

# **MDA / DEP Technology Transition Briefing for NDIA**



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**Doug Schaefer  
Director, Producibility and Manufacturing  
Missile Defense Agency**

**UNCLASSIFIED**



# Agenda

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- **Purpose**
- **DEP Mission**
- **DEP Functions**
- **Standards**
- **Next Generation Sensor Producibility**
- **Technologies Available for Transition**
- **Way Ahead**



# Purpose

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- **Brief NDIA on DEP-matured technologies that are available for transition**
- **Solicit ideas on how MDA can incentivize its contractors and PMs to embrace technology transition**



# DEP Mission Statement

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**Responsible to the Director, MDA, for BMD System-wide producibility and manufacturing risk assessment and mitigation. Supports the BMDS Elements by identifying and helping to mitigate risks impacting mission assurance, performance, schedule and cost**



# DEP Functions

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- Assess priority **BMDS risks related to producibility, manufacturing, quality, schedule and cost**
- Assess MDA technology program's applicability to BMDS requirements and their **readiness for transition**
- In concert with the Elements, assess and report transition readiness using **Engineering Manufacturing Readiness Levels (EMRLs)** and exit criteria metrics (i.e., Critical Knowledge Points)
- Conduct MDA **Industrial Base Assessments** and identify shortfalls / gaps affecting BMDS Element acquisitions. Support OSD and other agencies in remediation efforts
- In concert with the Elements, develop industrial and manufacturing investment strategies for system affordability and **insertion of successive new capabilities**



# Standards DEP is Developing

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- **Design**
  - **High Altitude Exoatmospheric Nuclear Survivability (HAENS)**
  - **Anti-Tamper**
- **Interface**
  - **Inertial Measurement Unit (IMU)**
  - **Power Bus**
  - **Guidance and Control**
  - **Communication**



# Standards Development Process

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- **Directed by MIB to develop IMU Standard on 18 MAY 04**
- **Based on the Aeronautical Radio Incorporated (ARINC) model**
  - **Well-defined physical, data, and power interfaces**
  - **Technology independent**
  - **Technology / functional growth incorporated**
    - **Example: 2006 Nav Radio with GPS is interchangeable with 1964 Nav Radio with *tubes***
- **Developed in close collaboration with government and industry**
- **Real cost savings identified in nonrecurring engineering**
  - **Design BMDS interfaces only once**

**Greater Use Of Standards = Improved Reliability**



# IMU Standard Implementation Status

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- **On 5 October, PCB directed that:**
  - **Each program identify costs associated with immediate implementation of MDA-STD-005**
  - **Each program develop a recommended implementation plan by 30 November 06**
  - **DO and DE meet with the program leads to understand the budget implications and develop a BMDS way forward**
- **DO and DE scheduled to meet with the program leads in mid-December 06 to review their program's data**
- **Cost and implementation is based on**
  - **New Starts**
  - **Block upgrades**
- **IMU Standard will not be retrofitted into existing systems**



# Standards Way Forward

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- **Inertial Measurement Unit Standard**
  - **MDA-STD-005 approved by MDA/D 5 OCT 2006**
- **Power Bus**
  - **Define the Battery Header**
  - **Define the connection between the battery and the missile**
  - **Draper Laboratory will co-develop**
- **Guidance Navigation and Control (GNC)**
  - **Data bus IEEE 1394b firewire**
  - **Data protocol**
  - **Power compatible with power standard**
  - **Draper Laboratory will co-develop**
- **Communication Standard**
  - **Common interface for onboard communications suite**
    - **Modem to mission computer**
    - **Modem to antenna**
  - **MITRE Corp will co-develop**



# Next Standards Development

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- **Costs to implement the next standards for which DEP needs funding**
  - **GNC is complex and will require approx 1.3 times the effort of the IMU Standard: \$500k**
  - **Power is straightforward and will require approx 0.8 times the IMU Standard: \$300k**
  - **Communications is similar to the IMU in complexity: \$375k**
- **Total projected cost: \$1.175M**
- **Additional standards requested for development of the BMDS open systems architecture**
  - **Data bus is complex and will require approximately 1.4 times the effort of the IMU Standard: \$525k**
  - **Mechanical – There are three major mechanical interfaces and each will require unique engineering consideration. Approximately two and a half times the IMU Standard: \$940k**



# Next Generation Sensor Producibility (NGSP-1) Flight Test Purpose

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The 1<sup>st</sup> NGSP flight test is an emerging technology and producibility demonstration of the KV telescope designs and material / technologies that offer improved mission assurance for next generation BMDS interceptor.

The primary test objectives are to flight test:

- Silicon carbide telescopes with silver coatings and a new scalable 4 mirror cassegrain telescope design
- Common 'plug & play' rad hard, programmable sensor electronics that enable interchangeability
- High bandwidth (200+Mbits/sec) rad hard interceptor downlink telemetry of sensor imagery, etc. via traveling wave tubes

and assess:

- Telescope, sensor electronics and telemetry supplier readiness/producibility



# NGSP Flight Testing Program

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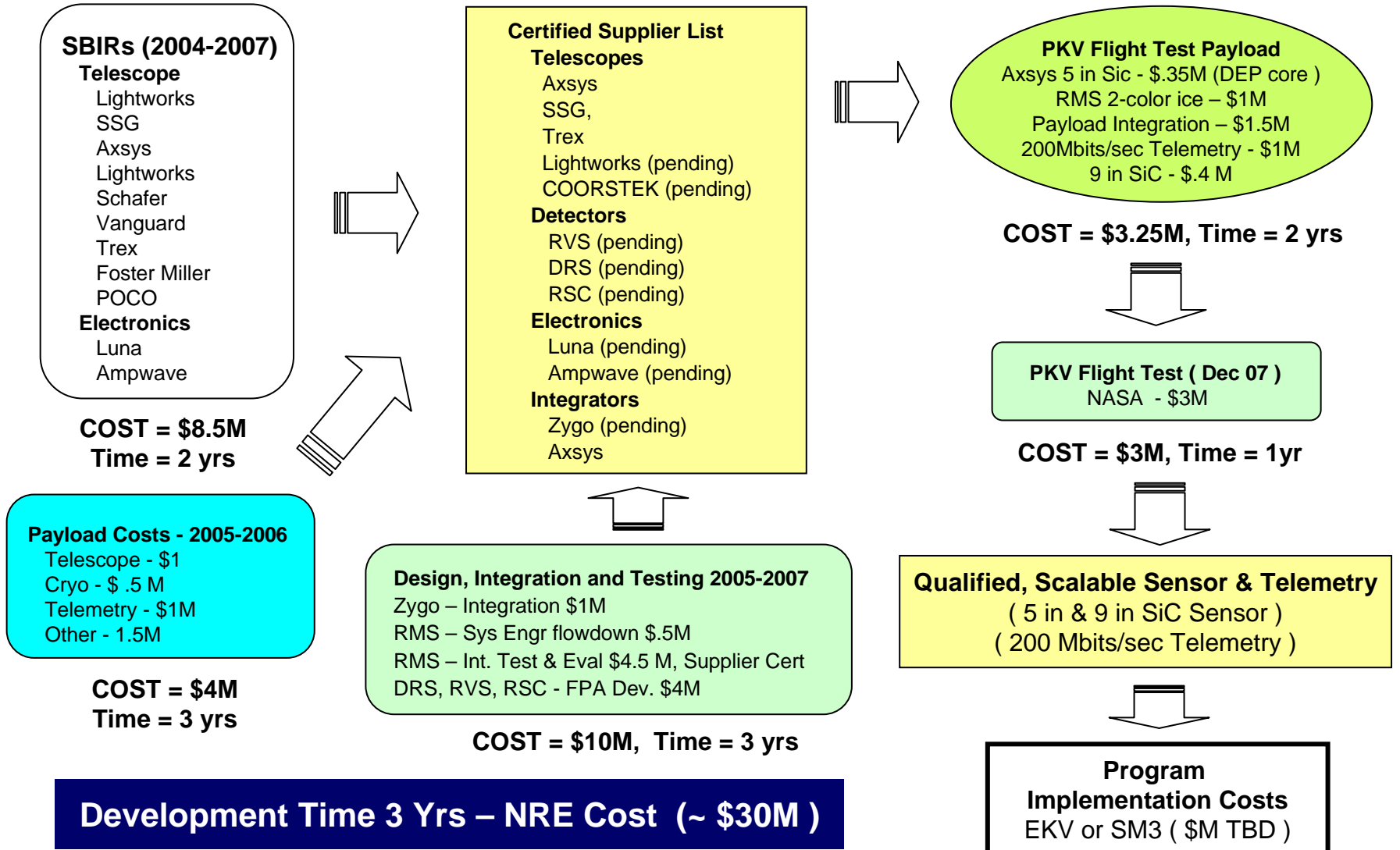
- **Collaborative investment (MDA/DEP, RMS, LM, and BAE)**
- **Non-program specific (EKV, SM-3, KEI, MKV, etc.)**
- **Begin by identifying producibility opportunities:**
  - Kill vehicle radiation tolerance / cost
  - Component / subsystem reliability
  - Infrastructure responsiveness to problems

**Improves mission assurance via flight testing of more radiation tolerant, producible and reliable technology**



# 1st Flight Test (NGSP-1) Costs

(Rad hard: SiC Telescope, 2-Color IR, Electronics, Telemetry)

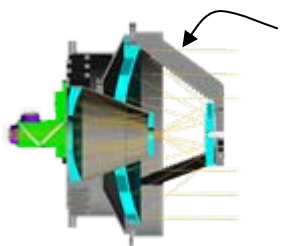




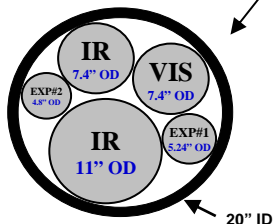
# Next Generation Sensor Producibility Program (NGSP) DEMONSTRATION FLIGHT TEST

**Improve mission assurance via enabling Rad Hard Seekers & ensuring Supplier Readiness - EMRL-3 ( TRL8, low rate mfg, ...)**

- Scalable 4 mirror Telescope Design ( enable multiple KV insertions - commonality )
- Rad Hard SiC Telescope ( survive vibration environments ) - Producers: Axsys & Zygo
- Rad Hard 2C-IR w/ & w/o Rad Hard Vis ( evaluate multiple mission CONOPS ),  
- Producers: 2-color LWIR FPA (DRS & Raytheon), Visible FPA ( Rockwell Scientific )
- Rad Hard, AT & adaptive Sensor Electronics ( multiple insertions - commonality )  
- Producers: LUNA Innovations & Raytheon
- Rad Hard, 200 Mbits/sec KV Downlink Telemetry ( multiple insertions - commonality )  
- Producers: Ampwave-CPI & Lockheed Martin-Sunnyvale



**Telescope Design w/  
2C-IR & Vis Sensors  
in Payload**



**Black Brant XI  
Sounding Rocket**

**Single Flight Test @ NASA-Wallops  
in Dec 07 Timeframe**

**Cost ~\$6M Total**





# Reserve Battery Industrial Base

## Problem

- Long history of quality and on time delivery problems
- Feast or famine Procurement cycles
- Industry financial instability

## Benefits

- Chance to correct years of problematic performance
- Creates methods for solving quality and manufacturing problems across program lines
- Stable and responsive industry

## Solution

- Work with Primes through NDIA to:
  - Assess current state-what is working and what is not
  - Enterprise wide
  - Use EPT (produces 80%) as a first step





# Eagle Picher Kick Off

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- Manufacturing assessment performed December 5-6
  - Eagle Picher
  - MDA
  - DRC
  - Tiburon Associates
- Enterprise wide opportunities identified
  - Energetics
  - Manufacturing weak links
  - Material management-Supply chain
- Possible VSM approach
- Focus on consolidation of manufacturing improvement efforts
- Essential to have Prime involvement



# Eagle Picher Commitment

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- EPT is willing to collaborate with MDA and our Prime Contractors to explore methods to improve uniformity and efficiency of our manufacturing processes throughout the sectors of our enterprise which impact the relevant programs...
  - » Steven E. Westfall
  - » President, EaglePicher Technologies



# What do we need?

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- Your advocacy!
- Participation of a few key experts
- NDIA Subcommittee Chairman and Point of Contact
  - James Gucinski
  - [jag@tiburonassociates.com](mailto:jag@tiburonassociates.com)
  - 812-825-4355

***Unified Processes Benefit All of the Stakeholders***



# Technologies Available for Transition into Kill Vehicles NOW

- Sunshade removal
- Sunshade
- KV Structure materials
- 4 mirror on-axis telescope
- Telescope coatings
- Telescope mirror material
- 2-Color FPA
- VLW Visible FPA
- Shielding for Electronics Package
- Off vehicle cryo
- Improved down link antenna
- SDR transmitter
- New formula thermal battery
- Composite electrical housings
- Common Divert thrusters
- Modular high level ACS thrusters
- Simplified DACS manifolds

**DEP is working to reduce additional risk and overcome the “not invented here” paradigm**



# Prime Contractors and MDA Program Manager Involvement

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- **Briefed MDA Program Managers and their industry counterparts on 13 Oct 06**
  - **Discussed DEP-matured technologies that are available for transition**
  - **Solicited ideas on how MDA could incentivize PMs and Primes to embrace technology transition**
  - **F. Al Riley (Raytheon) [f\\_a\\_riley@raytheon.com](mailto:f_a_riley@raytheon.com)**  
**Frank Moore (Northrup Grumman) [wf.moore@ngc.com](mailto:wf.moore@ngc.com)**  
**Pat Shanahan (Boeing) [patrick.m.shanahan@boeing.com](mailto:patrick.m.shanahan@boeing.com)**  
**Hal Jacob (Lockheed Martin) [hal.jacob@lmco.com](mailto:hal.jacob@lmco.com)**
- **Follow-up meeting held with Raytheon on XX Jan 07**



# Way Ahead

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- **Prime contractors and the PMs determine if any of the mature technologies should be transitioned into their product lines**
- **DEP can help by providing people, funding and other resources**
- **DEP is ready to assist in maturing those technologies that will reduce risk on your program**