Exceptional service in the national interest

Sandia National Laboratories

Sandia National Laboratories
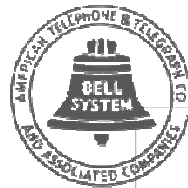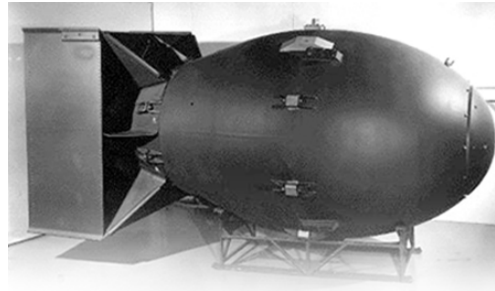
Careers in Nuclear Weapons

Jan Williams

Manager, Systems Integration

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Sandia's History

exceptional service in the national interest.
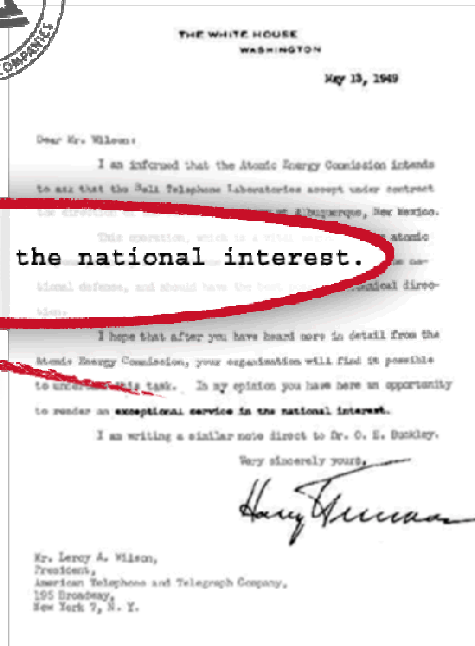
Sandia's Governance Structure

Sandia Corporation
- **AT&T: 1949–1993**
- **Martin Marietta: 1993–1995**
- **Lockheed Martin: 1995–present**

Government owned, contractor operated

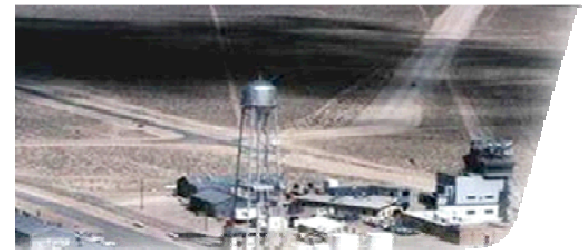**Federally funded research and development center**

Sandia's Sites

Albuquerque, New Mexico

Livermore, California

Tonopah, Nevada

Waste Isolation Pilot Plant, Carlsbad, New Mexico
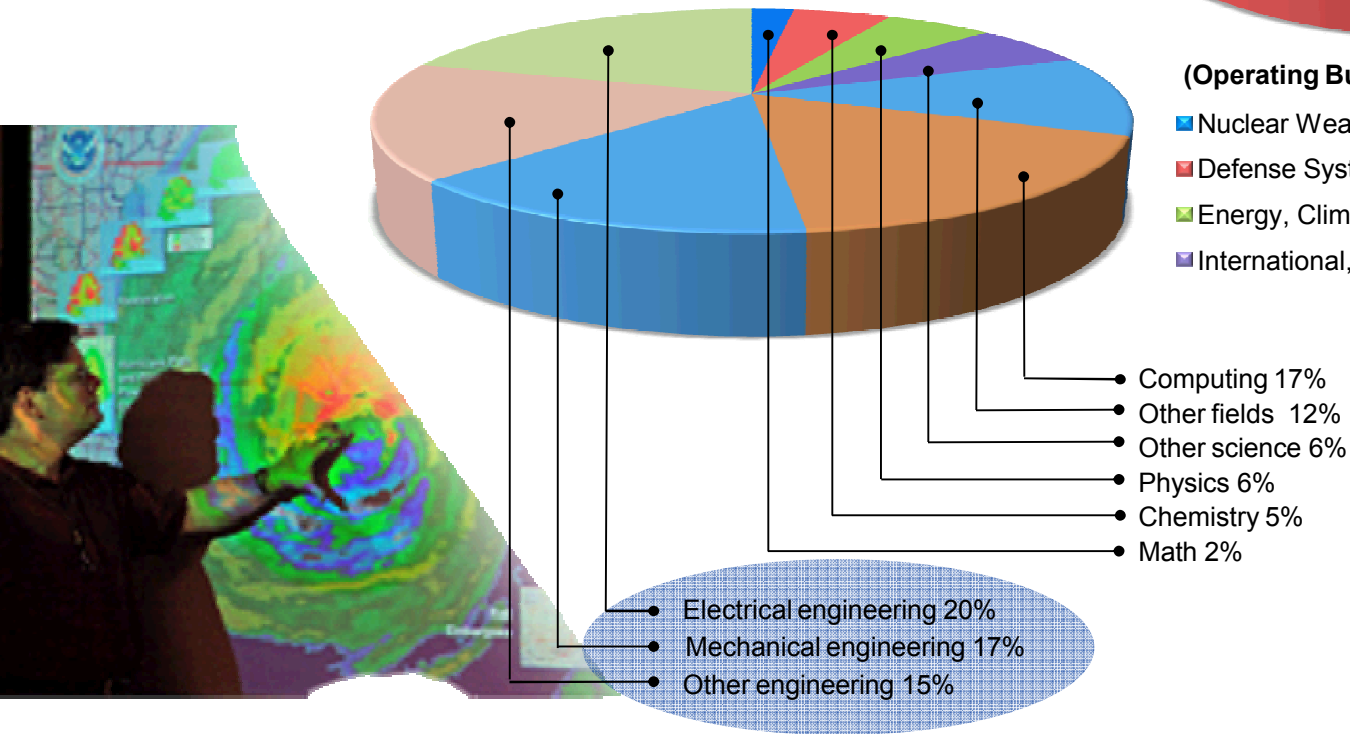
Pantex, Texas
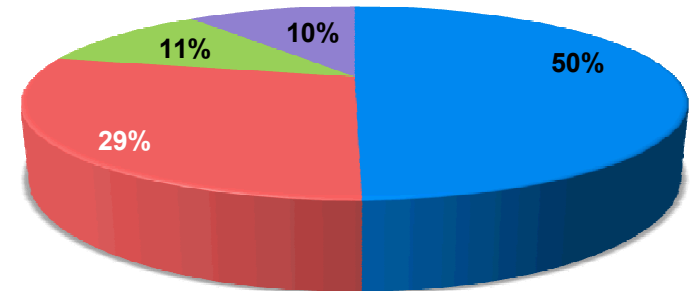
People and Budget

(As of October 11, 2011)

- On-site workforce: 11,876
- Regular employees: 9,122
- Gross payroll: ~$943 million

Technical staff (4,557) by discipline

- Computing 17%
- Other fields 12%
- Other science 6%
- Physics 6%
- Chemistry 5%
- Math 2%
- Electrical engineering 20%
- Mechanical engineering 17%
- Other engineering 15%

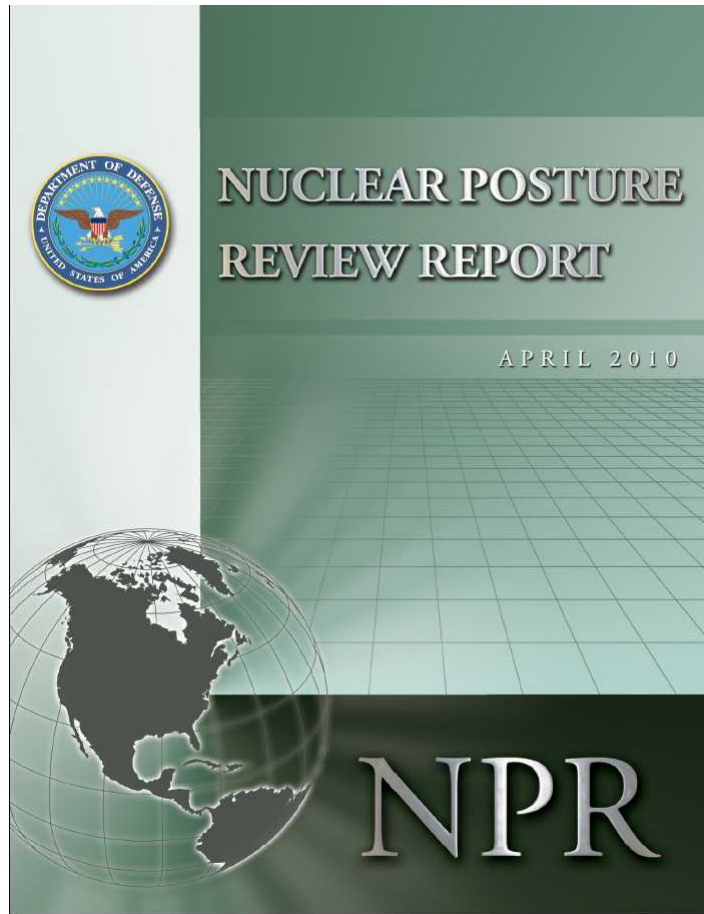## FY11 Operating Revenue $2.4 billion

50%
29%
11%
10%

(Operating Budget)

- Nuclear Weapons
- Defense Systems & Assessments
- Energy, Climate & Infrastructure Security
- International, Homeland, and Nuclear Security
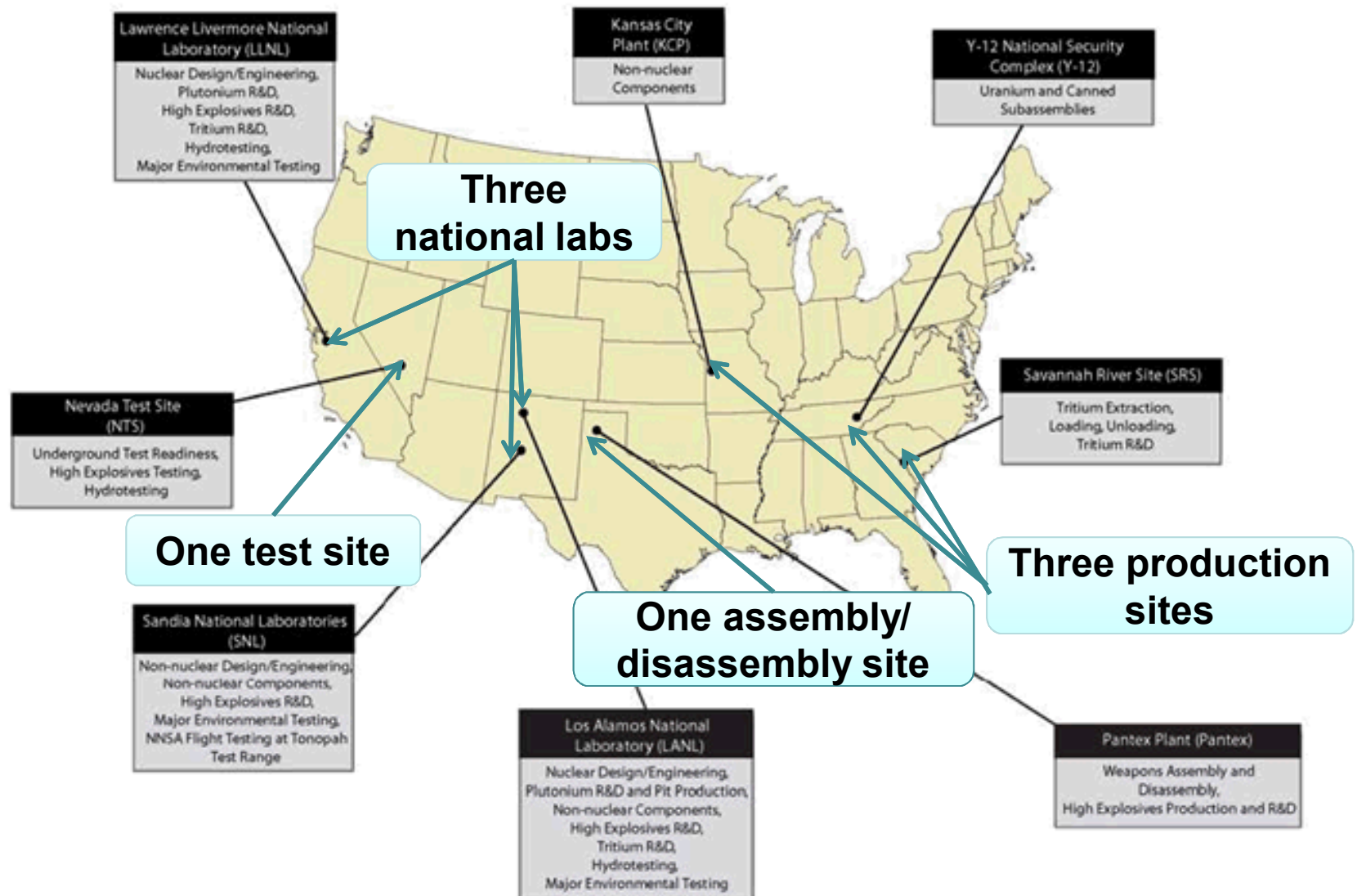
Nuclear deterrence is the official policy of the United States

NUCLEAR POSTURE REVIEW REPORT

APRIL 2010

NPR

Even in a time of stockpile reduction, we are tasked with maintaining a credible deterrent for the United States.

National Security Enterprise

Lawrence Livermore National Laboratory (LLNL)
Nuclear Design/Engineering, Plutonium R&D, High Explosives R&D, Tritium R&D, Hydrotesting, Major Environmental Testing

Kansas City Plant (KCP)
Non-nuclear Components

Y-12 National Security Complex (Y-12)
Uranium and Canned Subassemblies

Savannah River Site (SRS)
Tritium Extraction, Loading, Unloading, Tritium R&D

Nevada Test Site (NTS)
Underground Test Readiness, High Explosives Testing, Hydrotesting

Sandia National Laboratories (SNL)
Non-nuclear Design/Engineering, Non-nuclear Components, High Explosives R&D, Major Environmental Testing, NNSA Flight Testing at Tonopah Test Range

Los Alamos National Laboratory (LANL)
Nuclear Design/Engineering, Plutonium R&D and Pit Production, Non-nuclear Components, High Explosives R&D, Tritium R&D, Hydrotesting, Major Environmental Testing

Pantex Plant (Pantex)
Weapons Assembly and Disassembly, High Explosives Production and R&D

Three national labs

One test site

One assembly/ disassembly site

Three production sites

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Addressing Our Evolving National Security Environment is of the Greatest Importance
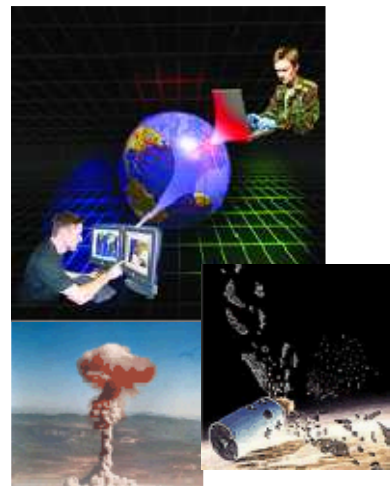
Traditional strategic
nuclear threats

Threats from
other nation states

Threats from
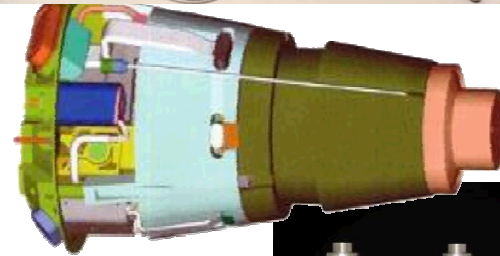non nation states

Threats of
tech surprise

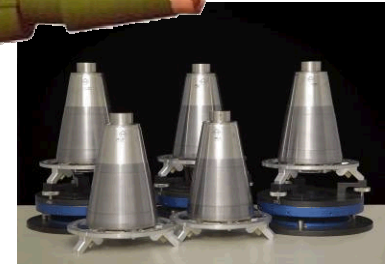Other threats: natural disasters,
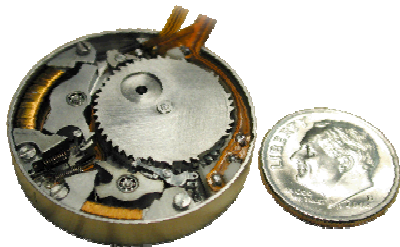climate change, energy supply

Nuclear Weapons

Integrated, engineered warhead systems

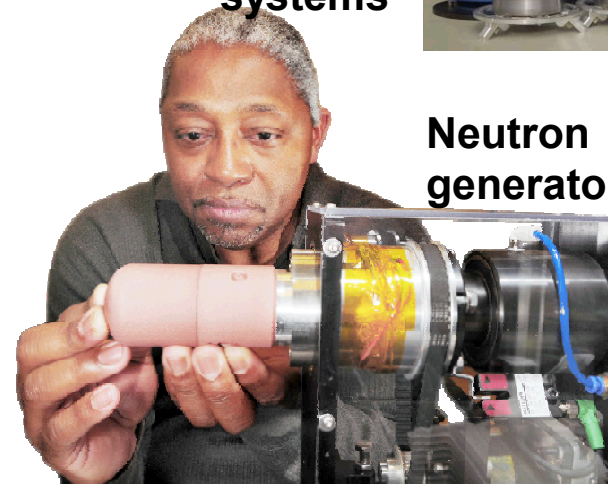**Arming, fuzing, and firing systems**

Neutron generators

Gas transfer systems

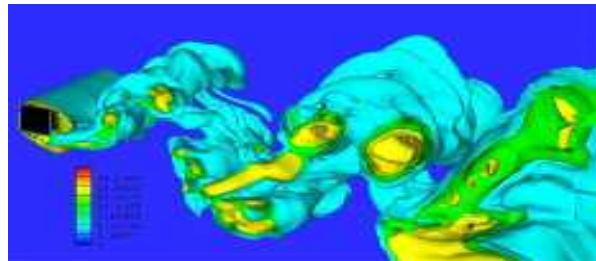**Safety systems**

Nuclear Weapons

High reliability, high consequence of failure, challenging environments, and technology solutions

Facilities and Capabilities

Microelectronics and microsystems

Design, fabricate, package, and test trusted semiconductor components
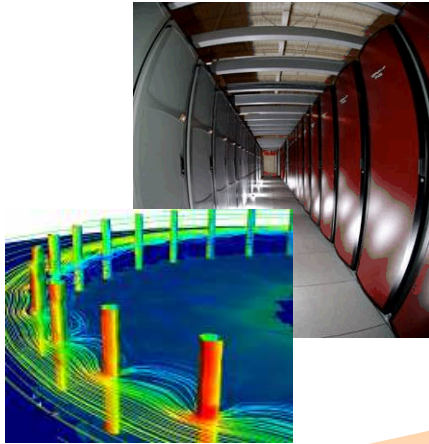

Computational simulation

High-performance hardware and software tools to enable solutions requiring massively parallel computers
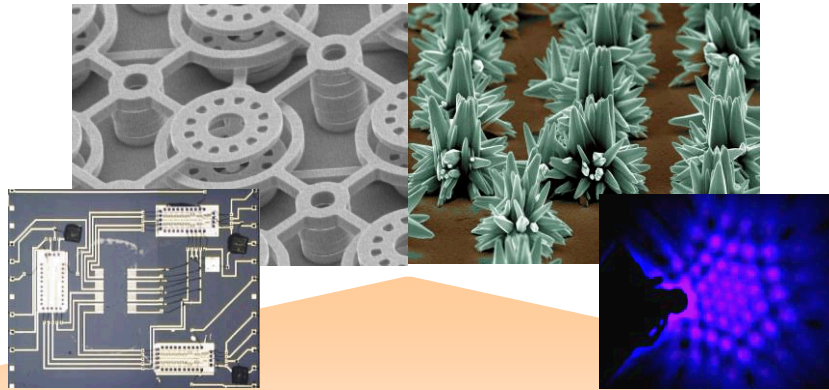

Environmental testing

Simulate environmental conditions and collect relevant data for systems, subassemblies, and components

Research Disciplines Drive Capabilities

High Performance Computing

Nanotechnologies & Microsystems
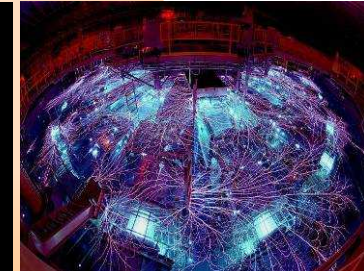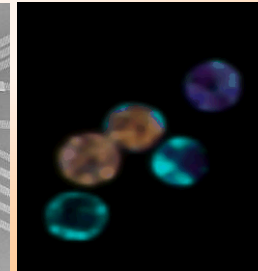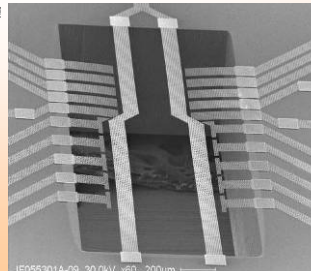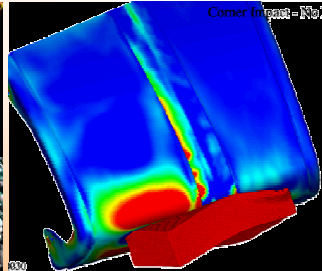
Extreme Environments
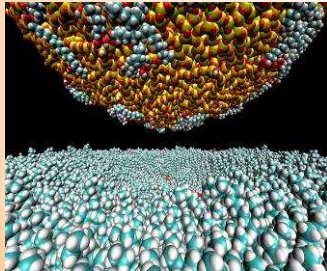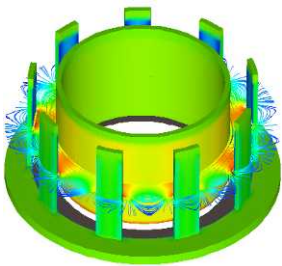
Computer Science

Materials

Engineering Sciences

Micro Electronics
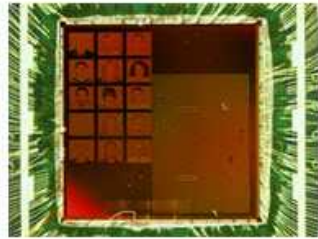
Bioscience

Pulsed Power

Research Disciplines

Other program areas

- Defense Systems and Assessments

- Energy, Climate, and Infrastructure Security
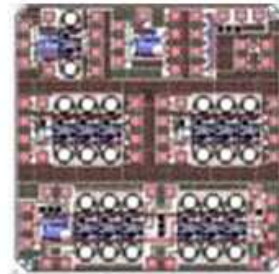
- International, Homeland, and Nuclear Security

So…what do weapon designers do?

Custom ASICs

Radiation Assurance

RFICs

13
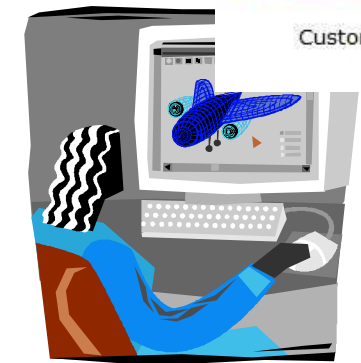
Careers in the design of non-nuclear components

- Most weapons contain over 2000 mechanical/electrical components

- These components deal with everything from guidance systems to safeguards against unauthorized use.

We need exceptional individuals in mechanical, electrical, electromechanical, optoelectronic, and computer engineering, and computer science, to update existing weapon systems in the stockpile to keep them:

- **Safe**
- **Secure**
- **Reliable**

Major activities in weapon engineering

Component Design

CS/ Computer Engineering applications
- Hardware
- Software
- Embedded systems
- Surety systems
- Systems test and integration
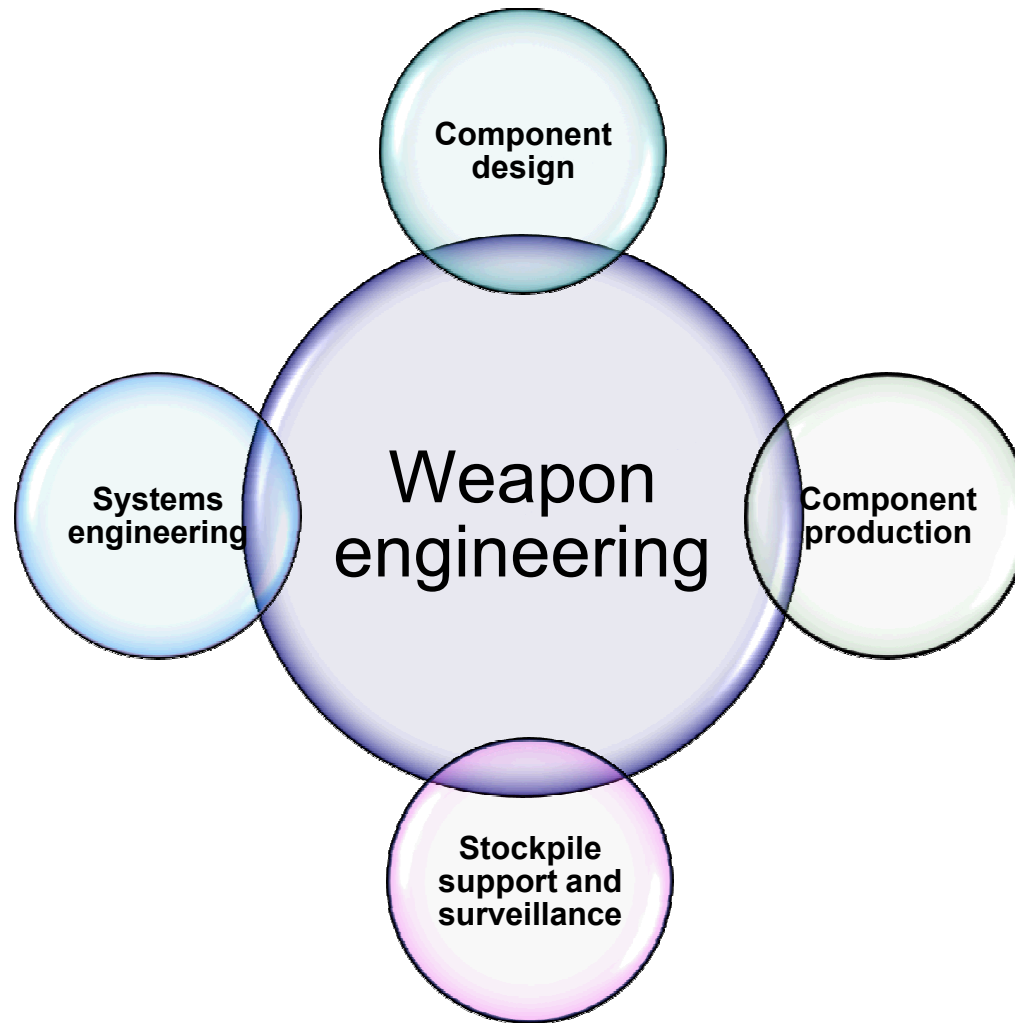
Electrical engineering applications:
- Opto-electronics
- Communications
- Instrumentation
- Telemetry
- RF design
- Digital and analog design
- Sensor systems
- Systems integration

Mechanical engineering applications:
- Microsystems
- Flight hardward
- Opto-mechanical design
- Surety systems
- Thermal management
- Systems integration

Component design

Key skill sets:
- Technical expertise in discipline
- Work on multi-discipline teams
- Requirements validation & test at component and subsystem levels

Weapon engineering

Component design

Systems engineering

Component production

Stockpile support and surveillance
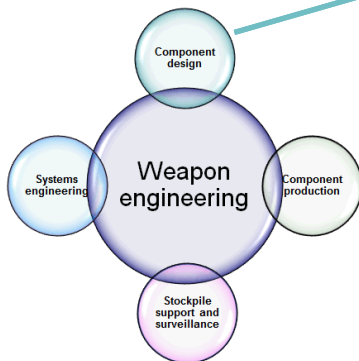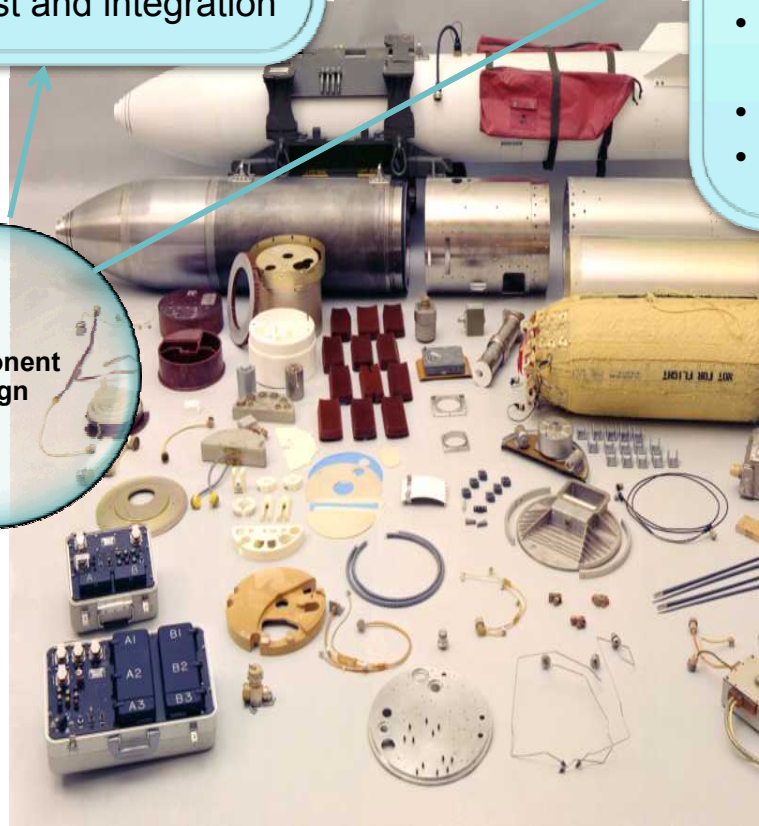
Component Production

Engineering disciplines hired:
- Mechanical
- Electrical
- Manufacturing
- Chemical

Products manufactured at Sandia:
- Neutron generators
- Neutron tubes
- Power supplies
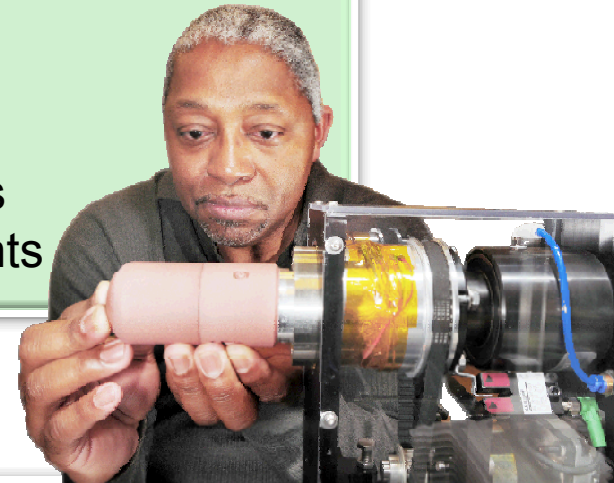- Rad-hard microchips
- Explosive components

Component production

Component design

Systems engineering

Weapon engineering

Component production

Stockpile support and surveillance
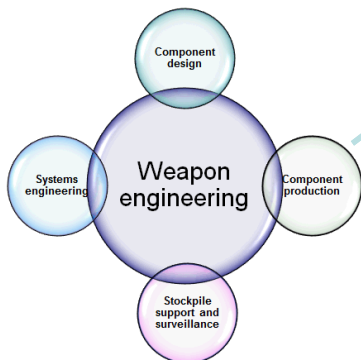
Key skill sets
- Production engineering
- Supply chain management
- Process engineering
- Life cycle product engineering
- Production technology maturation
- Lean/six sigma process improvement

Stockpile management and surveillance

Disciplines hired:
- Mechanical engineering
- Mech engrg technology
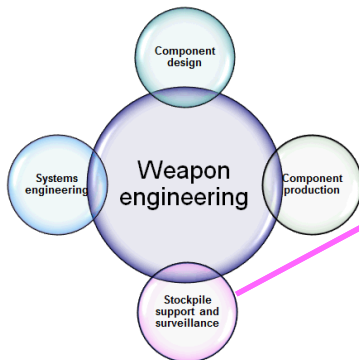- Electrical engineering
- Electrical engrg technology
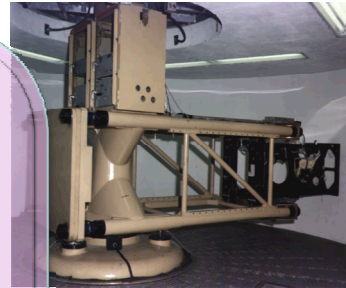- Computer engineering
- Systems engineering

B-2 with B83 Joint Test Assembly

Products and services:
- CAD designs for components and systems
- Surveillance testing for the current stockpile
- Detecting and predicting aging and wear in the current stockpile
- Test to certify the stockpile and identify any aging issues
- Maintaining fielded warheads

Stockpile support and surveillance

Component design

Systems engineering

Weapon engineering

Component production

Stockpile support and surveillance

Key skill sets:
- CAD design
- Software tools
- Materials aging testing
- Modeling and simulation
- Test design & execution

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Systems engineering

Disciplines hired:

- Mechanical engineering
- Electrical engineering
- Computer science
- Computer engineering
- Materials science
- Systems engineering

Systems engineering

Component design

Systems engineering

Weapon engineering

Component production

Stockpile support and surveillance

Key skill sets

- Working on and leading multidisciplinary teams
- Requirements analysis, management, and tracking
- Design trade space analysis
- Design and execution of system qualification tests
- Integration across disciplines or subsystems
- Program and project management
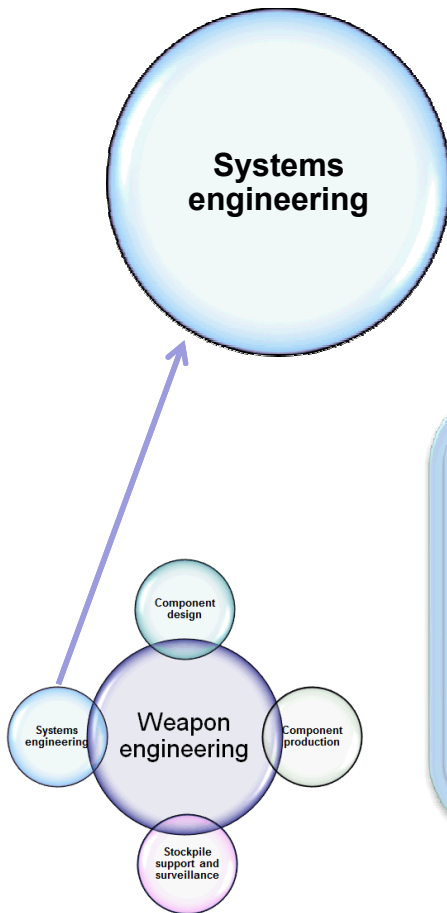
Early career: Iliarys "Vicki" Matos

- BSME from UPR, December 2010

- MSME at University of Wisconsin expected December 2012 through Sandia-paid special degree program

- Assigned to one of our warhead system groups

Mid-career: Nydia (Ortega) Brazeau

- BSCE from Georgia Tech in 1996

- Hired by Sandia in 1997

- Obtained MSCE (construction management) in 1999 from Georgia Tech through Sandia-paid special degree program

- Has had a broad variety of assignments at Sandia, from construction manager in Facilities to studies in nuclear weapons systems

- Native of PR!