AEGIS BALLISTIC MISSILE DEFENSE

"Custos Custodum Ipsorum"
Guard of the Guardians, Themselves

DR Trace

Being one view of NTW from 1994-2004

23 Feb 05

Outline

- LEAP Origins / Terrier LEAP
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LEAP Technology Program

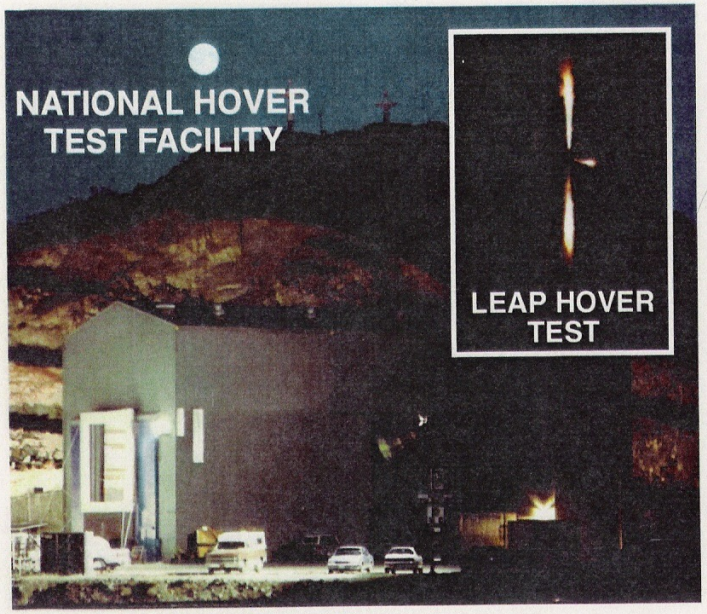
- Commenced in 1986, to develop and integrate advanced miniature kinetic energy interceptors and associated technologies and demonstrate through extensive ground testing
- To improve KW system performance, deployability, reproducibility, and cost effectiveness, the mass of the projectile must be driven down to ~10kg
- USA SMDC: Hughes concept from DARPA / Gremlin program
- USAF Phillips Laboratory: Boeing concept from Have String hypervelocity gun, Sagittar, and SBI
- USAF Phillips Laboratory: Rocketdyne division of Rockwell concept from kinetic hover integration test, SBI, and antisattelite technology

THEATER AIR DEFENSE
TAD
PROGRAM EXECUTIVE OFFICE

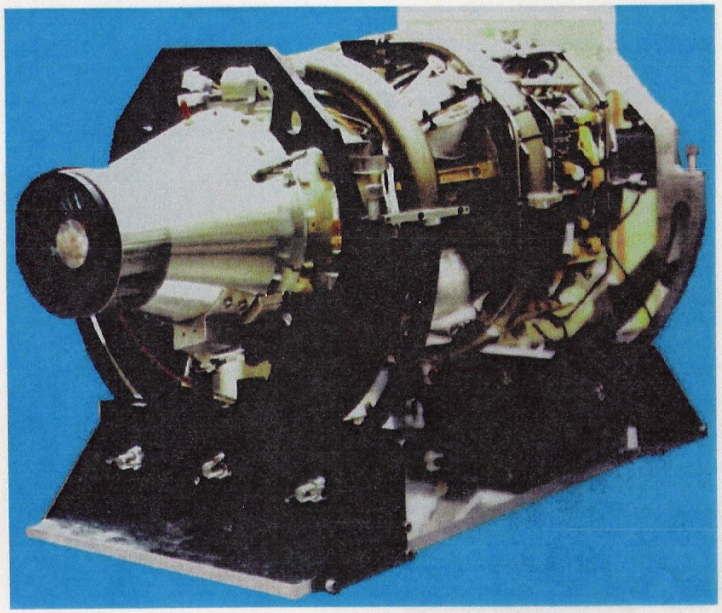
NAVY THEATER WIDE LEVERAGES KILL VEHICLE INVESTMENT

THEATER AIR DEFENSE

10 YEAR $400M BMDO INVESTMENT



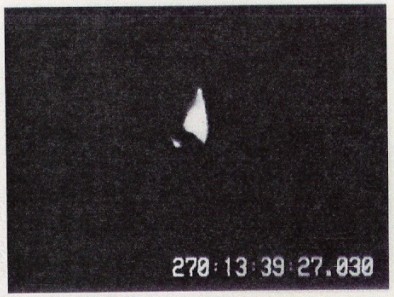
19 TOTAL HOVER TESTS



7 TOTAL LEAP FLIGHTS

Related Technologies

- BP
- SBI
- EKV
- GBI
- AIT
- LEAP
- GREMLIN
- SAGITAR



NOSECONE EJECTION

LEAP DEPLOYMENT

NTW_LEV2.CDR
121696

THEATER AIR DEFENSE
TAD
PROGRAM EXECUTIVE OFFICE

BMDO - NAVY LEAP PROGRAM

THEATER AIR DEFENSE

Program Objective

Demonstrate LEAP Can Be Integrated with a Tactical Missile for Exoatmospheric Theater Ballistic Missile Defense

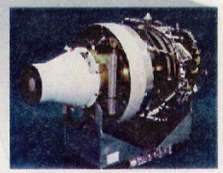
Advanced Solid Axial Stage

Attitude Control

ARIES Target

Leap Vehicle

Hughes KKV



Rockwell KKV

Nosecone Assembly

3rd Stage

2nd Stage

Boost

Terrier-LEAP Missile

USS R.K. TURNER

Standard Missile / Shipboard Combat System

Concept Proven

4 Flight Tests; 2 LEAPs

- 3 of 4 STANDARD Missiles 75%
- 2 of 2 ASAS Kick Stages 100%
- 1 of 2 LEAP KKVs 50%

LEAP TECHNOLOGIES SPACE TESTED AND INTEGRATED WITH STANDARD MISSILE

LEAPPROG(1).CDR
112296

LEAP Experimental Flight Test Record

LEAP 1 & 2 and FTV III & IV

Demonstrated to varying degrees:

• Exo-atmospheric flight and simulations	4 of 4
• Warhead deployment	3 of 3
• Target track/filter performance	2 of 2
• Fire control performance	2 of 2
• Weapons control performance	2 of 2
• Telemetry and uplink operation	2 of 2
• Missile airframe dynamics	2 of 2
• Third stage separation, propulsion, guidance & control	2 of 2
• GPS/INS performance	2 of 2
• Deliver warhead into engagement basket	1 of 2*
• Warhead acquisition and track of target	1 of 2**
• Warhead guidance, control and kinematics	1 of 2**
• Warhead intercept	0 of 2

* Cause of failure an anomaly in the Terrier Missile pre-launch initialization

** Most probable cause of failure suspected to be a short or wiring harness misconnect which prevented activation of the warhead battery

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Concept Evaluation and Integration Study

Aegis BMD

- **Chartered in March 1994 by PEO(TAD) to:**
  - **"define the technical approach and address the developments necessary to support near, mid, and far term sea based TBMD capability**
  - **"define associated ship, missile, and C2 technology and engineering trades**
- **Results:**
  - **Rigorous adherence to an evolutionary deployment approach for Navy TBMD:**
    - **Advocated evolving Area TBMD from existing AEGIS System, including SM-2 Block IV and existing BMC4I**
    - **Further evolution of AEGIS Area to achieve NTW**
  - **Concluded NTW defended area footprint had "an entirely different character" from any previously evaluated Army or Navy TBMD system**
  - **Found no obstacle to ABM treaty compliance for NTW**
  - **Recommended sensor netting, including Cooperative Engagement Capability, as a valuable targeting enhancement for TBMD**

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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO
Ser 00/4U500157
14 June 1994

MEMORANDUM FOR VICE CHIEF OF NAVAL OPERATIONS

Subj: NAVY THEATER BALLISTIC MISSILE DEFENSE (TBMD)

1. Navy is especially well positioned to develop Theater Ballistic Missile Defenses (TBMD) quickly aboard our AEGIS cruisers and destroyers. I am strongly committed to ensuring we rapidly deploy a robust TBMD capability based on the nation's prior investment in the AEGIS fleet, STANDARD missile and Navy command and control systems. I want to ensure we are fully engaged in all aspects of TBMD: Space based and airborne surveillance, Area (Lower Tier) defense, Theater Wide (Upper Tier) defense, Boost Phase/Ascent Phase intercept from ships or aircraft and Battle Management/Command, Control, Communications (BM/C3). At the same time, we should explore the potential for cooperation with western Pacific and NATO navies in deploying TBMD at sea. I consider Navy TBMD an urgent priority for the nation and our Navy.

2. You are directed to establish a robust TBMD organization within the Navy staff. We need the highest quality experienced people to lead this vital effort, backed up by promising young officers to grow expertise in this evolving mission area. Program sponsorship within my staff is assigned to the Director, Surface Warfare Division (N86), who will require an additional 10 billets to man properly a TBMD requirements branch. The Director, Theater Air Defense (TAD), will serve as the single officer responsible for all TBMD requirements and policy. Additionally, providing an additional 10 billets to the Ballistic Missile Defense Organization (BMDO) will increase Navy presence on that staff. This is a Navy-wide initiative requiring contributions by all.

3. We are in a unique window of opportunity for Navy to provide rapidly a critical contribution to the defense of our forces and allies overseas from attack by ballistic missiles. I want to move out and execute a ramp-up of our organization without delay.

J. M. BOORDA
Admiral, U.S. Navy

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TMD Comprehensive Analysis

- **Comprised of four efforts:**
  - **TMD C2 plan**
  - **TMD Commonalities Analysis**
  - **TMD Threat and Mission Priorities**
  - **TMD Capstone Cost and Operational Effectiveness Analysis (COEA)**
- **Required by FY 1994 Program Decision Memorandum**
- **Participants: BMDO, Joint Staff, Services**

Navy COEA Phase I

- Required by Navy Area TBMD FY94 Defense Acquisition Board (DAB) Acquisition Decision Memorandum (ADM)
- Chartered by Assistant Secretary of the Navy (Research, Development, and Acquisition)
- Purpose: Support Navy Area TBMD EMD Milestone
- Participants: Conducted by NSWC/Dahlgren
- Results (Question 1: Are both Navy Area and Theater Wide Programs required?)
  - Area TBMD is required
  - Combination of Area and Theater Wide provide best TBMD capability
    - Provides a robust / flexible defense in depth
    - Adds regional defense capability
    - Covers more critical assets more effectively
    - Extends threat coverage to longer range TBMs

Joint Staff TMD Program Review

- **Chartered in late 1995**
  - **To review and assess current and future systems**
  - **Prioritize candidate systems into effective and affordable architectures**
  - **Conducted by panel of four Service Four Stars (16 Star Panel)**
- **Findings**
  - **Lower tier first priority, PAC-3 and Navy Area**
  - **Continue development of multi-role systems capable of cruise and ballistic missile defense**
  - **Delay THAAD and NTW to mature at even pace — fly off in 2002-2003 timeframe**
  - **Refocus BMC4I. Recommended a vigorous approach to deploying netted, distributed systems. JCS tasked with providing an architecture**

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Blue Ribbon Panel

- **Chartered by: Director, BMDO and ASN(RDA) on August 4, 1995**
- **Purpose: To review alternatives and recommend the preferred approach to rapidly maturing Navy LEAP with an option for achieving UOES capability.**
- **Participants: General Welch, USAF (Ret), RADM Wayne Meyer, USN (Ret) plus four others**
- **Background:**
  - **In late FY95, Congressional interest offered the possibility of a significant funding increase with potential program acceleration.**
  - **While successfully demonstrating technology, none of the LEAP flights that included intercept as an objective (LEAP 2 & 3 and FTV-3 & 4) achieved an intercept**
  - **Two possible approaches for the next step:**
    - **Refly TERRIER LEAP, minimizing changes from previous flights to integrate to VLS (Hybrid LEAP)**
    - **Begin system engineering for AEGIS LEAP**
  - **Blue Ribbon Panel was to recommend the preferred approach**

Terms of Reference

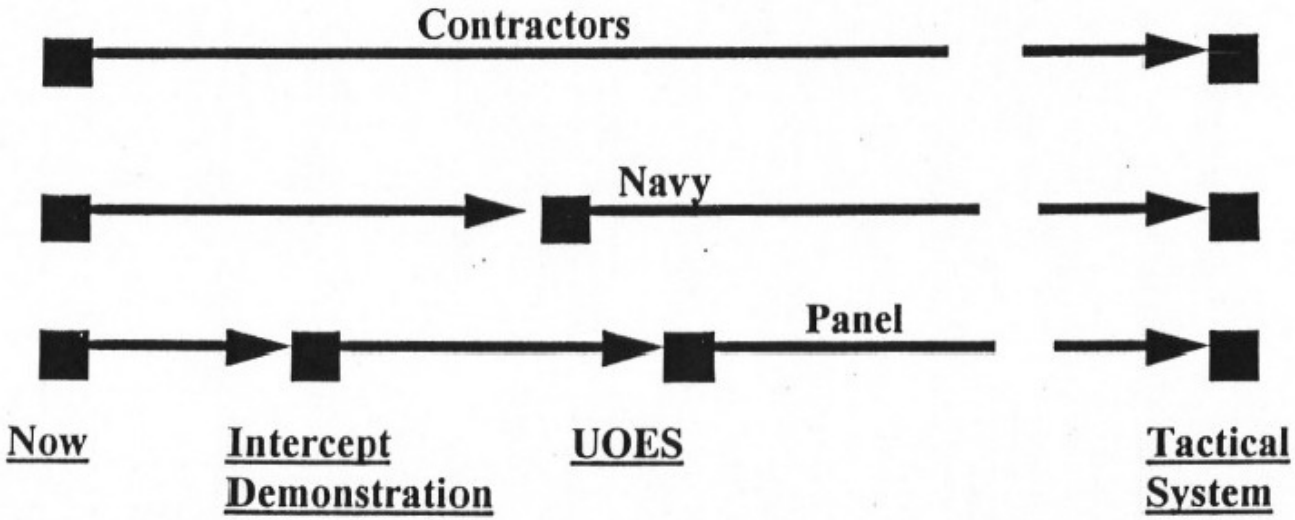
- Recommend an option for achieving a User Operational Evaluation System Capability. Develop a rigorous "apples to apples" comparison of alternatives.
- Address the following:
  - Has the LEAP experimental program to date validated the potential of a Light Weight KKV?
  - Has LEAP testing to date provided sufficient confidence to proceed to a UOES version of the eventual tactical system? If additional risk reduction experiments or LEAP testing is indicated, what should the nature of these tests be?
  - Assess the technical and programmatic risks associated with the alternatives proposed for proceeding to a Navy Theater Wide UOES system. Surface the technical trade-offs associated with proceeding directly to a tactical AEGIS LEAP system versus an interim flight test configuration.
  - What are the comparable costs and schedules for the alternatives to develop a Navy Theater Wide UOES capability? Are there steps which can be recommended which will achieve cost savings and/or improve the schedule for any of the alternatives proposed.

LEAP Risks

- For either approach
  - KKV end game performance
  - Integration with SM-2 Blk IV and Aegis system
  - Exo-atmospheric performance of SM-2, Blk IV
- For Hybrid LEAP
  - Reliability and integration issues associated with intercept failures
- For Aegis LEAP
  - Repackaging & miniaturizing the warhead
  - Dual pulse ASAS

A successful intercept demonstration program is essential to engineering risk reduction for either approach

Differences in Program Focus



- An intercept demonstration program needs to be a required milestone.
- Industry and the Navy need to focus near term risk reduction intensely on meeting well defined UOES requirements
- Features not essential to the intercept demo program and/or the UOES should be deferred, e.g.,2-color seeker, aim point selection, kill enhancement

Recommended Course of Action

- Ratify the concept of sequential program objectives -- Intercept Demonstration Program -- UOES -- Tactical System as the engineering development path for AEGIS LEAP.
- Support Option 2 -- AEGIS LEAP -- as the best approach to intercept demonstration and deploying an operationally capable UOES enroute to a ship-based Theater-Wide Ballistic Missile Defense Tactical System.
- PEO(TAD) should:
  - Prepare a plan to execute Option 2. Include an intercept demonstration program (physical intercept) before proceeding to UOES.
  - Submit budgetary requirements for a robust program to achieve UOES as soon as practicable.

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5.3.1 M1 = M2

In early March 1996, work was done and presented to PEO-TAD that was intended to address the questions related to system performance balance between Aegis and SM-3 and the question of the differences between the ALI demonstration and UOES.

One of the principal difficulties in performing engineering for SM-3 and Aegis was understanding exactly the requirements set to which the missile and Aegis were to be modified or designed. Accordingly, a proposed set of definitions was identified (Table 5-4).

Table 5-4 Missile Configuration Definitions

Attribute	M1 (for ALI demonstration)	M2 (for UOES)
Vbo	3.5 km/sec	Same
Design weight	3265.7 lb	Same
KW weight (full)	40 lb	Same
TSRM	Dual pulse (50/50 split)	Same
IR seeker	LWIR single color	Same
Minimum unshroud/ intercept altitude	92 km/110 km	Same
Aimpoint	IR image centroid	Selectable aimpoint
Discrimination	Celestial objects	Main body/RV
Target/Threat	Nonseparating (Aries)	Separating

The M2 would be the same hardware configuration as M1, but the additional capability (i.e., discrimination and aimpoint) would be enabled by software changes (primarily in the KW). M3 would be a 4.5-km/sec Vbo missile with more compatibility in the KW.

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SMCo

- Due to "urgency" and limited funds coming out of LEAP, PEO(TAD) desired to avoid a competition
- The competitors were urged to form a joint venture, and select the best of breed components to develop the SM-X (later SM-3)
- SMCo
  - Joint venture of Hughes and Raytheon
  - Round design agent for SM-3
  - KW was a separate subcontract from SMCo to a Hughes / Boeing team and Thiokol for the DACS
  - Third stage was contracted to Thiokol
  - First and second stages used existing (except the Mk 72 was not really in production, and later became a production limiter)
- SMCo was short lived before Raytheon purchased Hughes from GM, subsumed SMCo, and moved the missile teams to the desert.

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Ballistic Missile Defense Program Review

Aegis BMD

- **Chartered by USD(A&T) on August 22, 1995**
- **Purpose: Develop and evaluate program alternatives and associated funding for TMD, NMD, and supporting technology programs, taking account of FY96 Congressional action, program status, and changes since the Bottom-up Review**
- **Participants: OSD, Joint Staff, BMDO, Services**
- **Results Briefed in March, 1996**

BMD Program Review

Aegis BMD

- **Results:**
  - **Added $150M over FYDP for Navy Area**
  - **Increased NTW funding by $600M over FYDP**
  - **Slowed spending on THAAD to focus on risk reduction. Reduced THAAD funding by $2B over FYDP**
  - **(Recommended fly-off between NTW and THAAD)**
  - **Increased focus on BMC4I, with additional focus on cruise missile defenses**

- **Priorities:**
  1. **Area / Lower Tier Systems**
  2. **Theater Wide / Upper Tier Systems**
  3. **NMD**
  4. **Technology Base Development**

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Navy COEA Phase II

- **Required by**
  - **Navy Area TBMD FY94 Defense Acquisition Board (DAB) Acquisition Decision Memorandum (ADM), and**
  - **Ballistic Missile Defense Program Review**
- **Chartered by Assistant Secretary of the Navy (Research, Development, and Acquisition)**
- **Purpose:**
  - **Support Navy Theater Wide DAB Review**
  - **COEA will recommend the preferred material alternative for the Navy upper-tier mission**
- **Participants: Conducted by NSWC/Dahlgren**
- **Results:**
  - **In progress**
  - **Final Oversight Board expected in July 1998**
  - **Final report expected by NTW DAB Review in second quarter FY98**

Navy Theater Wide Assessment

- Chartered by PEO(TAD) on August 2, 1996
- Purpose: A thorough assessment of the NTW program to produce a plan to accelerate, to the maximum extent possible, the deployment of a credible NTW TBMD system.
- Participants: Navy, Government Labs, Industry Contractors
- Results: Generated a Flight Demonstration Program / AEGIS LEAP Intercept option that:
  - achieves an earlier intercept
  - has an event-driven schedule
  - has sufficient test articles (missiles and targets)
  - has a more deliberate test program
  - Invests in key Theater Wide program risks

Navy Comprehensive TBMD Program Review

Aegis BMD

- **Chartered by SECNAV AND CNO ON 29 OCT 96**
- **Purpose:**
  - **Conduct a Comprehensive Review of Navy TBMD programs and present a plan to accelerate deployment of the AREA and THEATER TBMD systems.**
- **Participants:**
  - **OPNAV staff, SECNAV staff, BMDO staff, PEO(TAD), PEO(SC/AP), JHU/APL, NSWCDD, LM/GES, SMCo**
- **Results:**
  - **An acceleration plan has been briefed to the OPNAV, SECNAV and BMDO staffs.**
  - **Individual acceleration recommendations are being reviewed for implementation.**

Comprehensive Program Review

Aegis BMD

- **Results:**
  - **Reaffirmed evolutionary approach**
  - **Reaffirmed commitment to deploy NTW expeditiously**
  - **Endorsed ALI program**
  - **Established Cruiser Modernization Program, reprioritized $1B**
  - **Directed Area TBMD programs to be forward fit in DDG51 Class**
  - **Identified two Linebacker ships to accelerate deployment of Navy Area**
  - **Recommended upgrades at PMRF**
  - **Recommended identification of an AEGIS Cruiser as TBMD test ship**
  - **Allocated SM-2 Block IV missiles to support TBMD testing**
  - **Recommended conversion of excess Terrier missiles for targets**
  - **Recommended funding for early BMC4I upgrades, including CEC**
  - **Endorsed establishment of an AADC prototype demonstration and test facility**
  - **Recommended merging AEGIS and TAD to streamline engineering and acquisition**
  - **Established Navy-wide priority and value of deploying TBMD at a rapid pace**

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Quadrennial Defense Review

Aegis BMD

- **Required by: Military Force Structure Review Act (National Defense Authorization Act for Fiscal Year 1997)**
- **Purpose: A fundamental and comprehensive examination of America's defense needs from 1997 to 2015. The QDR is intended to provide a blueprint for a strategy-based, balanced, and affordable defense program.**
- **Participants: OSD, Joint Staff, Military Services, and Commanders in Chief of the Combattant Commands**
- **Results:**
  - **…restructure of THAAD … allow us to explore increased commonality between the interceptor missiles and kill vehicles used in THAAD and the Navy Theater Wide system.**
  - **… reaffirmed our approach to the high priority PATRIOT Acvanced Capability - 3 and Navy Area Defense lower tier systems, Navy Theater Wide upper tier system…**
  - **(Report of the QDR Section VII: Transforming U. S. Forces for the Future)**

Upper-tier Commonality Study

- Chartered by Quadrennial Defense Review
- Incorporates prior JSET efforts resulting from BMD Program Review
- Purpose: Explore a common upper-tier interceptor / kinetic kill vehicle as elements of the TMD Family-of-systems architecture for the 2005-2010 timeframe to identify potential cost savings and technology risk reduction
- Participants: BMDO, Services, Joint Staff
- Results:
  - Initial results expected by 30 June, 1997
  - Final results expected by second quarter FY98

Commonality Alternatives System Study

Aegis BMD

- **Third study along this line:**
  - **1992 THAAD - AEGIS Compatibility Study**
  - **1994 AEGIS - THAAD Commonality Study**
- **Results:**
  - **Reaffirmed Army's technical approach to THAAD and Navy's technical approach to LEAP**
  - **THAAD variants did not meet Navy ORD requirements**
  - **NTW variants did not meet Army ORD requirements**
  - **Strongly urged development of both systems, both required by military necessity, develop without interruption or delay**
  - **Recommended programs be structured to allow for "block upgrades"**
  - **Endorsed continued development of two Kinetic Kill Vehicles as a wise hedge**

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Acquisition Strategy

- Minimum visibility to date → No Acquisition Strategy IPT (Insight Issue)
- PEO(TAD) prefers evolutionary approach
  - Key lies in definition of the Block I: Is it a UOES in all but name or a deployable tactical system?
  - The minimal information available indicates PEO(TAD) desire to acquire Blk I with RDT&E funds, therefore Blk I would have UOES-like restrictions
  - Deployable, tactical capability must utilize Procurement funds and complete Operational Evaluation
- PEO has directed that the SAMP not exceed ten pages
  - BMDO / OSD cannot understand how ten pages can cover the required information
- Acquisition Strategy approval required prior to Milestone Review by DoD 5000.2-R
  - Did ALI Acquisition Strategy point paper replace for this review?
  - Reasonable assumption as no new contract expected based on the DAB Review
- Dr. Schneiter publicly commented on NTW AS at the PEO-SYSCOM conference:

  Have Navy reveal their acquisition strategy by end of this month (i.e., October)

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Budget History PB93 - BES 99

Aegis BMD

NTW Budget History

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total Program	Delt OSD/BMDO
BMDO PB 95	31,500	80,000	17,725	30,590	33,400	36,510	39,145					268,870	
Congressional			+57,275										
Delta PB96 - PB95				-148	0	-36,510	-39,145						-75,803
BMDO PB 96	31,500	81,000	68,450	30,442	33,400	0	0	0	0			244,792	
Congressional				+170,000									
Delta BMD PR - PB 96					+26,600	+100,000	+150,000	+150,000	+175,000				+601,600
BMD Program Revie	31,500	81,000	75,000	200,442	60,000	100,000	150,000	150,000	175,000			1,022,942	
Delta PB 97 - BMD PR					-1,829	-3,774	-6,705	-7,788	-10,336				-30,432
BMDO PB 97	31,500	81,000	75,000	194,565	+58,171	96,226	143,295	142,212	164,664			986,633	
Delta POM 98 - PB 97						0	0	0	0				0
BMDO POM 98	31,500	81,000	75,000	200,442	58,171	96,226	143,295	142,212	164,664	153,004	157,058	1,302,572	
Delta BES 98 - POM 98						0	0	0	0	0	0		0
BMDO BES 98	31,500	81,000	75,000	200,442	58,171	96,226	143,295	142,212	164,664	153,004	157,058	1,302,572	
Congressional					+246,000								
Delta PB 98 - BES 98						+98,672	+48,778	+49,017	+26,266	-7,814	-7,614		+207,305
BMDO PB 98	31,500	81,000	75,000	200,442	304,171	194,898	192,073	191,229	190,930	145,190	149,444	1,755,877	
Delta POM 99 - PB 98							+2,077	-598	-2,617	-1,533	0		-2,671
BMDO POM 99	31,500	81,000	75,000	200,442	304,171	194,898	194,150	190,631	188,313	143,657	149,444	1,753,206	
Delta BES 99 - POM 99													
BMDO BES 99	31,500	81,000	75,000	200,442	304,171	194,898	194,150	190,631	188,313	143,657	149,444	1,753,206	
Congressional						+215,000							
Reductions						-15,484							
Current Program	31,500	81,000	75,000	200,442	304,171	394,414	194,150	190,631	188,313	143,657	149,444	1,952,722	
Total													**+699,999**

Outline

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NTW "OR" Ship Capability Options

Navy Theater Wide (NTW) Assessment Team

CAPT Charlie Hamilton
CAPT Dave Hammer

May 1999

Navy Theater Wide (NTW) Deployment Strategy

Develop a Comprehensive and Robust Program Strategy for Deploying the NTW Capability

- **Address**
  - NTW Block I capability deployed NLT FY2007/"OR" ship
  - PBD 224C direction provided by OSD and BMDO
  - Baseline computer program point of departure
  - ORD compliance
  - Which AEGIS cruisers for NTW Block I/Block II?
  - CG Conversion drivers/coupling
  - US/Japan cooperative development
  - An NTW test cruiser
  - Navy Radar and Standard Missile roadmaps

First Task

RADM Paige Tasker:

- Focus on assessment of "OR" single-mission ship capability for NTW Block I
- Provide a 30-day report:
  - Assess the risk, performance, schedule and cost of "OR" ship approach relative to the NTW Block I Program of Record
  - Address and assess areas of non-compliance with the ORD

DDR&E/BMDO:

- Address the "OR" ship questions in letters from DDR&E dated 22 Oct 98 and BMDO dated 10 Mar 99

USD (A&T):

- Provide a single-mission feasibility study within 30 days as directed in the NTW ADM dated 04 May 99

Second Task

RADM Paige Tasker:

- **Develop comprehensive and robust program strategy for development and deployment of NTW capability to include:**
  - **Both Blk I and Blk II Systems**
  - **Assessment of alternative development strategies**
  - **Related OSD and BMDO Upper Tier guidance**
  - **Related Surface Navy objectives**
  - **Consideration of new paradigms for doing new business**
- **Strategy must be well engineered, easily understood…consider political business and economic factors**
- **Consider relational implications and impact of:**
  - **PBD 224C direction by OSD and BMDO**
  - **Dr. Mark's "OR" ship proposal**
  - **AEGIS Cruiser Conversion Program**
  - **Radar and Missile Roadmaps**
  - **Japanese Cooperative Development**
  - **Need for NTW Test Cruiser**
  - **AEGIS Cruiser candidates and integration issues for Block I and Block II Systems**
  - **ORD Compliance**

Our Assumptions for NTW Block I

1) Funding for FY99-01 is fixed (PBD 224C)
2) SPY-1B radar without adjunct radars
3) AEGIS ship
4) FUE capability is 1 ship + 5 SM-3 missiles NLT FY2007
5) NTW Blk I fielding plan = 4 ships + 80 SM-3 ~2007–2011 (Appx D of SAMP)
6) M-9 is most demanding NTW Blk I threat
7) ALI remains on schedule
8) Sufficient funds available following FY00 USD (A&T) Upper Tier decision for FY07 FUE
9) No unique SM-3 missile changes to support "OR" capability
10) 6[III computer program CPAP is between 09/01 and 12/02

Our Assumptions for NTW Blk II

- Sufficient funding will be available for Blk II development
- FUE = 2012
- Fielding plan = 8 ships + 400 SM-3 Blk II (NTW ORD)
- AEGIS cruisers for Blk II system
- Japan/US TBMD Cooperative Development Program is start of required system engineering
- Significant radar enhancement required to meet threat drivers and effort is incorporated in Radar Roadmap
- Wide trade space for development of TBMD combat system and missile to meet ORD requirements

Block I Performance (Navy)

ACQUISITION PROGRAM BASELINE	OBJECTIVE	THRESHOLD
• DAB Program Review	APR 99	MAY 04
• Milestone II (BLK I) Review	NOV 03	MAY 04
• BLK I DT/OT		
– Start	FEB 06	AUG 06
– Complete	APR 07	OCT 07
• Milestone III	JUL 07	JAN 08
• FUE BLK I	SEP 07	MAR 08

"OR" Ship Options Maintain. . .

- Situational awareness
  - SPS 49 air search radar
  - SPS 73 surface search radar
  - AN/SLQ-32 (V) 3
  - SPQ-9B (horizon search)
  - IFF
- Self defense response
  - Air control and STAND-ALONE CIWS, GWS, CHAFF, SLQ-32 HWS, and Over the Side Torpedo (OTST)
  - Stand-alone TLAM after VLS certification
- "OR" achieved through program load swap out
  - Change out estimated at 10-20 minutes

NTW Assessment Team's "AND", "OR", "ONLY", "FUE" Definitions

- "AND" – Simultaneous multiwarfare mission capability including NTW and AREA TBMD. One program load.
- "OR" – NTW mission or Area TBMD/AAW/multiwarfare missions. NTW cannot be performed simultaneous with any other missions. Two program loads.
- "ONLY" – NTW ("exo" TBM intercepts) mission only. Equipment changes preclude performance of traditional missions. One NTW program load.
- "FUE" – First unit equipped is ship installation plus successful conduct of DT/OT.

6[III As The Point of Departure

- Lowest risk computer program development path
- Employ commercial technology adjunct processors to enhance AN/UYK-43 computers (SPY, C&D, and WCS)
- LSTP provides adjunct signal processor integration path
- Improved SPY processing and narrowband discrimination
- Cruiser Conversion AWS baseline
- Includes Area TBMD (lower cost, less schedule risk)

Why Not an Adjunct Radar to SPY for NTW Blk I?

- Ship integration efforts add risk to NTW Blk I (Radar Roadmap confirms)
- THAAD program GBR radar EMD Radar ground test FY05 to FY07, LRIP radar delivery FY08
- Development and integration timeline does not support FUE 07
- New start with attendant DoD INST 5000.2 administration
- Adjunct radar currently funded annually with no POM'd follow-on funding
- Adjunct radar being considered for Blk II task

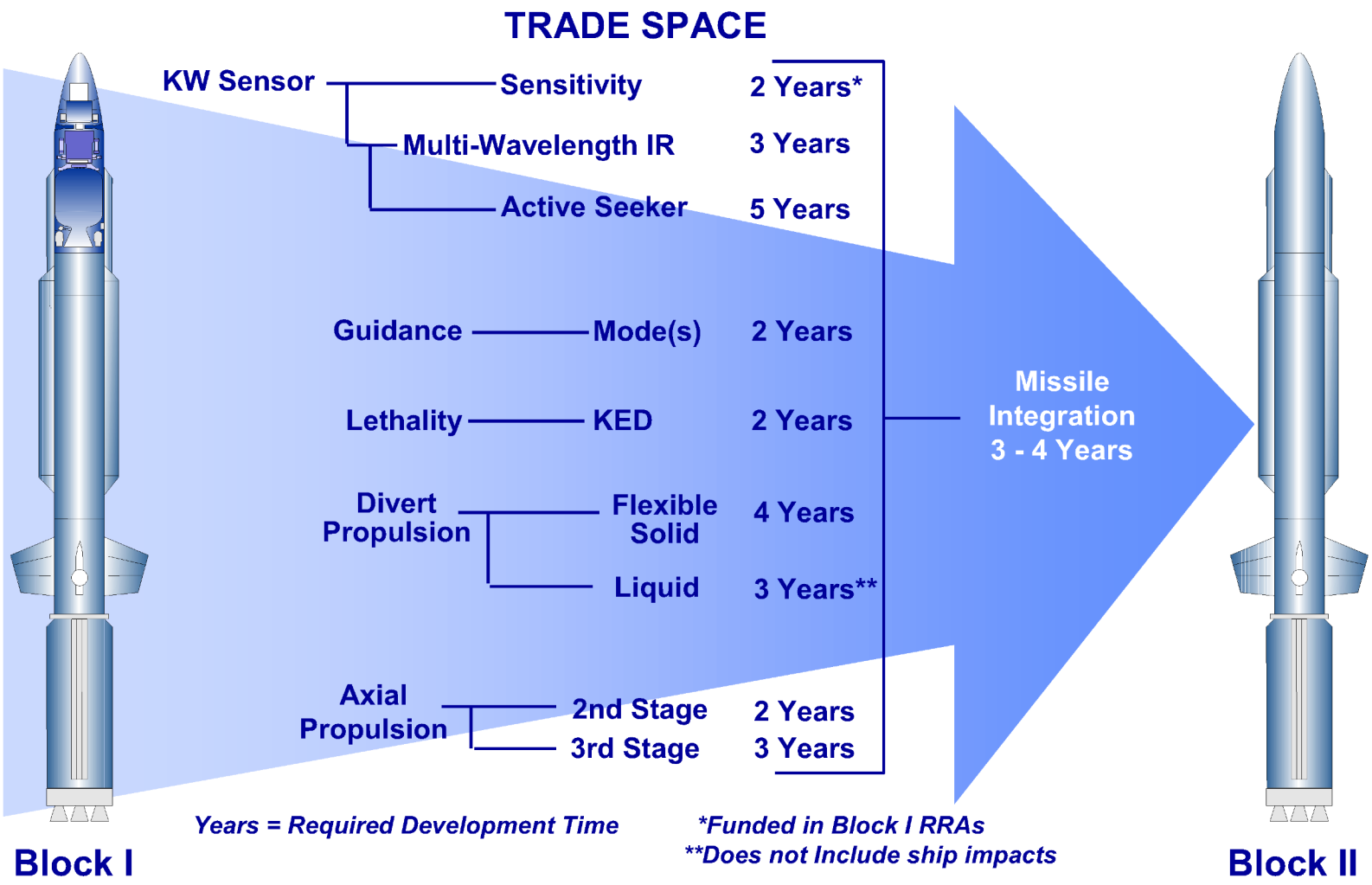
Summary of Options

	Legacy Equipment	NEW COTS Equipment
NTW Dedicated Subsystem	**Option 1** Replace AAW with NTW capabilities OR with (virtual) disk pack swap Overwrite non-TBMD code as needed Lowest risk, dead end option DT 1B+ capability **1/06** FUE capability **12/06** "AND" capability **N/A** Cost phasing: **Releases significant resources** Reuse/SLOC "OR" complexity **90%**	**Option 4** Dedicated NTW data processor Rehost interfaces to radar/VLS Rehosts existing related 6[III CP Results in COTS NTW architecture "OR" grows into complete COTS "AND" DT 1B+ capability **8/07** FUE capability **8/08** "AND" capability **3/10** Cost phasing: **Requires additional resources** Reuse/SLOC "OR" complexity **85%**
Integrated Multimission (Regression Testing Postponed)	**Option 2** Build "AND" capability Begins with OR capability "AND" capability in FY09 Reduces risk by extending schedule DT 1B+ capability **6/06** FUE capability **9/07** "AND" capability **FY07** Cost phasing: **Releases some resources** Reuse/SLOC "OR" complexity **95%**	**Option 3** Dedicated NTW adjunct data processor Captures command and control interfaces First step partial rehost of existing related 6[III CP to COTS NTW arch DT 1B+ capability **10/07** FUE capability **10/08** "AND" capability **6/09** Cost phasing: **Releases negligible resources** Reuse/SLOC "OR" complexity **110%**

Recommendations

- If the desire is to field an NTW Block I "OR" capability as soon as feasible, select Option 1.
- If the desire is to reduce schedule risk and provide a viable plan to an NTW "AND" Block I capability, select Option 2.
- If the desire is to reduce technical and schedule risks associated with fielding an NTW Block II capability while still achieving an NTW "OR" capability no later than 2007, select Option 1 and invest the significant released resources to NTW Blk II COTS Open System architecture starting FY02.

Standard Missile-3 Roadmap



Japan/U.S. Cooperative Program:
Four Phases

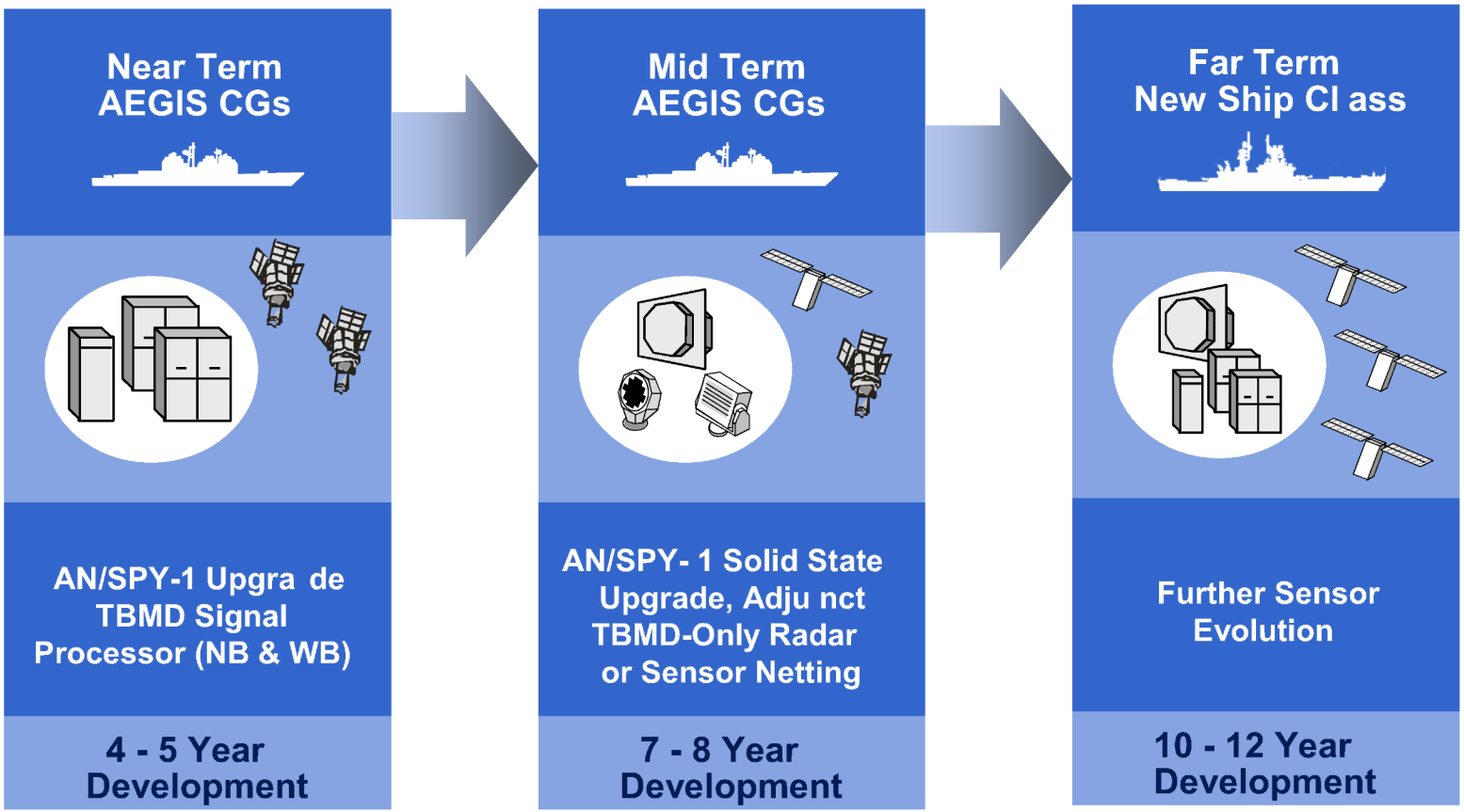
- **Requirements Analysis and Design***
  - Requirements-Based System Engineering Approach
  - System Concept Exploration and Guideline Development
    - System Concept: Ship, Missile, Battle Management
    - Preferred Missile and Component Concepts
    - Component Development Guidelines

System Functional Review

Missile Preliminary Design Review

  - Preliminary Design
    - PIDS/CIDS for Missile
    - Missile Component Specifications & Design Packages
    - Demonstration and Validation Phase Plan
- **Demonstration and Validation***
  - Rigorous Ground Test: Functional, Environmental, Performance
    - HIL
    - Hover
    - Captive Carry
  - Two Propulsion Test Vehicle Flights
  - At Least Five Flight Tests from U.S. and JMDSF AEGIS Ships
- **Engineering and Manufacturing Development**
- **Production**

Sensor Roadmap



NEAR AND MID TERM SENSOR INVESTMENTS REDUCE RISK FOR FAR TERM SOLUTION

ORD Derived NTW Blk II Radar Requirements for the AEGIS Weapon System

Quick Look Answer

Requirements Drivers for Blk I to Blk II Improvements	
Radar Range Requirements Double	**12 dB**
Threat Complex RCS Decreases	**5–10 dB**
Required sensitivity improvement from Blk I to Blk II	***17–22 dB***

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NTW EVOLUTIONARY STRATEGY

THEATER COMBAT SYSTEMS

AEGIS LEAP Intercept (ALI)

Target

- ARIES

SM-3

- Single Color IR Seeker
- Solid DACS
- Dual Pulse Third Stage

AEGIS Weapon System

- Minimal Demo Capability
  - —Supports Scripted Scenarios
- External Cues
- Area Detection and Tracking
  - —400-500 Km

NTW Block I

Preponderant Threat

- SCUD-C, NO DONG, M-9
- Separating Threats ≤ 1,000 Km
- Natural Associated Debris
  - —Deployment Hardware
  - —Major Objects (Boosters, ACM)

SM-3

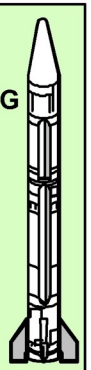
- Balanced RF/IR Debris Discrimination Capability

AEGIS Weapon System

- Balanced RF/IR Debris Discrimination Capability
- Ascent Phase Capability
- Theater Cueing

NTW Block II

Future Threat



- NO DONG, CSS-5, TAEPO DONG
- Separating Threats ≥ 1,500 Km
- Natural Associated Debris
  - - Solid Fuel - Chuffing/Thrust Termination
- Intentional Countermeasures

SM-3

- Improved Discrimination
- Advanced Seeker
- Integrated Guidance
- Lethality Enhancement
- Improved Propulsion (Divert, Axial)

AEGIS Weapon System

- High Power Discrimination
- AADC BMC4I

OPTIMUM NTW EVOLUTIONARY STRATEGY

THEATER COMBAT SYSTEMS

THREAT EPOCH I

AEGIS LEAP Intercept (ALI)

Target

- BMDO ARIES Target

AEGIS Weapon System

- Demo Capability
  - Supports Scripted Scenarios
- Ascent and Descent Intercepts

SM-3

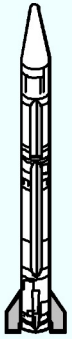
- MK 142 Kinetic Warhead IR Guidance
- MK 136 Third Stage Rocket Motor
- MK 104 DTRM
- MK 72Booster

GOAL: HIT THE TARGET

Capability 1 (C1)

Threat

- Preponderant 04-08
- Unitary / Simple Separating / First Generation Complex Separating
- Unintentional Counter Measures
- Medium Range



Weapon System

AWS 701
SPY + CSP
Single Mission VLS GPS Cannister Mods

BMC4I
LINK 11 / 16
DSP / SBIRS-HI

SM-3

- Producibility Improvements
- KW - MK 142 Mod X
  - 2 Color Seeker
  - All Reflective Optics
  - Adv DACS
- Lt Wt Nosecone

GOAL: CAPABILITY SOONEST

THREAT EPOCH II

Capability 2 (C2)

Threat

- Likely 09'-12'
- Known Complex Separating
- Intentional CM
- Medium - Long Range

Weapon System

AWS
Open Arch
+15dB Radar Sensitivity Upgrade

VLS - LtWt Canister
BMC4I
- Expanded AWS / MSL Links
- CEC Cues
- SBIRS - Hi/Lo Remote

SM-3

- Upgraded Axial Propulsion
- ADV KW MK X Mod X

GOAL: EVOLVE CAPABILITY

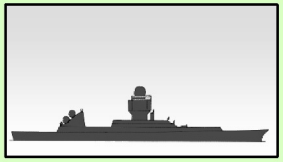
THREAT EPOCH III

Capability 3 (C3)

Threat

- Advanced 13 +
- Complex Separating +
- Sophisticated CM
- Long Range With Larger Operating Area

Next Generation CG



Next Gen Wpn Sys
W/ Open Architecture

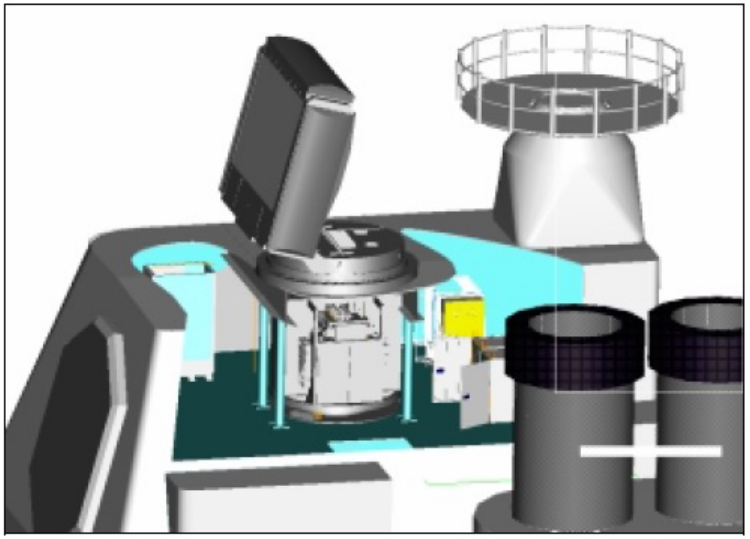
- TAMD Radar Suite
- VLS - No Change
- BMC4I
  - Direct SBIRS - Hi/Lo

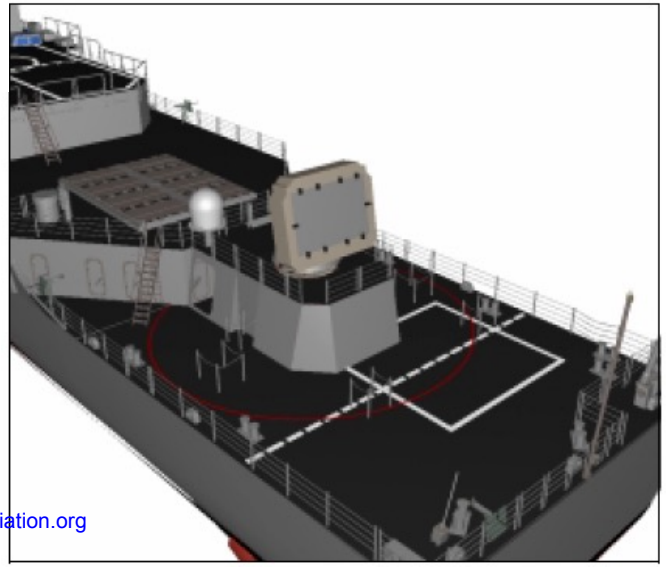
SM-3

- KW Mods to Pace the Threat

GOAL: NEXT GENERATION (PACE THE THREAT)

High Power Discriminator





Chronology of Navy Direction on NTW Development

- *September 1998:* **Execute NTW Block I Program of Record (POR) FUE in FY2007**
  - **SRR conducted March 1999**
- *February 2000:* **Execute evolutionary NTW Block I Spiral Development TBMD program**
  - **Block IA: Develop limited exo-atmospheric NTW capability in one cruiser as soon as possible**
    - **IPR (SDR like) conducted December 2000 (Block I SRD APP F)**
  - **Block IB: Make radar improvements (TBMD only CSP Adjunct) to extend to SRD compliant but single mission capability in two cruisers**
  - **Block IC: Further extend into multimission capability in four cruisers**
- *February 2001:* **Collapse spiral programs to an NTW 06 Contingency program meeting Block IB capabilities above but built off Cruiser Conversion Baseline 7 Phase IC**

Chronology of Navy Direction on NTW Development (Continued)

- *Fall 2001 Navy Direction*: **Develop an NTW 04 Capability and perform NTW Risk Reduction**
  - **NTW 04 Capability defined at December 2001 IPR**
- *Spring 2002 Navy Direction*: **Develop SMD Block 04 Testbed with ability to maintain FM-11 (3/05) flight test schedule while delaying original tactical transition scope effort to future when FY 02 funding reduced as well as continue Risk Reduction with reduced funding**
- *Current Navy Direction:* **Given Capabilities listed in Block 04 TCS dated September 2002 develop, Block 04 Program that can support intercept of simple separating target on range in Spring of 05 and meet as many as possible TCS capabilities by end of the Block 04 timeframe (end of 05) given funding available in FY 03 as well as continue Risk Reduction efforts**

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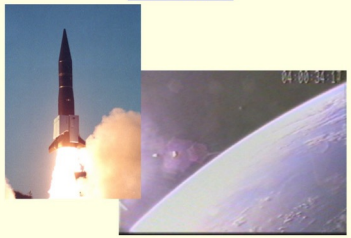
Dead Reckoning Trace: CY2002

- **With establishment of MDA and block approach**
  - **MDA / USN discussions focused on Baseline 1 Cruisers, the BMD Test Cruiser, and converting Destroyers for LRS&T**
  - **Another focus was on '04c program**
    - **Block 2004 Capability**
    - **Similar to current BMD 3.1 / SM-3 Block IA**
  - **Early missile configuration enabled by:**
    - **Cancellation of Navy Area**
    - **Completion of ALI exit criteria**
    - **Freed assets to develop current SM-3 Blk I**
  - **04c missile renumbered to SM-3 Blk IA**
- **Many plan options shown during year**
  - **Almost baselined Apr 02,**
    - **Approved by AT&L late Apr, followed next day by complete replan, but set strategy of moving contracts to 452 control**
  - **Lt Gen Kadish emphasized that reviewing options was not direction to change program plan**

NEW SEA-BASED MIDCOURSE DEFENSE (SMD) STRATEGY

TODAY
Aegis LEAP Intercept (ALI)

Target



- SCUD-like

Aegis Weapon System

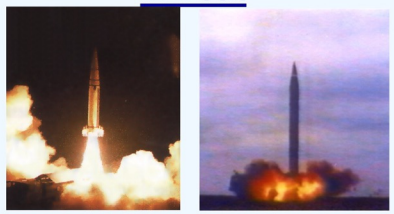
- Proof of Concept

Developmental SM-3

- Hit to Kill Kinetic Warhead

2004 ALI CONTINGENCY

Threat



- SRBM / MRBM

Aegis Weapon System

- Regional Defense

Tactical SM-3

- Discrimination Enhancements

FUTURE

Threat

- MRBM / ICBM

Weapon System

- Global Defense

Advanced Missile

- Evolved Missile Capability

As Presented to the Honorable Gen Nakatani, 22 Jun 01, and the Honorable Ichiro Fujisaki, 10 Aug 01

Dead Reckoning Trace: Funding Baseline

Aegis BMD

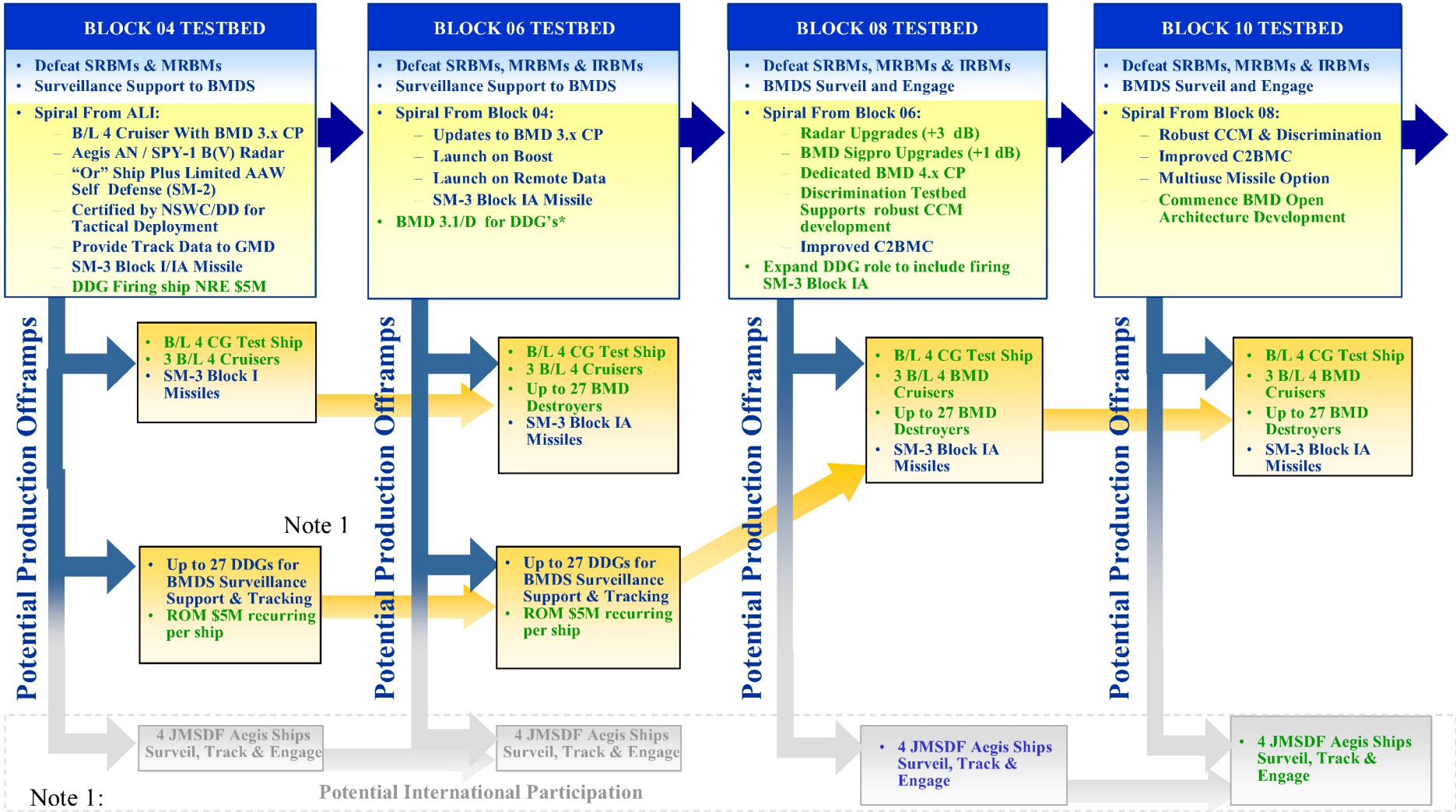
- **MDA / USN reached agreement by late 2002:**
  - **Stop focus on Baseline 1 conversion as a BMD exclusive ship**
  - **Transfer Baseline 1 funds to USN ($666M across FYDP)**
  - **USN to provide USS LAKE ERIE as continued BMD Test Ship**
  - **Outfit Cruisers and Destroyers for BMD**
  - **Provide SM-3 Inventory**
- **Funds returned to AEGIS BMD program line for**
  - **Cruisers Upgrades**
  - **12 Destroyer Upgrades, three previously funded**
  - **FY04-05 missiles, partial for FY06**
- **Funding baselined 10 Dec 02**
  - **Signed by Rob Snyder, Mr. Altwegg, RADM Paige, CAPT Grant**
  - **Rob Synder, in an unusually good mood, added $200M each FY08/09 as a starting point for Block 2008**
- **Program directed to return 12 Dec 02 with updated Program Plan**

NAVY PROPOSAL FOR NEAR TERM TESTING AND DEPLOYMENT OF BMD CAPABILITY

– 15 NOV 02 –

- **"LAKE ERIE – Committed now to MDA as Test Ship"**
  - Navy to retain funding responsibility for O & S costs (Fleet Fuel, OPTAR, OMN, MPN)
  - Ship to remain within Navy's operational structure for maintenance, personnel matters
  - Ship OPCON remains unchanged - caveat MDA does scheduling, in coordination with Fleet schedulers
- **"MDA BMD Test ship $ (POM 04) transfers to Navy to apply to Cruiser Conversion Aegis B/L 1 cruisers for Navy force structure needs"**
  - BMD Weapon System development costs included in MDA POM 04 submission for test ship
  - MDA needs to retain some of this funding to execute this plan.
- **"Buy 100 SM-3s starting in 03 (MDA $, or transfer)"**
  - MDA's FY03, POM 04 submission and request to OSD puts MDA on Track
- **"Complete/continue SM-3 development and testing (MDA $)"**
  - Planned
- **"Invest $ to convert 20 5.3.8's to LAKE ERIE Capability (MDA)"**
  - 15 DDGs in MDA POM 04 submission & request to OSD for Surveillance & Tracking (Weapons firing capability and the BMD signal processor needs to be added)
  - Three additional cruisers are also candidates for "LAKE ERIE Capability"

BLOCK CAPABILITY EVOLUTION (REVISION BASED ON NAVY PROPOSAL)



ROM Cost for upgrading to engagement capability for 20 DDG's

~ $5-10M Non recurring weapon system development

~ $55M Recurring equipment costs (in addition to $45m already budgeted for 15 Surveillance and Track ships. For total of $5M/ship equipment costs.

TEST CRUISER SPREAD
($ in Millions)

	FY03	04	05	06	07	08	09	Total
Aegis BMD	$384.6	576.2	880.4	693.3	831.0	489.0	445.0	4299.5
BMDS Augment	97.8							
"Test Cruiser" [1] Subset	-------	-------	191.0	250.0	378.0	131.0	116.0	[1] 1066.0
Budget without "Test Ship"	482.4	576.2	689.4	443.3	453.0	358.0	329.0	3331.3
Recommended:								
Navy share of "Test Ship" Subset			180.0	100.0	186.0	100.0	100.0	666
MDA share of "Test Ship" Subset			11.0	150.0	192.0	31.0	16.0	400
Resulting MDA/ Aegis BMD Budget	482.4	576.2	689.4	578.3	561.0	389.0	345.0	3621.3

Notes:

[1] Non-recurring weapon system development (≅ $800M) and conversion of 1st ship (≅ $250M)

AEGIS BMD BLOCK CAPABILITY EVOLUTION

ALI

BLOCK 04 TESTBED

- Defeat SRBMs & MRBMs BMDS Surveillance and Engage

- Spiral From ALI:
  - Aegis 5.3 Cruisers With BMD 3.1 CP
  - Aegis AN / SPY-1 B(V) / D Radars
  - "Or" Ship Plus Self Defense (SM-2)
  - Certified for Tactical Deployment
  - Provide Track Data to BMDS/GMD
  - SM-3 Block I/IA Missiles
  - Low-Exo Engagement Capability
  - Aegis 5.3 Destroyers with BMD 3.1 CP
  - Launch on TADIL-J

BLOCK 10 TESTBED

- Defeat SRBMs, MRBMs & IRBMs
- BMDS Surveillance and Engage

- Spiral From Block 04:
  - Aegis 5.3 Ships with BMD 4.0 CP
  - Integrate BMD SIGPRO
  - Robust CCM & Discrimination
  - Improved C2BMC
  - Launch on Boost
  - SM-3 Block IA Missiles

BUDGET AS OF 101530Z 10 DEC 02

		FY03	FY04	FY05	FY06	FY07	FY08	FY09	POM FY04-FY09
	Aegis BMD Appropriation	394.601							
	Less Aegis BMD Radar	-10.000							
	External Adjustments	-6.765							
	MDA Earmarks	90.100							
	Aegis BMD Allocation After Earmarks	467.936					+200	+200	
	Aegis Block 2004/06/08 (POM 04-09)		576.216	880.400	693.800	831.000	489.000	445.000	3915.416
	Less OSD PBD Transfer FY05-09			-180.000	-100.000	-186.000	-100.000	-100.000	-666.000
	Total Prior to Missile Defense Supplement	467.936	576.216	700.400	593.800	645.000	389.000	345.000	3249.416
Option 1	Add 10-20 sea based interceptors		120.000	154.000					
	Tactical Computer Program for Aegis Cruisers		6.000	2.000					
	Additional Five Interceptors			76.500					
	Integrate existing sea-based radars		24.000	24.000					
	Total	467.936	726.216	956.900	593.800	645.000	389.000	345.000	3655.916
Option 2	Buy Additional Missiles			180	100				280.000
	Total		726.216	1136.900	693.800	645.000	389.000	345.000	3935.916

Ad Astra

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FY 04 POM\POM DATA Breakdown 2\Aegis Funding Profile (v2 9 Dec).xls

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Dead Reckoning Trace: Program Baseline

- **Key components of 12 DEC 02 Plan:**
  - **Block 04 — focus on LRS&T and tacticalizing ALI**
  - **Block 06 / 08 —**
    - **Adding discrimination via BMD Signal Processor and missile improvements**
    - **Adding enhanced BMDS support (ESG terminology not yet prevalent)**
  - **Block 10 — focus on porting functionality to future Navy computing architecture**
  - **First deployable capability delivered at end of Block 2004**
  - **Did not have an IDO (9/30/04) delivery**
- **Lt Gen Kadish approved 12 DEC 02 plan**
  - **Highlighted need for missile inventory soonest**
    - **Repeatedly reemphasized, especially with Raytheon senior leadership**
  - **Subsequently alternated name of Block 06/08 from Discrimination Phase I / II to Counter-Counter Measure Support I / II, and back**
  - **Supported plan by prioritizing funds to help recover from FY03 Congressional reduction**
- **Direction to field IDO capability came after a "dramatic" Feb 03 Boeing / Raytheon EKV summit**

AEGIS BMD BLOCK PLAN STRATEGIC VIEW (FUNCTIONS & CAPABILITIES)

ALI

Proved Aegis LEAP Exo-Atmospheric Intercept Concept

BLOCK 2004

Tacticalize ALI + BMDS Surveillance

- Defeat SRBMs & MRBMs
- Surveillance Support to BMDS

- Spiral From ALI:
  - Aegis 5.3 Cruisers and 5.3 Destroyers with BMD 3.1 CP
  - Aegis 5.3 Destroyers with Surv 1.n
  - Aegis AN / SPY-1 B(V) / D Radars
  - "Or" Ship Plus Self Defense (SM-2)
  - Certified for Tactical Deployment
  - Provide Track Data to BMDS/GMD
  - Low-Exo Engagement Capability
  - Launch on TADIL-J
  - SM-3 Block I/IA Missiles
  - Operational Assessment

BLOCK 2006

Discrimination Phase I

- Defeat SRBMs, MRBMs & IRBMs
- Surveillance Support to BMDS

- Spiral From Block 04:
  - Updates to BMD 3.n CP
  - Discrimination Testbed Supports BMDS Surveillance
  - Synthetic WB Radar "Clip on"
  - "Open Loop" Discrimination with Prototype BMD SIGPRO
  - Launch on Boost
  - Launch on Remote Data
  - SM-3 Block IA Missiles
  - Certified for Tactical Deployment
  - Operational Assessment

BLOCK 2008

Discrimination Phase 2

- Defeat SRBMs, MRBMs & IRBMs
- Surveillance Support to BMDS

- Spiral From Block 06:
  - Integration of BLK 06 Discrimination Capabilities
  - Aegis 5.3 Cruisers and 5.3 Destroyers with BMD 4.n
  - Synthetic Wideband Radar Upgrade
  - Signal Processing & Feature Extraction Algorithms
  - Improved CCM Capability
  - Certified for Tactical Deployment
  - Improved C2BMC
  - SM-3 Block IA Missiles
  - Operational Assessment

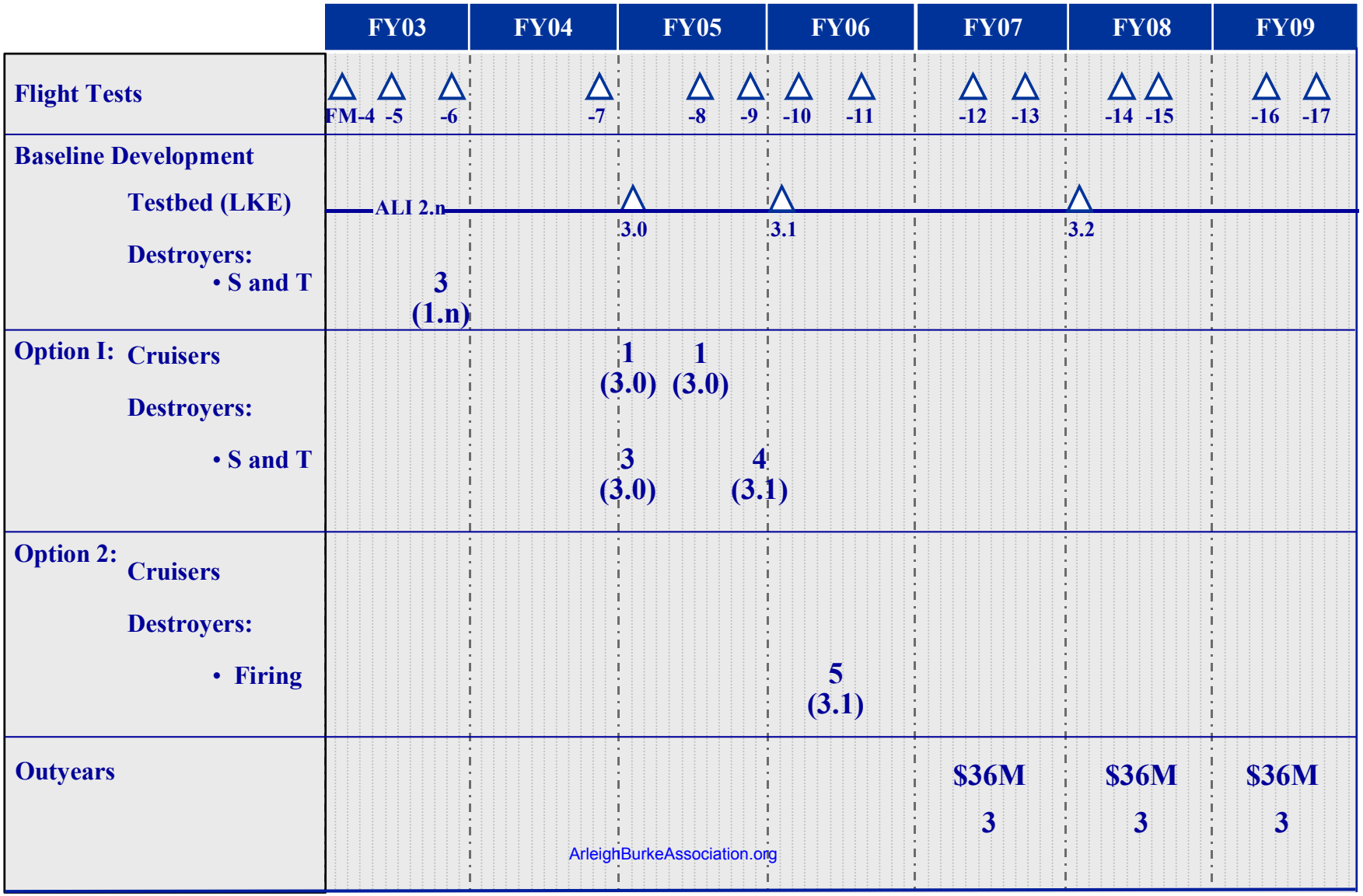
BLOCK 2010

Future Architecture for Baseline 7

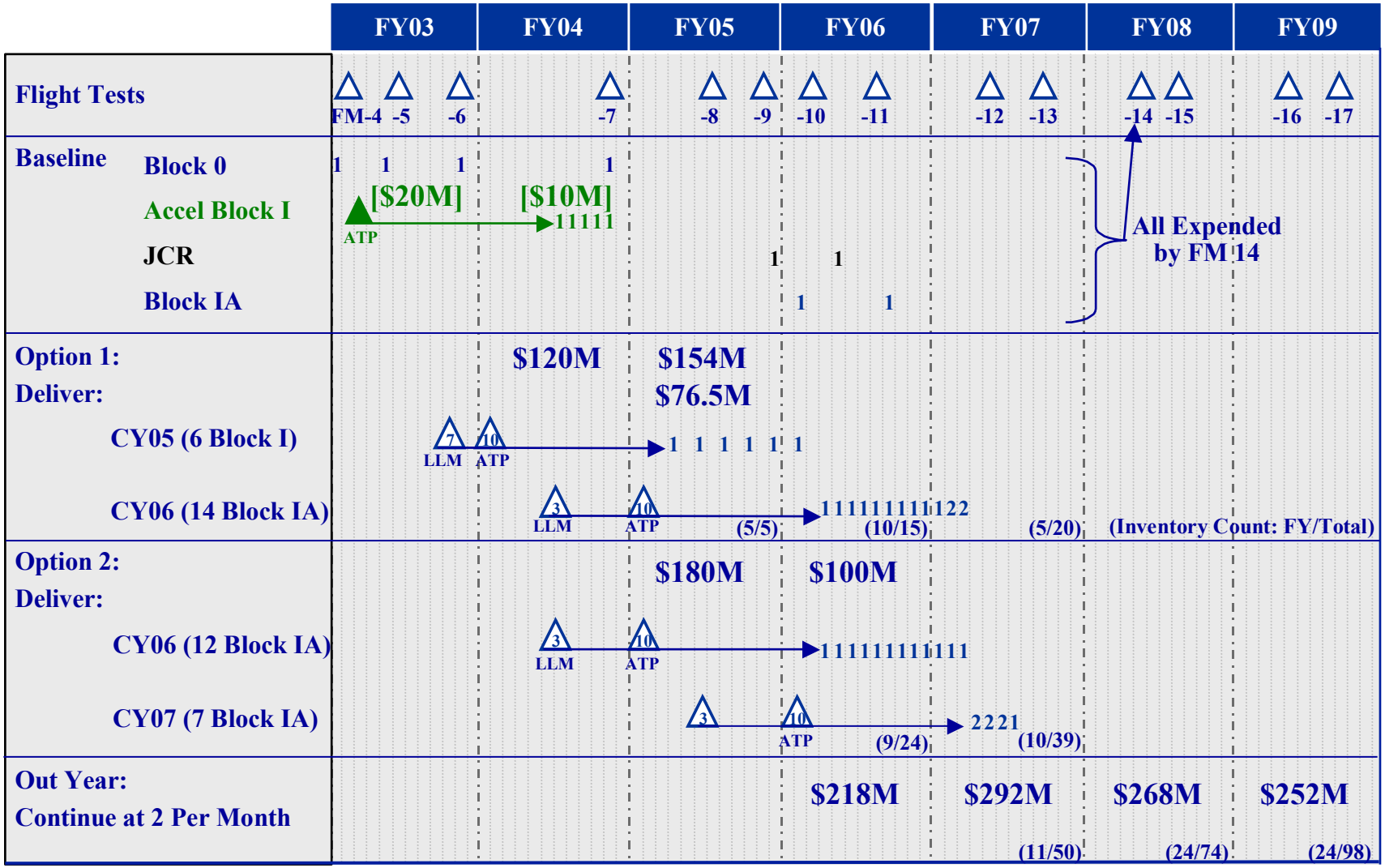
- Defeat SRBMs, MRBMs & IRBMs
- Surveillance Support to BMDS

- Spiral From Block 08:
  - Incorporate Advanced CCM Improvements
  - Develop Discrimination Algorithms, Adaptive Processing, C2BMC Upgrades for BMDS Integration
  - Architecture Upgrade for Incorporation of BMD into AWS 7.n
  - SM-3 Block IA Missiles
  - Certified for Tactical Deployment
  - Operational Assessment

AEGIS BMD SHIP OPTIONS



AEGIS BMD MISSILE OPTIONS



Missiles Priced as if Options & Outyear Executed

ArleighBurkeAssociation.org

Outline

- LEAP Origins / Terrier LEAP
- Concept Evaluation and Integration Study (CEIS)
- June 94 CNO Memo on Navy TBMD
- Capstone COEA / Navy TMD COEA I / Joint Staff TMD Review
- Blue Ribbon Panel (Oct 95)
- M1 = M2
- SMCo
- BMD Program Review (Jan 96)
- Other 1997 Studies
- 1997 QDR
- NTW DAB / ADM (May 99)
- Budget History (PB 93 - BES 99)
- Goat Island Study (May 99)
- Program Plan Evolution / Changes
- FY02 Options / Baseline
- Addition of LRS&T (Feb 03)

PRESIDENTIAL DIRECTIVE

Aegis BMD

Dec 16, 2002

- **"…our policy is to develop and deploy, at the earliest possible date, ballistic missile defenses drawing on the best technologies available."**
- **"The Administration has also eliminated the artificial distinction between "national" and "theater" missile defenses.**
- **"…the United States plans to begin deployment of a set of missile defense capabilities in 2004."**
- **"…We will deploy an initial set of capabilities that will evolve to meet the changing threat and to take advantage of technological developments."**
- **"The capabilities planned for operational use in 2004 and 2005 will include … sea-based interceptors …"**
- **"…these capabilities may be improved through additional measures such as: deployment of additional … sea-based interceptors…"**

Why is this Mission Different?

- National Urgency
- Defending Homeland
- Patrol
- Multiple CoComs
- Weapon is the J 3.6 Tadil Message
  - Timeline requires Auto-reporting of tracks
  - TIC and RSC are primary warfighters
- Radar focus is long range, narrow focus
  - vs short-medium range, hemisphere
- Two sets of Computer Programs

- Fundamental GMD interface approach established in Feb 28th meeting with John Ruddy = interface is at the satellite

BLOCK 04 SPIRAL CONFIGURATIONS

Aegis BMD

- Aegis LEAP Intercept – Program Complete
  - Proof of Concept for Sea Based Midcourse Ballistic Missile Intercept
- Surveillance (SURV)
  - Test and Evaluation Program
  - Engineering Data Collection and Evaluation
  - Risk Reduction for LRS&T (BMD 3.0e)
- **Long Range Surveillance & Track (LRS&T) IDO (BMD 3.0e)**
  - **First Increment Deployable Aegis BMD Capability (Sep 04)**
  - **Authorized for**
    - **LRS&T Support to GMD (Destroyers)**
  - **No Integrated Self Defense Capabilities**
- Initial Engagement Capability (BMD 3.0 + SM-3 Blk I)
  - Second Increment for Testing (Delivered – Dec 04, Flight Tested – Apr 05)
  - Authorized for
    - LRS&T to GMD (Cruisers and Destroyers)
    - Testing Engagement of SRBMs and MRBMs (Cruisers)
  - No Integrated Self Defense Capabilities
  - **Potential for Emergency Deployment**
- **Engagement Capability (BMD 3.1 + SM-3 Blk IA)**
  - **Deployable Aegis BMD Engagement Capability**
    (Dec 05 Emergency, Apr 06 Full Cert)
  - **Certified for Mission Requirements and Integrated AAW Self Defense**
    - **Multi-mission Capability less than 5.3.8**
  - **Fully Compliant With Block 04 Specification**

PLANNED AEGIS BMD BLOCK 04 MULTI-MISSION CAPABILITY

Aegis BMD

Baseline	5.3.8	3.0E	3.0	3.1
Ships:	Cruiser / Destroyer	Destroyer	Cruiser	Cruiser / Destroyer
Mission Ballistic Missile Defense				
Long Range Surveillance & Track	No	Yes	Yes	Yes
Engage Short / Medium Range BM	No	No	SM-3	SM-3
Planning Tools	No	Standalone	Standalone	Integrated
Embedded Training	No	Dynamic Test Targets only	Dynamic Test Targets only	ACTS / Scenarios – Less Than 5.3.8
Air Defense				
Standard Missile	Yes	No	No	Self Defense - Less than 5.3.8
Phalanx	Integrated	Standalone	Standalone	Integrated – Less than 5.3.8
Gun Weapon System DDG: MK 34 CG: MK 86	Integrated Integrated	DDG – Standalone	CG - Standalone	DDG – Integrated – No SPY CG - Standalone
Electronic Warfare	Integrated	Integrated – Less than 5.3.8	Integrated – Less than 5.3.8	Integrated – Less than 5.3.8
Air Control	Integrated	Voice Only – Less than 5.3.8	Voice Only – Less than 5.3.8	Voice Only – Less than 5.3.8
Strike / Surface				
Tomahawk	Standalone	Standalone	No	Standalone
Harpoon	Integrated	Standalone	Standalone	Standalone
Gun Weapon System	Integrated	Same as Air Defense	Same as Air Defense	Same as Air Defense
Undersea Warfare				
Vertical Launched ASROC	Integrated	Standalone	No	Standalone
Over The Side Torpedoes	Integrated	Standalone	Standalone	Standalone
Light Airborne Multi Purpose System	Integrated	Integrated – Less than 5.3.8	Integrated – Less than 5.3.8	Integrated – Less than 5.3.8
Command and Control				
Tactical data links	Non-BMD Focus	BMD Focus - Reporting of Air/Surface Less Than 5.3.8	BMD Focus - Reporting of Air/Surface Less Than 5.3.8	BMD Focus – Reporting of Air/Surface Less Than 5.3.8

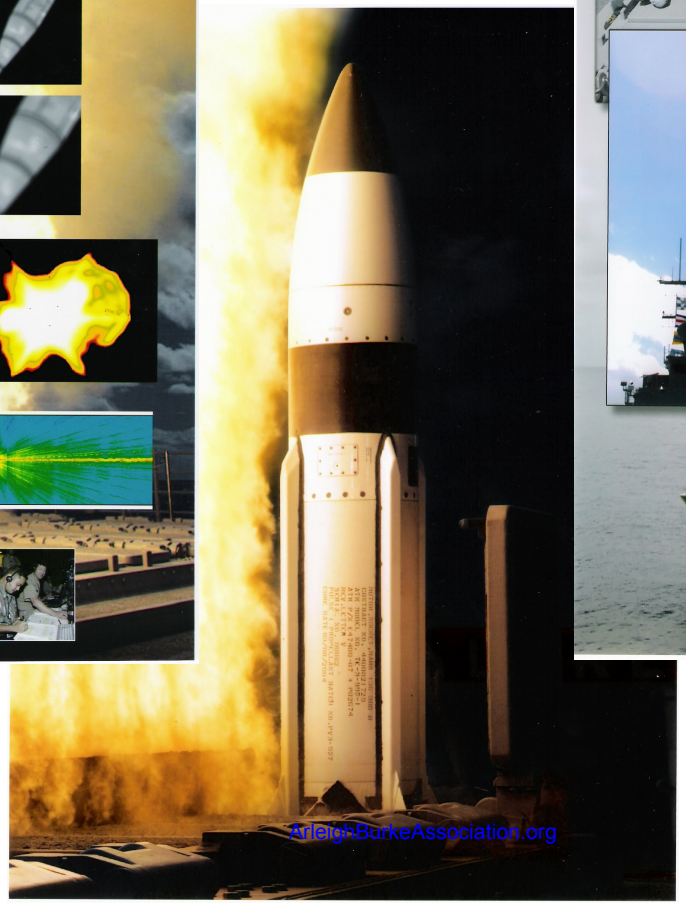
Key: Same as 5.3.8 | Not Available | By BMD Design | Sailor / Operational Regression

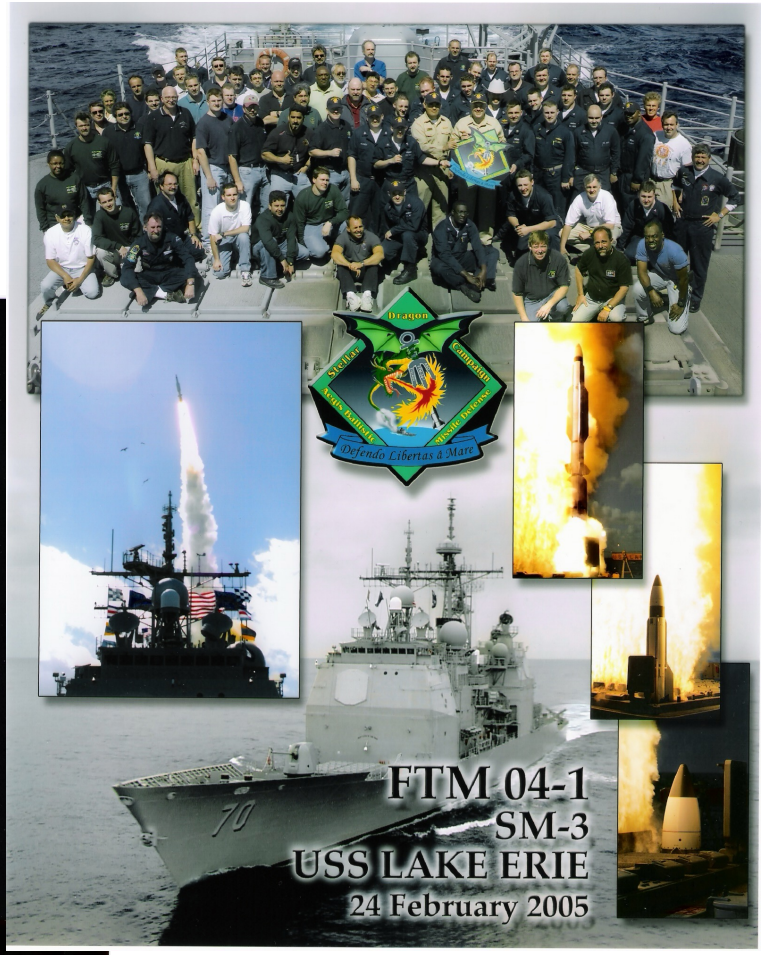
Conclusion

- **Program continued to successfully execute to approved program plan**
  - **Two destroyers outfitted for IDO, on station ready for call for fire on 9/30/04**
  - **Initial five deployment rounds (called green rounds, from the color used on the schedule chart) delivered in late October 2004**
  - **Lake Erie outfitted with 3.0 Engagement capability, successfully executed FM-7 in early 2005**
- **Initial capability delivered two years ahead of study assumptions of 2007**

FM-7

Aegis BMD





IDR 1-5 “Green Rounds”

Aegis BMD

- **Items Not Covered**
  - **Evolution of Organization Structure**
    - **From SP to TAD-B through TSC**
    - **Evolution of Program Office to Field Activity**
  - **Amount of engineering and variants covered**
  - **ABM Treaty Compliance Efforts**
  - **Evolution of ALI**

- **Some good references:**
  - **Friar's ALI Study (1995-1999), APL Technical Report**
  - **"Ready For Sea," BMD Study Findings on NTW, 1994-1998**

Backup

Dead Reckoning Trace: The Beginning

- **Program background was Terrier LEAP Experiment**
  - **Kill Vehicles came from SDIO technology programs**
  - **Two competing LEAP Kill Vehicles fired from NTU Cruiser**
  - **Range sensors provided fire control via INMARSAT to R. K. TURNER**
- **Two intercept attempts**
  - **FTV-3: Missile did not deliver KV to required handover, KV did acquire target and guide, expended divert and altitude prior to intercept**
  - **FTV-4: Missile properly delivered to handover requirements, KV battery failed to activate**
  - **All hardware expended, R. K. Turner decomissioned**
- **Navy Position: begin tactical development**
- **BMDO Position: continue experiment through intercept**
- **Chartered Blue Ribbon Panel to recommend an approach**
  - **Chaired by Gen Welch, co-chaired by RADM Meyer**
  - **Ratified sequential objectives: "Intercept Demo -> UOES -> Tactical"**
  - **"Support option 2 -- AEGIS LEAP --, as the best approach to demonstration and deploying an operationaly capable UOES…"**
- **Acting ASN(RDA) was tiebreaker supporting AEGIS LEAP**

Dead Reckoning Trace: Early Years

- **Multiple Program Plans from 1996-2002:**
  - **Most plans were NTW Block I to NTW Block II, containing:**
    - **21” Missile versions**
    - **Baseline 1 Cruiser Conversion**
    - **NTW “in a box”**
    - **Exclusive BMD ship — all other capabilities removed**
    - **High Power Discriminator**
    - **Etc.**
- **Funding varied widely year to year**
  - **BMD Program Update Review with ~$30M in FY97**
  - **Administration Reduced Funding each year**
  - **Congress Increased Funding each year**
- **Program was not baselined**
  - **Progress started toward DAB in late 1997**
  - **Did not progress beyond OIPT**
  - **Lack of funding baseline precluded reaching program baseline**
- **One element remained constant: AEGIS LEAP Intercept**

Dead Reckoning Trace: CY2002

- With establishment of MDA and block approach
  - MDA / USN discussions focused on Baseline 1 Cruisers, the BMD Test Cruiser, and converting Destroyers for LRS&T
  - Another focus was on '04c program
    - Block 2004 Capability
    - Similar to current BMD 3.1 / SM-3 Block IA
  - Early missile configuration enabled by:
    - Cancellation of Navy Area
    - Completion of ALI exit criteria
    - Freed assets to develop current SM-3 Blk I
  - 04c missile renumbered to SM-3 Blk IA
- Many plan options shown during year
  - Lt Gen Kadish emphasized that reviewing options was not direction to change program plan

Dead Reckoning Trace: Funding Baseline

Aegis BMD

- **MDA / USN reached agreement by late 2002:**
  - **Stop focus on Baseline 1 conversion as a BMD exclusive ship**
  - **Transfer Baseline 1 funds to USN ($666M across FYDP)**
  - **USN to provide USS LAKE ERIE as continued BMD Test Ship**
  - **Outfit Cruisers and Destroyers for BMD**
  - **Provide SM-3 Inventory**
- **Funds returned to AEGIS BMD program line for**
  - **Cruisers Upgrades**
  - **12 Destroyer Upgrades, three previously funded**
  - **FY04-05 missiles, partial for FY06**
- **Funding baselined 10 Dec 02**
  - **Signed by Rob Snyder, Mr. Altwegg, RADM Paige, CAPT Grant**
  - **Rob Synder, in an unusually good mood, added $200M each FY08/09 as a starting point for Block 2008**
- **Program directed to return 12 Dec 02 with updated Program Plan**

Dead Reckoning Trace: Program Baseline

Aegis BMD

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