UNDER WRAPS: The U.S. Stockpile Stewardship Program seeks to maintain a nuclear deterrent without nuclear tests.
PHOTO: PAUL SHAMBROOM

Based on the SFI data, we can draw two hopeful conclusions and one somewhat ambiguous one:

- The Stockpile Stewardship Program is successfully detecting defects.
- The program is effectively addressing them.
- As time goes on, it is taking longer to find a solution to a given defect.

The first two points suggest that stockpile stewardship is doing what it was designed to do. In particular, the number of open SFIs at the end of 2006 was the lowest in 10 years.

The third point, that it's taking longer to close SFIs, has several possible explanations. We can't know for sure which is correct, because the details of the SFIs are classified. It may be that the defects are presenting substantial and growing challenges. Or it may simply be that the labs don't have enough workers, or workers with the right experience, to resolve the problems quickly. In any case, it is not the nature of the defects but the rate at which defects emerge that indicates where a system is on the Weibull curve.

So is the existing stockpile now reaching the end of its Weibull curve? It doesn't look that way to us. Assuming that nuclear weapons age just like any other manufactured system, then as the weapons enter the end-of-life phase you'd expect to see a significant uptick in SFIs. But the data clearly indicate that no such rise is occurring—even in the oldest systems that have already exceeded their design lifetimes. Although there is a spike in the number of SFIs at the 20-year mark, no system older than that has exhibited a trend of increasing SFIs. Indeed, among the five nuclear weapon types in the active stockpile that were at least 25 years old in 2006—the B61-3, B61-4, W76, W78, and W80-1—only one age-related defect in nuclear components was detected. Further, other stockpile data show that SFIs are infrequent even for systems that are more than 30 years old.

Suppose, though, for argument's sake, that the active stockpile is going to reach the end of its Weibull curve in the near future. Even then, that doesn't mean switching to a new warhead is the way to go. For one thing, any new system would also be subject to the Weibull curve; that is, it would experience a significant number of defects during its early years. Proponents of RRW argue that the new designs would be easier to fix and simpler to maintain and pose fewer technical challenges than the warheads they would replace. At this point, there's no way of knowing if those claims are true.

Proceeding with a new nuclear weapon would also likely reduce funds for stockpile stewardship, especially in the current economic climate. Diverting resources from stewardship to the development of a new warhead could lead to a backlog in surveillance, and it could also prolong the time it takes to close SFIs. The result would be diminished confidence in the existing systems.

FOR ALL THESE REASONS, we don't favor switching to a completely new warhead. But there are elements of the RRW approach that may be worth considering and that could be incorporated into the existing program of stewardship. In particular, components that age rapidly could be replaced with newly designed parts that allow increased security and are easier to manufacture. For example, inserting wireless microsensors into or onto these new components would allow in situ monitoring and diagnostics and prevent having to disassemble systems for inspection. Instrumenting every active weapon in this way—rather than just inspecting a relative handful of each weapon type each year—would yield much more useful data about age-related problems.

There are many other options for maintaining the existing arsenal that have yet to be fully explored. One strategy is to reuse more of the components taken from previously tested, disassembled weapons. Another approach is to make more substantial improvements in aging components than is currently done. Of course, any such changes would take time to implement, so it's worthwhile to explore these options now. While the stockpile is undoubtedly aging, it doesn't appear to be close to the end of its useful life. That means there is still time for a careful evaluation of technical options for maintaining the nuclear deterrent, without having to resort to building entirely new warheads. ❑

TO PROBE FURTHER

The JASON January 2007 study of plutonium pit lifetimes is at http://www.fas.org/irp/agency/dod/jason/pit.pdf.

For a discussion of the Weibull curve, see http://www.weibull.com/hotwire/issue21/hottopics21.htm.

More information on the Annual Assessment Reports prepared by the directors of the DOE weapons labs is available at http://www.gao.gov/htext/d07243r.html.