

## **Is Britain involved in the US Reliable Replacement Warhead ?**

### Official MoD position

On 21 March John Reid gave the following response to a written question from Tory MP Julian Lewis:

*Dr. Julian Lewis:* To ask the Secretary of State for Defence what progress has been made on the reliable replacement warhead at Aldermaston; and if he will make a statement.

*John Reid:* There is no programme at Aldermaston to develop a new warhead. As we said in the 1998 Strategic Defence Review ("supporting essay 5 paragraph 14"), we maintain a minimum capability at the Atomic Weapons Establishment to design and produce a replacement for the current Trident warhead, should that prove necessary. No decisions on any replacement for Trident have yet been taken.

Answers to PQs on nuclear weapons are often obtuse. In this case, although there is no "programme .. to develop a new warhead" there is a capacity to design. This capacity would be lost unless there is some ongoing design work. John Reid's reply avoided the issue of British involvement in the Reliable Replacement Warhead (RRW) programme.

### Trident

The initial focus of the US RRW study will be Trident warheads.<sup>1</sup> The House Armed Services Committee said "the committee encourages the Department of Defense and the Department of Energy to focus initial Reliable Replacement Warhead efforts on replacement warheads for the Submarine Launched Ballistic Missiles".<sup>2</sup>

### Replacement Pit

There are major *Life Extension* programmes for all US nuclear weapons. These replace many non-nuclear components. RRW plans to go beyond this and replace the primary or fission device at the core of the nuclear weapon. The main part of the primary is an ellipse of plutonium called the pit.

The US budget for 2006 said "The initial focus [of RRW] will be to provide cost and schedule efficient *replacement pits* that can be certified without Underground Tests".<sup>3</sup>

---

<sup>1</sup> Nuclear Weapons: The Reliable Replacement Warhead Program, Congressional Research Service, 20 July 2005, p 40

<sup>2</sup> House Committee on Armed Services, National Defence Authorization Act for FY 2006, H Rept 109-89, HR 1815, 109<sup>th</sup> Congress, 1<sup>st</sup> Sess, 2005, p 464

<sup>3</sup> National Nuclear Security Administration Budget FY 2006 Weapons Activities – Directed Stockpile Work p 82

## Krakatau and Pit Certification

Krakatau was a joint sub-critical test by the UK and Los Alamos. It was one of a series of tests whose purpose was to examine how plutonium behaves under pressure.<sup>4</sup> The test provided data to verify computer models of how a nuclear weapon works. The US nuclear weapons laboratories use several of the most powerful supercomputers in the world to simulate nuclear explosions.

The results of Krakatau were described by Chuck Costa, test director from Los Alamos - "a truly outstanding data set was obtained, enabling direct impact on both the United States and UK *certification* efforts"<sup>5</sup>

The US funding for Krakatau is under the heading *Pit Certification* in the nuclear weapons budget. This *Pit Certification* programme has two objectives:

- To certify the Los Alamos manufactured W88 pit by 2007
- To "establish certification processes for future replacement pits"<sup>6</sup>

So there is a clear link between Krakatau, pit certification and RRW. One of the US objectives of Krakatau was to gather data that will be used to certify the replacement pit that is being designed under the RRW programme.

## New British warhead ?

In the quote above, Chuck Costa said that Britain was also using the Krakatau test for *certification*. In the US system *certification* is a stage that a new nuclear weapon has to go through before it is produced. Until 1992 *certification* involved a series of nuclear tests. It could be argued that Chuck Costa was using the term loosely, but his statement suggests Aldermaston will use the data from Krakatau for *certification* of any new pit that it built.

At the heart of the current expansion at Aldermaston is the acquisition of a series of computers, each one more powerful than its predecessor. These computers will be used, as in America, to simulate nuclear explosions. The Orion laser and new hydrodynamic facilities will provide experimental evidence to verify the computer models. The models can be used to simulate existing warheads and to design new ones.

---

<sup>4</sup> Sitelines, Nevada test site newsletter, January 2006

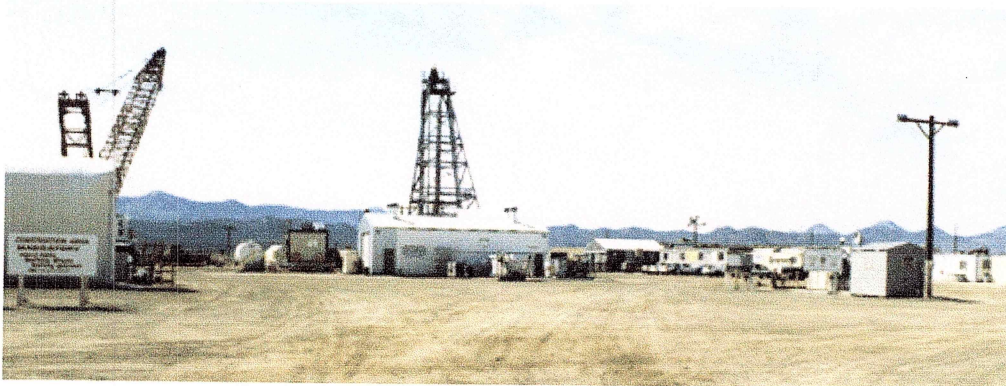
<sup>5</sup> Sitelines, March 2006

<sup>6</sup> National Nuclear Security Administration Budget FY 2006 Weapons Activities – Pit Manufacturing and Certification Campaign p 172

Dick Lear. He explains that the accumulation of alpha particles (helium nuclei) produced by the radioactive decay of plutonium atoms is thought to cause imperfections in the material's crystalline structure and thereby possibly affect its performance. To investigate the consequences of aging, subcritical tests compare the behavior of newly machined plutonium with that obtained from old, dismantled warheads.

The tests focus on ejecta and spall, phenomena that are thought to affect the performance of a nuclear warhead, specifically that part of the warhead called the primary. Ejecta are a violent spray of plutonium particles that are propelled from a material's surface when it is compressed by a powerful shock wave. Spall is the breakup of plutonium from the explosive shock wave reflected back from the surface.

*above, Riano et al.*



The U1A complex at the Nevada Test Site consists of several buildings and instrumentation trailers from which scientists monitor experiments conducted underground.

### Tests Provide Real-World Data

The Livermore tests, together with those performed by Los Alamos National Laboratory, play an important role in DOE's Stockpile Stewardship Program to ensure a safe and reliable nuclear weapons stockpile without underground nuclear testing. Stockpile stewardship depends in great measure on advanced computer simulations of weapon performance and materials aging. Subcritical experiments provide the actual data about the behavior of plutonium and thus are useful for improving computer simulation codes, enabling them to more accurately predict any problems with the nation's aging stockpile.

The Nevada tests are an important complement to hydrodynamic experiments on mock warheads conducted at Lawrence Livermore's remote Site 300 test facility in California. While similar to subcritical tests, the hydrodynamic experiments do not use plutonium. Because plutonium is the most enigmatic element in the periodic table (see S&TR, June 2000, pp. 15-22), tests using its surrogates cannot accurately answer all the questions scientists have about the behavior of