

## TECHNOLOGICAL INNOVATION

*Pantex and Y-12 researchers develop technologies to more effectively deliver the mission — now and in the future. Moreover, investments in technological innovation will ensure the sites continue to attract the engineering and scientific talent necessary to advance core capabilities.*

### Where Science and Technology Intersect

Pantex and Y-12 advance science and technology. The scope of the sites' research and development has widened from single-focus World War II defense missions to an array of capabilities to address today's nuclear security challenges.

### Unique Expertise

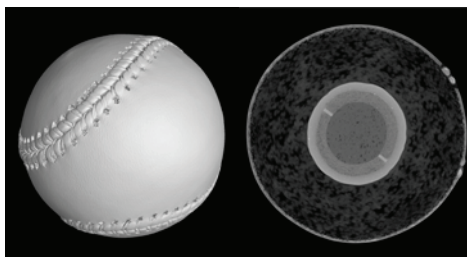
In meeting the country's evolving nuclear security needs, Pantex and Y-12 have developed unique skills and acquired a wealth of experience that benefit the nation and world. Expertise in science-based product evaluation, materials science, precision manufacturing, applied manufacturing technology, nuclear nonproliferation, data-driven operations management, software, and the handling of nuclear materials has spurred scientific research and sparked innovation.

#### Pantex & Y-12 Innovation (since 2010)

550+	invention disclosures
85+	patent applications
85+	patents issued
45+	commercial and federal intellectual property and research agreements
5	R&D 100 Awards

Pantex is home to CoLOSSIS, the world's only X-ray inspection system for nuclear weapon components. The technology allows surveillance engineers to look inside nuclear components without destroying the part. The ability to inspect component integrity provides greater confidence in the state of the nuclear stockpile.





## Stockpile Assurance

*Y-12 will soon use computed tomography or CT, computerized X-ray imaging, to replace conventional X-ray imaging of production parts. The 3D tomographic images provide more detailed surface and interior information. Data obtained using CT will be used to more accurately determine assurance of the nuclear weapons stockpile. (Above: computed tomographic images of a baseball and slice of baseball entrails)*



## Rapid Prototyping

*Using additive manufacturing to create tooling and parts is well-suited to Y-12's production environment. Also called 3D printing, additive manufacturing builds solid objects by printing and fusing layer upon layer of metal powder or plastic beads. Y-12's customized plastic tooling is lighter weight and can be produced quickly and in batches (multiple copies of the same design or different designs all at once).*



## Uranium Metal Purification

*Y-12's electrorefining technologies will produce ultra-pure uranium, a mission-critical material. Previously, uranium for Y-12's production operations has been purified using solution-based methods. In the future, electrorefining technologies will use electrochemical processes in molten salts to purify uranium metal. The technology will replace costly, high-risk processes with smaller, safer, and more efficient operations.*

## Plant Directed Research, Development, and Demonstration Program

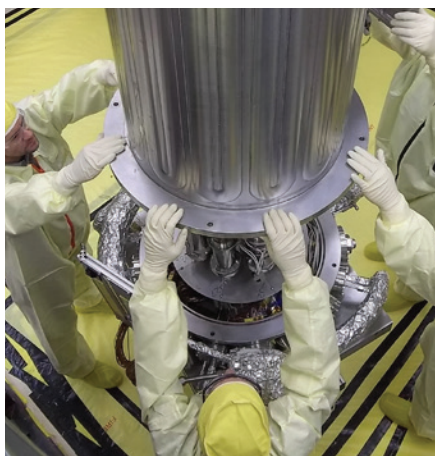
Pantex and Y-12 fund technical efforts through the Plant Directed Research, Development, and Demonstration (PDRD) program, a program that allows Consolidated Nuclear Security to invest directly in the development and application of technology that supports mission needs.

PDRD focus areas for the sites are business and process systems; weapons production; facility and capability sustainment; and materials manufacturing, fabrication, and characterization. PDRD projects improve efficiency in production and business systems and ensure the safety and effectiveness of the nation's nuclear stockpile.

## Partnerships

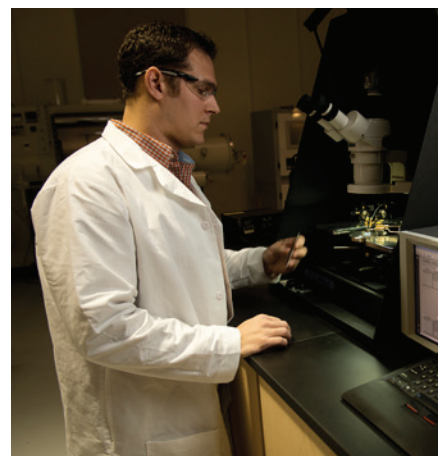
Pantex and Y-12 maintain a set of core capabilities in-house while supplementing with external partners as needed and where appropriate. The PDRD program encourages partnering with other sites in the nuclear security enterprise, universities, government agencies, and the private sector. Forming partnerships with universities and industries is key to the sites' applied technology development and commercialization efforts. Partnerships lead to better solutions, increased savings, and faster commercialization of technologies.

As part of a broader effort, Consolidated Nuclear Security works to transfer the award-winning technologies the sites' scientists and researchers develop to the commercial sector and other government organizations.



*NASA is partnering with Y-12 and others on a reliable, efficient, kilowatt-size fission power system for future space missions. The prototype system is fueled with highly enriched uranium alloy components produced at Y-12.*

*Photo credit: Los Alamos National Laboratory*



*Y-12's high-efficiency thermal neutron detector, the winner of an R&D 100 Award, is a single-crystalline device that can be used in handheld nuclear nonproliferation and homeland security applications to locate fissile materials. The solid-state neutron detector offers the significant advantages of portability, sensitivity, simplicity, and low cost.*