# Ballistic Missile Defense And the Missile Defense Agency

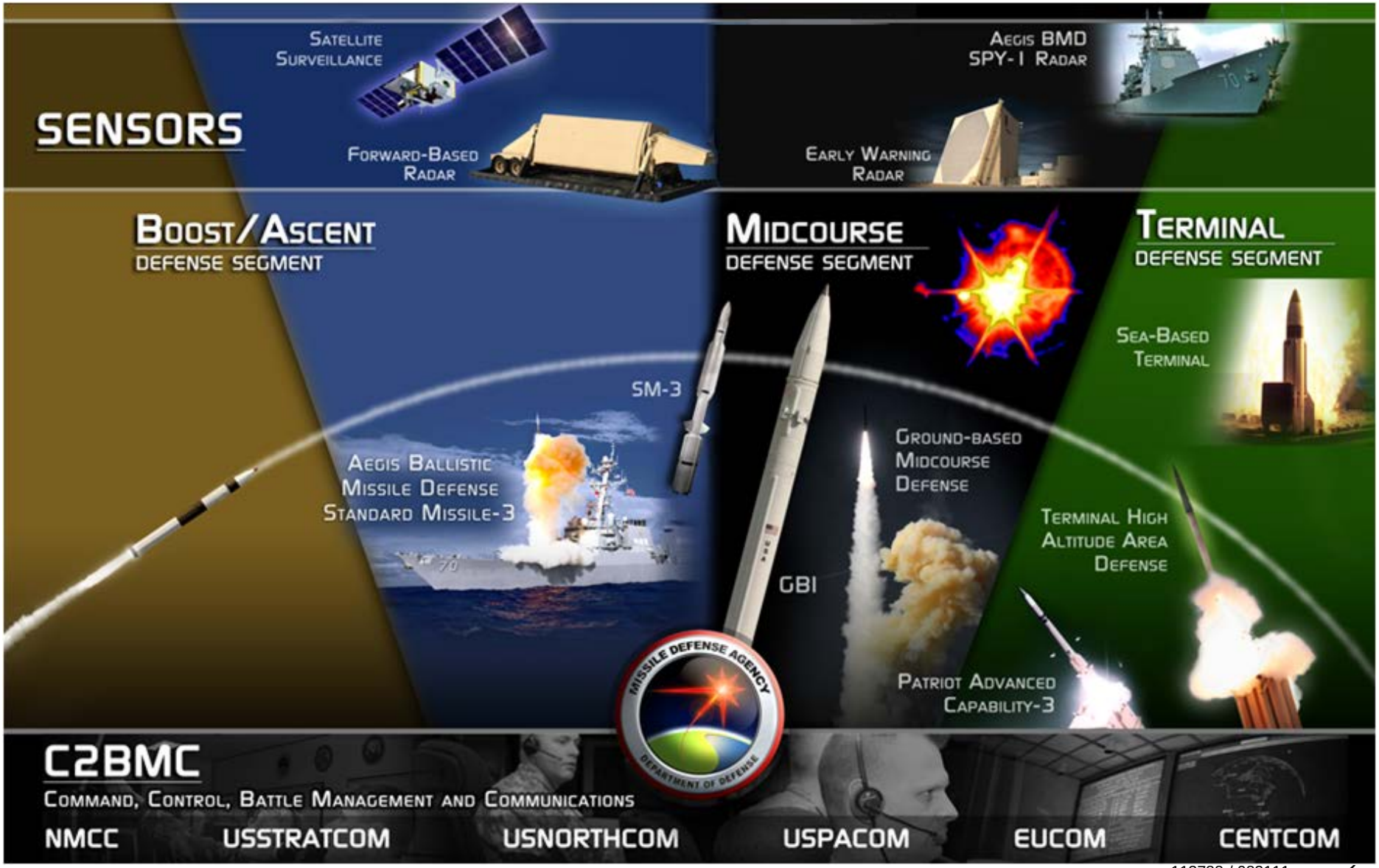
**May 2012**

**Dr. David Burns**

**Director for Science and Technology**

**Advanced Technology**

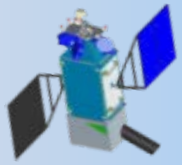
# Today's Ballistic Missile Defense System



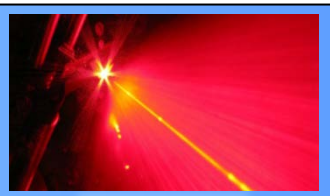
# Potential Areas Of Missile Defense Technology Collaboration

## Remote Sensing


Data Fusion


Space Components


Airborne


Advanced

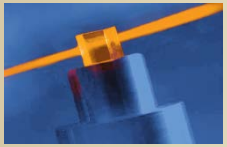
## Ballistic Missile Defense Interceptor

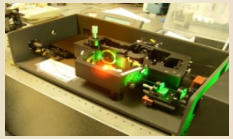

Guidance Components


Lightweight Structures

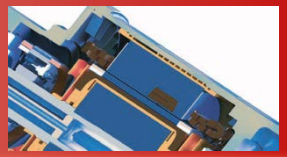
Communication components

## Directed Energy System


Crystal Windows

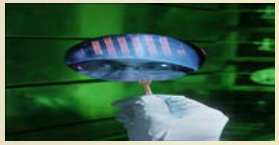

High Efficiency Energy Storage


Laser Diodes


Efficient Power Conditioning

## Producibility Quality Reliability


Nano-electronics


Ultra reliability


Micro-chip inspection

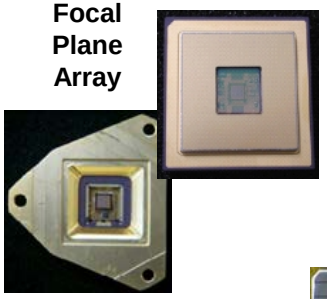
# Advanced Technology Programs

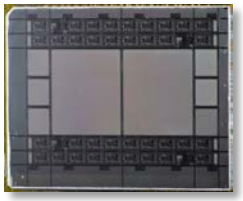
## Advanced Remote Sensing

Data Fusion

Space-Based Sensor

Focal Plane Array

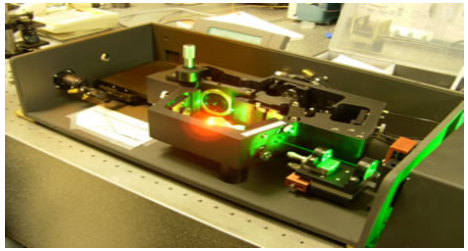




Infrared Detector Material

Image Processor

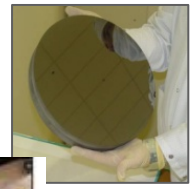
## Directed Energy Research

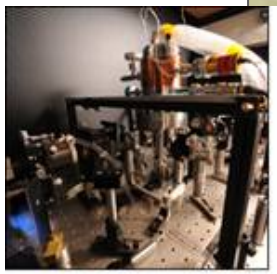


High Energy Laser

High Altitude Characterization

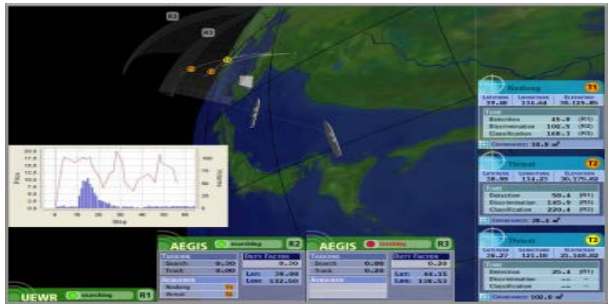
Laser Diodes





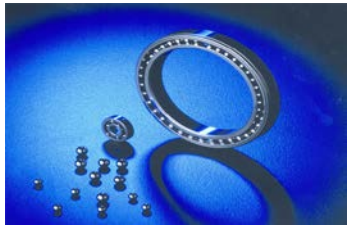
Cryo Laser

## Advanced Research

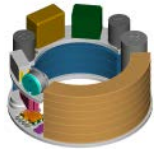


Advanced Algorithms

Housing Structure



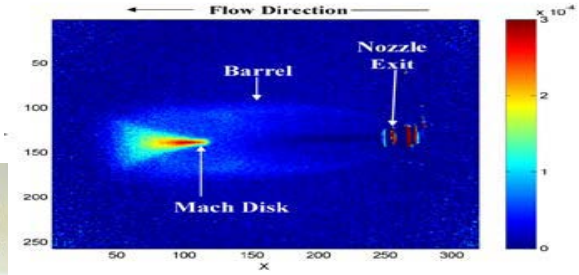
O-Ring and Bearings



Seeker Technology

Lightweight Composite

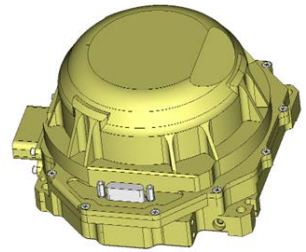
Silicon Carbide Mirrors



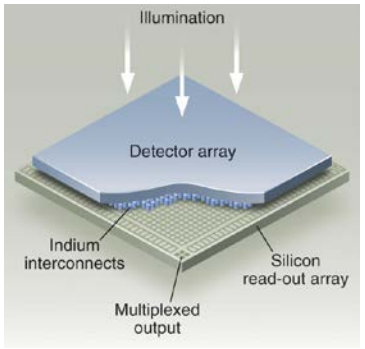

Low-Thrust Plume Signature Modeling

# Remote Sensing And Interceptor Technology

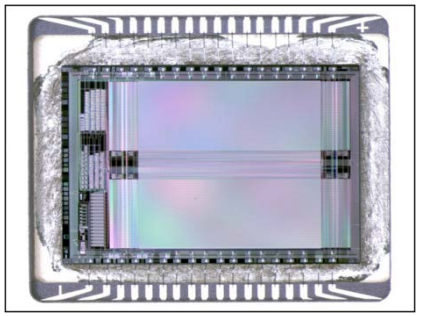
- **Larger Format Sensor Arrays**
  - Develop for greater sensitivity and longer acquisition ranges
- **Lower Noise Inertial Measurement Unit**
  - Reduce noise for higher accuracy by controlling biases and drift
- **Environmentally Ruggedize Electronics**
  - Increase structural and material survivability maintaining high performance in operational environments
- **Advanced Power Supplies**
  - Create lightweight solid state power sources for long duration operations
  - Increase energy levels and efficiencies



Inertial Measurement Unit




Focal Plane Array



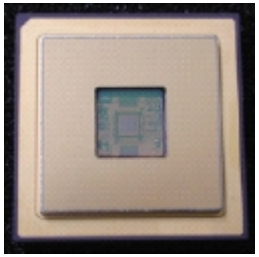
Ruggedized Electronics

Low Temperature Battery

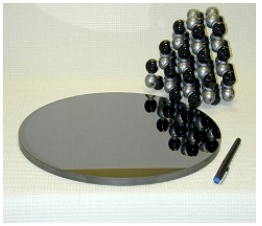
# Remote Sensing And Interceptor Technology

- **Lightweight Structures and Materials**
  - Reduce payload weight to achieve high velocity, agility, and fly-out range to increase battle space
- **Improve Thermal Management**
  - Develop advanced shielding materials to protect subsystems during stressful operating conditions
- **Multi-Spectrum Longer-Range Acquisition Seeker**
  - Increase focal plane array sensitivity
  - Develop lighter weight optics
- **Higher On-Chip Processing Capacity**
  - Increase chip processing speed to reduce dependence on ground-based data processing

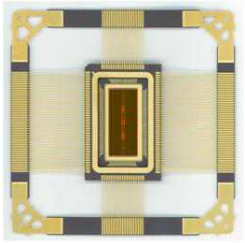
Lightweight Composite Sunshade



Multi Spectrum Focal Plane Array



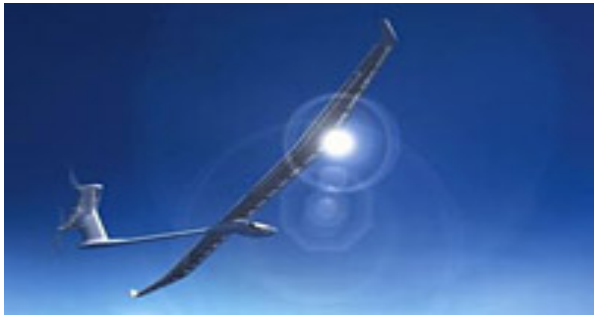
Silicon Carbide (SiC) Mirrors



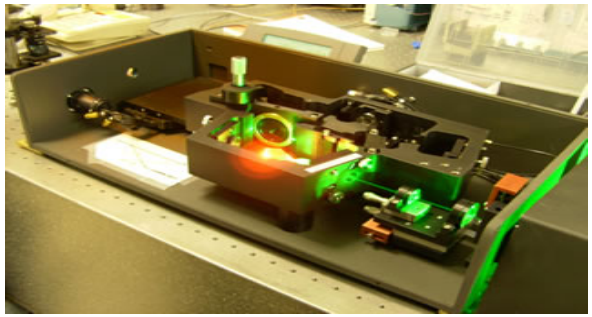
Hardened Dual-Port (DP) Static Random Access Memory (SRAM)

# Directed Energy Technology

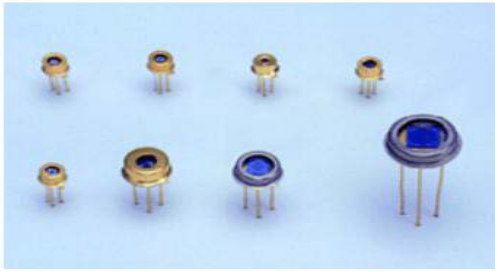
- **Lightweight Cooling for Solid State High Energy Lasers**
  - **Develop innovative solutions to cool solid state laser systems generating mega-joules of heat**
- **Power Sources / Batteries for High Energy Lasers**
  - **Develop techniques for lightweight, high energy density, multi-mega-joule power generation and storage**
- **Improve Diodes for High Energy Laser systems**
  - **Narrow bandwidth diodes**
  - **Less expensive**
- **Ultra Sensitive Detectors**
  - **High bandwidth, high frame rate, low noise**
  - **Camera system for wave-front sensing**
  - **Tracking, ranging, and imaging**
  - **Survivable optical gratings and coatings**



**Platform Integration**



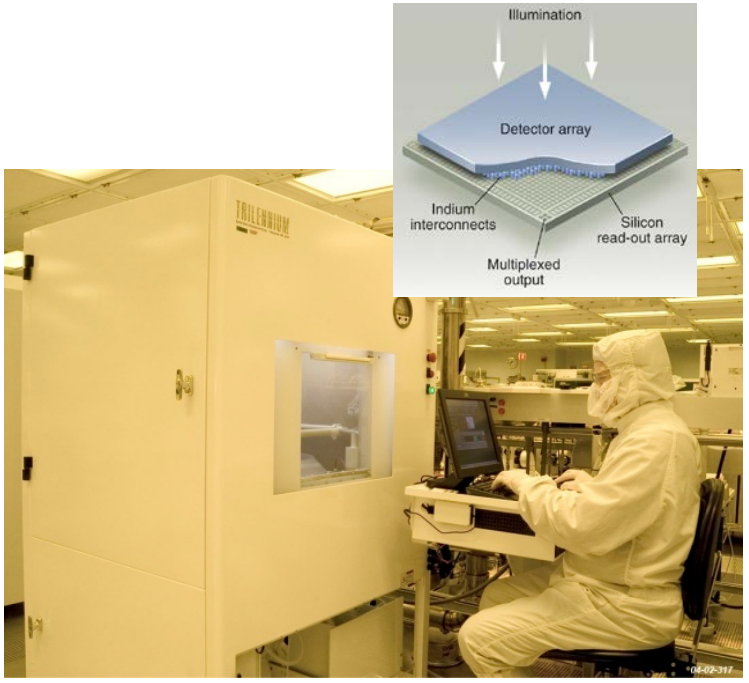
**High Energy Laser**



**Ultra Sensitive Detector Focal Plane Arrays**

# Producibility, Quality, And Reliability

- Our focus is on producibility, performance, *and* yield
- On-going efforts to improve focal plane array yields include:
  - Increased wafer size to improve yield
  - Transitioned from development to a production line
  - Initiated automated handling and material processing to reduce defects
  - Pursue multiple suppliers
  - Implement automated wafer cleaning process
  - Simplification of production processes




**Automated Clean-up Etch Process**

- Goal is to increase focal plane array yields and reduce cost without sacrificing performance

# University Research To Satisfy Missile Defense Needs

- **Missile Defense requires cutting edge technology**
  - Over $50M/year available for university research
- **Small Business Research**
  - Small Business Technology Transfer program
    - Universities partner with small business
    - Annual call for proposals from 24 Apr – 24 May 2012 and 26 Jul – 27 Aug 2012
    - Up to $660K per project is available
  - Small Business Innovation Research
    - Universities subcontract with small business
    - Annual call for proposals from 26 Jan – 27 Feb 2012 and 26 Jul – 27 Aug 2012
    - Up to $530K per project is available
  - Link: http://sbirsttr.com
- **Missile Defense Science & Tech Adv Research (MSTAR)**
  - Annual call for proposals from Spring/Summer 2012
  - $0.6M/year is available
- **Advanced Technology Innovation Broad Area Announcement (ATI BAA)**
  - Continuously open call for new ideas
  - Funding available as required
  - Link: http://www.mda.mil/business/research_opportunities.html

# Summary

- **Missile Defense Advanced Technology Programs are on the critical path to counter emerging BMDS threats**

- **Research Emphasis and Technology needs**
  - **Advanced Sensors**
  - **Directed Energy**
  - **Advanced Interceptor Technology**

- **MDA realizes the value of and looks to small business to lead the way in creative BMDS solutions to current and future Gap needs**