

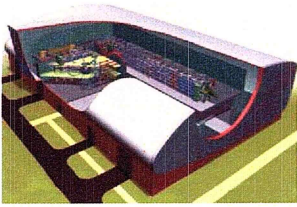
# What next for Aldermaston ?



The Atomic Weapons Establishment is today drafting detailed plans to build a series of new facilities at Aldermaston and Burghfield. They intend to have the capability to build new nuclear weapons that could replace Trident.

This report was written by the Scottish Campaign for Nuclear Disarmament for an inspection of Aldermaston by a delegation from Scotland on 12 June 2006.

# The plans for Aldermaston



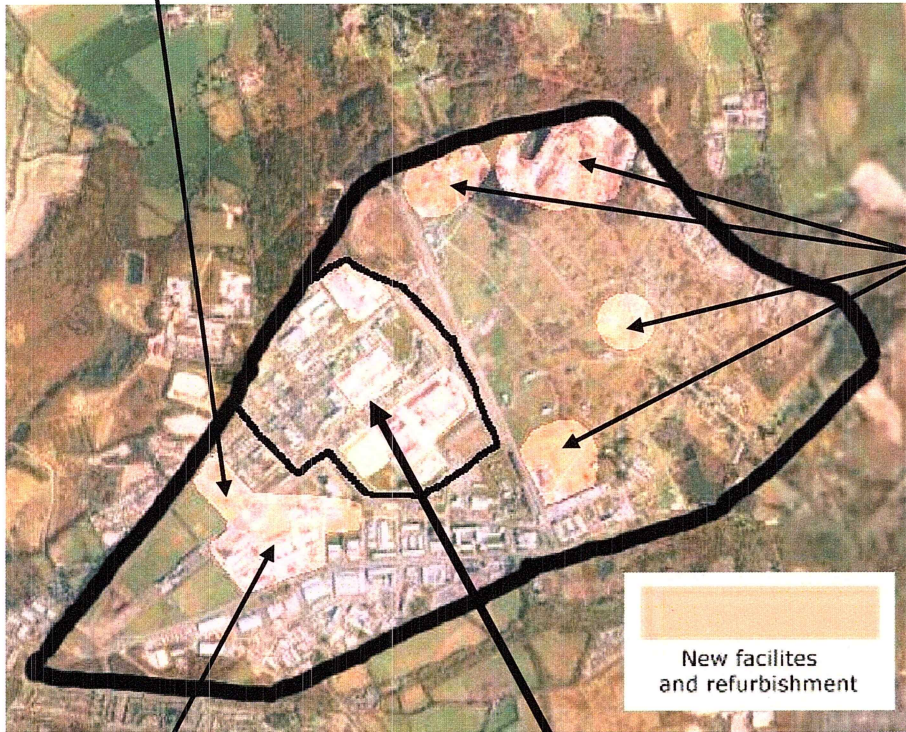
Site for Orion Laser



New Blue Oak computer



Planned Core Punch Facility



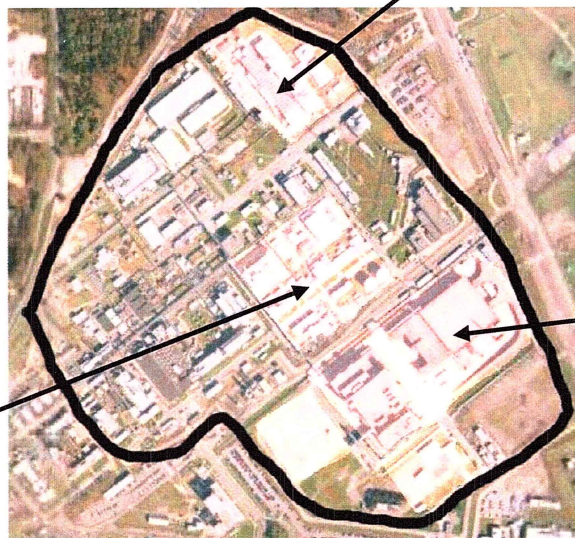
The site development plan suggests that four major new facilities could be built in the East of the site.

New facilities and refurbishment

Site cleared for new facilities



**A45**  
Manufactures HEU components. Area to be refurbished.



Site for new Enriched Uranium Facility

**High Security Area**



**A90**  
Manufactures Plutonium Pits. To be refurbished

The Atomic Weapons Establishment (AWE) design and produce British nuclear weapons. Nuclear components are manufactured at Aldermaston and the weapons are assembled at Burghfield. Both sites are near Reading in Berkshire.

On 19th July 2005 the Government announced they would spend £350 million each year for the next three years on new facilities at Aldermaston and Burghfield. In the same year AWE published a revised site development strategy. This shows that they would like to expand Britain's capacity to design and build nuclear weapons. Implementing this plan would cost more than the £1,000 million that has been disclosed so far. It would take many years to complete.

## **AWE Site Development Strategy**

### 1. Research facilities

#### a. Supercomputers

Computer modelling is at the heart of the AWE research programme. AWE would like to be able to simulate in great detail the detonation of a nuclear weapon. Today American scientists are using the most powerful supercomputers in the world to achieve this. The AWE computing project is copying the US example, but running 5 years behind it.

In 2002 AWE installed the Blue Oak computer, with a power of just under 3 Teraflops.<sup>1</sup> In 2006 an order was placed for Larch, a £20 million computer with a peak performance of 40 Teraflops. If it were in service today Larch would be the most powerful computer in Europe. And Larch is only a stepping-stone. AWE would like to acquire more and more powerful supercomputers throughout the coming decade.

The primary function of the research facilities listed below would be to provide experimental data to support the computer models.

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<sup>1</sup> One Teraflop is one thousand billion floating point operations per second.

#### b. Orion Laser

AWE plan to build a powerful new laser in the West part of the Aldermaston site. If built Orion would be 1,000 times more powerful than the Helen laser currently operating in Aldermaston. AWE can carry out a limited number of experiments in the new American laser, the National Ignition Facility (NIF). Work in the two facilities would be coordinated. NIF will be used principally for thermonuclear research, to understand how high-yield nuclear weapons (hydrogen bombs) work. The experiments planned for Orion may be critical to the design of the fusion part of any future thermonuclear weapon.

#### c. Core Punch Facility

AWE intend to submit proposals to build a substantial new hydrodynamic test building, called the Core Punch Facility. The objective of this will be to understand how the implosion system in the primary of a nuclear weapon works. Hydrodynamic tests analyse how metal responds when compressed by high explosives. The tests take place inside a blast-proof chamber. Steel is used in place of the plutonium in a real warhead. The Core Punch Facility would have an array of X-ray machines to analyse each explosion.

One option AWE are likely to consider is the production of a new primary which could be used in future nuclear weapons. The Core Punch Facility would play a crucial role in this.

#### d. Material Sciences

Nuclear weapons contain a wide variety of materials. It is proposed that new facilities will be built at Aldermaston, and possibly also at Burghfield, for research into material science. This research will look not only at how individual materials behave but also at how components of a nuclear warhead may interact.

## 2. Production facilities

### a. Warhead assembly facility

Nuclear weapons are currently assembled and disassembled in Burghfield. In 2002 AWE considered closing Burghfield and building a new assembly plant at Aldermaston. They have since revised their opinion. They now propose that the new facility will be built next to the old one in Burghfield. Plans for this are likely to emerge during 2006.

### b. Plutonium component manufacture

The A90 building in Aldermaston manufactures Plutonium pits for nuclear weapons and carries out related research. The 2005 site plan suggests that A90 will be refurbished.

### c. HEU component manufacture

AWE would like to build a new facility to manufacture components from Highly Enriched Uranium (HEU). This building would probably make the secondary (fusion) part of any future thermonuclear weapon.

### d. Tritium Facility

AWE are considering building a new Tritium Facility. A decision is likely to be made in 2006. This would be in addition to another tritium building which has only recently been completed. Tritium is used both in warheads and in research.

### e. High Explosives

Currently a number of buildings in Aldermaston and Burghfield process high explosives for nuclear weapons. AWE plan to centralise these and build a new Explosives Handling Facility.

### f. Submarine Fuel Facility

In the longer term AWE are considering building a new facility to manufacture and assemble HEU components for submarine reactor fuel.

## **In what scenarios might these new facilities be needed ?**

### Scenario 1 Trident is dismantled in the near future

If the objective of AWE were to become immediate disarmament then there would be no need to proceed with most of the planned developments. There would be no need for the Orion Laser, the Core Punch Facility or new supercomputers. The current stockpile could be dismantled in the existing facility at Burghfield before a replacement facility was built. If A90 was totally dedicated to disarmament then it could dismantle both the plutonium pits and the HEU secondaries. There would be no need for new HEU facilities. AWE could focus on developing the skills required for nuclear decommissioning.

### Scenario 2 Trident remains in service for its original planned life

Trident warheads would all be withdrawn from service after 25 years, between 2020 and 2025. Both Britain and the US have extensive experience of keeping warheads in the stockpile up to this age. If the stockpile were retired when originally planned there would be no need to build Orion, the Core Punch Facility or new computers.

In 2003 AWE said that Orion would be in service by 2007. Two years later this date had been put back to 2010. In their radioactive discharge report, AWE say that Orion, the Core Punch Facility and the new Uranium facility will be commissioned between 2008 and 2012.<sup>2</sup> But there was a delay of 11 years before the A90 building was in service. The full range of facilities would be unlikely to bear results until 2015. This is only 5 years before the first Trident warheads would be due to be retired.

If the warhead life was restricted to 25 years then the warhead surveillance programme could be reduced. This would free up space in A90 and remove

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<sup>2</sup> Information to support proposals for revised Radioactive Substances Act 1993 Radioactive Waste Discharge & Disposal Authorisations for AWE plc at Aldermaston. AWE November 2005.

the need for new HEU facilities. A case could be made for building a new facility at Burghfield to dismantle Trident warheads.

### Scenario 3 The life of Trident is extended

In 2001 an official statement said "the overarching objective of the UK nuclear warhead programme is to keep the Trident warhead in service, and to be able to underwrite its performance and safety over a period much longer than its originally intended service life."<sup>3</sup> This reflects the "Life Extension" approach which was predominant in the US until very recently. The aim of Life Extension is to keep warheads in service for as long as possible. Weapons are refurbished and upgraded but not fundamentally redesigned. AWE talk about how they need to understand how a weapon ages. When they do so they are not referring just to keeping Trident in service until 2025, but to increasing its life. The new facilities at AWE could be used to try to substantially extend the life of Trident, by 10 or 20 years.

### Scenario 4 A new warhead is designed and produced

When AWE Ltd took over the running of the establishment in 2000 one of their first tasks was to produce a plan to safeguard UK options and capabilities for a future nuclear weapon. The 2003 annual report says that AWE must "maintain a capability to provide warheads for a successor system should Her Majesty's Government ever require one."<sup>4</sup> The requirement is not only to be able to design, but also to produce a new nuclear weapon. If the Comprehensive Test Ban Treaty were not in force then the development of a new warhead would require a series of nuclear tests between 2015 and 2020. The proposed new research facilities could give AWE a simulated testing capability by 2015. Designing a new weapon would require substantially greater resources than sustaining an

existing system. The full range of facilities described in the site plan would be required in order to have the capability to design and build a replacement warhead.

A90 is a copy of the TA-55 building at Los Alamos. The US government plans to produce between 30 and 40 plutonium pits per year from TA-55. A90 will have a similar capability.<sup>5</sup> The age of A45 and other buildings means that it would be difficult for AWE to manufacture the HEU component of a new thermonuclear warhead in existing facilities. The plans to refurbish A90 and build a new HEU facility indicate that AWE intend to have the capability to manufacture a new thermonuclear weapon. It is likely that the proposed new facility at Burghfield will be designed on the assumption that it could assemble, refurbish and disassemble a future warhead between 2020 and 2050.

### **Life Extension or Replacement ?**

The review of scenarios suggests that AWE has drawn up the site development strategy on the assumption that the UK will continue to have nuclear weapons beyond 2025. This could be achieved either by extending the life of the current warhead (scenario 3) or by designing and building a new one (scenario 4).

The US nuclear weapons establishment has concentrated on Life Extension for the past decade. However this approach has recently been challenged. Since 2005 there has been pressure to develop a Reliable Replacement Warhead (RRW). In May 2006 Congress reallocated funds away from Life Extension and towards RRW. Studies into RRW will report in November 2006 and in the first part of 2007.

The British Trident warhead is an Anglicised version of the US W76-0 design. It contains several vital components procured off-the-shelf from America. W76 is at the centre of the Life Extension / RRW debate in the US.

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<sup>3</sup> High Energy Density Physics, National Nuclear Security Administration, April 2001, Appendix G – United Kingdom Statement on High Energy Density Physics.

<sup>4</sup> AWE annual report 2003/04

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<sup>5</sup> A90 has 4 operating bays. These can be used for manufacture, dismantlement or research. The bays can be modified to alter the balance between research and production in the workload.

Under the Life Extension programme there is already a project to substantially modify the warheads, introducing many new components. The resulting W76-1 warhead will be available from 2007. The RRW study is looking at a more fundamental redesign of the W76 warhead, principally the production of a new plutonium pit. As this is at the heart of the weapon it would make it a completely new warhead. It is likely to be called W76-2. If approved, W76-2 would enter service between 2012 and 2015.

On 23<sup>rd</sup> February 2006 a nuclear warhead device, made by AWE, was detonated in the Krakatau sub-critical test at the Nevada test site in America.<sup>6</sup> The MoD said the purpose of the experiment was to test existing warhead components.<sup>7</sup> However Jacob Perea, the Project Manager at Los Alamos admitted that data from the test would be used for their RRW study. He added that he thought it would be "pretty surprising" if AWE were not watching the RRW programme closely.<sup>8</sup>

The pit of the current W76-0 warhead and its British equivalent contain Beryllium as well as Plutonium. Beryllium is not radioactive but it is toxic. The American RRW pit will probably avoid using Beryllium. The Beryllium components for Trident warheads were made at the Atomic Weapons Establishment in Cardiff which closed in 1997. Beryllium machining has become a problematic issue for AWE. For the longer term AWE may wish to move away from Beryllium and adopt an RRW-type warhead.

AWE have probably not made a clear decision between Life Extension or Replacement. They are keeping their options open. The greatest demand would arise if the Government decided to build a new warhead. So their site

development plan probably assumes that this will be the case.

### **New weapons for new roles**

The US laboratories are being asked to design weapons that can be used in new scenarios, as well as in an all-out attack on Russia. The new emphasis is on increased accuracy and lower-yield. This is seen as making nuclear weapons more "useable".

There is no clear indication that a lower-yield or variable-yield warhead for Trident is being developed by the US Laboratories or AWE. However both are probably interested in going down this road. The variable-yield option is more likely as it would enable a smaller stockpile of weapons to be used for a variety of roles.

Lockheed Martin has designed an "Accuracy Adjunct" for the Trident warhead. This was flight tested in 2002 and 2005. It substantially increases the accuracy of Trident by adding flaps to the Reentry Vehicle so it can be manoeuvred. The Accuracy Adjunct was designed for nuclear Trident. Current proposals to arm some US Trident missiles with conventional warheads are based on the same technology. The Accuracy Adjunct would provide the increased accuracy which a lower yield warhead would require. So it is likely that Britain is interested in this.

### **1980s building projects at AWE**

AWE does not have a good record when it comes to major building projects. £1,200 million was spent between 1982 and 1996. The main building, A90, slipped 11 years behind schedule. The adjacent A91 nuclear waste facility was so poorly built that in November 2005 the MoD wrote of all of the £147 million that had been spent on it.

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<sup>6</sup> In sub-critical tests High Explosives are detonated next to a small amount of plutonium. The quantities involved are not large enough to produce a nuclear yield.

<sup>7</sup> Britain and US working on nuclear warheads to replace Trident, Ian Bruce, 10 April 2006

<sup>8</sup> In the wilderness, a computer readies a new nuclear arsenal, Tim Reid, Times, 7 April 2006

## An alternative role for AWE

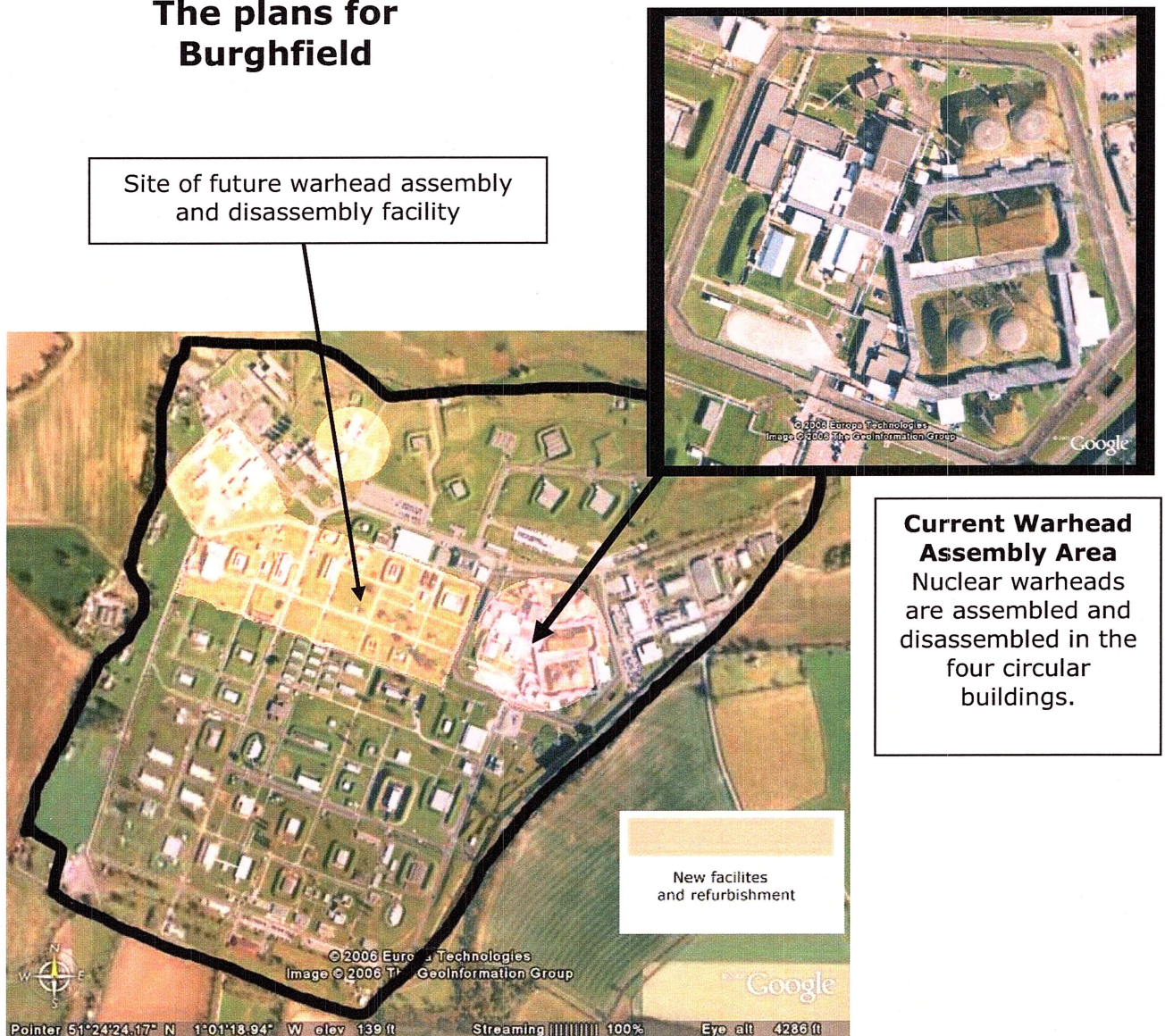
Today a small part of the work of AWE is monitoring observance of the Comprehensive Test Ban Treaty. A report by Pugwash has explained how the resources of AWE could be diverted away from building nuclear weapons and towards verifying nuclear disarmament.<sup>9</sup>

<sup>9</sup> Verifying Nuclear Disarmament: A Role for AWE Aldermaston, Tom Milne & Henrietta Wilson, British Pugwash Group, 1999.

## Conclusion

The Ministry of Defence and AWE are trying to pre-empt the decision on whether to replace Trident by building new facilities at Aldermaston and Burghfield. Their proposals assume that the UK will continue to have nuclear weapons after 2025. Designing and building a new warhead would be more difficult than Life Extension and so would require a greater capacity. The facilities appear to be designed to give AWE the capability of producing the next generation of nuclear

## The plans for Burghfield



# British Trident nuclear warhead

