

Next Generation Missile Defense - 2018 Space and Missile Defense Symposium -



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08 August 2018

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Approved for Public Release
18-MDA-9734 (6 Aug 18)



MDA Assets Globally Deployed - Today -

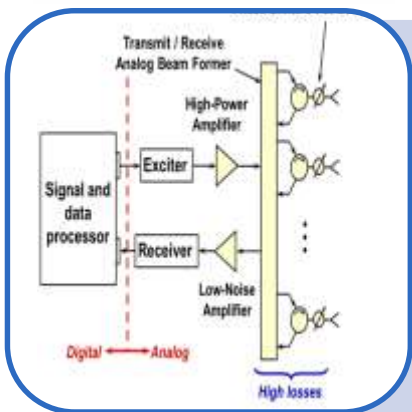


"The chart shows BMD assets, availability by date, and planned commitments. The Joint Staff Global Force Management Process assigns warfighting asset deployments, i.e., AN/TPY-2 radars, THAAD batteries, Aegis BMD ships, SM-3 missiles, Patriot batteries."

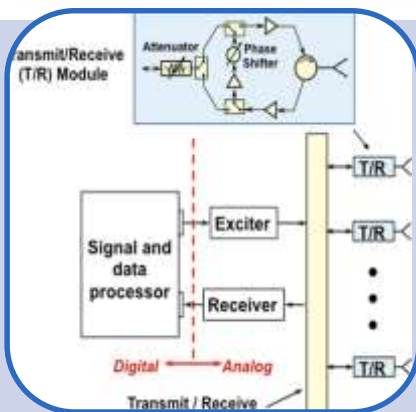


Next Generation of Radar Technology

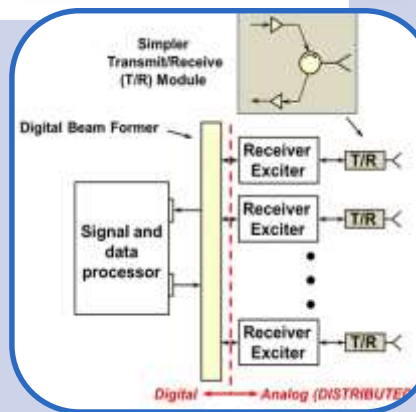
Analog Passive Array (1970's)



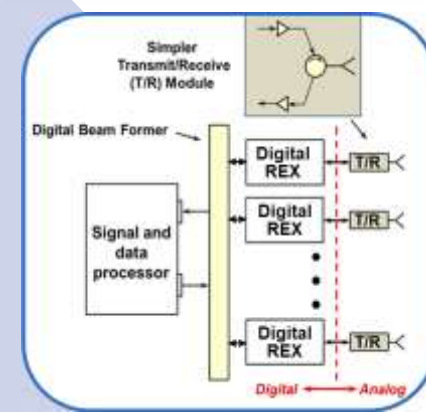
Analog Active Array (AESA) (1990's)



Digital Beam Former (2010's)



Digital Receiver/Exciter (2020+)



SPY-1, PATRIOT



SPY-4, TPY-2



CEAFAR, Space Fence, ELTA



LRDR

Digital arrays are important to the DoD as they provide continuous system capability improvement to pace rapidly evolving threats through its high flexibility in waveform design



Next Generation BMDs Radars

Low-Cost field-programmable gate array

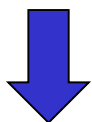
+

Low-Cost analog-to-digital and digital-to-analog electronics

+

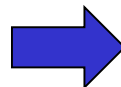
Low-cost single-stage frequency converter

Low-cost wideband Distributed Digital Receiver Exciter



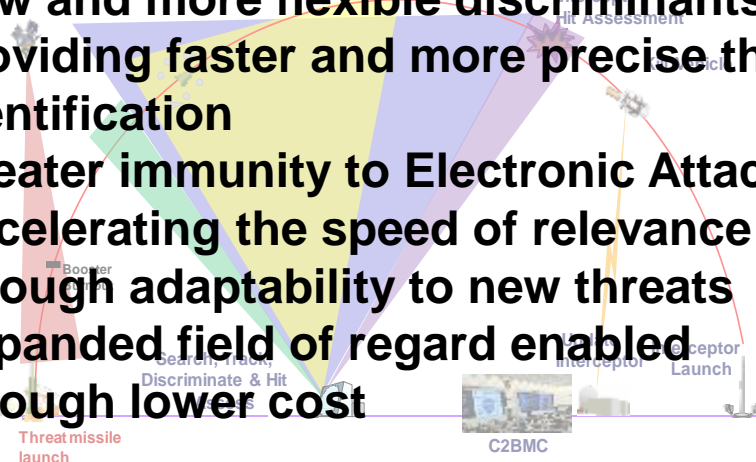
- Improved Waveform Diversity
- Improved Polarity Agility
- More affordable upgrades
- Higher Availability
- More informed and flexible Maintenance
- Lower initial cost

Next-generation Affordable phased arrays



BMDs Performance Advancements

- New and more flexible discriminants providing faster and more precise threat identification
- Greater immunity to Electronic Attacks
- Accelerating the speed of relevance through adaptability to new threats
- Expanded field of regard enabled through lower cost



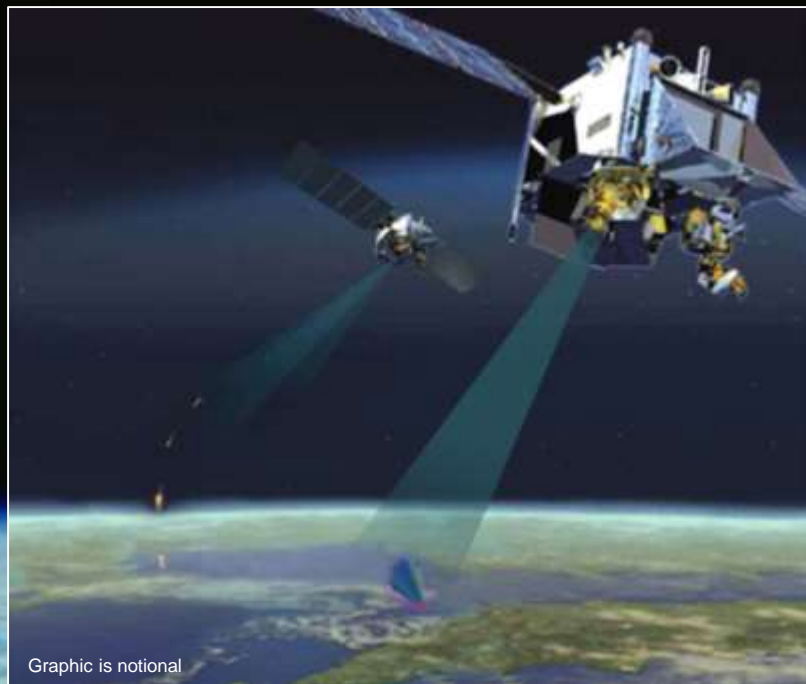
Homeland Defense family of radars



Space Sensors (Test Bed) Space Surveillance and Tracking System (STSS)

System Overview

- Two Spacecraft and Ground Station Demonstration
- Operated from Missile Defense Space Center (MDSC) – Schriever AFB CO
- Status: On-Orbit Supporting BMDS



Graphic is notional

Demonstrated Capabilities Space-Based Infrared Sensors

- Detect and track launched missiles
- Track objects through midcourse
- Help to discriminate real threats
- Assess interceptor hits
- Track targets above and below horizon

Contributions

- Show technical feasibility of missile tracking from space
- Collect phenomenology for multiple infrared sensor bands to guide the future operational system design
- Exploit utility of space tracking data within an integrated BMDS



Next Generation Space Sensor Layer - Detect, Warn, Cue -



Approach

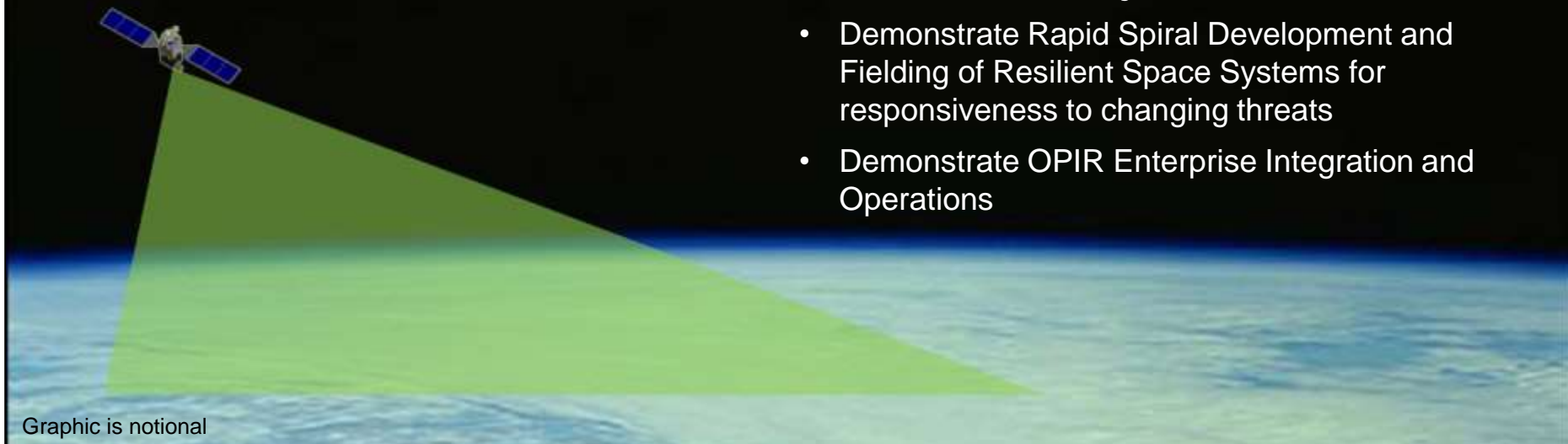
- Competitive Acquisition of Operational Prototype System
- Multiple Spacecraft & Ground Station
- Resilient Space System Approaches
- Maximize use of commercial systems, mature technologies, modular design approaches
- Collaboration with Mission Partners

Planned Capabilities

- Wide Field of View Sensor
- Detect and track ballistic missiles in boost phase
- Tracking of advanced threats
- Precise Handover to BMDS Sensors and Weapons

Objectives

- Demonstrate Rapid Spiral Development and Fielding of Resilient Space Systems for responsiveness to changing threats
- Demonstrate OPIR Enterprise Integration and Operations



Graphic is notional



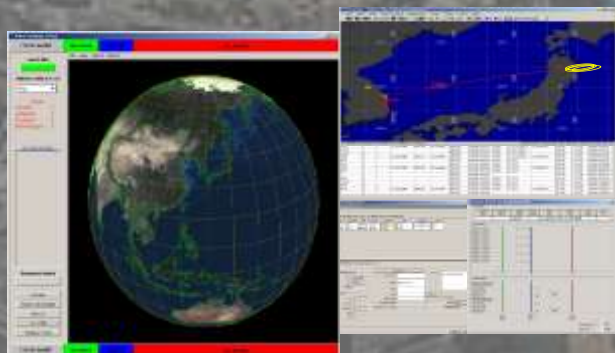
Command and Control, Battle Management and Communications



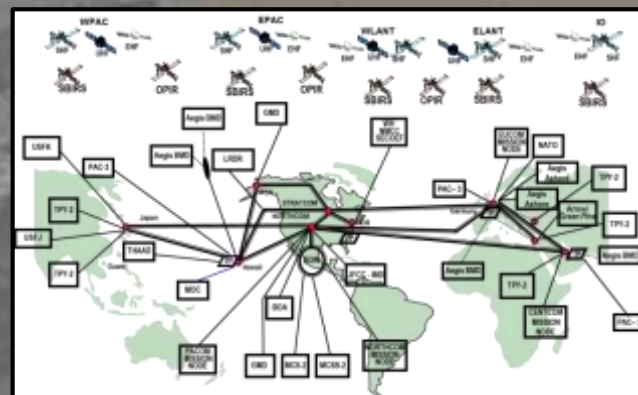
- Planning the defense design



- Managing the Shooter/Sensor battle



- Fusing and creating BMD tracks



- Building worldwide network infrastructure



C2BMC Multi-Domain Architecture

- Domains**
- Mobile, Fixed, Space
 - Global
 - Extensible



- Missions**
- Missile Defense
 - Missile Warning
 - Space SA
 - Space Asset Tasking
 - Earth Observation



- Employment**
- Cross-Domain
 - Cross Operational Area

- Functionalities**
- Operations
 - Training
 - Planning
 - Multi-mission Support



- Communications**
- Diverse Path / Threat Resilient
 - Cyber Secure

Allies and Partners



Next Generation C2BMC

- **Leverage Artificial Intelligence, Machine Learning Opportunities**
 - **Defense Planning and Design**
 - **Real Time Sensor/Shooter Battle Management Aides**
 - **Cyber Defense Monitoring**
- **Enhanced Space and Missile Defense Collaboration**
 - **End-to-end Track Custody**
 - **Mutual Support for Missile Defense, Strategic Warning, Space Situational Awareness**
- **Enhanced Sensor to Shooter**
 - **Access and Integration with Non-traditional Missile Defense Sensors**
 - **Improved Sensor to Sensor Cueing**
 - **Ballistic and Maneuvering System Track and Reporting**
 - **Automated Engagement Coordination**



Summary



- **Threat Continues to Advance**
- **MDA is Evolving the BMD System to Pace the Threat**
- **Greater Sensor Capabilities**
 - **Coverage – Air, Terrestrial and Space**
 - **Ballistic and Hypervelocity Threats**
 - **Multi-Mission Flexibility**
- **C2BMC Infrastructure Enables Growth**
 - **Any Sensor-to-Any Shooter**
 - **Enhanced Sensor Management**
 - **Multi-Domain (Space, Missile Defense, etc.)**
 - **Extensibility with Allies/Allied Systems**