



As decades go by, our “body machinery” begins to break down. So may nuclear weapons. Because nuclear weapons contain slowly decaying, radioactive materials, they gradually accumulate defects; that is, they age.

At Los Alamos and Lawrence Livermore National Laboratories, scientists are working on mitigating the effects of aging and extending the lifetimes of nuclear weapons in the stockpile. These weapons were designed with routine maintenance in mind but not for long-term robustness. To ensure such robustness, scientists must accurately assess the functional lifetime of individual components. Because plutonium ages, testing and certifying plutonium components are among the most important challenges.

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BETWEEN 1945 AND 1990, APPROXIMATELY 60,000 NUCLEAR WARHEADS WERE BUILT IN THIS COUNTRY. TO ASSESS THE CONDITION OF OLDER WEAPONS, SCIENTISTS ARE ACCELERATING THE AGING OF PLUTONIUM. THEN THEY EVALUATE THE EFFECTS OF AGED PLUTONIUM ON WEAPONS SAFETY AND PERFORMANCE.

ACCELERATED AGING OF PLUTONIUM

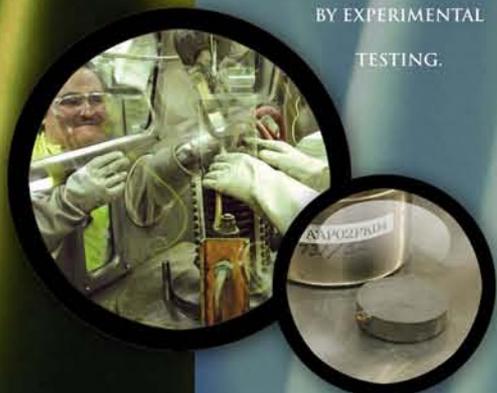
MONITORING THE WEAPONS STOCKPILE FOR PERFORMANCE, SAFETY & RELIABILITY

As the plutonium primary (the weapon’s fission component) ages, the metal changes its properties and composition. Those changes could affect weapon performance, safety, and reliability.

To predict when such changes require component replacements, experimenters are accelerating the aging process of plutonium. To initiate accelerated aging, researchers “spike” a plutonium-239 alloy with 7.5 percent plutonium-238. Spiked plutonium accumulates radiation damage 16 times faster than typical weapon alloys. As a result, in four years the spiked material will have “aged” the equivalent of 64 years.

By understanding how plutonium components age and how such aging influences component performance, scientists will be able to maintain a nuclear weapon in peak condition throughout its designed lifetime.

LOADING THE CASTING FURNACE WITH PLUTONIUM-238 AND -239, THIS WORKER DUPLICATES THE PROCESS USED AT THE ROCKY FLATS PLANT TO CAST PLUTONIUM INGOTS. FROM SOLID PLUTONIUM INGOTS (LOWER RIGHT), WE FABRICATE SAMPLES TO EXAMINE THE EFFECTS OF ACCELERATED AGING BY EXPERIMENTAL TESTING.



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