MARKING SIX DECADES OF SERVICE

By Rebecca Ullrich and John Taylor

In As You Like It, *Jaques remarks that*
"All the world's a stage …
And one man in his time plays many parts,
His acts being seven ages."
As Sandia enters its seventh decade, let us examine the highlights of its ages.

BEGINNINGS

Sandia began in 1945 as Z Division of Los Alamos with a mission of consolidating nuclear weapon ordnance engineering activities. That group eventually moved to Kirtland Army Airfield, a site chosen for its proximity to the military, an airfield, and space to grow. By 1949, the site separated from Los Alamos, and Sandia Corp., a wholly owned subsidiary of Western Electric, was created.

SANDIA AERIAL VIEW in 1945, when it was still a part of Los Alamos Laboratory called Z Division.

The Berlin Blockade, the first Soviet nuclear test, and the beginning of the Korean War firmed the resolve of policymakers to maintain a war reserve nuclear weapon stockpile, and by 1953 Sandia's role included nonnuclear design, testing, production, and military liaison. Sandia was also the primary assembly site for nuclear weapons from 1948 to 1952.

LITTLE BOY

THE EARLY COLD WAR

During the 1950s, both the numbers and types of nuclear weapons "exploded." Transistors, printed circuit boards, and the introduction of missiles as a delivery system pushed smaller, lighter designs. Introduction of low-maintenance, ready-for-use weapons and the lay-down capability drove redesign of many nonnuclear components and systems. Sandia expertise expanded to design and test the resulting technologies, innovating in parachute design, materials science, and data capture during testing. The workforce and the site grew. Unique test facilities, beginning with a rocket-powered centrifuge and expanding to include additional centrifuges, drop towers, sled tracks, and shock facilities were added over the years. By the end of the decade, plans were underway for nuclear reactor facilities to expose components to a variety of radiation environments. The Lab also opened a second facility in Livermore, Calif., in 1956 and added the Salton Sea site and Tonopah Test Range to its arsenal of capabilities.

SANDIA LIVERMORE in 1958, two years after it was established across the street from the Lawrence Livermore laboratory.

By the late 1950s, this expansion left the Lab with new and unique design and testing capabilities. The internal focus remained on ensuring that there were sufficient personnel with appropriate expertise to support the new efforts. Upper management pushed for both educational advancement and a deeper research capabilities, piloting the first in a series of educational programs, the Technical Development Program, in 1959. Sandia also began to hire PhDs in the sciences, focusing on materials science to both explore what was happening as materials interacted and and to provide improved materials for weapon designs.

PROJECT PLOWSHARE sought ways to harness nuclear explosives for peaceful purposes.

Nineteen fifty-nine proved a banner year for change in other areas. As Sandia achieved maturity in its primary mission area, it began to move into spinoff areas, including the Vela program to detect nuclear detonations; Sandia participated in both the seismic detection and satellite components of Vela, work that became significant permanent lines of business for the Lab. The Lab also provided nuclear effects and explosives expertise to the Plowshare Program.

WILLIS WHITFIELD in the laminar flow clean room in 1959.

The laminar flow clean room originated in 1959, when Willis Whitfield was asked to address the problem of removing particulates from the environment for manufacturing close-tolerance parts. This work led to Sandia's first commercial spinoff, with the improved clean room transforming surgery, food handling, and manufacturing.

Although the number of weapon designs declined in the 1960s, the Lab moved into advanced development efforts, improving permissive-action link technology and pursuing safety studies in response to high-profile nuclear accidents at Greensboro, Thule, and Palomares.

DURING THE 1960s, Sandia continued to refine weapon components.

Active diversification came in the form of alternative energy research, beginning in the early 1970s. Declines in defense and government research spending also led to a series of layoffs, causing retrenching and the elimination of some advanced programs.

BY THE 1970s, Sandia was deeply involved in alternative energy research, a role that has increased substantially over the years.

THE ENERGIZED EIGHTIES

The 1980s started with the Soviet invasion of Afghanistan, but by the end of the decade, the Cold War was essentially over. Three new nuclear weapons, the W84, the W85, and the B83, were put into production, and development activities began on the W82, the W88, the W89, the B90, the B91. Of these, only the W88 for the Trident missile would survive to enter the stockpile,

A W88 launch vehicle, the Trident submarine-launched ballistic missile, undergoes test-firing in the Pacific.

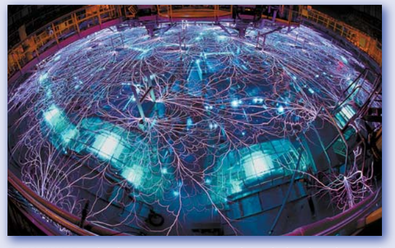
although that outcome was far from clear in the mid-1980s. In addition, 10 nuclear weapons, ranging from the venerable W31 to the relatively young W66, were retired. The residents of "Weapon City" were busy indeed! On the other side of the coin, revenue from WFO programs reached 50 percent of the Laboratory budget for the first time, a harbinger of things to come.

The thawing of the US-Soviet relationship that began under President Reagan finally bore fruit with the signing of the INF Treaty in 1986. Sandia played a major role in both the negotiation of this landmark agreement and in its implementation. The unprecedented portal-perimeter monitoring system installed at the Votkinsk Missile Plant was designed, prototyped, and constructed at Sandia and

PERIMETER MONITORING SYSTEM undergoing tests at Sandia.

then disassembled and flown to the Soviet Union. Sandia also participated in the Joint Verification Experiment, a set of jointly monitored nuclear detonations at the Nevada Test Site and the Semipalatinsk Test Site.

Reagan's Star Wars initiatives gave Sandia the impetus to upgrade its weapon effects and pulsed power fusion



Z MACHINE pulsed power experiments have helped understand weapon effects without nuclear testing.

work in Area 4. The Lab also started what would become a major initiative with the Defense Department to examine nuclear weapon technologies that might be adapted to improve our conventional weapon capabilities.

The catastrophic nuclear accident at Chernobyl, following on the heels of the less severe, but politically sensitive, event at Three-Mile Island, also brought nuclear power back into a rather negative public spotlight, and Sandia worked in its niche specialties of waste disposal, transportation, and risk assessment to try and minimize those aspects of the problem for policymakers. Work on other forms of energy production, including solar and wind, continued.

TESTS OF TRUPACT waste containers conducted at Sandia were instrumental in showing that rad wastes could be safely transported.

Science took a front-row seat with development of the Center for Radiation-hardened Microelectronics and its successor, the Materials Development Laboratory.

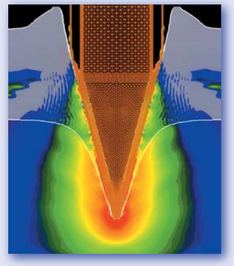
WILLIS WHITFIELD during a tour of Sandia's Materials Development Laboratory, a facility that grew out of Willis's invention of the laminar flow clean room in the 1950s.

TRANSITIONS IN THE NINETIES

The fall of the Berlin Wall and the collapse of the Soviet Union ushered in a period of transition and change at Sandia. The apparent loss of our nation's primary adversary, the change from AT&T to Lockheed Martin oversight, the increasingly shrill debate over maintaining an aging weapon stockpile and its associated infrastructure, the end of underground testing, and the substantially increased oversight by DOE in the form of the Tiger Teams all jarred the traditional stability of the Lab.

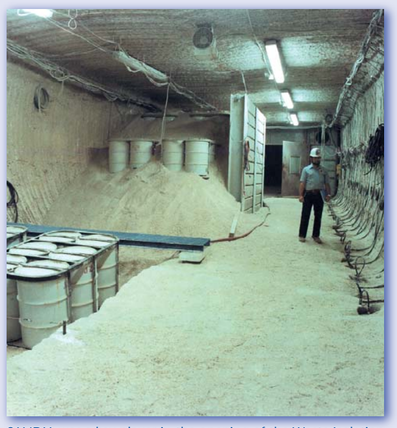
THE FALL OF THE BERLIN WALL marked the beginning of the end of the Cold War. In the post-Cold War world, Sandia's mission would evolve to address new challenges.

However, the Sandia can-do attitude prevailed. Major programs were initiated to prevent the spread of nuclear weapon technology by assisting the struggling Russian nuclear establishment, along with an innovative Cooperative Monitoring Program that focused on relief of regional tensions in the Middle East and South Asia. Sandia increased its emphasis on modeling and simulation in support of the DOE Science-Based Stockpile Stewardship program, and we rose to the occasion by implementing new and more stringent ES&H requirements.



COMPUTER modeling and simulation were instrumental in DOE's Science-Based Stockpile Stewardship program.

The end of underground testing made the Area 4 accelerators even more critical to stockpile certification and, for a time, Sandia had no active nuclear weapon development programs. Instead, the focus was on more agile and environmentally friendly production of components for existing weapon systems. In addition, litigation over the WIPP site continued, finally leading to the issuance of an operating permit in 1999. Design and evaluation work continued at Yucca Mountain.



SANDIA was a key player in the opening of the Waste Isolation Pilot Plant near Carlsbad, N.M.

NEW THREATS EMERGE

On the morning of Sept. 11, 2001, the world changed. Certainly each of us knows exactly where he or she was when the regular programming on KOB or KGO was interrupted with news of the terrorist attacks. We reacted with a full-court press in homeland security, adapting long-term expertise in areas such as radiation monitoring, physical security, and explosives detection to direct defense of the homeland.

THE 9/11 ATTACKS led to ramped-up efforts by Sandia in the area of homeland security.

Stimulated by a new war in Afghanistan, the ongoing conflict in Iraq, and continued concern over the availability of low-cost, climate-friendly sources of energy, work for others funding

SANDIA-DEVELOPED synthetic aperture radar has been a key capability for the modern American warfighter.

has grown to more than 60 percent of Laboratories revenue. Technologies such as synthetic aperture radar, enhanced combustion, and advanced robotics have gained broad acceptance.

There was something of a hiatus in arms control in the early part of the decade, but interest resumed following the 2008 presidential election. The MESA project, Sandia's largest-ever construction project, began in the spring of 2002 and finished three years early and under budget in August 2007.

Even with uncertainties about the nuclear weapon budget, Sandia continued to fulfill its historic responsibilities to help to keep the stockpile safe, secure, reliable. Improvements were made to several weapon systems, including the B61 and the W76, and Sandia engineers continue to work with Los Alamos, Livermore, and Pantex to ensure that the weapons in the stockpile retain their capabilities.

AS SANDIA enters its next 60 years, its stewardship of the nation's nuclear deterrent remains a critical mission.

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Jaques' seventh age of man is "second childhood" with a largely negative context. Sandia seems destined to "upstage" Jacques by redefining second childhood as a rebirth of the energy and enthusiasm that has characterized the Labs for its six decades and that meets President Truman's 1949 challenge to perform "exceptional service in the national interest" for many decades to come.