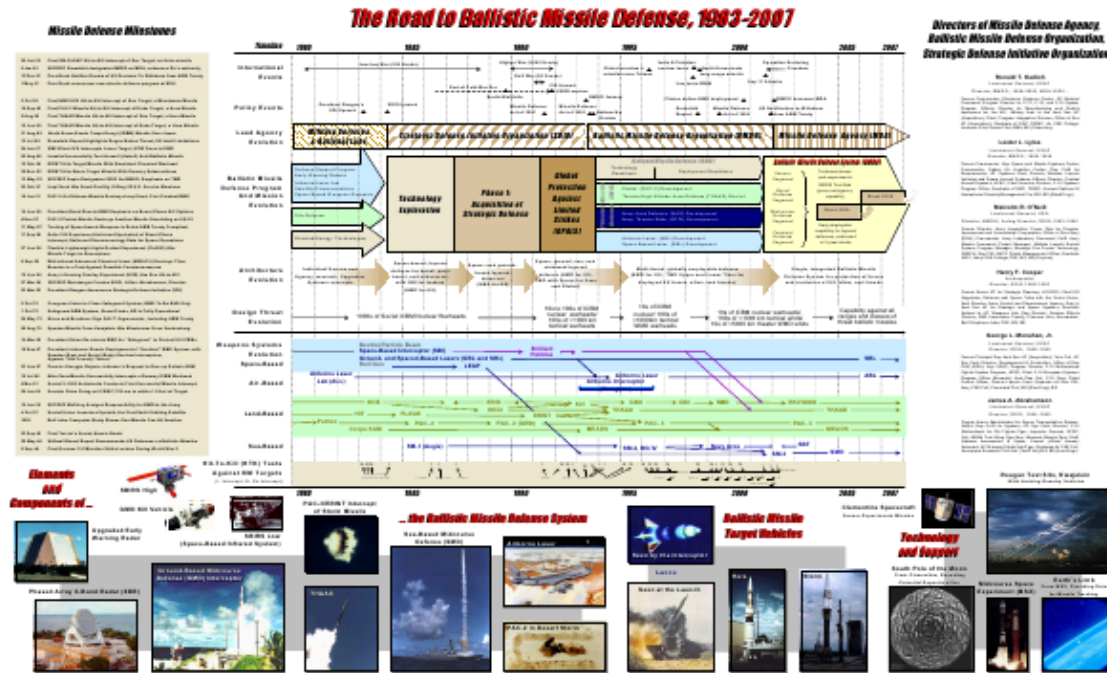


<https://docs.google.com/document/d/1SAoZsFJXSLwzSMuvSbutPkleWuMX8hOAIIOH9wHDtKI/edit?usp=sharing>



2000 2005 2007

- ▲
- ▲
- ▲ ▲

Global Protection Against Limited Strikes (GPALS)  
 Elements and Components of ...  
 North Korea tests long range missile

- ▲
- ▲ BMDO formed
- SDIO formed ▲
- ▲ Missile Defense
- Act of 1993
- ▲

## National Missile Defense (NMD) Technology Readiness

Site Defense

Directed Energy Technologies

**Design Threat Evolution**



**Missile Defense ▲**

**▲ Act of 1999**

Elements and Components of ...

... the the Ballistic Missile Defense System

Ballistic Missile Target Vehicles

Technology and Support

**25 Jan 02 First SM-3/LEAP Hit-to-Kill intercept of Exo Target, an Aries missile**

**2 Jan 02 SECDEF Rumsfeld designates BMDO as MDA, enhances Dir's authority**

**13 Dec 01 Pres Bush Notifies Russia of US Decision To Withdraw from ABM Treaty**

**1 May 01 Pres Bush announces new missile defense program at NDU**

**2 Oct 99 First NMD EKV Hit-to-Kill Intercept of Exo Target, a Minuteman Missile**

**16 Sep 99 First PAC-3 Missile Hit-to-Kill Intercept of Endo Target, a Hera Missile**

**2 Aug 99 First THAAD Missile Hit-to-Kill Intercept of Exo Target, a Hera Missile**

**10 Jun 99 First THAAD Missile Hit-to-Kill Intercept of Endo Target, a Hera Missile**

**31 Aug 98 North Korea Sends Taepo Dong I (IRBM) Missile Over Japan**

**15 Jul 98 Rumsfeld Report Highlights Rogue Nation Threat; US Intell Limitations**

**24 Jan 97 SM2 Block IVA Intercepts Lance Target; NTW Goes to EMD**

**20 Aug 96 Israelis Successfully Test Arrow II (Hetz-2) Anti-Ballistic Missile**

**15 Feb 94 ERINT Hits Target Missile With Simulated Chemical Warhead**

**30 Nov 93 ERINT Hits Storm Target Missile With Dummy Submunitions**

**13 May 93 SECDEF Aspin Designates SDIO As BMDO, Emphasis on TMD**

**25 Feb 91 Iraqi Scud Hits Saudi Facility, Killing 28 U.S. Service Members**

**18 Jan 91 PAC-2 Air Defense Missile Destroys Iraqi Scud, First Combat BMD**

**14 Jun 89 President Bush Directs BMD Emphasis on Boost Phase Kill Options**

**4 Nov 87 PAC-2 Patriot Missile Destroys Another Missile Simulating an SS-23**

**11 May 87 Testing of Space-based Weapons Is Ruled ABM Treaty Compliant**

**11 Sep 86 Delta 180 Experiment Achieved Equivalent of Boost Phase**

**Intercept; Gathered Phenomenology Data for Space Operations**

**27 Jun 86 Flexible Lightweight Agile Guided Experiment (FLAGE) Hits**

**Missile Target in Atmosphere**

**6 Sep 85 Mid-infrared Advanced Chemical Laser (MIRACL) Destroys Titan**

**Booster in a Test Against Possible Countermeasures**

10 Jun 84 Army's Homing Overlay Experiment (HOE) Has Exo Hit-to-Kill  
 27 Mar 84 SECDEF Weinberger Creates SDIO; LtGen Abrahamson, Director  
 23 Mar 83 President Reagan Announces Strategic Defense Initiative (SDI)  
 2 Oct 75 Congress Votes to Close Safeguard System; BMD To Be R&D Only  
 1 Oct 75 Safeguard ABM System, Grand Forks, ND Is Fully Operational  
 26 May 72 Nixon and Brezhnev Sign SALT I Agreements, Including ABM Treaty  
 28 Aug 70 Spartan Missile From Kwajalein Hits Minuteman From Vandenberg  
 14 Mar 69 President Nixon Re-orientes BMD As "Safeguard" to Protect US ICBMs  
 18 Sep 67 President Johnson Directs Deployment of "Sentinel" BMD System, with  
 Spartan (Exo) and Sprint (Endo) Nuclear Interceptors, Against "Nth Country Threat."  
 23 Jun 67 Premier Kosygin Rejects Johnson's Request to Give up Galosh ABM  
 19 Jul 62 Nike Zeus Missile Successfully Intercepts a Dummy ICBM Warhead  
 4 Mar 61 Soviet V-1000 Antimissile Conducts First Successful Missile Intercept  
 20 Jan 60 Soviets Claim Firing an ICBM 7,752 nm to within 1.24 mi of Target  
 16 Jan 58 SECDEF McElroy Assigns Responsibility for BMD to the Army  
 4 Oct 57 Soviet Union Launches Sputnik, the First Earth Orbiting Satellite  
 1955 Bell Labs Computer Study Shows One Missile Can Hit Another  
 23 Sep 49 First Test of a Soviet Atomic Bomb  
 29 May 46 Stillwell Board Report Recommends US Defenses vs Ballistic Missiles  
 8 Sep 44 First German V-2 Missiles Strike London During World War II  
 SBIRS High

#### Weapons Systems Evolution Space-Based

Air -Based

Land-Based

Sea-Based

Hit-To-Kill (HTK) Tests Against BM Targets (I - Intercept, N- No Intercept)

Sea-Based Midcourse Defense (SMD)

Phased Array X-Band Radar (XBR)

Missile Defense Milestones

Homing Overlay

NMD/GMD

Experiment (HOE) LEAP PAC-2

PAC-3 I N N

I

GMD Kill Vehicle

Upgraded Early Warning Radar

## **Midcourse Defense Defense (GMD) (GMD) Interceptor Interceptor**

### **PAC-2 in Desert Storm**

## **The The Road Road to to Ballistic Ballistic Missile Missile Defense, Defense, 1983-2007 1983-2007**

Directors of Missile Defense Agency,

Timeline 1980 1985 1990 1995

Ballistic Missile Defense Organization, Strategic Defense Initiative Organization

### **Gulf War (90 Scuds)**

Ronald T. Kadish Lieutenant General, USAF Director, BMDO, 1999-2002; MDA 2002 -

Former

Commander, Electronic Systems Center, AF Materiel President Reagan's

### **SDI Speech**

### **Missile Defense Act of 1991**

### **Bottom-Up**

### **Review**

Command; Program Director for C-17, F-16, and F-15 System Program Offices; Director for Manufacturing and Quality Assurance for the B-1; Military Asst to the Asst Sec AF (Acquisition); Chief, Program Integration Division, Office of Sec AF (Acquisition); Graduate of ICAF, DSMC, Air C&S College; Instructor Pilot, Senior Pilot; MBA, BS (Chemistry)

Lester L. Lyles Lieutenant General, USAF Director, BMDO, 1996-1999

Former Commander, Hqs, Space and Missile Systems Center; Commander, Ogden Air Logistics Center; Dep CofS for Ballistic Missile

Requirements, AF Systems Cmd; Director, Medium Launch Vehicles and Space Launch Systems Offices; Director, Tactical Defense Program And Mission Evolution

Defense Support Program Early Warning Radars Airborne Laser Lab Satellite Communications Space Based Weapons Research

Phase Phase 1: 1:

Patriot (PAC-3) Development Theater High Altitude Area Defense (THAAD) Dev'mt Acquisition of Strategic Defense

Aircraft Systems, AFSC; Chief Avionics Division, F-16 Systems Program Office; Graduate of NWC, DSMC, Harvard National & International Security Management Crs; MS, BS (Mech E ngr) Acquisition of Strategic Defense

Malcolm R. O'Neill Lieutenant General, USA Director, BMDO; Acting Director, SDIO, 1993-1996

Former Director, Army Acquisition Corps; Dep for Program

Airborne Laser (ABL) Development

Assessment and International Cooperation, Office of Sec Army (RDA); Commander, Army Laboratory Command; CofS Army Space Based Laser (SBL) Development

Missile Command; Project Manager, Multiple Launch Rocket System; Program Manager, Strategic Fire Control Technology, DARPA; Dep PM, NATO Patriot Management Office; Graduate AWC, Army C&S College; PhD, MS, BS (Physics) Space-based, layered defense for boost, post- boost, and midcourse; with GBI for leakers (NMD for US)

## **Space- and ground- based layered deterrent (NMD for US)**

### **Space, ground, sea, and Architecture**

**H**

#### **Henry F. Cooper Evolution**

Ambassador Director, SDIO, 1990-1993

Former Senior VP for Strategic Planning, JAYCOR; Chief US Negotiator, Defense and Space Talks with the Soviet Union, Asst Director, Arms Control and Disarmament Agency; Dep to Asst Sec AF for Strategic and Space Systems; Scientific Advisor to AF Weapons Lab; Dep Director, Nuclear Effects Division, R&D Associates; Faculty, Clemson Univ; Researcher, Bell Telephone Labs; PhD, MS, BS

George L. Monahan, Jr. Lieutenant General, USAF Director, SDIO, 1989-1990

Former Principal Dep Asst Sec AF (Acquisition); Vice Cdr, AF Sys Cmd; Director, Development & Production, Office of Dep CofS (RDA), Hqs, USAF; Program Director, F-16 Multinational Fighter System Program, AFSC; Chief, F-16 European Systems Program Office (Brussels); Asst Dep Cdr, F-16 Pgm; Flight Control Officer, Gemini Launch Crew; Graduate Air War Coll, Army C&S Coll; Command Pilot; MS (Elec Engr), BS

James A. Abrahamson Lieutenant General, USAF Director, SDIO, 1984-1989

Former Assoc Administrator for Space Transportation System, NASA; Dep CofS for Systems, AF Sys Cmd; Director, F-16 Multinational Air Cbt Fighter Pgm; Inspector General, AFSC; Cdr, 4950th Test Wing; Pgm Mgr, Maverick Missile Pgm; Staff, National Aeronautics & Space Council (White House); Astronaut, AF Manned Orbital Lab Pgm; Graduate Air C&S Coll, Aerospace Research Pilot Sch (Test Pilot); MS, BS (Aero Engr) air-based layered defense (NMD for US; TMD with Space for Area and Global)

#### **SBL**

#### **THAAD**

#### **PAC- 3**

Delta 180

PAC-2 I ABL

N

I

LEAP ERINT

I

#### **Clementine Spacecraft Sensor Experiments Mission**

##### **SBIRS Low (Space-Based Infrared System)**

##### **South Pole of the Moon From Clementine, Revealing Potential Deposits of Ice**

#### **Experiment Midcourse Space (MSX)**

#### **From for Earth's MSX, Missile Providing Tracking**

#### **Limb**

#### **Data**

#### **International Events**

#### **Policy Events**

#### **Lead Agency Evolution**

#### **Operation Enduring Freedom**

## Individual Service and Agency research; Upgrades; Systems concepts

### ▲ Sep 11 Attacks

Clinton defers NMD deployment

▲ ▲ BMDO becomes MDA

US Notification to Withdraw

▲ from ABM Treaty Ballistic Missile Defense System (BMDS) (BMDS)

*Segment Sensor*

Technical demos and experiments

*Segment Defense Boost*

BMDS Test Bed gives contingency capability

Block 2004

Early deployable Terminal

*Segment Defense*

capability for layered defenses, enhanced in 2-year blocks

**Multi-tiered, globally employable defense (NMD for US; TMD Upper and Lower Tiers for deployed US forces, allies, and friends)**

**MEADS**

**SBT**

Block 2006

*Midcourse*

*Segment Defense*

**Single, integrated Ballistic Missile Defense System for protection of forces and territories of US, allies, and friends**

1000s of Soviet ICBM Nuclear Warheads

10s nuclear to 100s warheads/ of ICBM

100s tactical of warheads >1000 km

10s of ICBM >1000km nuclear/ WMD warheads 100s tactical

of

10s of ICBM nuclear warheads/ 10s 100s of >5000 of >1000 km km theater tactical WMD whds/

whds

Capability against all threat ranges ballistic and classes missiles of

**NMD**

**SMD**

I I I

I N

I SM-3/LEAP I 1980 1985 1990 1995

2000 2005 2007

**PAC-3/ERINT Intercept of Storm Missile**

Military Services & National Labs

**Neutral Particle Beam Space-Based Interceptor (SBI) Ground- and Spaced-Based Lasers (GBL and SBL)**

**Pebbles Brilliant**

**Rail Gun**

**LEAP Airborne Laser Lab (ALL)**

**Airborne Laser Airborne Interceptor (Peregrine)**

**HOE ERIS**

**E2I**

**GBX**

**GBI EKV/GMD HIT**

**FLAGE**

**HEDI**

**ERINT THAAD Patriot PAC- 2**

**PAC- 2 (GEM) PAC- 3 Corps SAM**

**MEADS SM-1 (Aegis)**

**SM-2, Blk IV**

**Navy Area**

**SM-3**

**NNNNIIIIINN**

**NIINN**

**NNNIIERIS**

**I**

**THAAD THAAD 22 March 2002**

**Iran-Iraq War (350 Scuds)**

**Rumsfeld Report**

**Technology Exploration**

**Strategic Defense Initiative Organization (SDIO)**

**N**

**FLAGE**

**Afghan War (2000 Scuds)**

**Berlin Wall falls End of Cold War Era**

**CIS formed,**

**USSR expires**

**Ballistic Missile Defense Organization (BMDO)**

**China launches 4 missiles near Taiwan**

**Deployment Readiness**

**Lance**

**Seen at the Launch**

**India & Pakistan nuclear tests**

**▲ Iran tests IRBM**

**THAAD**

**▲**

**Storm HeraHera**

**Missile Defense Agency (MDA)**

**Reagan Test Site, Kwajalein With Arriving Reentry Vehicles**