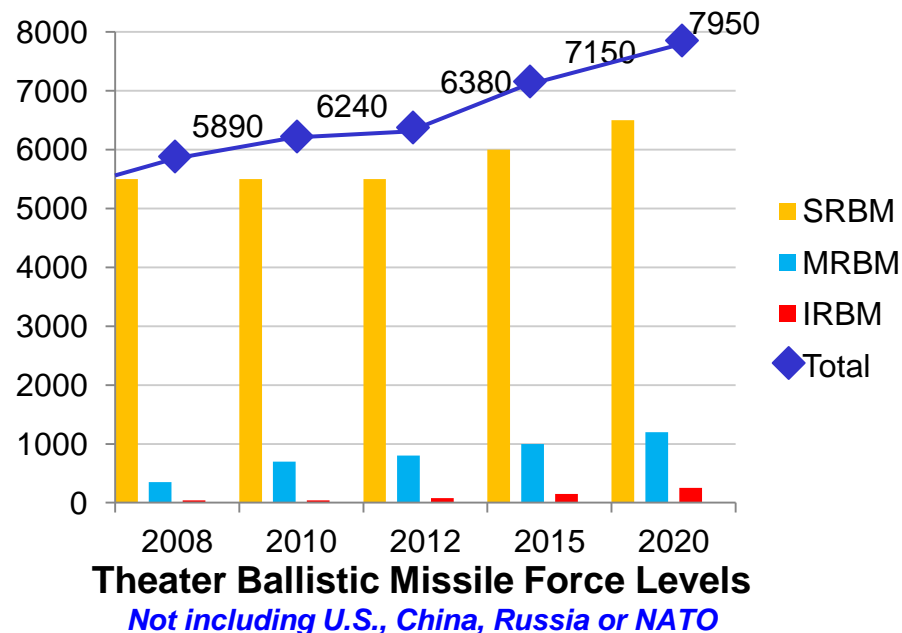
**To: American Society Of Naval Engineers**

**By: VADM J. D. Syring, USN  
Director  
Missile Defense Agency  
February 22, 2013**



# The Increasing Ballistic Missile Threat

- Increasing theater threat capabilities
  - Accuracy & Range
- Developing ICBM threat
  - North Korea developing road-mobile ICBM
  - Iran may be technically capable of flight-testing an ICBM by 2015
- Challenging Missile Defense
  - Maneuver/Salvo firings/Countermeasures



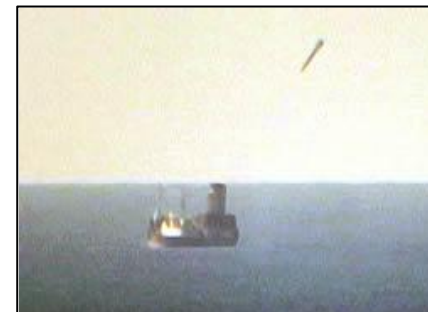
**North Korean Road-mobile ICBM  
on Parade, 2012**



**North Korean  
Taepo Dong-2  
SLV Launch,  
December 2012**



**Iranian Missile Launches During  
Noble Prophet Exercise, 2012**



**Iranian Antiship Ballistic  
Missile Test, 2011**



# Today's Ballistic Missile Defense System

## SENSORS



Satellite Surveillance

Forward-Based Radar



Sea-Based X-Band Radar



Aegis BMD SPY-1 Radar



Early Warning Radar



## ASCENT

DEFENSE SEGMENT

## **BMDs**

The Ballistic Missile Defense System

Aegis Ballistic Missile Defense Standard Missile-3

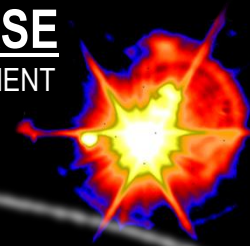


SM-3



## MIDCOURSE

DEFENSE SEGMENT



Ground-Based Midcourse Defense

GBI



Patriot Advanced Capability-3



## TERMINAL

DEFENSE SEGMENT

Sea-Based Terminal



Terminal High Altitude Area Defense



## C2BMC

Command, Control, Battle Management and Communications

NMCC

USSTRATCOM

USNORTHCOM

USPACOM

USEUCOM

USCENTCOM





# Aegis Ballistic Missile Defense

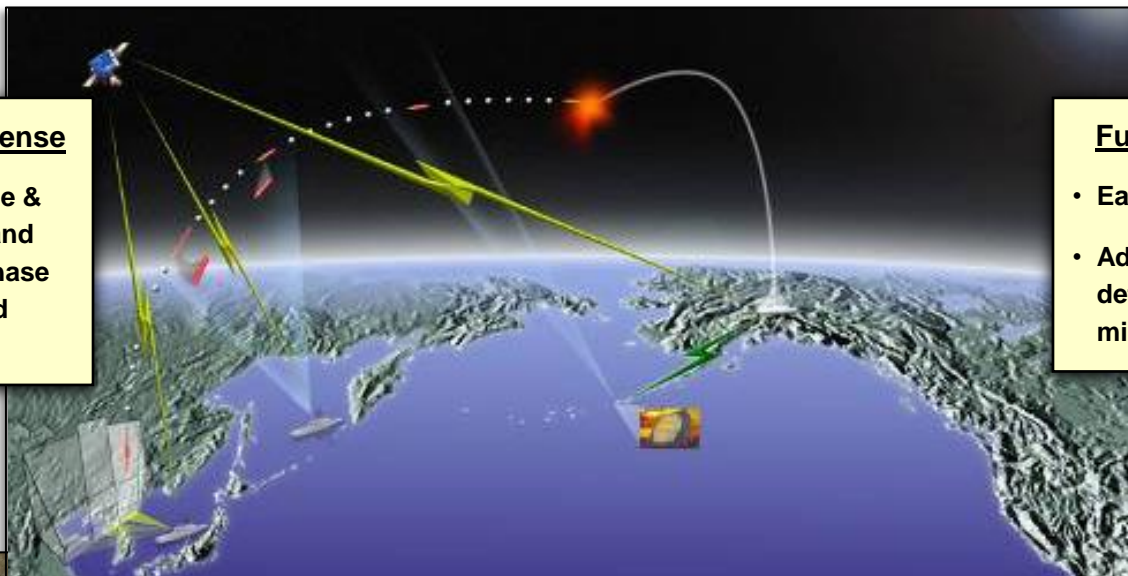
## – Role In The BMDS –

### Current Homeland Defense

- Long-Range Surveillance & Track function detects and tracks in early ascent phase providing forward-based BMDS sensor support

### Future Homeland Defense

- Early intercept capability
- Advanced SM-3 variant defeats long-range ballistic missile



### Regional Defense

- Ascent/midcourse engagement capability defeats short-, medium- & intermediate-range ballistic missiles
- Terminal defense capability defeats shorter-range ballistic missiles



**Defending Against Homeland and Regional Threats in all Phases of Flight**

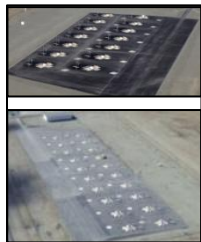




# U.S. Ballistic Missile Defense Overview

## Homeland Defense Today With Upgrades And Enhancements Through 2020

### Ground-based Midcourse Defense (GMD)



Ft. Greely, AK



Vandenberg AFB, CA



Ft. Drum Communication Uplink (2015)



GMD Fire Control

### Aegis Long-range Search & Track



Sea-based Radar



Space-based Infrared



AN/TPY-2 (Forward-based)

### Upgraded Early Warning Radars



Cobra Dane



Fylingdales



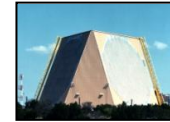
Clear 16



Beale AFB



Thule



Cape Cod 2017

### Phase I: Operational (DEC 2011)

### 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



AN/TPY-2 (FBM)



THAAD



Aegis BMD 4.0.1/5.0



SM-3 IB



Aegis Ashore



Patriot



THAAD



Aegis BMD 5.1



SM-3 IIA



Aegis Ashore



Patriot



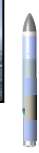
Initial PTSS



THAAD



Aegis BMD 5.1



SM-3 IIB



Aegis Ashore



PTSS



AN/TPY-2 (FBM)



Patriot

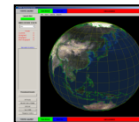


THAAD

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



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



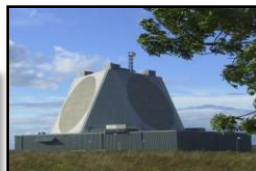
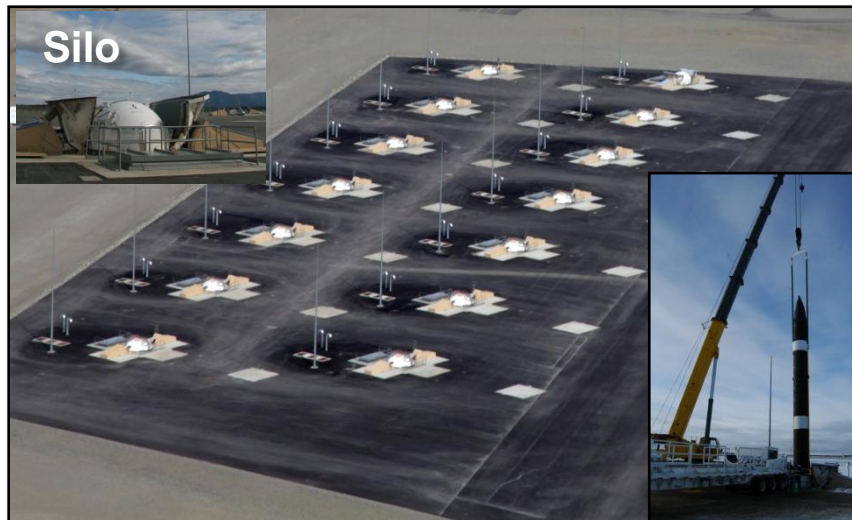
Command, Control, Battle Management and Communications (C2BMC) Displays



# Homeland Defense Upgrades

## ✓ Fort Greely Missile Field 2 2012

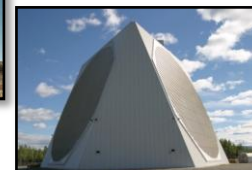
Silo



Fylingdales  
Radar Upgrade  
✓ 2010



Thule  
Radar Upgrade  
✓ 2011



Clear  
Radar Upgrade  
2016



Cape Cod  
Radar Upgrade  
2017

## Sensor Upgrades

## Infrastructure Upgrades



✓ Missile Assembly Building (MAB)  
2012



✓ Power Plant  
2012



✓ 2nd Fort Greely  
Fire Control Node  
2011

## Fire Control Upgrades



Fort Drum In-Flight Interceptor  
Communications System  
Data Terminal (IDT)  
2015

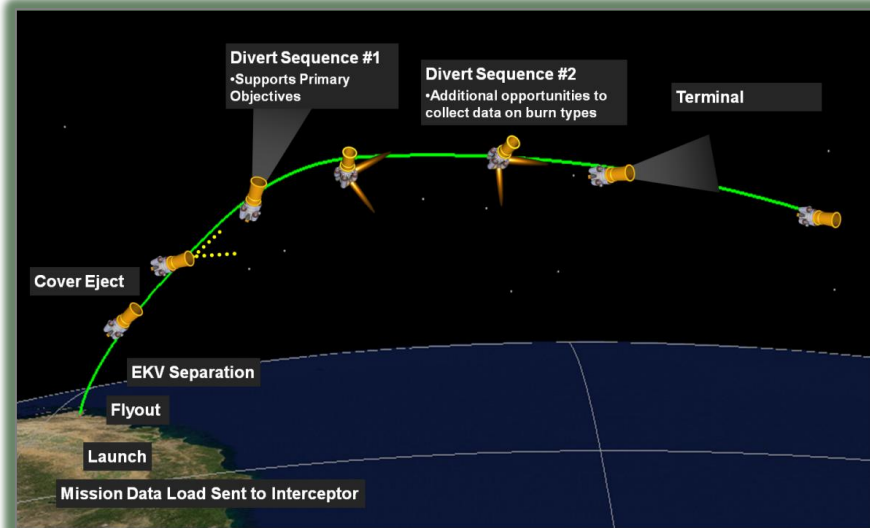


# Ground-Based Midcourse Defense Testing

## – Controlled Test Vehicle (CTV-01), 26 January 2013 –



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

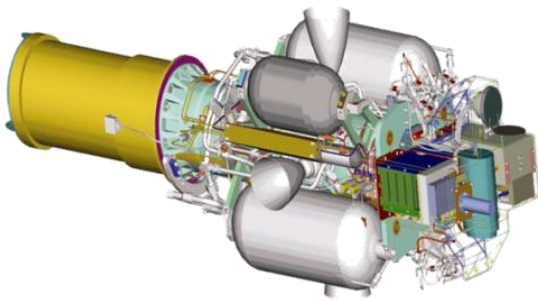






# Ground-Based Midcourse Defense (GMD) Return To Intercept

- Flight Test 6a (FTG-06a) failed on 15 December 2010
  - A guidance error in final seconds caused the Exoatmospheric Kill Vehicle (EKV) to miss the target warhead
- Independent Failure Review Board assembled
  - EKV's guidance system had a fault related to space-related dynamic environments
- Return to Intercept (RTI) program
  - Non-intercept GBI test with modified EKV successfully completed on 26 January 2013
  - Previously failed intercept test will be repeated



**Exoatmospheric Kill Vehicle**







# U.S. Regional Missile Defense Capability



## Missile Defense Sensors

- Precision Tracking Space System (PTSS)
- Aegis SPY-1 Radars
- AN/TPY-2 Radars – Forward-Based Mode



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



## Aegis Ballistic Missile Defense

- Standard Missile-3 (SM-3) Block IA / IB / IIA / IIB



## Terminal High Altitude Area Defense



## Patriot (Army Program)





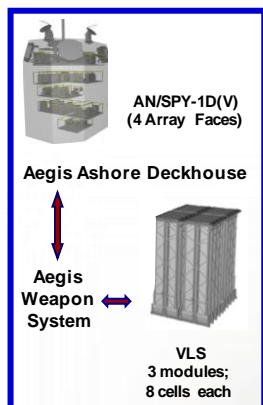
# Aegis Ballistic Missile Defense Program

Autonomous (2004)

Launch on Remote (Ship to Ship) 2006

Launch on Remote (BMD Sensors) 2008

Engage on Remote



Aegis Ashore 2015  
Hawaii Test Site 2013

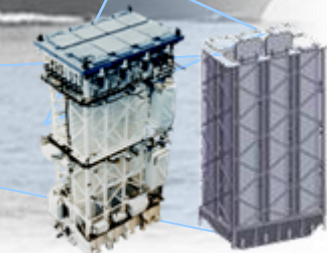
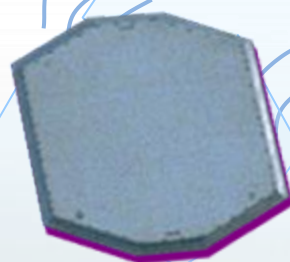
Open  
Architecture 2012



Aegis Ballistic Missile Defense  
Signal Processor (BSP)  
Upgrade 2012



Radar System  
AN/SPY-1



Vertical  
Launching  
System Mark 41

SM-3 B1k IIB  
VLS Concept

SM-3



B1k I / IA / IB  
2004/2006/2013



B1k IIA  
2018



B1k IIB  
2021

Sea-Based  
Terminal



SM-2  
B1k IV  
2008  
Near  
Term



SM-6  
Missile  
2015  
Incr 1



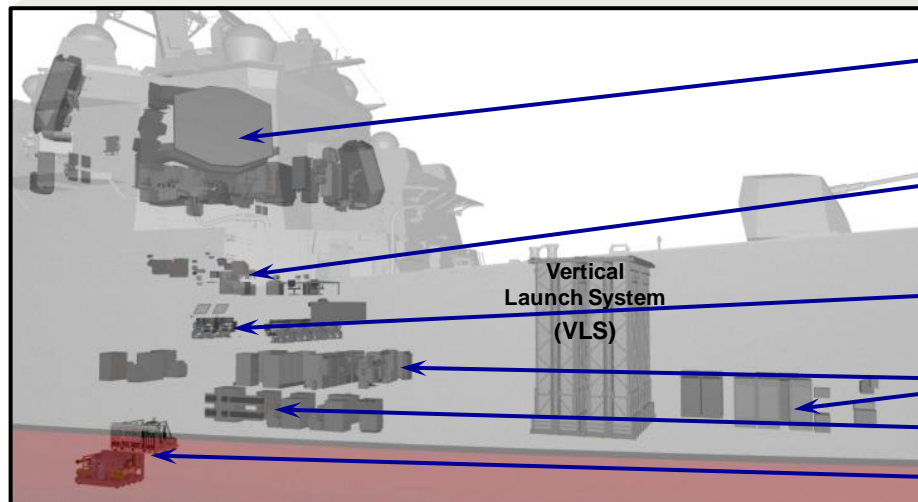
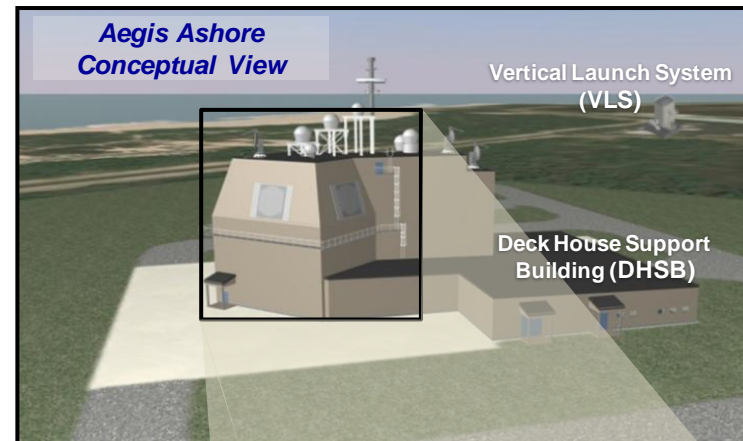
SM-6  
Missile  
2018  
Incr 2



# Aegis BMD Transition From Sea To Ashore



U.S. Navy Destroyer (DDG 113)



SPY Radar and Fire Control System (FCS)

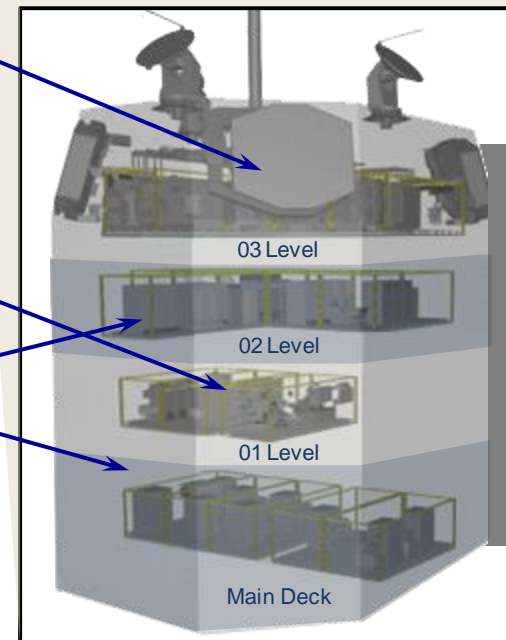
Combat System Maintenance Central (CSMC) \*

Combat Information Center (CIC)

Processors

Power Supplies

Cooling Skids \*



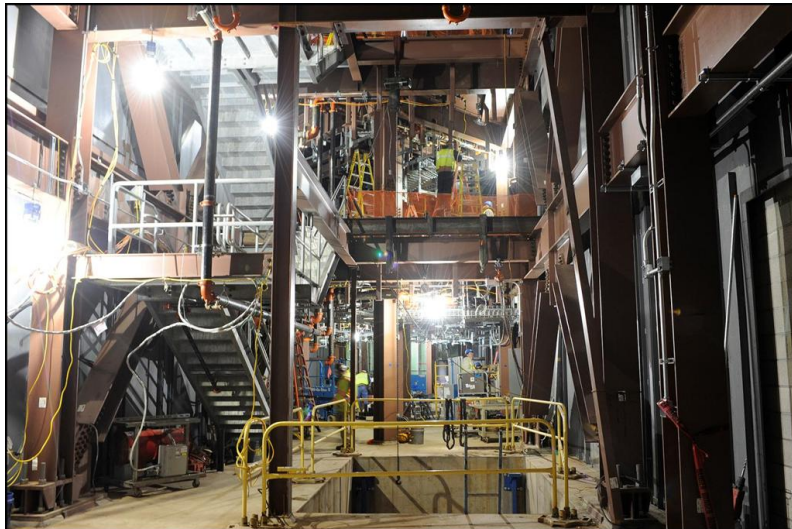
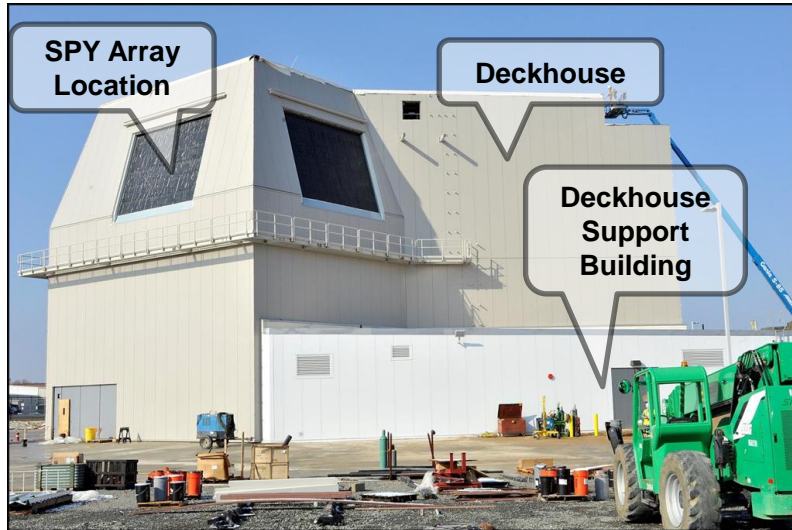
\*Located in the Deckhouse Support Building



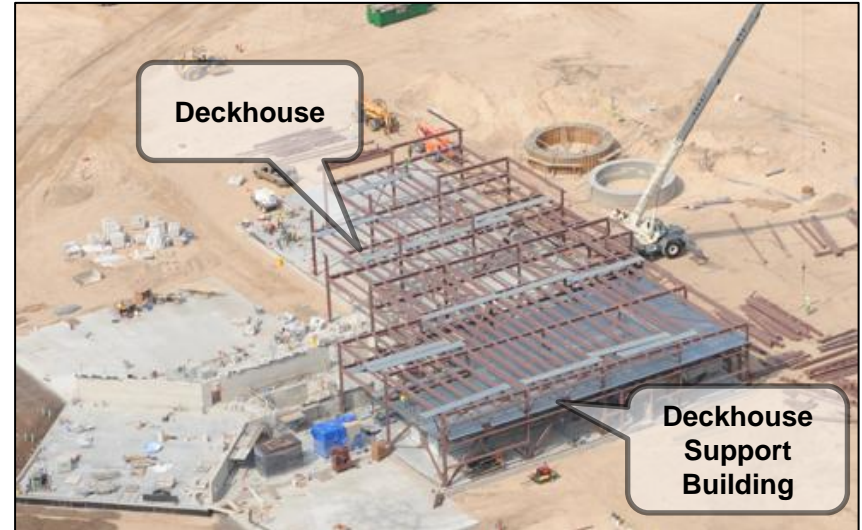


# Aegis Ashore Construction

## Moorestown, NJ



## Pacific Missile Range Facility, HI

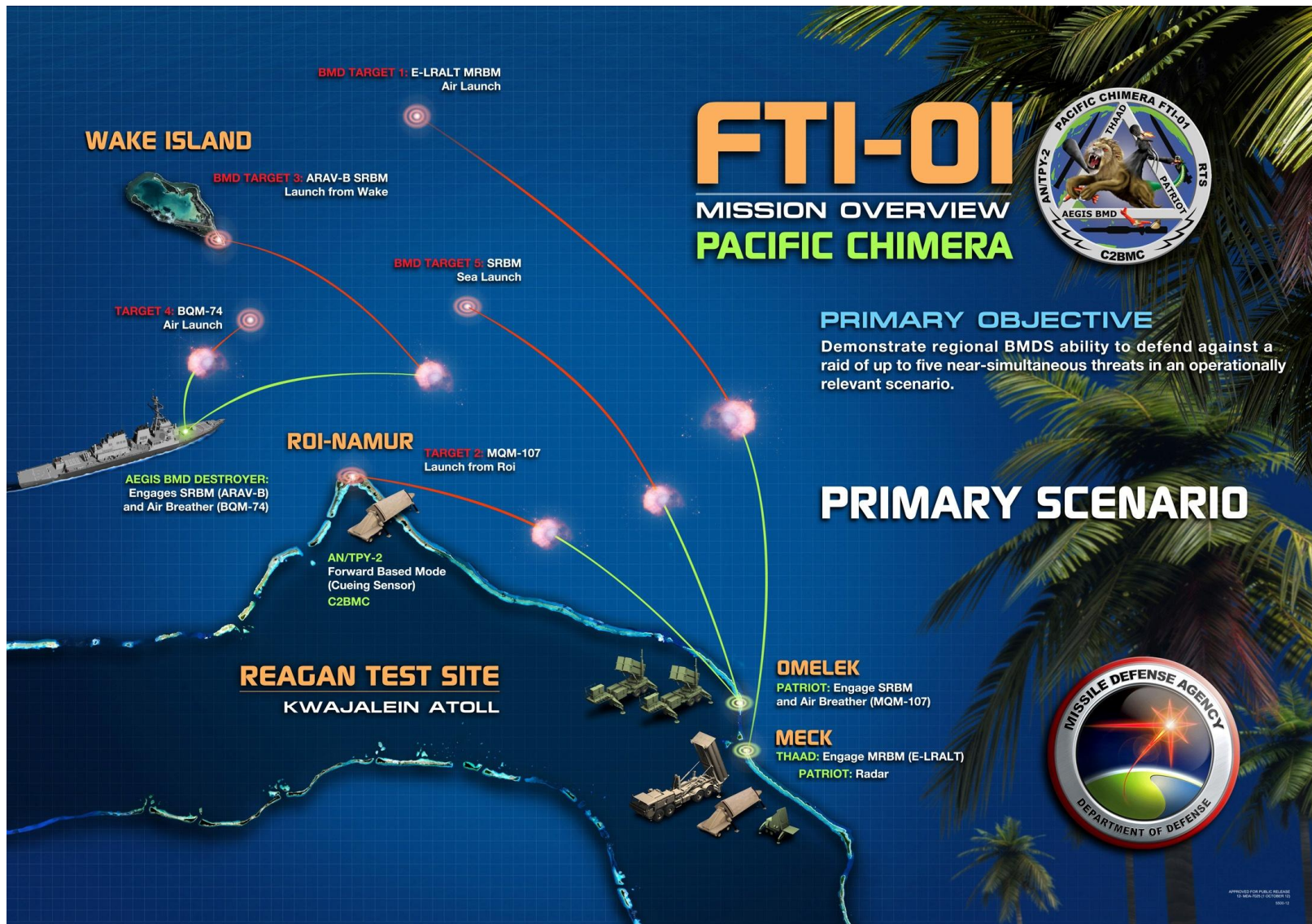






# Flight Test Integrated (FTI-01)

– 25 October 2012 –





# Flight Test Integrated (FTI-01) Results

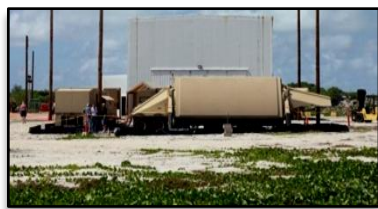
## Command, Control & Engagement Support



Overhead Sensors



Hickam AFB, Hawaii  
UTCO / ADAFCO  
PACFLT / 94<sup>th</sup> AAMDC  
(Upper/Lower Tier Coordination)



AN/TPY-2 Forward-Based  
Mode (Cueing Sensor)

## Weapon Systems



AEGIS (Broad Ocean Area)



THAAD (Meck Island)



Patriot  
(Omelek Island)

## Targets



ARAV-B (Wake Island)



BQM-74 (G-1)



MRBM (C-17)



SRBM (MLP)



MQM-107 (Roi Namur)

## SCORECARD

Engaged:  
✓ Intercept  
Not  
Confirmed

✓ Successful  
Intercept

✓ Successful  
Intercept

✓ Successful  
Intercept

✓ Successful  
Intercept





# Flight Test Standard Missile (FTM)-20

– Aegis BMD 4.0.2 and SM-3 Block IB Intercept –

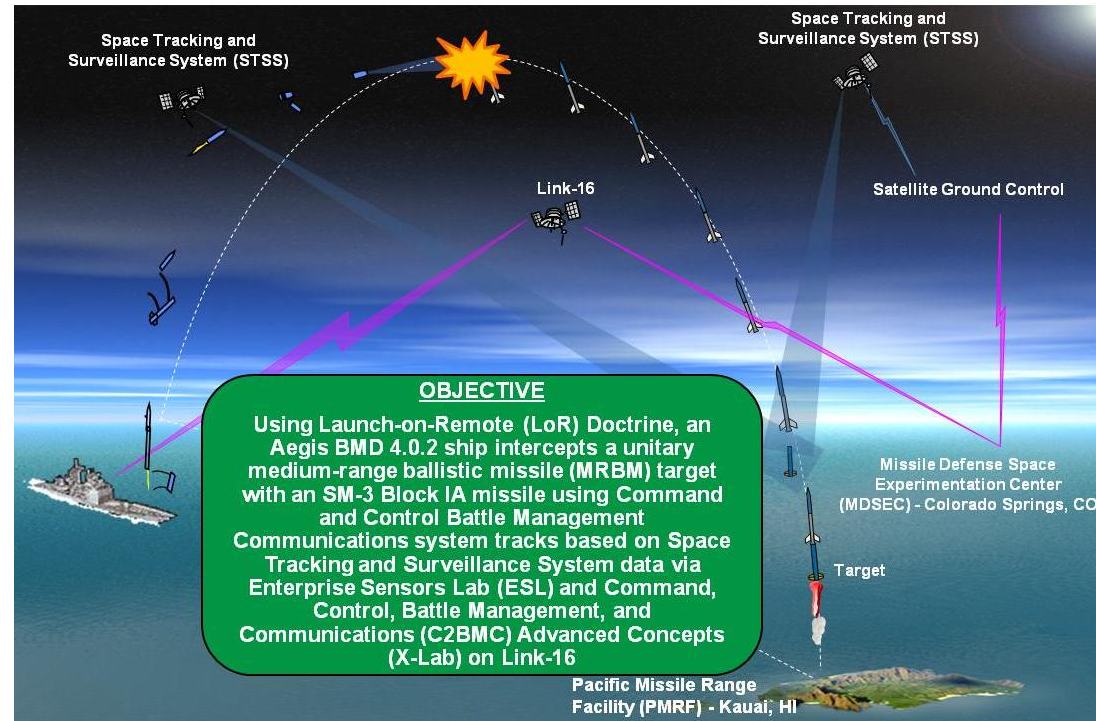
– 12 February 2013 –

## • Mission Firsts

- Successful intercept with BMD 4.0.2 and SM-3 Blk IA missile
- Launch-on-Remote based on Satellite data

## • Mission Insight

- Off board Sensor data – fire control quality
- Integrated Link architecture
- Use of satellite track data to Launch-on-Remote expands battlespace and ship operating area

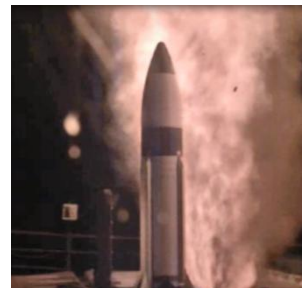


FTM-20 video

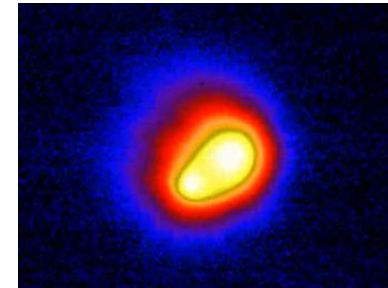


VM513

Target Launch  
Pacific Missile Range Facility



Standard Missile-3 Block IA  
USS LAKE ERIE



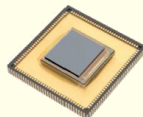
Intercept



# BMDS Priority Technology Investments

## Investment Area

### *Discriminating Sensors*



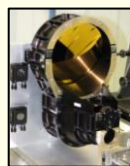
**Airborne  
Multispectral  
Sensors**

### *High Power Lasers*



**High Power and  
Low Weight**

### *Novel Kill Vehicles*



**Kill Vehicle  
Advanced  
Sensors &  
Enhanced  
Lethality**

### *Discrimination Algorithms*



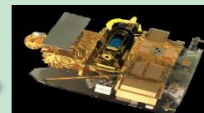
**Robust  
Discrimination  
Methods**

### *Breakthrough Technologies*

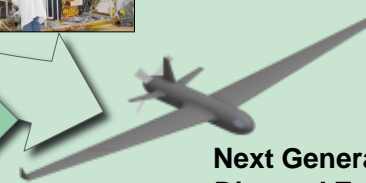


**Rail Guns**

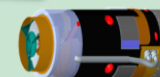
## Capability Derived



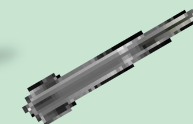
**Airborne and  
Space-Based  
Advanced Sensors**



**Next Generation  
Directed Energy**



**Advanced Kill  
Vehicles & Projectiles**




**Enhanced Discrimination,  
Kill Assessment, Sensor Fusion,  
End-to-End Sensor Correlation**

**NEXT GENERATION GAME CHANGERS**




# International Partners

## Europe


 **NATO:** NATO BMD Interim Capability (InCa) fielded, Planning and execution for lower tier (IOC 2015) and for Territorial BMD (IOC 2018-2020); Continue testing /exercises NATO BMD InCa and C2BMC

 **Czech Republic:** BMD Framework Partner; R&D Cooperative Project

 **Denmark:** BMD Framework Partner; Thule Upgraded Early Warning Radar; RDT&E Cooperative Project

 **France:** R&D Cooperative Project

 **Germany:** PAC-3; PA on Laser Communications Experiment

 **Italy:** BMD Framework Partner

 **Netherlands:** PAC-3; Maritime BMD studies


 **Poland:** Agreed to host Aegis Ashore

 **Romania:** Agreed to host Aegis Ashore


 **Russia:** Missile defense discussions

 **Spain:** Hosting BMD-capable ships to support NATO BMD and other missions


 **Turkey:** AN/TPY-2 radar host, R&D Cooperative Project

 **UK:** BMD Framework Partner; Fylingdales Upgraded Early Warning Radar, Joint Project Arrangements for Cooperative Projects

## Middle East

 **Israel:** Arrow Deployed, Arrow System Improvement Program; development of David's Sling Weapon System; Iron Dome

 **Kuwait:** Missile defense discussions


 **Qatar:** Missile defense discussions; LOR for THAAD, Patriot, EWR, ADOC

 **Saudi Arabia:** Missile defense discussions; PAC-3 purchase

 **United Arab Emirates:** Foreign Military Sales cases for THAAD and PAC-3

## Asia / Pacific

 **Australia:** BMD Framework Partner; R&D Cooperative Project

 **Japan:** BMD Framework Partner; AN/TPY-2 radar host, 21" Missile Development; 4 Aegis BMD capable ships

 **ROK:** Missile defense discussions

Engagement /  
Outreach

Missile Defense  
Analysis

Cooperative Missile  
Defense Projects

Co-development

Deployment





# Summary

- **Balance of capabilities, requirements, and risks to deter aggression, project power, and protect U.S. and allied interests**
- **Deployment of capabilities ongoing 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 interoperable missile defense**

**Missile Defense Capability – Globally Deployed**

