

The cycle is continuous and is closely integrated. Data and information from our surveillance programs and from the hundreds of experiments and simulations being performed, help to identify which parts of a weapon are aging gracefully, and which parts present current and potential future problems.

Stockpile surveillance has been a major element of the U.S. nuclear weapons program ever since the first weapons were put into service. Approximately 100 stockpile weapons are thoroughly examined each year. The results provide data not only for assessing the current safety and reliability of the stockpile, but also for developing predictive models and age-focused diagnostics required to anticipate weapons refurbishment requirements.

The Enhanced Surveillance Program (ESP) is developing the technologies and methods, as well as a fundamental understanding of materials properties and weapons science, to significantly improve detection and predictive capabilities. For example, the ESP identified an aging mechanism in a stockpile high explosive, ultimately concluding that the changes actually improved the stability of the explosive. This assessment is permitting us to reuse the high explosive during the W87 life extension program, thus avoiding significant costs. We have also embarked on a novel strategy to accelerate the aging process in plutonium. The capability to predict the lifetime of components made from plutonium will permit us to more accurately identify when pit replacements are needed and when the significant facility investments must be made in order to support pit replacement.

Technical work on the W76/Mk4 Dual Revalidation Project drew to a close in December 1999. There were significant accomplishments in each of its major areas of investigation.

- \$ **System Level Assessment B** The Military Characteristics and Stockpile to Target Sequence were reviewed and updated and the system was shown to meet requirements. The system also was assessed against safety requirements and for abnormal environments and successfully met them. Results from various tests are being used to validate new computational models, leading to an improved understanding that will be used for future assessments, evaluations and other analyses.
- \$ **Primary Physics Assessments B** Five hydrodynamic tests were completed, four by Los Alamos National Laboratory and one by Lawrence Livermore National Laboratory. Two of the tests used stockpile-aged high explosives. A modern one point safety assessment was completed that reaffirmed the safety margin calculated in previous assessments. A modern intrinsic radiation analysis was performed. Significant progress was made in baselining.
- \$ **Secondary Physics Assessment B** There is an improved understanding of the secondary. Significant progress was made in baselining and benchmarking of the secondary.
- \$ **Physics Package Engineering Assessment B** A test of the ability of the secondary to withstand the revised long-term shipboard vibration environment was completed and the

results show it meets requirements. Extensive testing of the high explosive thermal sensitivity, chemical composition, and density properties was completed. An aged physics package was disassembled, inspected, and the aged components tested. A detailed description and catalogue of the function, composition, requirements, state, and design intent of each component was assembled.

§ **Arming Fuzing and Firing (AF&F) and Weapon Electrical System (WES) Assessment B** Nineteen AF&Fs were disassembled, inspected, and put through product acceptance testing. An age aware model of the fire set was completed and electronic sub-component models were developed. Most AF&F hostile environment testing is complete.

In addition to these specific accomplishments, the Dual Revalidation Project provided an opportunity to train many people within the DOE and DoD nuclear weapons communities. Engineers and scientists responsible for the system have developed in-depth experience. The project also provided significant contributions to the W76/Mk4 6.2/6.2A life extension study. The review team reports are scheduled to be submitted by the end of March, 2000.

DOE has redirected the Dual Revalidation effort into baselining and peer review. The decision was made to baseline all the systems over the next five years while designers with underground test experience are still on the payroll. After the systems are baselined, we will assess any gaps discovered in our knowledge and develop a plan to fill them in.

### **Manufacturing Capabilities**

Manufacturing continues to play a critical role in the Stockpile Stewardship Program. During FY1999, almost 1300 Limited Life Components (LLCs) were produced. Plans call for the production of over 2000 LLCs in FY2000. These product deliveries signal the successful transfer of production activities from plants which have been closed. The weapons complex is also performing major refurbishment actions on several weapon types, including the B61 and the W87.

The W87 is a key component of the U.S. land based ballistic missile element of the U.S. nuclear deterrent triad. In December 1998, the Y-12 plant at Oak Ridge completed and shipped to Pantex the first refurbished canned sub-assembly for the life extension program of the W87 under our Stockpile Life Extension Program. Early in 1999, the first deliveries of electronic and mechanical parts for the W87 life extension were shipped to Pantex from the Kansas City plant. The first W87 life extension unit was delivered to the Air Force in May 1999. The W87 was the first production unit completed under the life extension program. This is considered a major milestone in meeting a DOE commitment made to the Air Force.