



The Need for Independent Plutonium Pit Aging Studies

Summary: The United States is aggressively expanding the production of plutonium “pit” bomb cores to at least 80 pits per year, which the Pentagon has called the number one issue in its \$1.7 trillion plan to “modernize” nuclear forces. The average age of plutonium pits is around 40 years. Los Alamos Lab Director Thom Mason has said that “The best way to deal with this dilemma [of uncertainty about aging effects] is to take it off the table. We do that by making new pits, immediately.” Thus, he justifies spending tens of billions of dollars, creating additional occupational and public risks, generating more radioactive wastes with uncertain disposal pathways, fundamentally transforming the Lab into a nuclear weapons production site and fueling the increasingly dangerous new nuclear arms race.

But does independent review of pit aging data support this need to immediately produce new pits? The answer is no given that independent experts concluded in 2006 that pits last at least a century with no determined end date. Further, no future pit production is scheduled to maintain the safety and reliability of the existing nuclear weapons stockpile – it is all for speculative new designs which could raise reliability issues or even prompt the U.S. to resume testing.

Recommendation: Congress should require new, independent, comprehensive review of plutonium pit aging data before committing ~50 billion dollars over 30 years to expanded plutonium pit production.

A Brief History of Pit Aging Studies

During the Cold War the Department of Energy’s Rocky Flats Plant near Denver produced on the order of 70,000 plutonium pits, the fissile cores or “triggers” of nuclear weapons. It ceased production in 1989 after the FBI and EPA conducted a dramatic raid investigating environmental crimes. In 1997 limited production of up to 20 pits per year was re-established at the Los Alamos National Laboratory (LANL), although the Lab never produced more than eleven pits in any one year.

In the early 2000’s the National Nuclear Security Administration (NNSA) was increasingly sounding alarms over plutonium pit aging, saying that pits produced at Rocky Flats in the 1980’s would last only on the order of 45 years.¹ But even before then, in 1999 the JASONs (longtime expert consultants to the federal government) were reporting that:

“Pit lifetimes are now discussed as 60 or 90 years... because there is neither evidence nor physical reason to expect that pit aging on the present time scale has in any way degraded weapons performance, there is no reason to rush decision making as to future pit production rates.”²

Despite this expert advice, the NNSA began to push for a new-design Reliable Replacement Warhead and related expanded plutonium pit production. This initially included a proposal for a “Modern Pit Facility” capable of producing up to 450 pits per year, with concerns over possible pit aging cited as a primary driver for this huge new pit production plant.³ However, in 2006 the

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JASONS concluded in a well-publicized report that plutonium pits have reliable lifetimes of at least 100 years.⁴ Following that, Congress deleted funding for both the Reliable Replacement Warhead and the Modern Pit Facility.

In 2012 the Lawrence Livermore National Laboratory added to the reassuring data about pit aging by declaring:

“This continuing work shows that no unexpected aging issues are appearing in plutonium that has been accelerated to an equivalent of ~ 150 years of age. The results of this work are consistent with, and further reinforce, the Department of Energy Record of Decision to pursue a limited pit manufacturing capability in existing and planned facilities at Los Alamos instead of constructing a new, very large pit manufacturing facility (called the Modern Pit Facility) that would have been capable of producing hundreds of pits a year.

Bruce Goodwin, principal associate director for Weapons and Complex Integration, says he is "extremely pleased" at the continuing positive results... The results, he says, are highly positive for the safety and reliability of the stockpile and for avoiding the costs associated with remanufacturing pits.”⁵

Nevertheless, in May 2018 the Pentagon and NNSA announced an aggressive plan to produce at least 80 pits per year,⁶ with simultaneous production at LANL of at least 30 pits per year and at least 50 pits per year at the Savannah River Site, costing at least \$50 billion over 30 years.⁷

In 2019 Congress mandated a new JASON study that should:

“...include recommendations of the study for improving the knowledge, understanding, and application of the fundamental and applied sciences related to the study of plutonium aging and pit lifetimes, an estimate of minimum and likely life-times for pits in current warheads, and the feasibility of reusing pits in modified nuclear weapons. The report shall be submitted in unclassified form but may include a classified annex.”⁸

However, JASON did not have time to do a full study, as it said:

The report requested by the SEWD [Senate Energy and Water Development Committee] was too wide in scope for JASON to complete during its 2019 Summer Study. NNSA, JASON, and SEWD staff agreed to divide the study into two phases:

- Phase One: Perform a 2019 JASON Summer Study that would generate a letter report covering updates since the prior JASON study on plutonium aging, Pit Lifetime, delivered in 2006.
- Phase Two: Assess the need for the full study, and if deemed necessary and timely, perform a more detailed, multi-year JASON study.⁹

Phase One, the letter report, diminutive in size (all of two and a half pages), was completed. For Phase Two, in the letter report JASON did assess the need for a new study (see below) but did not receive any further directive from Congress or the NNSA to “perform a more detailed, multi-year JASON study.” However, conveniently for NNSA, the JASONS did recommend that “pit manufacturing be re-established as expeditiously as possible in parallel with the focused program to understand Pu aging...” So NNSA has moved aggressively to expand plutonium pit production but has not updated JASON-reviewed pit aging data as far as is publicly known. It should be emphasized that the 2019 Congressional mandate for new and complete review of pit

aging data has yet to be fulfilled, despite the staggering costs that NNSA plans for expanded plutonium pit production.

The 2019 JASON letter report does point the way to what a future pit aging study should address:

“...in general, studies on Pu aging and its impacts on the performance of nuclear-weapons primaries have not been sufficiently prioritized over the last decade.”

“The [labs’ pit aging studies] program should assess and, if necessary, mitigate threats to primary performance caused by Pu aging. The labs briefly presented their program to address Pu aging to JASON. The plan seemed sensible, but a detailed JASON assessment would require additional information about the program as well as technical details.

Continued study of Pu-aging should address the following:

- Investigation of the properties of naturally and artificially aged Pu that are relevant to primary yield. These include compressibility, strength, and entropy at weapons-relevant pressures and densities.
- Completion of aging studies for the full set of Pu materials used in the stockpile.
- Extending the range of accelerated aging to identify the types, modes, timescales, and uncertainties in changes of Pu behavior that would affect primary performance.
- The utility of integrated sub-critical experiments with new and aged Pu pits should be explored. They could cover the temperature and pressure conditions encountered during primary implosion to provide information about consequences of Pu aging.”

The NNSA and the nuclear weapons labs have capitalized on this half-of-a study, citing it as a “paradigm shift.” For example, as the Los Alamos National Laboratory puts it:

“In 2019, the independent scientific advisory group Jason released a study that assessed plutonium pit lifetimes. The study, a follow up to the 2006 Jason report that concluded there wasn’t enough proof to support a plutonium aging issue, stated that plutonium aging might in fact eventually impact the reliability of U.S. nuclear weapons. In the unclassified summary, the authors “urge that pit manufacturing be re-established as expeditiously as possible in parallel with the focused program to understand aging, to mitigate against potential risks posed by Pu aging on the stockpile.”

With this sudden paradigm shift, concern about aging pits has become more palpable in recent years. How much longer will pits last?

“We don’t have an immediate concern with aging,” says Los Alamos Director Thom Mason. “Up to this point, the plutonium pits in America’s nuclear weapons have been very robust. But the pits we have today were largely manufactured in the 1980s, and we don’t have the predictive ability to say with certainty that our current, 40-year-old pits will be good until any particular date. It’s sort of glass half full, glass half empty; we can’t prove that they will fail, but we also can’t prove that they will work.”

The best way to deal with this dilemma is to “take it off the table,” Mason explains. “We do that by making new pits, immediately.”¹⁰

With that the LANL Director justifies an expanded plutonium pit production program that will cost tens of billions of dollars, raise occupational and public risks, generate increase radioactive wastes with uncertain disposal pathways, fundamentally transform the Lab into a nuclear weapons production site and fuel the increasingly dangerous new nuclear arms race.

Congress has made its ongoing concern over the lack of pit aging studies explicit in legislation. The FY 2021 Consolidated Appropriations Act enacted the following provision:

“Pit and Plutonium Aging.-There is concern with the apparent lack of focus on advancing knowledge regarding pit and plutonium aging since the JASONs conducted its first study in 2006. Given the future needs of the nation's nuclear deterrent, a robust program of research and experimentation is needed. Therefore, NNSA is directed to develop a comprehensive, integrated ten-year research program for pit and plutonium aging that represents a consensus program among the national laboratories and federal sponsors. Such a plan shall include estimated cost of ongoing research, new or upgraded capability needs, and key near-, mid-, and long-range milestones. The plan shall be submitted to the Committees on Appropriations of both Houses of Congress not later than 180 days after enactment of this Act.”¹¹

As far as is publicly known no such plan has been submitted to Congress despite its statutory requirement. That said, a ten year plan to have plutonium pit aging studies is not sufficient to begin with when uncertainty over pit aging is being used as the rationale for an aggressive plutonium pit production program costing at least \$50 billion over the next thirty years.

Recommendation: Congress should require new, independent, comprehensive review of plutonium pit aging data as outlined by the JASONs before committing ~50 billion dollars over 30 years to expanded pit production.

This fact sheet is available at <https://nukewatch.org/fact-sheets-item/the-need-for-independent-pit-aging-studies/>

¹ “In approximately 2020, some pits in the enduring stockpile will be approaching the 45-year pit lifetime.” *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*, USDOE, May 2003, Volume 1, page 2-4, <https://www.energy.gov/sites/default/files/EIS-0236-S2-DEIS-01-2003.pdf> In the face of Congressional and public opposition NNSA never completed a final programmatic environmental impact statement for the Modern Pit Facility.

² *Remanufacture*, JASONs, JSR-99-300, October 1999, <https://rlg.fas.org/JSR-99-300.pdf>

³ See *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*, USDOE, May 2003, Volume 1, Sec. 2.1.1. “Pit Aging as a Driver,” page 2-1, <https://www.energy.gov/sites/default/files/EIS-0236-S2-DEIS-01-2003.pdf>.

⁴ *Pit Lifetimes*, JASON, November 2006, https://www.nukewatch.org/facts/nwd/JASON_ReportPuAging.pdf This JASON study came about because Nuclear Watch New Mexico, knowing of the earlier *Remanufacture* JASON report, suggested to then-Senator Jeff Bingaman that a new JASON pit lifetime study would be appropriate. He then successfully passed that requirement through an amendment to the 2004 Defense Authorization Act.

⁵ *Plutonium at 150 years*, LLNL, 2012, <https://www.llnl.gov/news/plutonium-150-years>

⁶ *Joint Statement from Ellen M. Lord and Lisa E. Gordon-Hagerty on Recapitalization of Plutonium Pit Production*, NNSA, May 10, 2018, <https://www.energy.gov/nnsa/articles/joint-statement-ellen-m-lord-and-lisa-e-gordon-hagerty-recapitalization-plutonium-pit>

⁷ See *Plutonium Pit Production Engineering Assessment Results*, slide 10, https://nukewatch.org/newsite/wp-content/uploads/2019/03/FINAL-Pu-Pit-Production-EA-Results-05.14.18_Unclassified.pdf This combines NNSA’s decision to implement Alternative 1 (SRS) and Alternative 2a (LANL) for a total of \$43 billion. Since then the construction costs of the Savannah River Plutonium Processing Facility have more than doubled to \$11 billion, rounding out pit production costs over 30 years at \$50 billion, which is bound to go up yet more. It should also be noted that NNSA cost estimates of new warheads do not include the cost of pit production for them.

⁸ Senate Report 115-258, Energy and Water Development Appropriations Bill, FY 2019, page 104, <https://www.congress.gov/115/crpt/srpt258/CRPT-115srpt258.pdf>

⁹ *Letter Report to the NNSA*, JASON, November 13, 2019, but not transmitted by NNSA to Congress until April 6, 2020, <https://irp.fas.org/agency/dod/jason/pit-aging.pdf>

¹⁰ *Pit production explained*, LANL, December 21, 2021, <https://discover.lanl.gov/publications/national-security-science/2021-winter/pit-production-explained>

¹¹ FY 2021 Consolidated Appropriations Act, Division D, p. 108, <https://www.aip.org/sites/default/files/aipcorp/images/fyi/pdf/Budgets/fy21-approps-nnsa-final-explanatory-statement.pdf>