SAND2018-12469C

Sandia National Laboratories Site Report - Albuquerque

NDT NON-DESTRUCTIVE TESTING

PRESENTED BY

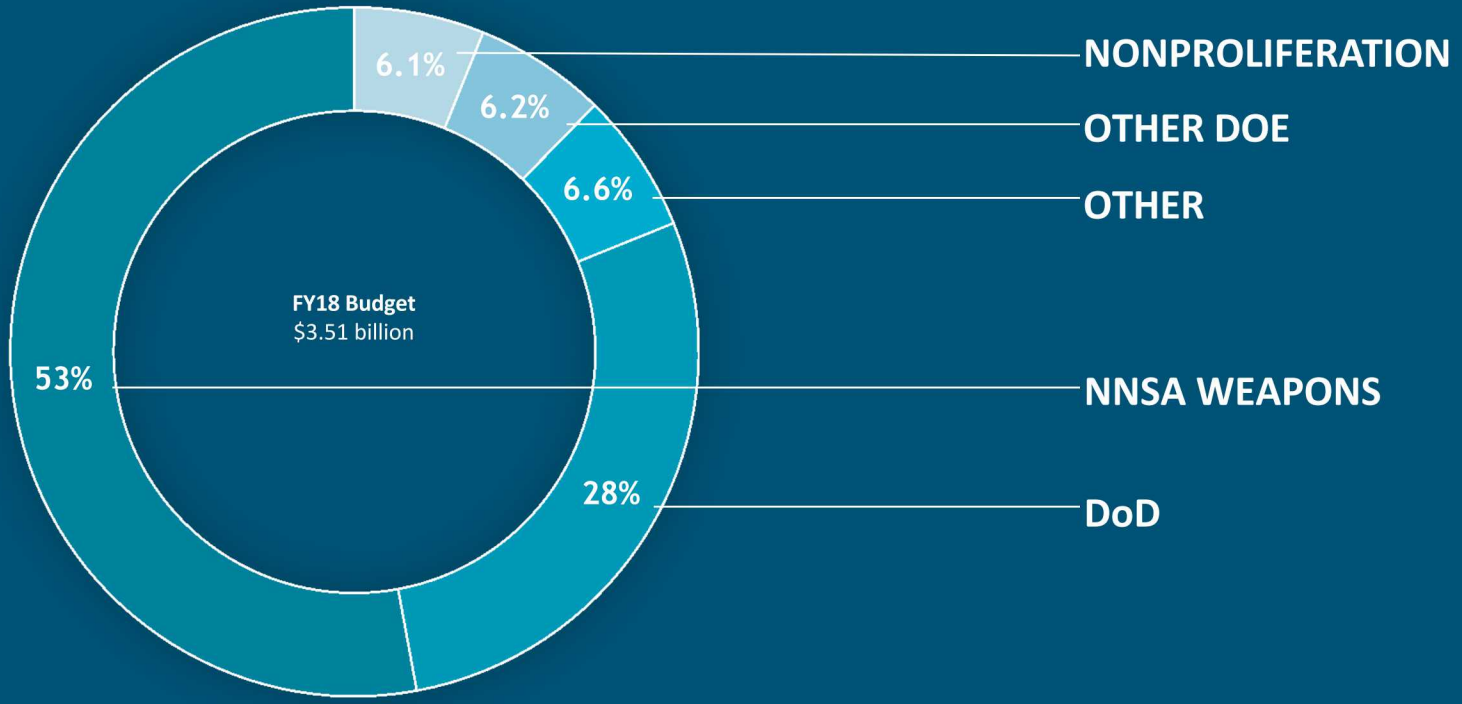
Nedra Bonal

11/5/18 – 11/9/18, Kansas City National Security Complex

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

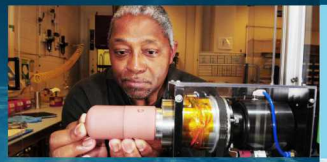
Sandia Has Two Main Locations

Sandia's Funding ~ $3.51 Billion



Data as of July 2018

Fulfilling Our National Security Mission



Nuclear Deterrence

Defense Nuclear Nonproliferation

National Security Programs

Energy & Homeland Security

Advanced Science & Technology

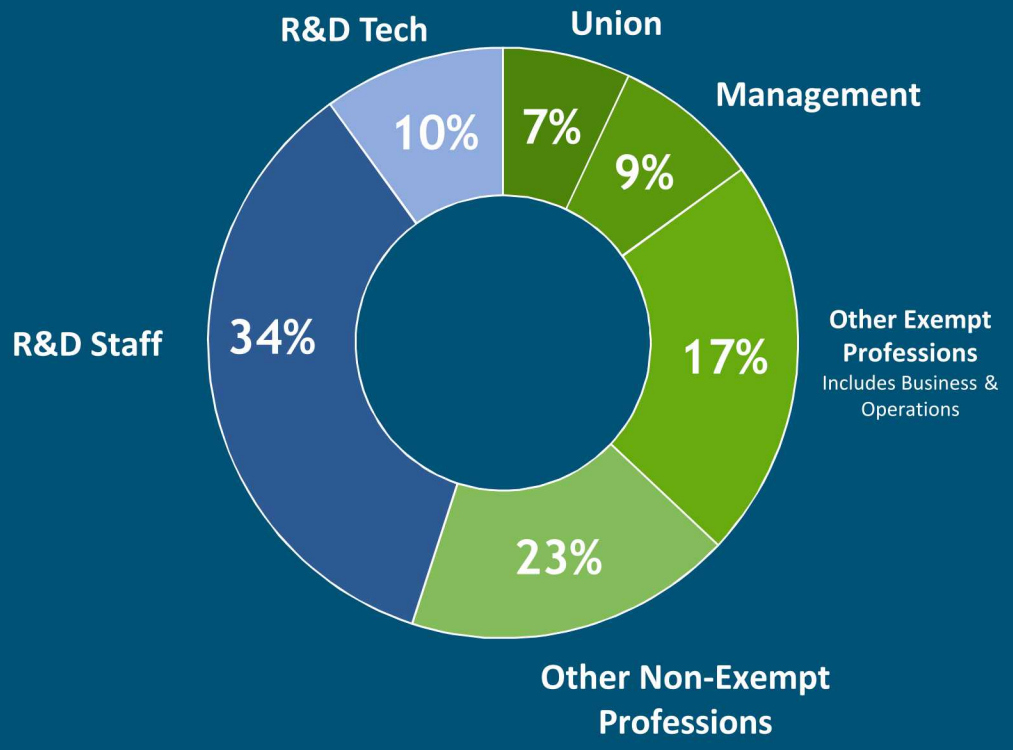
of life.

Our Workforce ~12,900 employees

~11,200 Regular employees
~1,700 Temporary employees, students & postdoctoral appointees

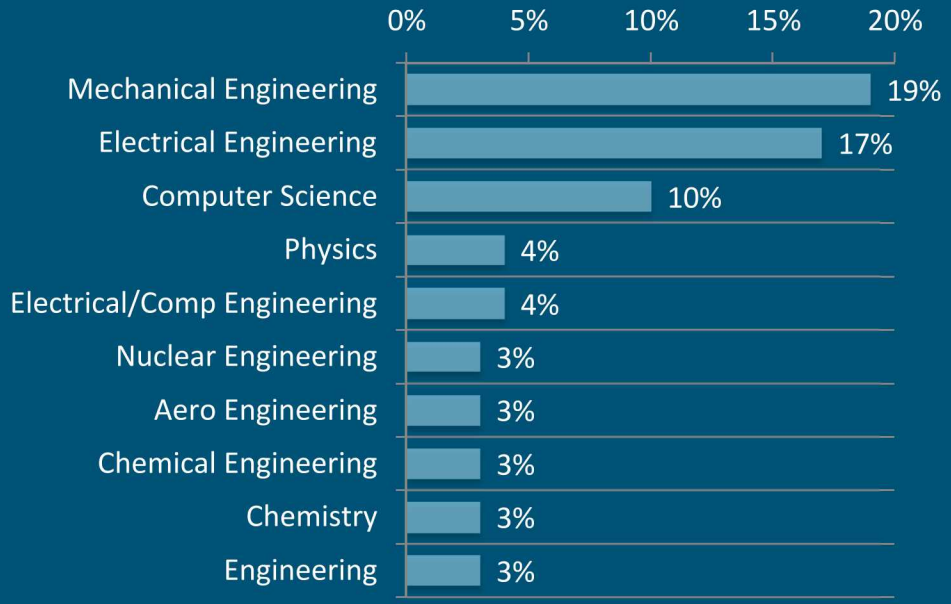
New Mexico Site:
Workforce: ~10,000
R&D employees: ~3,800
(R&D Staff & Technologists)

California Site:
Workforce : ~1,200
R&D employees: ~600
(R&D Staff & Technologists)

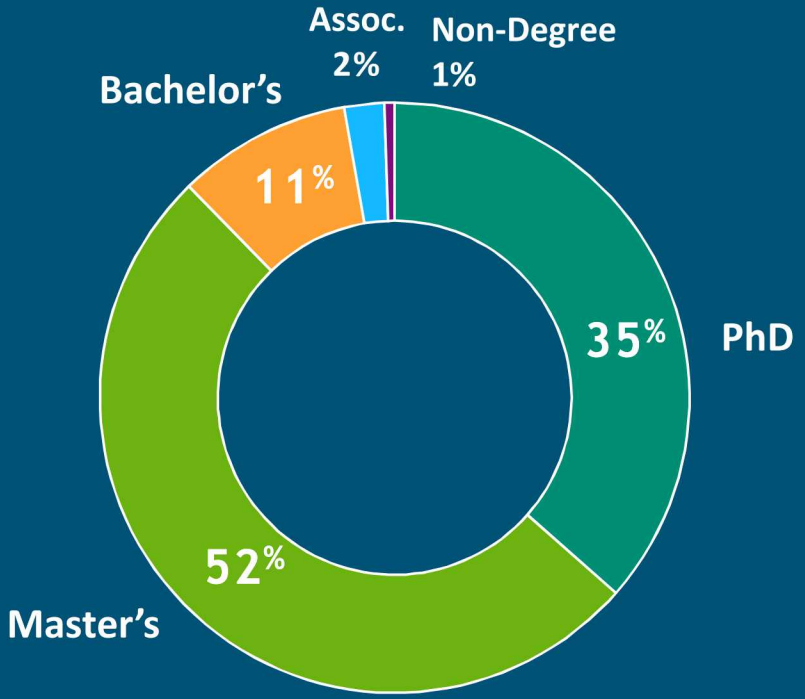


Data as of June 29 end of Q3 of the FY18

R&D by Discipline & Degree

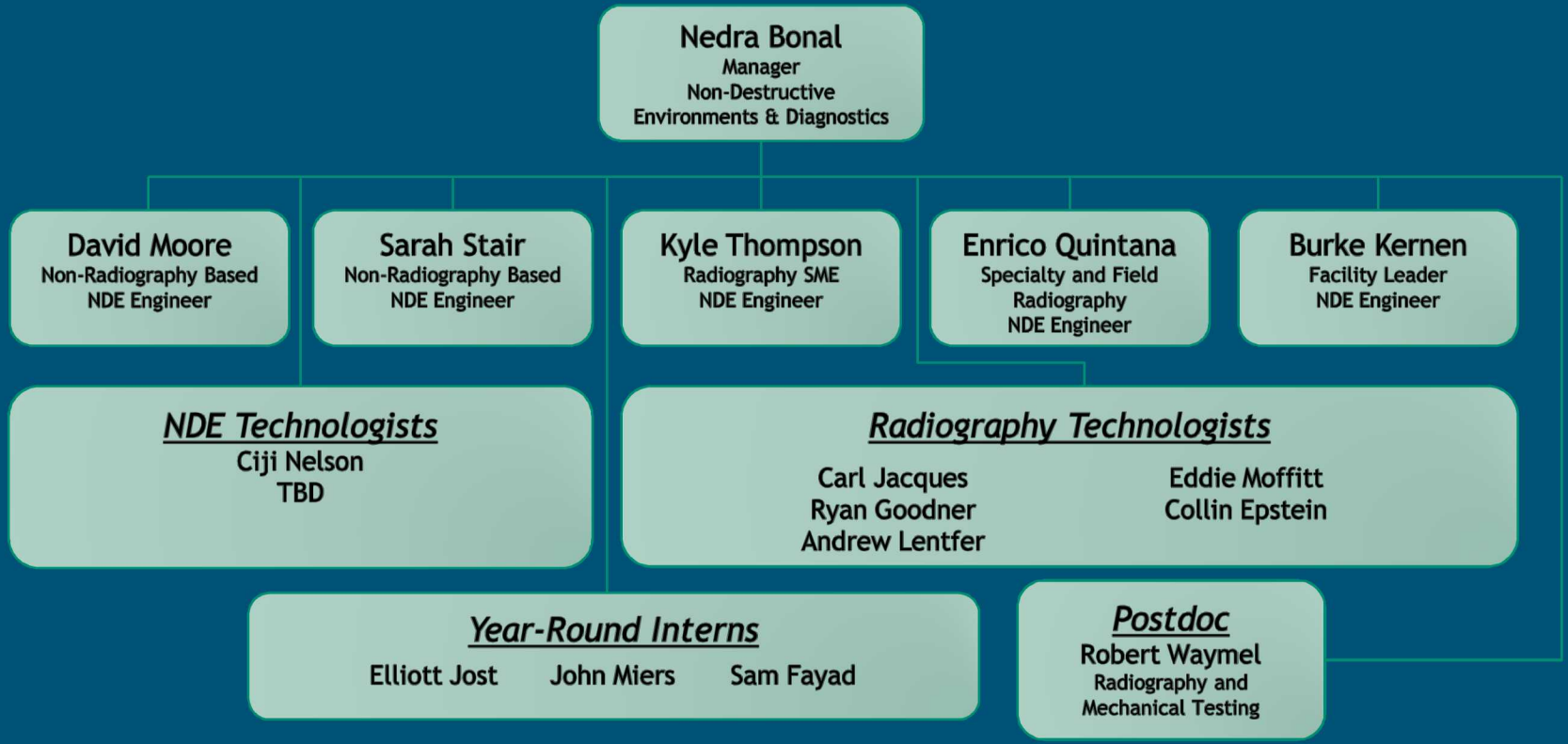


Top 10 job descriptions shown, Regular exempt non-management employees only



Data as of June 29 end of Q3 of the FY18

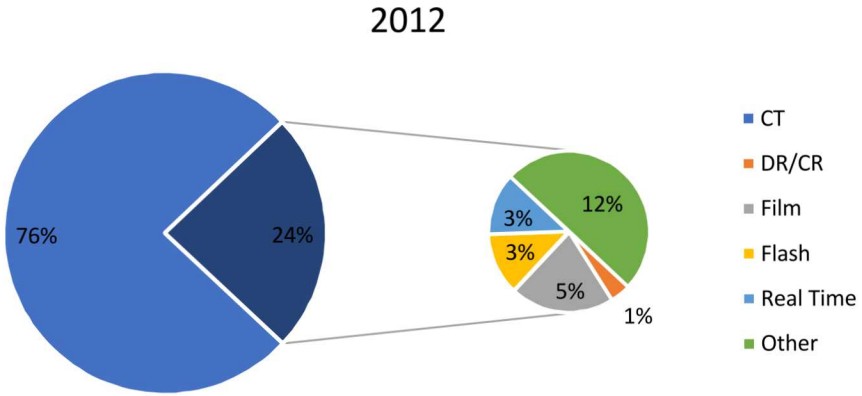
Non-Destructive Environments & Diagnostics Department 1529

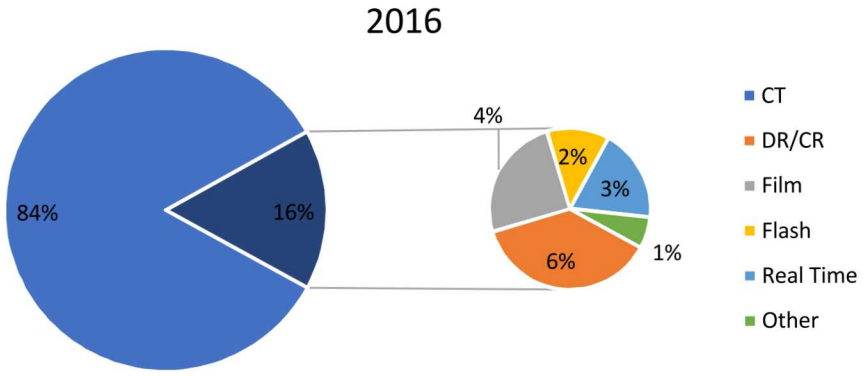


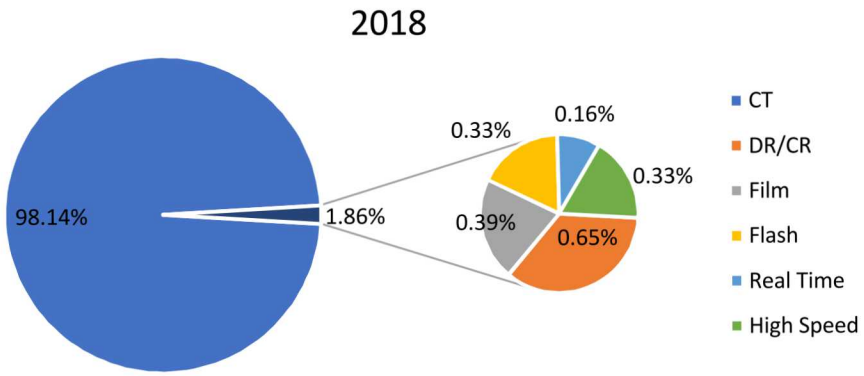
Radiography Capabilities

Devices	X-ray System	Energy Level	Part Thickness	Nominal Feature Size	Deliverables
4	Micro Focus	10-220 kV	<1” Steel	5um	Film, CR, CT, DR
1	Mini Focus	10-450 kV	~2” Steel	100-200um	Film, CR, CT, DR
1	Micro Focus (Nikon)	10-450 kV	~2” Steel	10-25um	Film, CR, CT, DR
2	High Energy	6-9 MeV	~12” Steel	85-200um	Film, CR, CT, DR
1	Flash X-ray	450 or 1 MeV	~6” Steel	500um	Film, CR, DR
1	Nano Focus	160 kV	<.25” Steel	500nm	CT
3	Portable Pulsed	270kV-370kV	~1” Steel	100-200um	Film, CR, DR
1	XRF	50 kV	Surface	n/a	Material ID

Radiography Work Estimate by job count

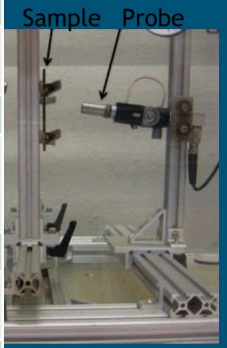


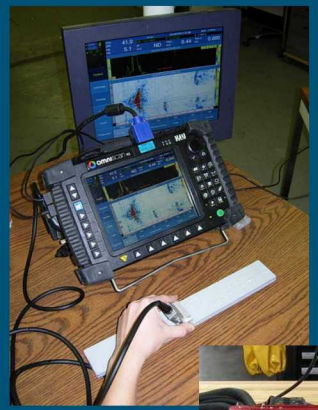




NDE Capabilities (non-radiography)

Devices	Ultrasonic Systems	Services Provided
1	Mistras UltraPAC™ UPK-T10	Immersion ultrasound scan; A-, B-, and C- scan images
1	Mistras UltraPAC™ UPK-T36	Immersion ultrasound scan; A-, B-, and C- scan images
1	Mistras UT Tablet	Contact ultrasound; A-, B-, and C- scan images
1 ea.	TD PS45 Pocket-Scan 8 channel, 32 channel	Contact ultrasound; A-scan images; can monitor multiple probes in through transmission and pulse echo; portable
1	NDT Solutions MAUS	Contact ultrasound; A- and C-scan images; portable
2	Olympus 5077PR Square Wave Pulser/Receiver	Contact ultrasound; A-scan images; material property measurements
3	Olympus OmniScan	Contact ultrasound and phased array; A-, B- and C-scans for both methods; portable
1	Olympus 1000i	Contact ultrasound; A- and B-scans; portable





Devices	IR Equipment	Resolution	Services Provided
1	VoyageIR	Microbolometer IR camera - 30 Hz @ 320 X 256 14 bit USB	Heat gun with trigger control. Handheld color touchscreen (live or saved images available). Disbonds and internal fracture of composites.
2	EchoTherm	FLIR 6106; 60 Hz 14 bit, 640 x 512 Pixels. InSb detector.	Corrosion Detection thin metal structures and polymer printed parts
1	FLIR E-60 Handheld	Focal plane array IR Camera 320 X 240	Temperature Measurements -20 to 650 °C
1	FLIR	FLIR 8501sc, 1280 x 1024 Pixels InSb detector.	Camera controlled by ethernet cable to a laptop. High speed data recording available, microscope lens for high zoom applications.

NDE Capabilities (non-radiography)

Devices	Eddy Current Systems	Frequency Range	Services Provided
1	Nortec 500	10 Hz-12 MHz	Bolt Hole, Crack Detection, Thickness Measurements, Corrosion Detection, Metal Sorting
1	Olympus 600	10 Hz-12 MHz	Bolt Hole, Crack Detection, Thickness Measurements, Corrosion Detection, Metal Sorting
1	Omni-Scan Eddy Current Array Scanner	20 Hz-6 MHz	Bolt Hole, Crack Detection, Thickness Measurements, Corrosion Detection, Metal Sorting, Phase Array, Automated Inspections

Devices	MT Equipment	Type	Services Provided
1	PL-10 AC Magnetizing Coil	AC Inspection	Surface and subsurface crack detection on ferrous materials
1	DA-200 Yoke	AC and DC inspection.	Surface and subsurface crack detection on ferrous materials

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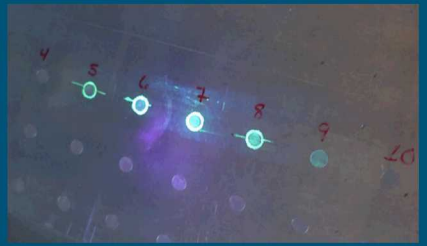
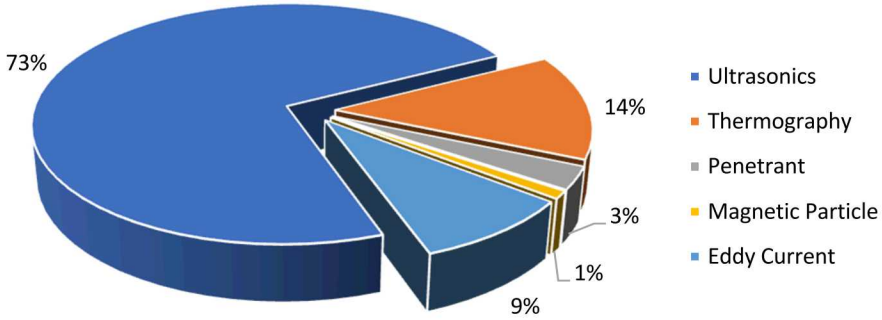
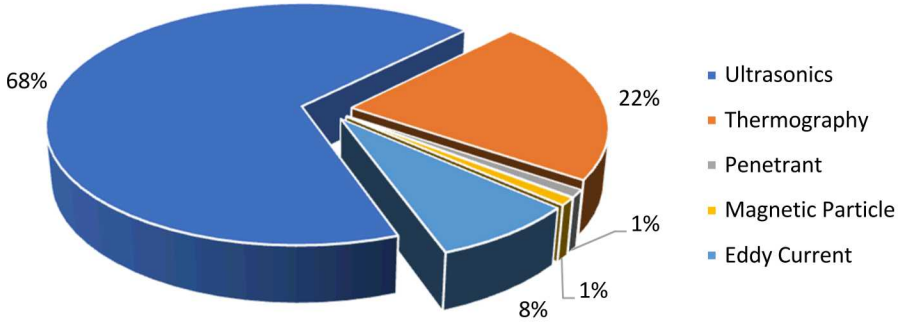


NDE Work Estimate by job count

2016



2018



Collaborative Work

Radiography Technique Development and Support

- Nano, Micro, Millimeter resolutions
- CR, DR, CT, High Speed Real-Time, Flash, DVIC, Phase Contrast, Dual Energy, Threat Detection, Material Properties, High Energy (>1MeV), Model Validation

Multi-Organization Collaboration

- NW Complexes (Multi-Site), TSA, Homeland Security, Nuclear Response, DOD

CT Reconstruction and Acquisition Software

Multi-Org Hardware/Software Integration and Specification

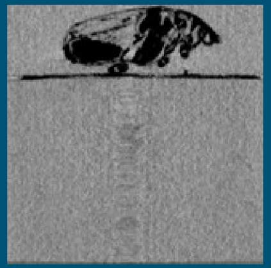
- New technologies, Research and Development, Implementation

IR technique development

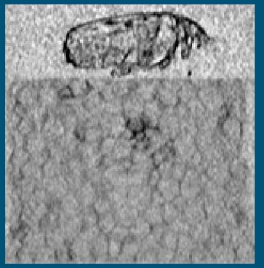
- Secure Transport Maintenance Inspection

Current Research Area Highlights

- X-Ray Phase Contrast Imaging (XPCI)
  - Under development to enhance imaging of low density materials
  - Collin Epstein will be presenting on it this week
  - FY19 Goal: Make non-destructive 3D imaging with x-ray phase contrast imaging fast



Absorption image
Can't see foam



XPCI-enabled dark field image.
See foam structure and defects

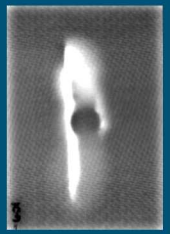
- Develop Inspection Methods
  - Composite Inspections
  - Additive Manufactured Parts Inspections
  - Conventional versus advanced inspection comparisons
  - David will be presenting on Composites
  - Sarah Stair will be presenting on AM it this week

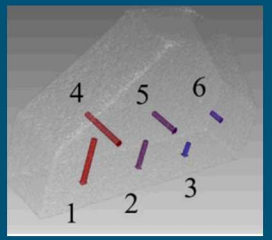
Immersion UT

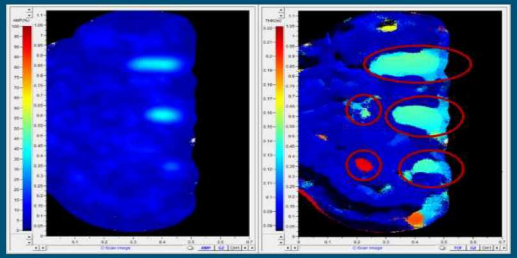
VS

Shearography

Flash IR







Current Research Area Highlights (cont.)

- Quantitative X-ray Diagnostics
  - X-ray Digital Image Correlation (DIC) – LDRD
    - Determine 2D and 3D surface deformation in optically refractive or opaque settings
    - Dynamic environments (shock and thermal)
    - Typically requires real-time/high-speed imaging capability
  - Digital Volume Correlation (DVC) – LDRD and DE
    - Similar to DIC but utilizes volumetric imaging capability
    - Quasi-static mechanical testing environment (apply force, acquire scan, repeat)
      - Robert Waymel will be presenting on it this week
      - Sam Fayad will be presenting on it this week
  - High Speed X-ray Imaging – Various DoD and DOE Funding
    - Utilize 9-channel flash x-ray system to create cine-radiography movies (250,000 frames per second)
      - Imaging of large explosive events (<60 lb NEW to date, pipe bombs and shaped charges)
    - Utilize medical x-ray tube for high speed continuous imaging
      - Smaller explosive events (detonators, fragmenting explosives)
      - Still in development – Need to determine maximum frame rate, stereo imaging
      - Have two Varian medical x-ray tubes; 150kV, 500mA, 300ms

Questions?