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End to End Weapons Engineering

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LANL Weapons Engineering Overview

Presentation Overview:

- LANL Nuclear Weapon Engineering Elements
- Weapon Systems
- Capabilities / Lifecycle
- Testing
- DARHT
- Questions

LANL Nuclear Weapon Engineering Elements

Research
&
Development

Dismantlement
&
Disposition

Surveillance
&
Monitoring

Manufacturing

External Interface
with
NWE & DoD

Engineering
&
Design

Prototype/Hardware
Development

Testing
&
Experiments

Design Definition

Nuclear Measurements

Stockpile to Target Sequence

- Different environments require different solutions

LANL Weapon Systems – Air Force

LANL Weapon Systems – Navy

A safe, secure and deterrent requires a broad suite of science and engineering capabilities

These capabilities allow LANL to address 21st century national security challenges

Engineering is critical for the entire lifecycle

- LANL engineering test capabilities replicate the STS environments and evaluate warhead performance to those environments

- Shock
- Vibration
- Acceleration
- Temperature (hot or cold)
- Strain
- Pressure
- Rotation

- **Environmental testing**

- Provides test data in different environments
- Augments data for modeling
- Validates models

Shock and Vibration capabilities

These resources allow LANL to test “live” HE

DARHT video

- LA-UR-19-30233

Entire Lifecycle Engineering

- Research and Development
- DOD interface
- Initial Design
- STS considerations
- Qualification
- Manufacturing
- Surveillance
- Life Extensions / Alterations
- Stewardship

Questions?

Backups

E Division Capabilities

- Nuclear process design
- Process automation and robotics
- Glovebox design and integration
- Radiography
- Nondestructive testing and evaluation
- Mechanical design, fabrication, and testing
- Thermal design and analysis
- Cryogenics
- Process Modeling
- Industrial engineering
- Systems engineering
- Risk analysis
- Instrumentation and control development
- Weapon assembly
- Weapon environmental testing
- Assembly engineering
- Advanced engineering analysis

J Division Capabilities

- Accelerator operations
- Accelerator and beam physics
- Mechanical engineering and maintenance
- Vessel operations: fielding, cleanout, repair, and procurement
- Dynamic structure R&D
- High Explosive (HE) operations
- Technical and operational expertise in planning and executing complex and hazardous system/subsystem tests
- Experiment integration to include designing, modeling, and conducting integrated experiments
- Experiment and diagnostic probe design and construction
- Data analysis
- Develop and field x-ray and related diagnostics
- HE fabrication and disposal
 - Pressing
 - Sawing
 - Machining
 - Inspection
 - HE waste treatment

M Division Capabilities

- Analytical chemistry
- HE science
- Materials synthesis and formulation
- Processing, characterizing, and examining new and traditional HE
- HE-pulsed power
- Small-scale safety, sensitivity, and performance testing of energetic materials
- Shockwave initiation and detonation physics
- Dynamic properties of materials
- Explosives detection
- Investigations of reacting energetic materials
- Reactive flow modeling
- Shockwave compression of organics and shock-induced chemistry
- HE crystal growth
- Gas and powder gun

PF Capabilities

- Classified and unclassified DU and Be machining
- Welding and cutting of nonhazardous materials
- Fabrication programming
- Dimensional inspection
- Programming support for other fabrication and inspection activities
- Engineering (fabrication and metrology)
- Machine tool lifecycle support
- Managing LANL's Machinist Pipeline Program

Q Division Capabilities

- Nuclear Explosive
Package design, system engineering, and system integration
- Ground, flight, and hydrodynamic qualification testing
- Firing system, detonator, and actuator design
- Gas transfer system (GTS) and GTS related design
- Advanced surety and safety systems
- Development of Safety and Surety Architectures and Assessment Methodologies
- Data processing, environmental analysis, and requirements development
- NNSA business practice execution

W Division Capabilities

- Nuclear Explosive
Package design, system engineering, and system integration
- Ground, flight, and hydrodynamic qualification testing
- Designer/drafter
- Military liaison
- Nuclear explosive safety
- Production liaison
- Use Control
- Weapons Response
- Engineering
 - Quality
 - Requirements
 - Software
 - Surveillance
 - Systems
 - Test