



Anglo-French nuclear co-operation and the 'Teutates' programme

A briefing from Nuclear Information Service

Under the terms of a new treaty Britain and France intend to collaborate on nuclear warhead technology for the next 50 years.

Official announcement

On 2 November, during a summit between UK prime Minister David Cameron and France's President Nicolas Sarkozy, the two leaders issued a declaration on defence and security co-operation (<http://bit.ly/9hfyDI>). The declaration announced that the two nations would sign a Defence and Security Co-operation Treaty, with a subordinate treaty which will allow them to work together to develop new facilities for modelling the performance of nuclear weapons.

The declaration stated that the two leaders have decided “to collaborate in the technology associated with nuclear stockpile stewardship in support of our respective independent nuclear deterrent capabilities, in full compliance with our international obligations, through unprecedented co-operation at a new joint facility at Valduc in France that will model performance of our nuclear warheads and materials to ensure long-term viability, security and safety – this will be supported by a joint Technology Development Centre at Aldermaston in the UK”.

In a statement in the House of Commons on the same afternoon (<http://bit.ly/c1dtgz>) Defence Secretary Liam Fox provided a little more information about the planned arrangements. Fox said that “the treaty provides for the joint construction and operation of a new hydrodynamics facility at Valduc in France and a technology development centre at the Atomic Weapons Establishment [AWE] at Aldermaston. These facilities will be operational from 2015. This programme, named Teutates, will assist both countries in maintaining the safety and reliability of their respective nuclear stockpiles and will improve expertise in countering nuclear terrorism. The facilities will enable each country to undertake hydrodynamic experiments in a secure environment. The hydrodynamic facilities use radiography to measure the performance of materials at extremes of temperature and pressure. This enables us to model the performance and safety of the nuclear weapons in our stockpile without undertaking nuclear explosive tests”.

The Defence Secretary confirmed that the two treaties, which will last for at least 50 years,

are to be laid before Parliament, allowing MPs to discuss them as part of the ratification process. The texts of both treaties will be placed in the Libraries of both the House of Commons and the House of Lords.

He stressed that much of the detail of the Teutates programme has yet to be sorted out, saying "Achieving the envisaged level of co-operation will take time and will require changes to long-established ways of working. We will put in place measures to deliver long-term commitment to joint projects and we expect to announce new areas of work at regular intervals".

The reason behind the programme: cost cutting

The planned arrangements for military co-operation between France and the UK have been dubbed 'L'Entente Frugale' by the media and it is clear that the principal motivation behind them is a need to cut military spending at a time of economic downturn.

According to French defence analyst Bruno Tertrais (<http://bit.ly/cLDwRJ>), the impetus behind the Teutates programme lies fairly and squarely in the British camp as a response to expected cuts in public spending. Overtures on defence co-operation were made to France following the general election in the UK earlier this year, when the British announced that they would be making cuts and asked what could be done together on a mutual basis.

Joint analysis of nuclear weapon research programmes indicated that the technical needs and timetables of both countries were very similar and a joint programme could satisfy them simultaneously. In the short term, however, there will be significant set-up costs and it is not yet clear how – or even if – major savings will be made in the long term.

Scope of nuclear co-operation arrangements

Before the signing ceremony for the agreement President Sarkozy's office stated that future nuclear collaboration would be pursued "in total respect of the independence of [the] deterrent powers of the two countries". The agreement is limited to collaboration at nuclear weapon research facilities, and does not enable exchanges of strategic information, co-operation on the deployment of nuclear weapons (for example, by co-ordinating or alternating patrols of submarines carrying nuclear weapons), or the exchange of nuclear materials or warheads, although "there may be transport of nuclear materials in France and the UK".

The Teutates programme (named after a Celtic war god worshipped by the ancient Britons and Gauls) as outlined to date by ministers has two elements. In France a joint hydrodynamics research facility, known as EPURE, is to be built at the site operated by the Commissariat à l'Énergie Atomique (CEA) Direction des Applications Militaires (<http://bit.ly/co6WnS>) in Valduc, about 45 kilometres north-west of the city of Dijon in Eastern France. EPURE will conduct physics experiments with the aim of underwriting the reliability and safety of nuclear weapons – although data from the experiments could also be used to design new warhead types. In these experiments warhead mock-ups and component materials will be subjected to extremely high temperatures and pressures, created by the controlled use of explosive charges, to mimic the processes which occur during a nuclear explosion. Under such conditions solid materials exhibit flow properties

similar to those of liquids and gases, and so this branch of research is known as hydrodynamics. Hydrodynamic experiments use high powered flash X-ray machines to record changes in materials as the experiment proceeds, and experimental data is analysed using supercomputers to model how a nuclear warhead would behave during a real nuclear explosion.

For its part, the UK will build a Technology Development Centre at the Atomic Weapons Establishment (AWE) at Aldermaston, which will undertake development work to underpin the radiological equipment technologies to be used in EPURE. This is likely to be based around the work of AWE's pulsed power programme, which has for many years worked to develop high-powered X-ray equipment and similar technologies for use in AWE's research programmes.

"Several dozen" British and French scientists would work together at Valduc and Aldermaston and the facilities would cost both countries several million Euros, according to President Sarkozy's office. One of the aims of the joint programme is to ensure both parties maintain expertise in the technical fields of warhead physics – an area of growing concern in the nuclear weapons arena as scientists with experience of warhead design and explosive nuclear testing grow older and retire.

As well as agreeing to co-operate on nuclear weapons, the new treaty will allow the UK and France to work together on developing technologies and systems for new nuclear powered submarines. The summit declaration states: "We plan to develop jointly some of the equipment and technologies for the next generation of nuclear submarines. To that end, we will launch a joint study and agree arrangements in 2011. Co-operation will help to sustain and rationalise our combined industrial base and will also generate savings through the sharing of development activities, procurement methods and technical expertise".

Will nuclear secrets be shared?

Both the Valduc and Aldermaston facilities will enable each country to undertake sensitive work in support of their own national programmes in a secure environment, without necessarily exchanging information from their experiments. "EPURE is designed to allow both countries to keep, for each experiment, full sovereignty over the results," according to a statement from the French President's office. It is not yet clear how this will be managed, but Nature reporter Geoff Blumfiel has speculated that classified data could be kept separate by using duplicate arrangements for data management. AWE's 'Orion' laser has been designed to route data to two completely separate networks: one classified, the other open, with servers kept in physically separate rooms and separate data analysis centres (<http://bit.ly/as6jNn> and <http://bit.ly/9vOelr>).

Despite this, one of the aims of the joint programme does appear to be to allow direct co-operation between teams from the two nations. According to a statement from the Elysée, co-operation will allow scientists and experts of both countries to share expertise and experiences, and create a climate of trust between teams conducive to scientific debate and challenge to preserve the long-term quality and motivation of nuclear weapons scientists.

Current nuclear infrastructure programmes and facilities

Hydrodynamic experiments in support of the French nuclear weapons programme already take place at the 'Airix' facility at the CEA's Moronvilliers site. Airix has been open since 2000, but only allows X-ray images from experiments to be recorded on one geometrical axis. The new facility at Valduc, which is expected to come into service by 2022 with a lifespan of several decades, will allow images to be recorded on several axes – a big step forward in analytical capacity. Experiments generating data to assist in the modelling of nuclear explosions will also be undertaken using the CEA's Megajoule Laser (LMJ), currently under construction at Cesta in Bordeaux and expected to enter service in 2012.

In the UK a major infrastructure upgrade programme is currently underway at AWE. A high powered laser, Orion, opening in 2011, will play a similar role to the French Megajoule Laser, and earlier this year AWE took delivery of a number of new supercomputers for modelling warhead performance and nuclear explosions. In September AWE was given planning permission for Project Hydrus – a new hydrodynamics facility at Aldermaston – and construction work is now commencing on Hydrus. NIS has been informed that, despite the Teutates programme, work on Hydrus will continue, and that AWE takes a positive view of the proposals for co-operation, seeing them as a pragmatic step forward, with its role being to sort out and implement details underpinning the high-level agreement.

The primary aim of the Anglo-French defence co-operation programme is to reduce expenditure, and both the United Kingdom and France will save "very substantial millions" by co-operating on the EPURE facility, according to Liam Fox. The Ministry of Defence (MoD) does not intend to release information on the costs of the new project at this stage for reasons of commercial sensitivity, but the costs of building, operating over several decades, and dismantling the facility will be shared equitably between the two countries. MoD believes that cooperation has the potential to save considerable sums for both parties, particularly for the UK in the initial four years as the French will pay the early build costs on EPURE, but it is too soon to say with confidence what total savings over the life of the programme might be or what staffing levels will be.

Funding for AWE's infrastructure upgrade programme has been earmarked until 2025, although the programme is being reviewed with the aim of identifying areas where savings could be made. It is possible that Hydrus will be constructed to a lower specification than originally planned, with more complex experiments now being scheduled to take place at Valduc. NIS has been told that both the UK and France will ensure that any expenditure already incurred will be optimised for the mutual benefit of the joint programme, for example towards the design of new facilities and enabling technologies. Over the next few years both nations intend to modify their respective national programmes to transition to Teutates. Work will focus on the detailed design and building of the joint facilities.

Impact on US – UK nuclear collaboration

The UK co-operates closely with the United States of America in the design and construction of its nuclear weapons, and nuclear co-operation between the two states is closely controlled by the US – UK Mutual Defense Agreement (MDA), first signed in 1958 and reviewed on a regular basis. Concerns that the new Anglo-French agreement will compromise the terms of the MDA have apparently been discussed at a high level between the UK and the US. Liam Fox told Parliament: "In my discussions with Secretary

Gates, ahead of the defence review and afterwards, the agreement was one of the four elements about which the United States was most concerned. Our commitments under the 1958 treaty are in no way jeopardised, and the United States was fully consulted before and after the moves that we are discussing were made ... I was personally involved in discussions with the United States on this issue. After we made some of the details available, there was no resistance from either the Administration or the military to this proposal. They were fully satisfied that it met the reservations that they might otherwise have had”.

Mr Fox has pointed out that France also co-operates with the USA on nuclear weapons, saying: “For a long time there has been a French-American bilateral relationship and an Anglo-American bilateral relationship on the nuclear deterrent ... there has been discussion for some time about whether the relationship should be trilateral, given the cost of the programmes, but the decision has been taken that for the moment the double bilateral relationship will continue. We are strengthening the third, Anglo-French, part of that, because we believe it is in our interests to do so for reasons of both cost-effectiveness and our obligations under the non-proliferation treaty”.

Both the UK MoD and the French CEA are listed as partners in the research programme for the National Ignition Facility superlaser at the Lawrence Livermore National Laboratory, part of the USA's National Nuclear Security Administration, suggesting that there has been some degree of co-operation between France and the USA on high energy physics research programmes relating to nuclear weapons (<http://bit.ly/9dzg57>).

However, conservative commentator John Bolton, former US Ambassador to the United Nations, has claimed that the deal to share nuclear secrets is not supported by large sections of the US defence community and may lead Washington to limit the sharing of intelligence with the UK (<http://bit.ly/b2J5Ho>).

International treaty obligations

Disarmament NGOs have expressed concerns that the Anglo-French agreement does not sit easily alongside commitments that both nations have made under the terms of the Non Proliferation Treaty. Article I of the Non Proliferation Treaty states that: "Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices" (<http://bit.ly/9PaLg7>). Article VI of the treaty requires nuclear weapon states to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament. The UK and France are open to accusations that the planned arrangements for co-operation break the spirit, if not the letter, of the Non Proliferation Treaty.

The Comprehensive Test Ban Treaty, which recognises that a ban on nuclear weapon test explosions constrains the development and improvement of nuclear weapons and constitutes an effective measure of nuclear disarmament. As the new research facilities are intended to allow research into the development of nuclear weapons without the need for a test explosion, they could also be seen as breaching the spirit of the Comprehensive Test Ban Treaty.