

# Status of the U.S. Missile Defense Programs

The Conference on Security and Cooperation  
in South Asia: A Global Perspective

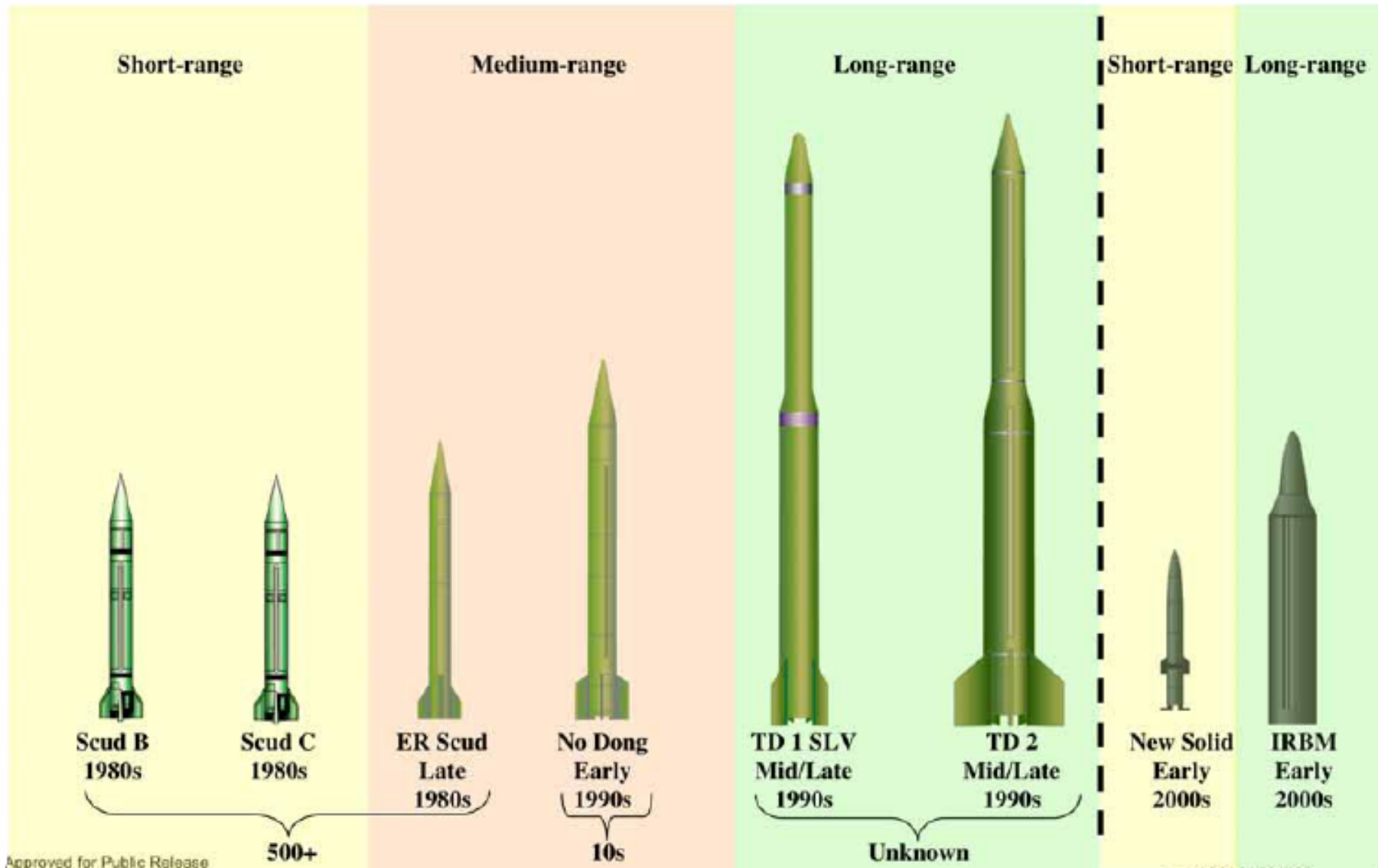
Berlin, Germany

**Hon. Philip E. Coyle**  
**Senior Advisor**  
**Center for Defense Information**  
**October 8, 2007**





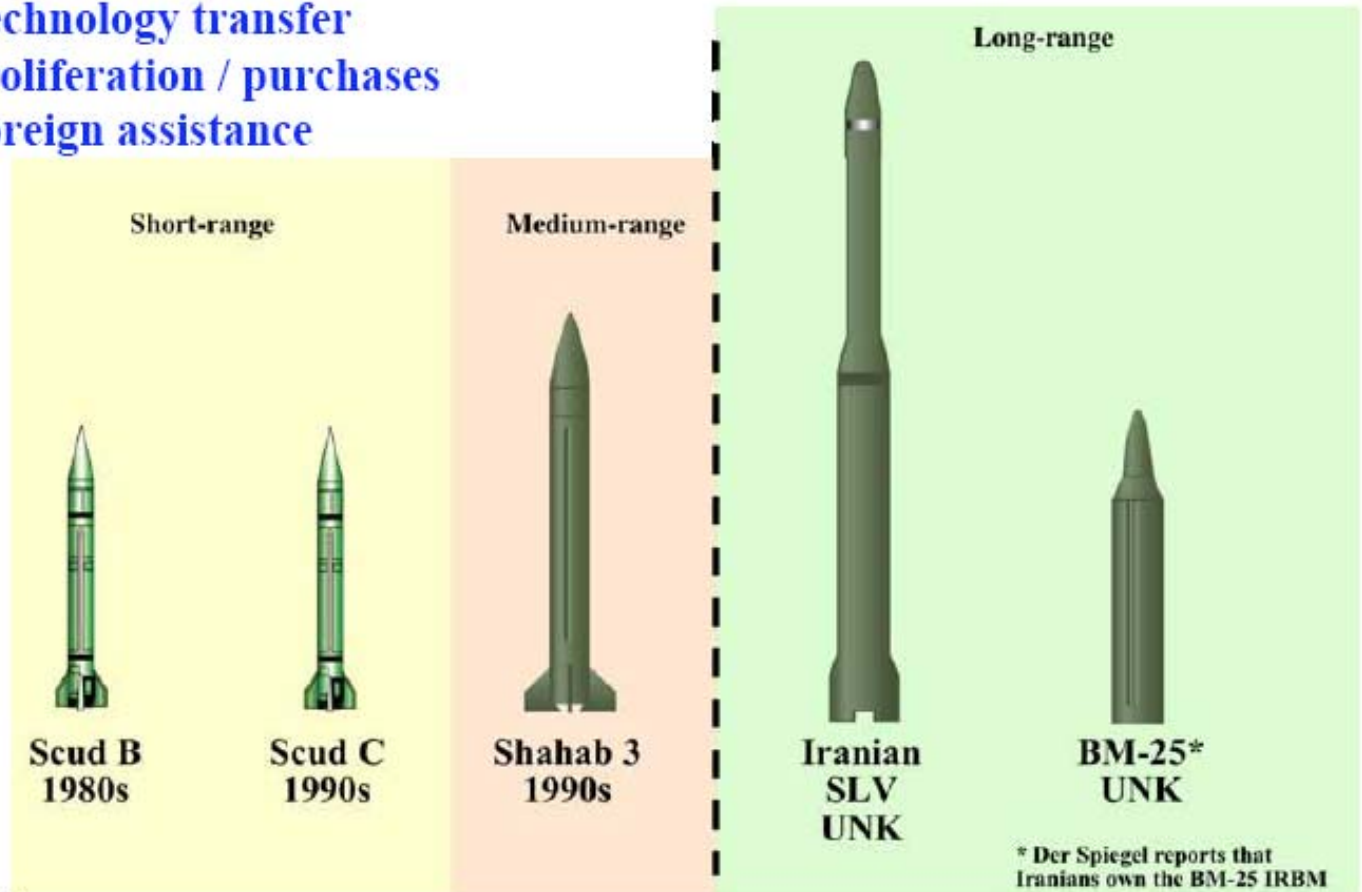
# North Korean Ballistic Missiles





## Iranian Ballistic Missiles

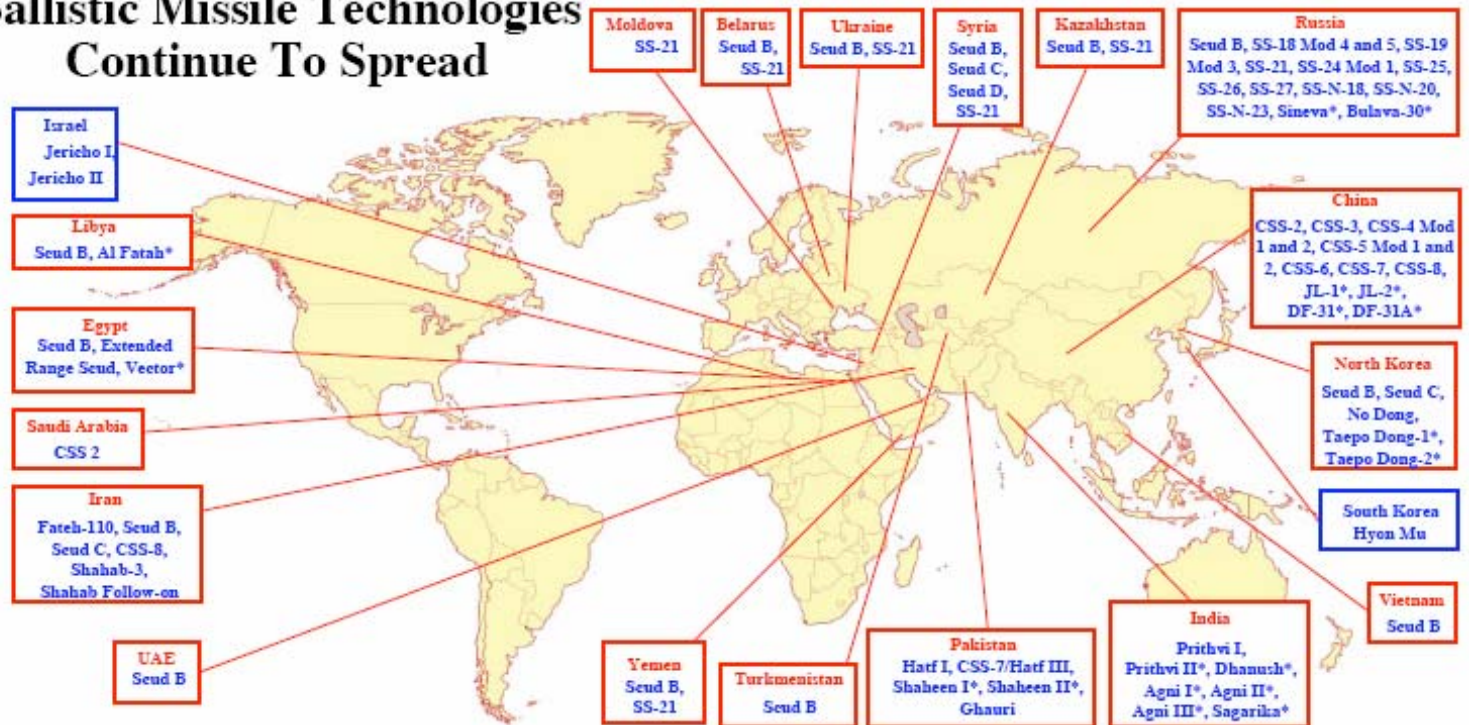
- Iranian missile capability likely to accelerate due to
  - Technology transfer
  - Proliferation / purchases
  - Foreign assistance





# Non-NATO Ballistic Missile Capability – 2005

## Ballistic Missile Technologies Continue To Spread



\* Missiles: Not Yet Deployed

- Ballistic missiles increasing in range and sophistication
- Pace of proliferation increasing

# The Pentagon claims the threat from enemy missiles is growing and shows missiles in 20 countries!

But all but two of those 20 countries - Iran and North Korea - are either friends, allies, or countries from which we have no missile threat, e.g. Israel, India, Pakistan, Vietnam, South Korea, Moldova, Ukraine, Saudi Arabia, Egypt, etc.

Moldova??? Yes, Moldova.

And, with the exception of Russia and China, none of those 20 countries - including Iran and North Korea - have missiles that can reach the United States anyway.

Recently Ms Pamela J. McCue, Director, MSIC, said in a speech that Venezuela was the new emerging threat due to ties with countries that have developed missiles and anti-US sentiments.\*

\*Tuesday, August 14, 2007, at the 2007 Space and Missile Defense Conference, "Future Opportunities and Challenges facing our National Security with particular emphasis on the Emerging Missile Defense Threats and Space Operations."

# Layered Missile Defense Goal

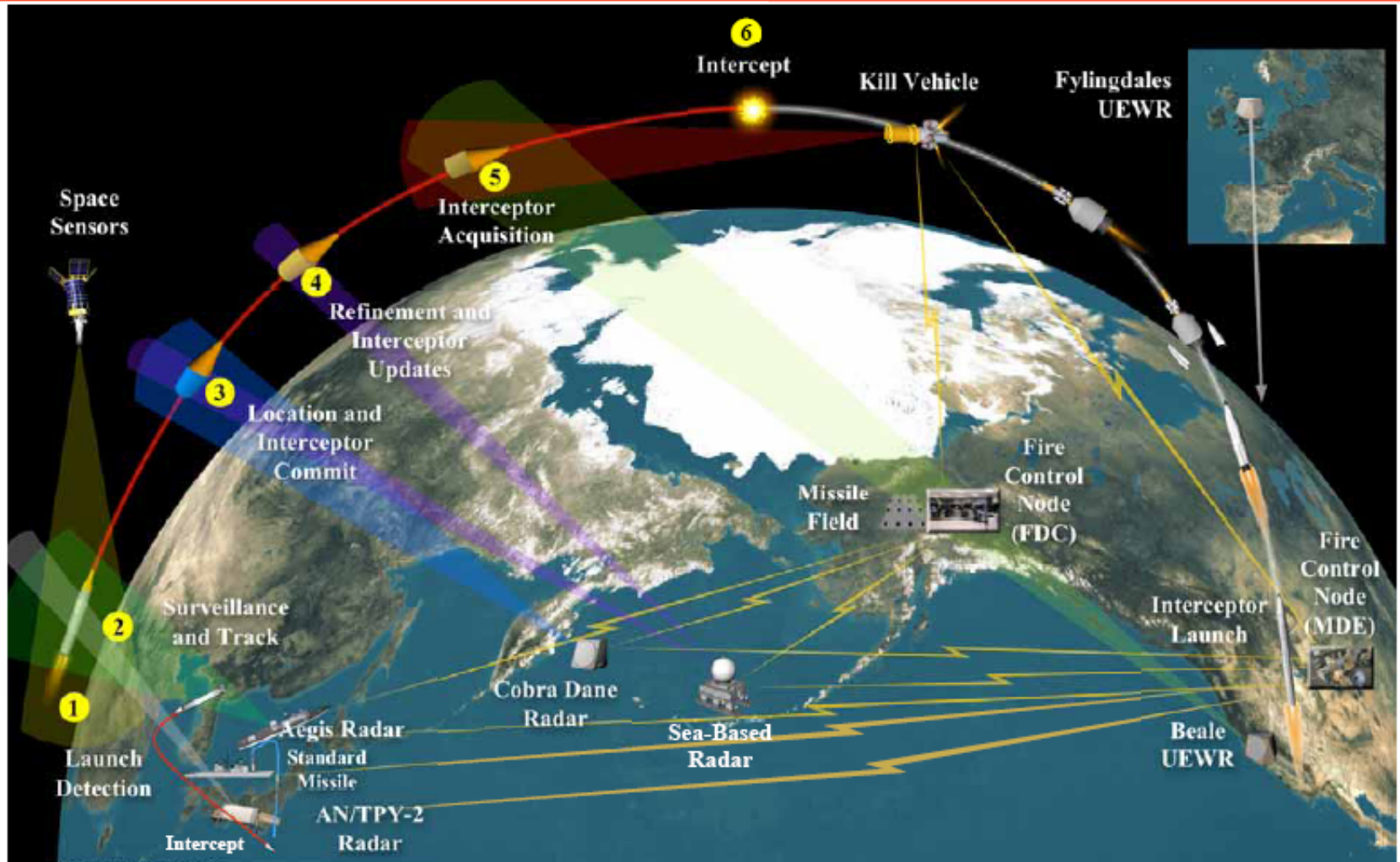
- To be able to shoot down enemy missiles of all ranges: short, medium, long, ICBM,
- In all phases of flight: boost, midcourse, terminal,
- From land, sea, air, and space.

If one layer misses, hopefully the next layer won't, etc.





# An Integrated Approach To Ballistic Missile Defense





# Integrated Ballistic Missile Defense System

## Sensors



Defense Support Program



Space Tracking And Surveillance System



Sea-Based Radars



Forward-Based Radar With Adjunct Sensor



Midcourse X-Band Radar



Early Warning Radar



Airborne Laser



Kinetic Energy Booster



Aegis Ballistic Missile Defense / Standard Missile-3



Multiple Kill Vehicle



Ground-Based Midcourse Defense



Terminal High Altitude Defense



Sea-Based Terminal



Patriot Advanced Capability-3

Command, Control, Battle Management & Communications

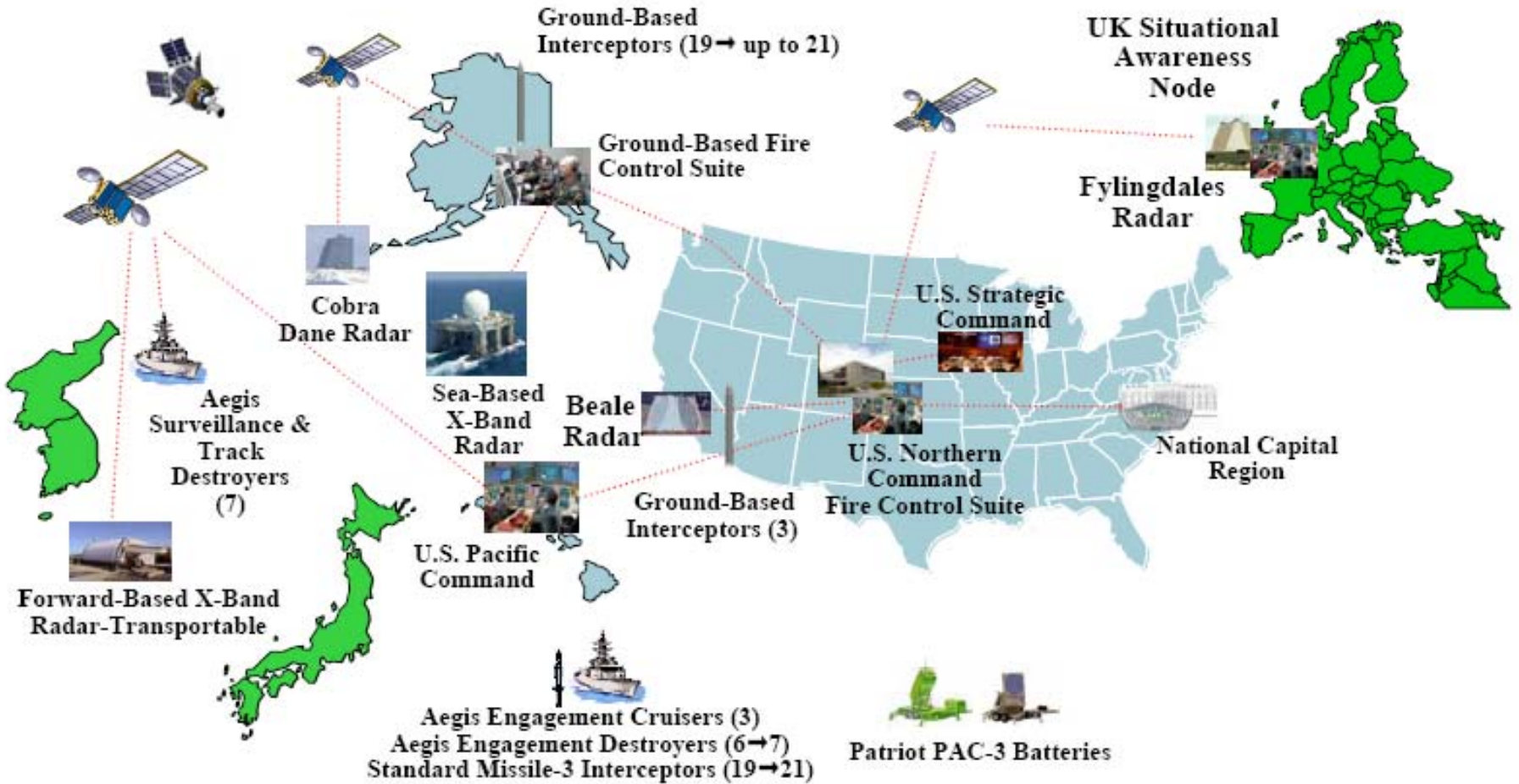


NMCC USSTRATCOM USNORTHCOM USPACOM EUROM CENTCOM





# System Configuration August 2007 → End 2007



**None Of This BMD Capability Existed In June 2004**



# System Configuration 2013



# Summary

## Deployed Ground-Based Interceptors

System	August 2007	End CY-2007	Planned 2013
Ground-Based Alaska	19	21	40
Ground-Based California	3	3	4
<b>Totals</b>	<b>22</b>	<b>24</b>	<b>44</b>
Europe	0	0	10

# Summary - Patriot PAC-3

	August 2007	End CY- 2007	Planned 2013
PAC-3 Batteries	~ 36	?	60
PAC-3 Interceptors	~ 500th delivered	?	798

# Summary - AEGIS

	August 2007	End CY- 2007	Planned 2013
Destroyers Surveillance	7	8	Convert to Engagement
Destroyers + Cruisers Engagement	6 + 3	7+ 3	18
SM-3	19	21	132
Terminal Sea- based	0	0	Up to 100



# Summary THAAD

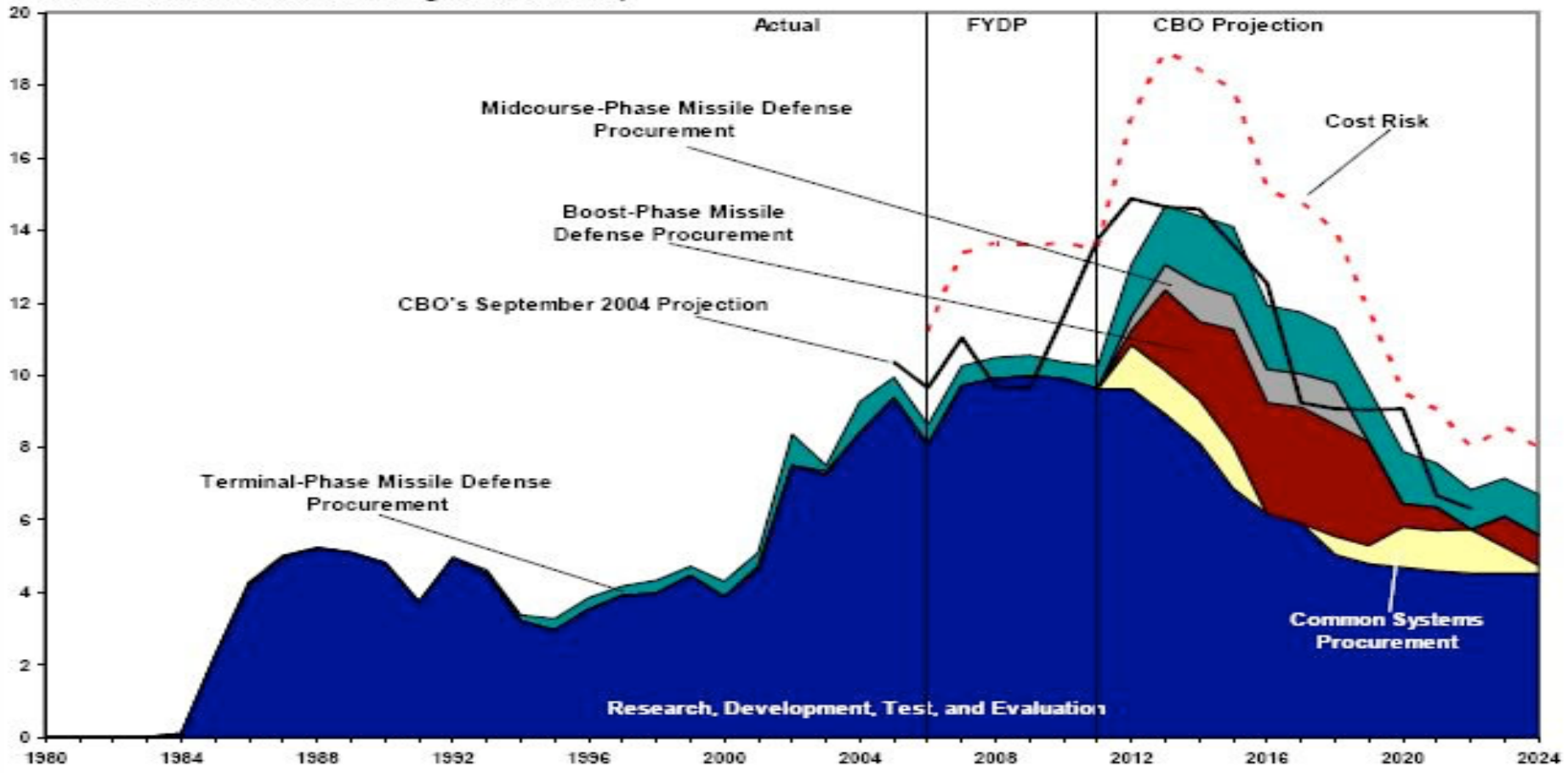
System	August 2007	End CY-2007	Planned 2013
THAAD Fire Control	0	?	4
THAAD Interceptors	0	?	96
Additional FBX Radars	1	2	3

# CBO Missile Defense Cost

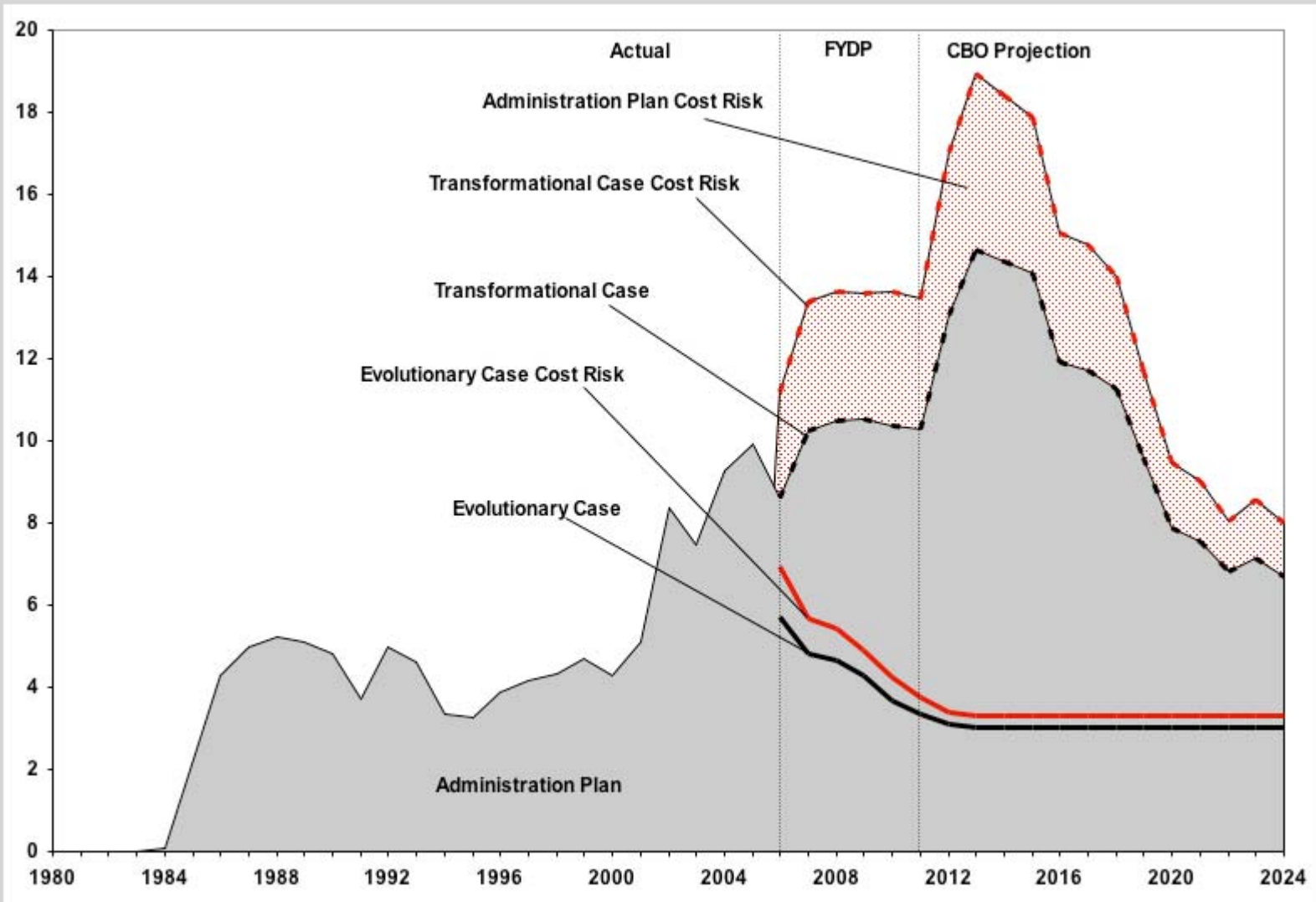
Figure 3-30a Updated

## Past and Projected Spending for Missile Defense Investment

Billions of 2006 Dollars of Total Obligational Authority



# CBO Missile Defense Cost (cont.)



# Over-Reliance on Technology to Solve Difficult National Security Problems

- In 1999, former Secretary of Defense William Perry made a series of diplomatic trips to convince North Korea to stop developing and testing long-range missiles
- Remarkably successful. As news of his success reached the Pentagon, officials there used to joke: "There goes the threat!"
- The joke showed that perhaps the easiest route in dealing with North Korea can be through creative diplomacy, not military technology.
- Dollar for dollar, Dr. Perry was the most cost-effective missile defense system the United States ever had.
- The Bush administration did not sustain that agreement and immediately began threatening North Korea. That the U.S. would stop threatening North Korea was a key point in Dr. Perry's agreement.

# “Technical Realities”

- “The ballistic missile defense system that the United States will deploy later this year will have no demonstrated defensive capability and will be ineffective against a real attack by long-range ballistic missiles. The administration’s claims that the system will be reliable and highly effective are irresponsible exaggerations.”

Union Of Concerned Scientists, May,  
2004



# SBX

- Sea-based X-band radar
- So far only used “off line”
- First test providing in-flight target updates still to come.
- Many issues with maritime environment

# SBIRS-High

- Intended Replacement for DSP
- Originally, two HEO + 4 GEO
- \$~30 billion over cost and years behind schedule
- To be scaled back to no more than 3 satellites, and replaced by Overhead Non-Imaging Infrared (ONIR) missile warning satellite system.
- “Intractable” technical difficulties.

# STSS

- Space Tracking and Surveillance System
- Downgraded from SBIRS-Low
- Originally 24 LEO satellites
- As with SBIRS-High, discrimination capabilities falling by the wayside
- Problematic for identifying decoys and countermeasures.

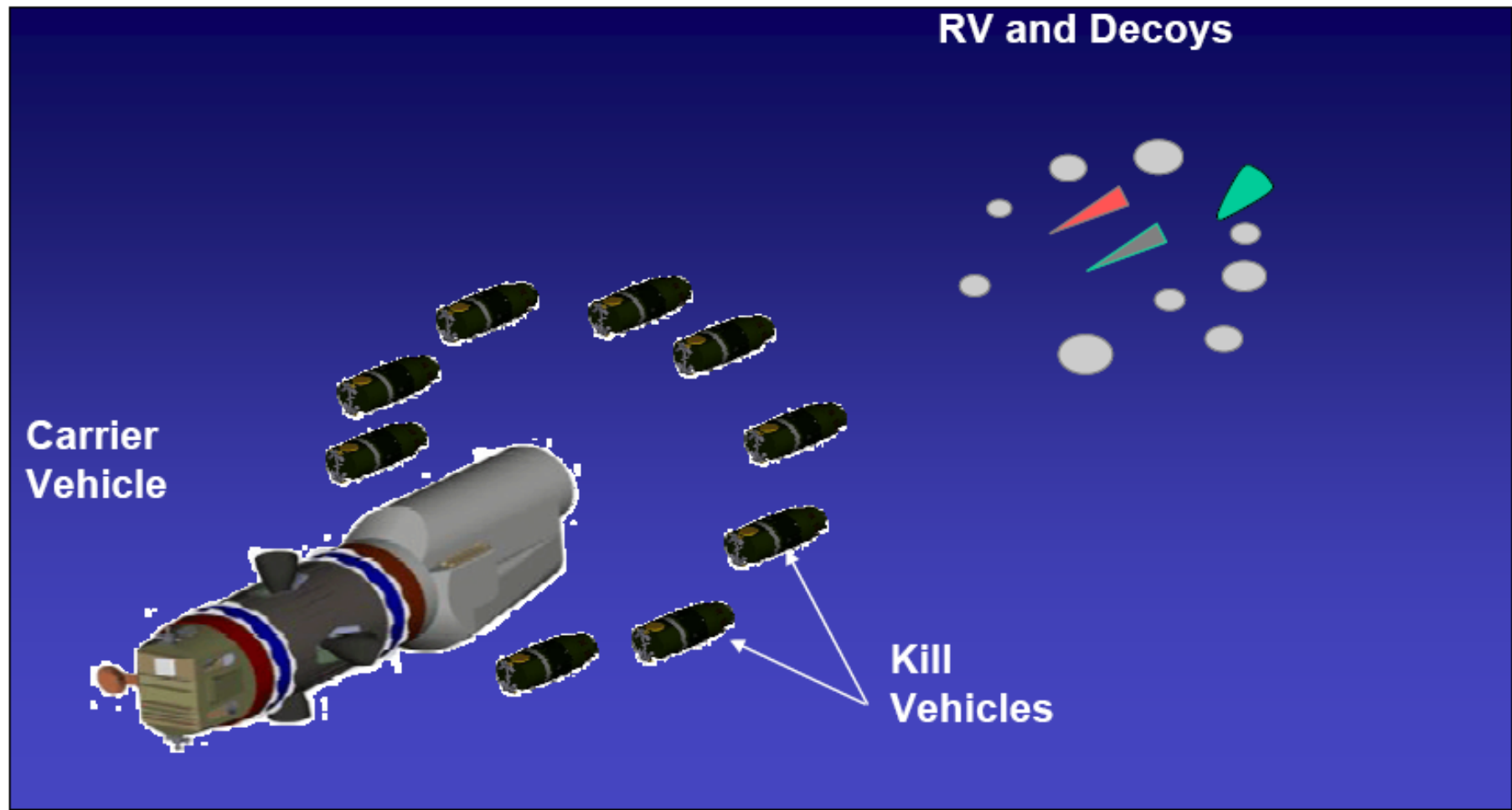
# Airborne Laser

- 6 giant laser modules each the size of a Chevy Suburban, carried in a 747
- Beam goes out a nose turret
- >\$5 billion for first aircraft thru 2009
- 5-7 aircraft if on station 24x7
- Atmosphere interferes with laser beam
- Enemy countermeasures
- Chemical replenishment



# *BMDS MIDCOURSE DEFENSE*

## *Multiple Kill Vehicles (MKV)*





# NFIRE test August 23, 2007

- Successful test of Near-Field Infrared Experiment (NFIRE) for missile defense.
- NFIRE satellite launched on April 24, 2007.
- Tracked modified Minuteman II missile launched from Vandenberg AFB, CA
- NFIRE satellite got within 3.5 kilometers of the missile.
- NFIRE to gather plume data about missiles.
- Also an anti-satellite program in disguise?

# A Current Assessment

- The missile defense hardware being deployed by the U.S. in Alaska and California, and proposed for Eastern Europe, has no demonstrated effectiveness to defend Europe or Asia, let alone the U.S., from an attack by Iran or North Korea under realistic operational conditions.
- For this reason, the US Missile Defense Agency has "dumbed down" the threat from Iran or North Korea to be just one or two missiles with no decoys or countermeasures.
- And yet still the Missile Defense Agency has not been able to demonstrate the ability to stop even that idealized threat under realistic operational conditions.

# The Importance of Operational Criteria

- Clinton Criteria ~ December 1999:
- Whether the threat is materializing
- The status of the technology based on an initial series of rigorous flight tests, and the proposed system's operational effectiveness
- Whether the system is affordable; and
- The implications that going forward with NMD deployment would hold for the overall strategic environment and our arms control objectives.

# The Importance of Operational Criteria, cont'd

- Nitze Criteria ~ National Security Directive No. 172, May 30, 1985:
- The system should be effective
- Be able to survive against direct attack; and
- Be cost effective at the margin - that is, be less costly to increase one's defense than it is for an opponent to increase its offense against it.



# MDA Capability-Based Acquisition

Capability-Based
<ul style="list-style-type: none"><li>• Up-front acknowledgement that specifics of future threat are unknown, but general characteristics are</li></ul>
<ul style="list-style-type: none"><li>• Emphasizes useful existing technology over hoped-for developments</li></ul>
<ul style="list-style-type: none"><li>• Willingness to accept militarily useful early capabilities while continuing to improve through continuous Spiral Developments</li></ul>
<ul style="list-style-type: none"><li>• Fixed budget drives affordability trades</li></ul>

**Flexible and Responsive  
No Key Performance  
Parameters**



## Management by Knowledge Points

- **Knowledge Points:** Events which demonstrate critical technologies or capabilities at component and system levels
- **Data from Knowledge Points drive key decisions**



# Development Program

## Boost Phase Kill

### Airborne Laser



- Over 70 successful laser firings
- Atmospheric compensation and tracking test against target, July 2007
- Lethal shutdown 2009

### Kinetic Energy Booster



- Successful 1<sup>st</sup> and 2<sup>nd</sup> stage static firings (2<sup>nd</sup> successful 1<sup>st</sup> stage firing, June 2007)
- Booster flight test in 2008
- Operational avail 2014

### NFIRE



- Successful launch April 2007
- Experiments on boosting missiles in August / October 2007

## Counter-countermeasure

### Multiple Kill Vehicle



- Land- and sea-based volume kill capability
- Flight test in 2013
- Initial capability in 2017

## Mobile Midcourse

### SM-3 Block IIA 21" Interceptor



- Agreement with Japan signed June 2006
- First flight 2014
- Operational avail 2015

## Enhanced Fire Control

### Space Tracking and Surveillance System



- Launch 2 demonstration satellites in early 2008
- First launch of operational satellite 2016-2018

## Endoatmospheric Navy

### Sea-Based Terminal



- Far-term program definition in work

**Knowledge Points Drive Development Progress**



## Integrated Ballistic Missile Defense

---

- Value Added
- The battlefield effect is that the integrated BMD System can...
  - Defend against more missiles simultaneously...
    - Allow fewer leaked missiles...
      - Conserve more interceptor inventory...
        - And defend a larger area...
          - ...than individual assets could if operating independently
- C2BMC doesn't make the individual radars or interceptors — we make the aggregate system more capable by capitalizing on the collective information reported by the other BMDS assets

**C2BMC creates a Combat Information Center for the BMDS**





# European Site Initiative

## Proposed Long-Range Missile Defense Elements In Europe

- **European interceptor site**
  - Up to 10 silo-based long-range interceptors located in Eastern Europe (2011-2013)
- **European midcourse radar**
  - Re-location of a narrow-beam, midcourse tracking radar currently used in our Pacific test range to central Europe (2011)
- **Forward-based radar**
  - Field an acquisition radar focused on the Iranian threat from a forward position to provide detection, cueing, and tracking information
- **Why Poland and Czech Republic**
  - Geometry
  - Range from Iran







# International Activity Highlights

## Framework Partners



**Japan:** Forward-based X-Band radar siting, 21" Missile Development



**UK:** Fylingdales UEW, lethality studies system-level analyses, advanced technology programs, target development



**Australia:** Science and technology cooperation



**Denmark:** Upgrade Thule Early Warning Radar, Technology Discussions



**Italy:** Framework MOU signed, MEADS partner, architecture analysis study

## Continuing Activity



**Israel:** Arrow Deployed, Arrow System Improvement Program



**Germany:** MEADS Partner, Laser Cross-Link Technology



**Netherlands:** PAC-3, Trilateral Frigate Program Maritime Cooperation



**NATO:** Active Layered Theater BMD – System Engineering and Integration

## New Relations / Emphasis



**Spain:** U.S. -Spain Missile Defense Technical Group established



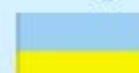
**Poland:** Missile Defense Consultations and Workshops; expressed interest in hosting missile site



**Czech Republic:** Missile Defense Consultations; expressed interest in hosting midcourse radar



**United Arab Emirates:** Consultations on air and missile defense



**Ukraine:** Exploring possible cooperative projects



**India:** Missile Defense Discussions and Workshops ongoing



**Russia:** Theater Missile Defense Exercise Program



**France:** Exploring interest



**Republic of Korea:** Expressed Interest in missile defense

# A Current Assessment

- The missile defense hardware being deployed by the U.S. in Alaska and California, and proposed for Eastern Europe, has no demonstrated effectiveness to defend Europe or Asia, let alone the U.S., from an attack by Iran or North Korea under realistic operational conditions.
- For this reason, the US Missile Defense Agency has "dumbed down" the threat from Iran or North Korea to be just one or two missiles with no decoys or countermeasures.
- And yet still the Missile Defense Agency has not been able to demonstrate the ability to stop even that idealized threat under realistic operational conditions.



We've ACHIEVED PARITY!

FLOOD

ANTI-MISSILE SYSTEM

ICBM

N. KOREA

FTT

SPLOOSH

Mike Keefe THE DENVER POST 07/08/06

Back Up Slides



## Future Trends

### Sensors and Sensor Integration

---

- Ultimate goal of continuous birth-to-death tracking
- BMD System Track – the correlation and fusing of multi-sensor tracks into a single system track for use by the shooter
  - Enabler for launch-on and engage-on concepts
  - Both operational and technical challenges exist
- Integration of space sensors (ONIR)
  - Going beyond missile warning needs with improved ground processing
  - Initial SBIRS HEO data provides a glimpse into what the future will bring



# *PROJECT HERCULES*

## *Program Description/Contribution*

---

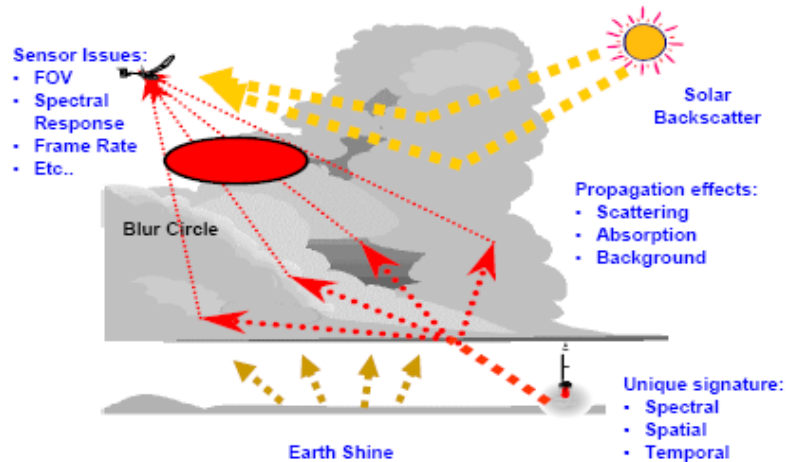
### **PROJECT HERCULES**

- **Develops robust detection, tracking, and discrimination algorithms to counter deliberate countermeasures, as well as off-nominal and evolving missile threats.**
- **Develops a physics-based Decision Architecture that applies advanced decision theory to future BMDS command, control, and battle management (C2BM) concepts.**
- **Develops algorithms useful against targets in all phases of flight with specific projects for forward based sensors, the Decision Architecture, and mitigating countermeasures.**
- **Develops algorithms to enhance BMDS element capabilities in Block 06, 08, 10 and beyond for insertion into their respective programs.**



# *BMD TECHNOLOGY*

## *Early Launch Detection and Tracking (ELDT) Concepts*



### Technology Concept

- Provide for significant improvement in the ability to detect, track, and classify targets from launch until burnout
- Enable rapid initiation of boost phase engagement to improve kill probability
- Improve measurement accuracy of burn out position and velocity to improve downrange reacquisition

### Technical Approach/ Program Objective

- Determine feasibility of sensor concepts via:
  - Data collection/ analysis
  - Proof of Concept & prototype development
  - Ground/airborne field experiments
- Products Include:
  - Hypertemporal electro-optical (EO)/infrared (IR)
  - First alert/cueing narrowband electro-optic
  - Over The Horizon Radar (OTHR)
  - Combined technology approaches

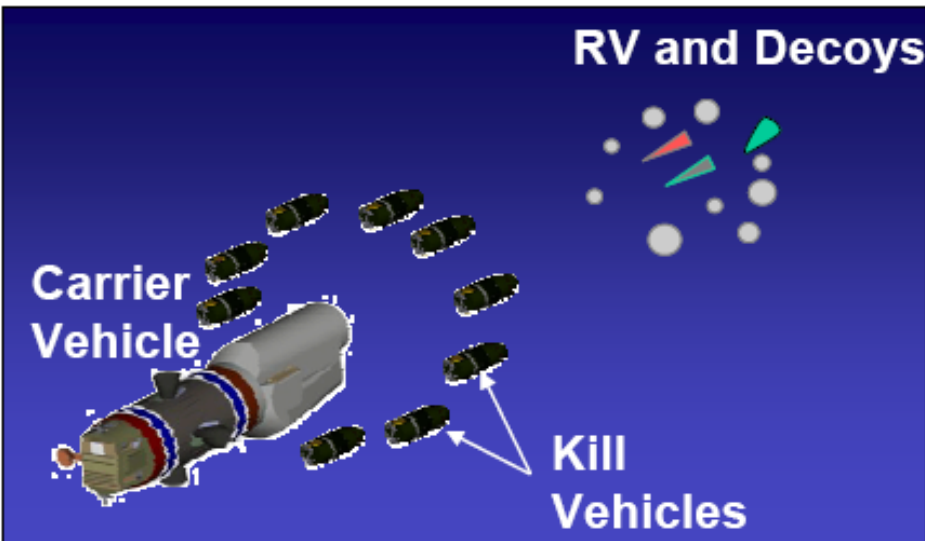
### Benefit to BMDS

- Large standoff detection range
- All weather operation
- Wide area surveillance
- Unambiguous detection within several seconds of launch
- Accurate tracking for handover to engagement systems





# *BMDS MIDCOURSE DEFENSE Multiple Kill Vehicles (MKV)*



## **Technology Concept**

- Engage midcourse threat clusters with multiple small (~ 5 kg) kill vehicles (KV) launched from a carrier vehicle (CV)
- MKV operation:
  - Launch from GMD silo farm
  - Discriminate using existing BMDS assets (SBX, STSS, etc.), plus CV sensor
  - Weapon-target assignment by CV
  - KVs kill all remaining credible targets
- Hydrocode results show KVs lethal vs RVs

## **Technical Approach/ Program Objective**

- System development contract competitively awarded to Lockheed Martin on 7 Jan 04
- KV critical design review conducted 2Q FY05, hover tests in FY07, intercept flights in FY09 for KV demonstration (TRL=6)
- Knowledge – based decision points
- System flight tests (CV and KVs) vs multiple targets in Pacific Testbed in Block 10

## **Benefit to BMDS**

- Provides new capability for midcourse defense
  - Increases firepower – addresses multiple targets to mitigate midcourse discrimination problem
  - Robust against lack of *a priori* target information
- MKV is affordable, compatible, and mission flexible
- Works within existing/planned BMDS
- Potential limited fielding in Block 12





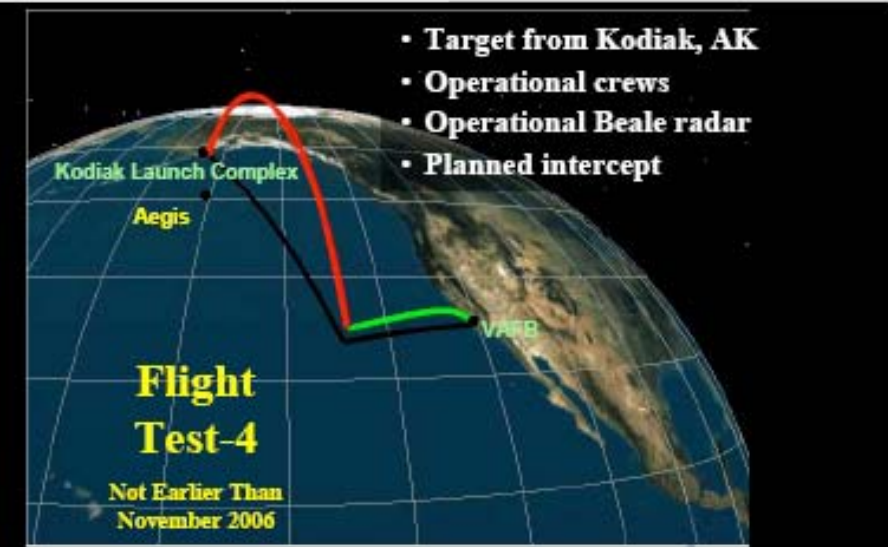
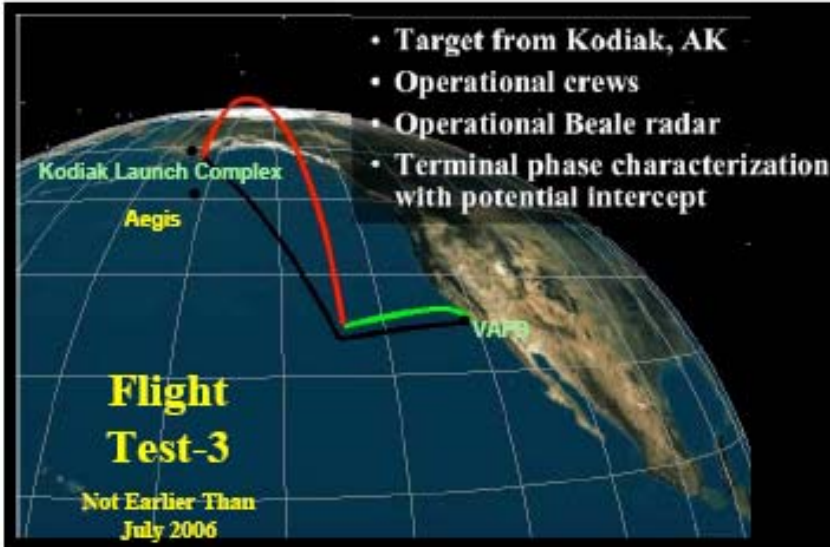
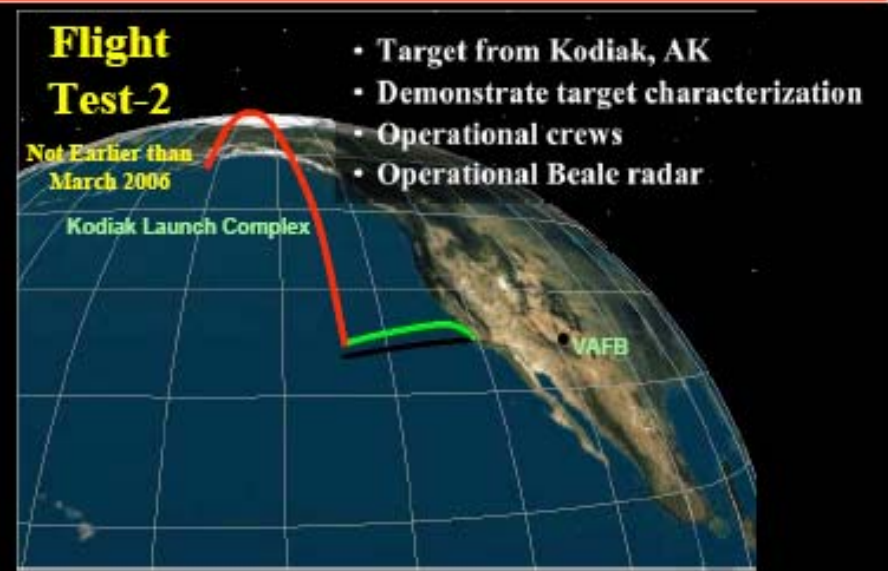
## *Multiple Kill Vehicles (MKV) Program Description/Contribution*

---

- Transformational weapon system development program to deal with midcourse discrimination problem
- MKV system engages midcourse threat clusters with multiple small (~5 kg) kill vehicles (KV) launched from a carrier vehicle (CV)
- MKV destroys large numbers of targets using a single engaging interceptor missile
  - Reduces the burden on sensors and algorithms, which no longer need to be programmed to select one, most likely target
  - Dramatically alters the statistical probability of kill in favor of the defender
  - Provides for early, decisive engagement of an adversary complex.



# Mission Readiness Task Force Flight Test Overview



[www.cdi.org](http://www.cdi.org)