

# Plutonium & Aldermaston: An Historical Account

IN ITS 1998 STRATEGIC DEFENCE REVIEW the British government announced that it was initiating 'a process of declassification and historical accounting with the aim of producing by Spring 2000 an initial report of defence fissile material production since the start of Britain's defence nuclear programme in the 1940s'. The result is *Plutonium & Aldermaston: An Historical Account*, published by the Ministry of Defence (MOD). The work was justified in the following terms: 'The Government is committed to transparency and openness . . . [and] to work[ing] towards the goal of the global elimination of nuclear weapons . . . [this] will require States which have had nuclear programmes outside international safeguards to account for the fissile material that they have produced. This contributes to the process of nuclear disarmament by developing confidence that as States reduce and eventually eliminate their nuclear weapons, they have not concealed stocks of fissile material outside international supervision . . .'.

This study is very welcome. It is remarkable how far the MOD has travelled to embrace transparency in this field—a great deal further than its counterparts in Beijing, Moscow and Paris. Nonetheless the MOD has not met the precise objective set in 1998. It has reported not on fissile material *production*, but on plutonium *transfers* into, and out of, the Atomic Weapons Establishment (AWE) at Aldermaston, where UK nuclear warhead components are manufactured.

Furthermore the MOD is not justified in claiming that the study 'is similar in scope, from the UK perspective, to the major US Department of Energy (USDOE) programme of work to account for defence stocks of nuclear materials'. The US programme (part of the 'Openness Initiative') was much more thorough than the MOD's, rested on assessments of production rather than transfers, distinguished between inventories of weapon- and reactor-grade plutonium, took careful account of wastes, and covered highly enriched uranium (HEU) as well as plutonium.

It appears that the MOD focused its study on transfers for three main reasons. First, the government was not prepared to commit the money and manpower that a thorough search for, and analysis of, production records would have entailed. The impression is that hard-pressed officials who were unable to persuade their seniors to extract from the MOD's enormous budget the slender resources required carried out this study on a 'shoestring'.

Second, those involved in the study seem to have concluded, even in the absence of a thorough search, that production records relating either to reactors or reprocessing plants could not yield the information from which accurate inventories could be assembled. Accounting practices in the 1940s, 1950s and early 1960s were evidently lax by later standards, and some records from the early period are missing and may never be traced. Not that the quality of transfer data was a great deal better. Those conducting the study had to rely on Sellafield's consolidated accounts of transfers to Aldermaston, since shipper and receiver records had been destroyed.

## In this special issue . . .

*Trust & Verify* focuses on two studies published in April by the British government (see [www.mod.uk](http://www.mod.uk)). They deal with nuclear transparency and verification and were foreshadowed in the July 1998 Strategic Defence Review. Although they do not fulfil their mandate in all respects, the reports deserve to be highlighted since they represent an initial attempt by one nuclear weapon state to meet its commitment to nuclear disarmament—reinforced by the recent Nuclear Non-proliferation Treaty (NPT) Review Conference. In VERTIC's view, the two reports should lead to further steps by the British government and emulation by the other nuclear weapon possessors.

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# Trust & Verify

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Third, the UK nuclear weapon production cycle (from plutonium to components to warheads) is not under the control of a single government agency. While in the US the production cycle has long been the responsibility of the USDOE, in the UK it was divided when the UK Atomic Energy Authority (UKAEA) was broken up in the early 1970s. From

produced in the Calder Hall and Chapelcross reactors, and, initially, in the civil Magnox reactors, found its way to Aldermaston, where it was processed and/or stored prior to being used for weapons or moved elsewhere for civil or military purposes. Up to the mid-1970s plutonium fuel assemblies for civil research facilities were usually supplied from

Aldermaston. Its prominence stemmed from its expertise in the science and technology of plutonium metal and its use as a transit camp for materials dispatched to, and received from, the US. Furthermore, governments in the 1940s and 1950s decided to concentrate such activities there, rather than spread them across a number of sites.

The report provides tables detailing to the nearest tenth of a kilogramme annual transfers of plutonium to and

from Aldermaston between 1952 and 1999 (see table). (A forthcoming *VERTIC Briefing Paper* by William Walker will explain the transfers summarised in the table and will elaborate on issues raised in this article.) One aspect deserves attention here: the inventory difference declared by the MOD.

The accounting exercise reveals that the quantities recorded as being delivered to Aldermaston fall short (after removals) of the quantities of physical stocks by 0.29 tonnes. This discrepancy is due to 'the poorer quality and completeness of some of the older records . . . [which were] of variable quality in the period of the 1950s and early 1960s'. The MOD's assessment of this discrepancy is unsatisfactory in two respects.

First, the discrepancy is referred to as the 'inventory difference'. The US Openness Initiative, which revealed similar discrepancies in US accounts, defined 'inventory difference' as the book inventory less the physical inventory. This mirrored the definition of the International Atomic Energy Agency (IAEA) when assessing 'material unaccounted for'. For reasons unexplained, the MOD has inverted the definition by equating 'inventory difference' to physical inventory less book inventory.

Even more confusing, the definitions of 'book inventory' and 'physical inventory' are at variance with the customary definitions used by the IAEA and, for that matter, by the UK government wherever safeguards are applied. Equating 'physical inventory' with 'weapon cycle stock' seems especially inappropriate since 'physical inventory' is commonly taken to refer to all materials within a material balance area (including wastes) and is not confined to those held in a particular stock. In any case the UK's 'weapon cycle stock' is only partly located at Aldermaston and in what might be called a 'material balance area'—a large fraction is assigned to warheads deployed on *Trident* submarines. The MOD should have adopted different terminology if it felt unable to comply with customary definitions. It is surprising that other parts of the British government did not insist on this.

## **The study's main revelation is the extent to which the AWE acted as the centre of plutonium processing (as opposed to separation, which occurred at Sellafield), for the UK's military and civilian programmes**

1971, fissile materials were produced by British Nuclear Fuels Limited (BNFL), which answered thereafter to the UK Department of Energy, which was absorbed into the Department of Trade and Industry (DTI) in 1992. After 1971 these departments also presided over a truncated UKAEA and its civil research and development activities at Dounreay, Harwell and elsewhere. The MOD assumed responsibility for weapon design, production and testing activities at Aldermaston and other sites. Fissile material production has, therefore, never come under the wing of the MOD. As a result, a thorough analysis of plutonium production would have required interdepartmental negotiations, agreements and financial transfers that the study's sponsors were probably happy to avoid, especially given the short time allowed for the work.

In the event the plutonium transfer data provide a rough surrogate for production data, as all plutonium entering the weapons programme has been delivered to Aldermaston. These data and the findings drawn from them have considerable worth, even if the case for relying on them could have been better argued in the report.

## **The findings**

What does the study tell us? It reveals that the UK's defence stockpile from which warheads are manufactured comprised 3.51 tonnes of plutonium on 31 March 1999—the study's reference date. This includes 0.3 tonnes that the MOD has declared to be surplus to military requirements. By June 2000 just over 100 kilogrammes had been transferred to Sellafield and placed under international safeguards and the remainder was expected to follow soon.

The study's main revelation is the extent to which the AWE acted as the centre of plutonium processing (as opposed to separation, which occurred at Sellafield), for the UK's military and civilian programmes. Most of the plutonium

## Plutonium transfers to and from Aldermaston, 1952–31 March 1999 (tonnes)

	Receipts from	Removals to	Net transfer
<b>UK</b>			
Sellafield	14.68	3.93	+10.75
Unidentified sites	0.37	—	+0.37
Winfrith	0.65	2.82	-2.17
Harwell	0.52	0.53	-0.01
Dounreay	0.14	0.22	-0.08
<b>USA</b>			
Barter exchange	—	5.37	-5.37
Classified transfers	0.47	0.47	0.00
Expended in tests	—	0.20	-0.20
Waste disposal	—	0.07	-0.07
<b>Total</b>	<b>16.83</b>	<b>13.61</b>	<b>+3.22</b>
Defence stockpile	—	—	+3.51
Inventory difference	—	—	(+0.29)

Second, the report concludes that 'the overall level of the Inventory Difference is low in comparison to the amount of material delivered to Aldermaston, at some 1.7% of plutonium delivered'. This percentage is misleading. Around 2.5 tonnes of plutonium were delivered to Sellafield in the early period when the main problems arose, implying that the discrepancy then exceeded 10%. Furthermore, as the 2.5 tonnes largely comprised weapon-grade material, the discrepancy for the weapon-grade inventory is much higher than 1.7%. Lacking information on plutonium production, the MOD has had no means of checking how the discrepancy arose. Unlike the USDOE, which has devoted substantial resources to finding the sources of inventory differences, the MOD appears content to let the matter rest. It suggests that 'this is a reasonable outcome given the long period covered and the limited availability of records for the early years'.

## Conclusion

In conclusion, this is a valuable but flawed report. The government states in the summary that it 'does not believe that it will ever be possible for any of the relevant States to be able to account with absolute accuracy and without possibility of error or doubt for all the fissile material they have produced for national security purposes'. Most governments and safeguards agencies will accept this judgement, although they still expect countries with nuclear weapon programmes to do their utmost to maximise accuracy and minimise error. Anything less would thwart the disarmament objectives that the MOD so laudably upholds in these documents.

There is another reason why the MOD should not rest on its laurels. In the interests of equity and security, the rigorous 'self-auditing' of fissile materials should be a universal obligation for all states with nuclear weapon programmes. It is common sense that all states should know what they have and where it is. If the UK study had matched the scope and methodology of the US Openness Initiative, both governments would have been well placed to press other states to accept this obligation.

The report's summary ends with the following statement:

'In view of the labour-intensive nature of the work involved and the limited resources available the Government intends now to seek the views of UK academic and non-governmental experts on their priorities for information in this area before setting any further internal work in hand.'

My priority would be for DTI and MOD to launch a joint study of defence fissile material production, encompassing both plutonium and HEU, augmenting the work carried out on fissile material transfers. The complaints about 'limited resources' are not persuasive given the huge scale of expenditure on other security programmes.

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# Confidence, Security & Verification

## The challenge of global nuclear weapons arms control

THIS SECOND REPORT, published by the Atomic Weapons Establishment (AWE) itself, is the product of an 18-month study to 'identify the technologies, skills and techniques required and what is available in this country' for developing British expertise in the verification of nuclear disarmament. It is path-breaking for several reasons. First, the authors presume, encouragingly, that the US–Russia nuclear disarmament process will continue and, sooner or later, involve other nuclear weapon states. Second, the verification under discussion is unprecedented and affects the most sensitive part of nuclear disarmament: the irreversible destruction of nuclear warheads. Third, the need for greater transparency by nuclear weapon complexes is emphasised. Fourth, the report promises co-operation with experts outside of the nuclear weapons establishment, including non-governmental organisations.

Most of the report is devoted to a discussion of verification scenarios, serving as an easily readable introduction to the technical challenges of verifying the elimination of nuclear warheads. An essential first step is warhead authentication: the report calls this the central problem of verification. It notes that verification must permit authentication with sufficient confidence, while protecting sensitive information in order that proliferation of nuclear know-how does not occur. Several possible verification scenarios, involving varying degrees of intrusiveness, are outlined, and several radiometric and other technologies that are applied to a variety of warhead designs are described. Since no single technology would be able to authenticate all warhead types, a combination of methods would be necessary and effective as long as a transparency regime was in place. The report also outlines several verification scenarios for dismantlement and disposition. Many of the technologies are the same as for authentication and, again, combinations must be used for credible effect. In addition the report considers the need for monitoring nuclear installations after successful disarmament has occurred and mentions some of the technologies planned or already used for nuclear safeguards, notably environmental monitoring, including country-wide random measurements, measurements during on-site inspections, and data collection.

Like the MOD's plutonium study, though, this report suffers from some shortcomings. First, it appears consistently to underplay the achievements of the International Atomic Energy Agency (IAEA), the benefits of full-scope safeguards and the danger of clandestine nuclear weapon programmes. It declares, for instance, that, 'The IAEA programme has recently been extended, following the Gulf War where the production of nuclear warhead materials was being accomplished without

IAEA knowledge'. Actually a revolution in IAEA safeguards is being implemented, following not just the case of Iraq, but of North Korea and South Africa. And the Iraqis had an advanced nuclear weapon programme that extended well beyond nuclear materials. Moreover, not just the IAEA but everyone else was ignorant of it. The report almost grudgingly acknowledges that 'IAEA/EURATOM Safeguards technologies and non-nuclear treaty technologies may be useful in a future Nuclear Weapons verification regime'. In fact they would be central. The IAEA's Strengthened Safeguards System aims to detect clandestine nuclear weapon programmes and, therefore, incorporates technologies that will be useful in monitoring a nuclear weapon-free world. The study also proposes that AWE investigate how knowledge, experience and techniques from the Nuclear Non-Proliferation Treaty (NPT) and Comprehensive Nuclear Test Ban Treaty (CTBT) communities 'may be transferred to a nuclear weapons arms control regime'. In fact they are already an integral part of such a regime and will be of a nuclear disarmament regime.

Second, the verification technologies considered in the report are mainly those specifically devised to deal with nuclear arms control. Yet there are many additional possibilities. An example is satellite imagery for detecting undeclared nuclear plants. Another powerful verification tool often mentioned in arms control treaties is so-called national technical means, which include not only nationally owned and controlled technologies, but also intelligence activities. In addition 'societal verification', involving scientists, other experts, non-governmental organisations and the general public, can help ensure that violations will be revealed in a timely way.

Third, although the report sensibly recommends that sensitive parts of the verification process take place only among the nuclear weapon states themselves, the verification of nuclear disarmament and maintenance of a nuclear weapon-free world will be of legitimate interest to the entire international community. Many states will be eager to assist in verification. In the long term, the goal must be to create a global verification system applicable to, and involving, all states, as with the CTBT.

Fourth, while the study admirably fulfils the first part of its mandate, dealing convincingly with the technical requirements of nuclear disarmament verification, it largely fails to fulfil the second part: to assess the UK's overall capabilities in the field. It surveys AWE's capabilities extensively, but only vaguely and in passing suggests that capabilities might lie elsewhere. Although the AWE conducted a questionnaire-based survey of likely repositories of such expertise and capacities, these are not revealed in the report. The results will 'be used in the



research phase'. Why could not all of us be informed of the breadth of UK capabilities, especially seeing that that was a part of the Strategic Defence Review's brief?

In the absence of such information the report proposes, not surprisingly, that a Verification Research Programme be created at AWE. It will initially have three prime foci: technical research into the verification of nuclear arms control and reduction; arms control and reduction verification studies; and continuation of CTBT verification research.

But to be successful and relevant the programme needs to comprehend not just the technical aspects of warhead disposition, but other verification techniques and technologies. All such tools must be set in the context of the theory and extensive practice of disarmament and arms control, the political and legal context of verifiable nuclear disarmament and

the compliance context in which technical capabilities will be required. The UK will also have to determine its niche in nuclear verification research, since other countries, most notably Russia and the US, are already well advanced in the field.

This report is an indication that the British government is serious in considering how it might prepare for joining the nuclear disarmament process through greater involvement and investment in verification. It is to be commended as a good start towards that end.

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## ***Peace Missions Monitor***

### **Peruvian election monitors leave in huff**

The monitoring mission of the Organization of American States (OAS), which had been scheduled to observe the run-off presidential election in Peru on 28 May, withdrew before the vote. The poll, which had become necessary after President Alberto Fujimori failed to gain an absolute majority in the first round on 9 April, appeared likely to be marred by widespread electoral fraud. The head of mission, Eduardo Stein, a former Guatemalan Foreign Minister, said that he had been deceived by Peruvian officials who, contrary to previous understandings, had refused to permit observers to test computer programmes to make sure that vote counting would be transparent and valid.

Source *New York Times*, 27 May 2000, p. A5; Executive Summary, Final Report of the Chief of the Electoral Observation Mission for the General Elections in the Republic of Peru, 4 June 2000, [www.oas.org](http://www.oas.org).

### **Zimbabwe: UN ousted but other monitors help deter violence**

Meanwhile the UN withdrew from monitoring the Zimbabwean elections after President Robert Mugabe rejected its offer to co-ordinate the numerous international observers attempting to monitor the violence-plagued electoral process. The Zimbabwean authorities had tried, in several ways, to prevent the observers from carrying out their tasks. Nonetheless there were several reports of violence in areas where observers were obviously present. The election itself passed off relatively peacefully. The Commonwealth Observer Group reported shortcomings in the election preparations and widespread intimidation and violence, but a commendably transparent counting process.

Source *International Herald Tribune*, 12 June 2000, p. 6; Commonwealth Observer Group Interim Report, London, 27 June 2000, [www.thecommonwealth.org](http://www.thecommonwealth.org).

### **UN verifies Israeli withdrawal from Lebanon**

The UN has verified Israel's withdrawal from Lebanon, despite protests from Beirut. After the sudden Israeli pull out in May, following 22 years of occupation, the UN Interim Force in Lebanon (UNIFIL) sent teams to the so-called Blue Line, which the UN established as a basis for verifying the withdrawal. They confirmed Israel's departure, an assessment endorsed by the UN Security Council on 18 June. Lebanon protested at what it claimed were continuing Israeli violations of the border, and contested the UN's right to demarcate the Blue Line. The UN Secretary-General, Kofi Annan, explained to the Lebanese that the UN was not demarcating the border as such, since that could only be done by the states concerned, but was establishing a line for verification purposes. In a strong assertion of UN powers with regard to compliance he stated that, while Lebanon could report suspected Israeli violations, it was up to the UN to decide whether any had actually occurred.

Source *New York Times*, 27 May 2000, p. A4; *International Herald Tribune*, 19 June 2000 p. 9, 20 June 2000, p. 6, 21 June 2000, p. 4.

### **UK to monitor Russian Moldova withdrawal**

The UK is establishing a mission to assess and monitor Russian weapons stored in Moldova's separatist province, Trans-Dniester. The arrival of the monitoring mission in Moldova is intended to be the first step towards the withdrawal of 2,500 Russian troops from the province. UK Foreign and Commonwealth Office Under-Secretary of State David Menning announced the mission, although he did not say when it would begin. Some 120 main battle tanks, 130 artillery pieces and 1,000 armoured personnel carriers from Russia's 14th Army are to be pulled out.

Source *Jane's Defence Weekly*, 17 May 2000, p. 6.

# Climate change: good verification confronts multiple uncertainties

STATES PARTIES to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) met in June in Bonn, Germany, for the first of three formal meetings in 2000. This busy schedule has been set in the hope that states parties can adopt rules for implementing the 1997 Kyoto Protocol at the Sixth Conference of the Parties in The Hague in November 2000. Parties can then start ratifying and preparing for entry into force of the Protocol. In an experimental approach, the parties met for a week of informal discussions and workshops prior to the formal Twelfth Meetings of the Subsidiary Bodies to the Convention, which were held from 12–16 June.

Contentious issues continue to dog the negotiations and these are unlikely to be resolved until the last minute in The Hague. Parties were able to bypass some of these in Bonn, however, and make constructive progress in other areas. In particular, work on verification of the Protocol is relatively free of controversy. Methodological experts negotiating rules for Articles 5, 7 and 8 made headway on guidelines for monitoring, reporting and reviewing implementation of the Protocol, while their colleagues were stuck in political quagmires elsewhere in the conference venue.

In fact the methodological experts produced the only tangible outcome of the meetings—draft guidelines for national systems for estimating greenhouse gas emissions and removals according to Article 5.1. These lay out the institutional, legal and procedural arrangements to be made by developed nations (listed in Annex 1 of the Convention) for estimating greenhouse gas emissions and removals, and for reporting and archiving inventory information. The guidelines cover planning, preparation and management of inventory activities, such as collecting activity data, selecting methods and emission factors, estimating emissions and removals, implementing uncertainty assessment and quality assurance/control activities, and procedures for verification of inventory data at the national level.

A related development was the Intergovernmental Panel on Climate Change (IPCC)'s adoption, in May, of its report: *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. The guidance is intended to assist parties using existing national greenhouse gas inventory guidelines to prepare higher quality inventories in which uncertainties are reduced as far as possible. The Subsidiary Body for Scientific and Technical Advice recommended that Annex 1 parties have good practice in place by 2003, and encouraged non-Annex 1 parties to apply the guidelines to the extent possible.

Much progress was also made in developing guidelines for the Article 8 review process. Parties agreed on 'Proposed

elements of draft guidelines under Article 8', which will form the basis of negotiating text for the next set of meetings in Lyon, France, in September. Parties generally agree on what should be reviewed and when. But much remains to be agreed, including the institutional arrangements for review, the procedures for identifying and classifying problems to pass on to the compliance body and the procedures for adjusting inventories not prepared according to guidelines.

Verification issues also crept into other negotiating groups. An issue for the mechanisms group was whether parties must demonstrate that they are in compliance with their monitoring and reporting commitments under Articles 5.1 and 7 before they can take part in emissions trading, Joint Implementation (JI) and the Clean Development Mechanism (CDM). Positive movement was made on this issue, as the US shifted position towards the use of pre-commitment period review of compliance with Articles 5 and 7. The mechanisms group also considered the whole issue of how to monitor, report and review emissions reductions made using JI and the CDM.

As might be expected, verification also featured in the discussions of the Joint Working Group on Compliance. Among other issues, the Group discussed how and by whom compliance problems would be brought to the attention of the compliance system. It is generally agreed that the Article 8 review process will refer 'problems of implementation' to the compliance procedure, but the mechanism for this is unclear. It is also unclear what the role of the UNFCCC Secretariat will be in this process.

Finally, verification was an underlying theme of extensive discussions on the use of biological sinks, such as forests and soils, to meet the greenhouse gas emission commitments in the Protocol. Discussion revolved around the IPCC Special Report on Land Use, Land Use Change and Forestry (LULUCF)—also adopted in May. The report shows that the amount of emission removals by sinks that parties could claim may vary enormously depending on the definitions and accounting methods adopted. Verification of most of these emission removals would be a nightmare. Consequently some parties, and most non-governmental organisations, are critical of including all LULUCF activities in the Protocol, especially as JI and CDM projects. Given the potential benefits to them in reaching their greenhouse gas emission reduction targets, though, a range of otherwise unaligned parties supports full use of LULUCF.

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### **NPT Review Conference: agreement on disarmament at safeguards' expense**

To the surprise of many observers, the sixth Nuclear Non-Proliferation Treaty (NPT) Review Conference, which took place from 24 April–19 May 2000 in New York, ended with agreement on a strong final document. It contained, for the first time, 'an unequivocal undertaking' by the nuclear weapon states to accomplish the 'total elimination of their nuclear arsenals leading to nuclear disarmament'. States parties also agreed on further development of the verification capabilities required to 'provide assurance of compliance with nuclear disarmament agreements for the achievement and maintenance of a nuclear-weapon-free world'. The UK was instrumental in achieving this by introducing a detailed working paper on verification. The nuclear weapon states parties also committed themselves to increased transparency with regard to their nuclear weapon capabilities in implementing agreements pursuant to Article VI and as a voluntary confidence-building measure to support further progress towards nuclear disarmament.

Discussions on measures to strengthen nuclear safeguards and export controls were controversial. Stronger language was sacrificed in order to reach overall agreement. The IAEA Director-General, Mohamed ElBaradei, emphasised the need to speed up implementation of the strengthened safeguards system, arguing that the Agency can fully implement safeguards, as required by Article III of the NPT, only in those states that have a comprehensive safeguards agreement and an Additional Protocol in force. This view was supported by a group of 10 states—Australia, Austria, Canada, Denmark, Hungary, Ireland, the Netherlands, New Zealand, Norway and Sweden. The so-called G-10 suggested that implementation of safeguards agreements under Article III.1: 'should be designed to provide for verification by the Agency of the correctness and completeness of a State's declaration, so that there is a credible assurance of the non-diversion of nuclear material from declared activities and of the absence of undeclared nuclear material and activities'.

Australia was even more direct in proposing that, 'in the near future', an INFCIRC/153 safeguards agreement, coupled with an Additional Protocol, should constitute the full-scope safeguards required by Article III of the NPT and be a condition of supply. But these progressive proposals were eliminated in the drafting process leading up to the final document. Also eliminated were references to the role of export controls in preventing proliferation of nuclear weapons. China, France and Russia are reported to have been driving forces behind this regrettable weakening of language on safeguards and export controls. All three countries have shown a past interest in exporting nuclear technology to non-NPT members.

The conference did give its support to the CTBT and its Preparatory Commission (PrepCom) in Vienna, which is implementing the verification provisions of the Treaty. PrepCom Executive Secretary Wolfgang Hoffmann argued that states can gain by actively participating in the International Monitoring System (IMS)—89 countries are being equipped with cost-free, cutting-edge technology for IMS stations. The final document emphasised 'the importance and urgency of signatures and ratifications, without delay and without conditions and in accordance with constitutional processes', to achieve the early entry into force of the CTBT. It also called on all states to continue their moratoria on nuclear testing.

**Source** NPT Review Conference working papers and documents (see the British-American Security Information Council's website, [www.basicint.org](http://www.basicint.org)); analyses of the conference (see the ACRONYM Institute website, [www.acronym.org.uk](http://www.acronym.org.uk)); VERTIC *Briefing Papers* 00/1 and 00/2: Trevor Findlay and Oliver Meier, 'Fulfilling the NPT: A Verifiable Test Ban'; and Oliver Meier, 'Fulfilling the NPT: Strengthened Nuclear Safeguards', available at [www.vertic.org](http://www.vertic.org).

### **US and Russia agree on early warning and plutonium disposition**

On 4 June 2000 US President Bill Clinton and Russian President Vladimir Putin signed two Memoranda of Agreement (MOA) on early warning of missile launches and an agreement on plutonium disposition.

The first early warning MOA commits them to establish a Joint Data Exchange Center (JDEC) in Moscow. The centre, which is expected to be completed in a year, will be manned by 16 US and 81 Russian staff—the latter will be responsible for security and support. Operations will start with limited monitoring of each other's long-range ballistic missile launches. There will be separate computer monitors for each side, with no data fusion taking place. When a launch is detected, the two sides will exchange information, such as location, type, direction and likely area of impact. The source will remain concealed. Phase two will start after several months, when the two sides will begin notifying each other of missile launches down to the 500-kilometre (km) range. During the third and final stage, the two sides will also monitor third party missile launches targeted at either Russian or US territory. According to a US official the idea is that 'these folks in the center would be able to consult both among themselves and with their folk back home to help resolve any ambiguous events'.

The JDEC succeeds the Y2K Center in Colorado, which hosted staff from both countries during the millennium rollover until the middle of January 2000. The US has disclosed that this centre was originally intended to be a training facility for the Moscow Center and was turned into a joint warning centre

on short notice. The US has also revealed that it has agreed actively to assist Russia to repair and expand its early warning capabilities, including a joint Russian American Observation Satellite (RAMOS), and completion of an early warning radar in the Mishelevka region.

The second MOA signed in Moscow concerns the exchange of pre-launch notifications. Such a regime could be open to other states, but this is still under negotiation.

Clinton and Putin also agreed on the management and disposition of 34 metric tonnes of weapon-grade plutonium, which has been withdrawn from each of their nuclear weapon programmes and declared excess to defence purposes. The US intends to use 25.5 tonnes of its amount as fuel in nuclear reactors and will immobilise through vitrification the remaining 8.5 tonnes. Russia wants to use all 34 tonnes of its amount in mixed oxide fuel elements. Both sides intend to construct industrial-scale disposition facilities by 2007. They also undertook to stop reprocessing plutonium until the 34 tonnes are disposed of and to conduct any future reprocessing under effective, mutually agreed monitoring. Eventually these verification measures will become part of the trilateral initiative being negotiated between the IAEA, Russia, and the US.

Source 'Memorandum of Agreement Between the United States of America and the Russian Federation on the Establishment of a Joint Center for the Exchange of Data from Early Warning Systems and Notifications of Missile Launches', White House Fact Sheet, 4 June 2000, [www.whitehouse.gov](http://www.whitehouse.gov); 'Background Briefing on US-Russia Early Warning Agreement', *Security Issues Digest*, no. 110, 7 June 2000, [usa.grmbi.com](http://usa.grmbi.com); 'Joint Statement Concerning Management and Disposition of Weapon-Grade Plutonium Designated as No Longer Required for Defense Purposes and Related Cooperation', White House Press Release, 4 June 2000, [www.whitehouse.gov](http://www.whitehouse.gov).

## First IRA inspections

The first inspections of Irish Republican Army (IRA) arms dumps, foreshadowed in an offer made by the organisation in May, have taken place. Two international inspectors, former Finnish Prime Minister Martti Ahtisaari and Cyril Ramaphosa, former Secretary-General of the African National Congress, examined several arms caches at undisclosed locations, comprising explosives, weapons and other materials. They reported to the Independent International Commission on Decommissioning, a body established by the 1998 Good Friday Agreement to verify the decommissioning of paramilitary arms, that the weapons were 'safely and adequately stored'. They also reported that they were able to reassure themselves that the 'weapons and explosives cannot be used without our detection'. Tamper-proof seals were apparently installed to help verify that the weapons cannot be withdrawn from the stockpiles without future detection. Ahtisaari and Ramaphosa undertook to re-inspect the stockpiles regularly to determine that they remain secure.

Since the locations of the stockpiles, their significance and size, and the inspection methods employed remain confidential, it is difficult for outsiders to assess the importance of the process. Nonetheless it is unlikely that the two eminent

'inspectors' would have agreed to become involved without assurances that the process is effective and sustainable. Moreover the opening up of IRA weapon stockpiles for inspection is unprecedented in Irish history. While it does not constitute the decommissioning of weapons envisaged in the Good Friday process, it is a significant confidence-building measure, which the other participants in the process would be wise to accept as a useful beginning and to emulate where necessary.

Source *International Herald Tribune*, 27 June 2000; Report of the Independent International Commission on Decommissioning, Dublin and Belfast, 25 June 2000.

## Cartagena Biosafety Protocol signed and reporting issues tackled

A highlight of the fifth meeting of the Parties to the 1992 Convention for Biological Diversity (CBD), held in Nairobi, Kenya, from 15–26 May, was the signing of the Cartagena Protocol on Biosafety by 68 states parties (see *Trust & Verify*, no. 90, March 2000, p. 8). A ministerial roundtable on 23 May agreed that the inaugural meeting of the Intergovernmental Committee for the Cartagena Protocol (ICCP) would cover, *inter alia*, information sharing, capacity building and the compliance regime. Monitoring and reporting will be covered at the second meeting.

Parties also endorsed a new standardised reporting format for their second national report under the CBD—due in May 2001—and subsequent reports. Reports are to be prepared through a consultative process, involving all stakeholders, and will consist of answers to questions intended to draw parties out on the extent to which they are complying with the Convention. The information will not, however, be used to rank or otherwise compare parties' performance.

Source 'Governments sign Cartagena Biosafety Protocol', *ENDS Daily*, 25 May 2000; 'Fifth meeting of the Conference of the Parties to the Convention on Biological Diversity: 15–26 May 2000', *Earth Negotiations Bulletin*, vol. 9, no. 160, 29 May 2000.

## Ritter turnaround on Iraq inspections

Contrary to his previous assertions, former UN Special Commission (UNSCOM) inspector Scott Ritter now claims that Iraq has effectively been deprived of its weapons of mass destruction. In an article in *Arms Control Today*, Ritter claims that, 'By 1997, Iraq no longer possessed any meaningful quantities of chemical or biological weapons agents, if it possessed any at all and the industrial means to produce these agents had been eliminated or were subject to stringent monitoring'.

Richard Butler, former UNSCOM Executive Chairman, countered that he had not seen a shred of evidence of this in Ritter's reports from Iraq at the time. Butler's recently published account of his UNSCOM experience contends that 'notwithstanding the massive amount of time and resources that were devoted to this job, it is not known, accurately, what capability for making and using weapons of mass destruction Saddam retains'.

Source Ian Brodie, 'Saddam "has no missiles left"', *The Times*, 4 July 2000,



p. 17; Scott Ritter, 'The Case for Iraq's Qualitative Disarmament', *Arms Control Today*, pp. 8–14; Richard Butler, *Saddam Defiant: The Threat of Weapons of Mass Destruction and the Crisis of Global Security*, Weidenfeld & Nicholson, London, 2000.

## IAEA tracks radioactive sources in Georgia

The IAEA has undertaken its first aerial reconnaissance mission. At the request of the Georgian Ministry of the Environment it used French helicopters equipped with gamma radiation equipment to detect discarded military and commercial radiation sources. According to the IAEA, about 280 such sources (shielded and unshielded) have been found in Georgia since the dissolution of the Soviet Union. The mission was carried out under the Agency's Technical Co-operation Programme and lasted from 23 May until 16 June. It covered 1,200 square kms, focusing on highly populated areas and abandoned military sites. The IAEA discovered one caesium-137 source in the city of Poti and three areas with slightly elevated radiation levels. A final report will be delivered to the IAEA Director-General and the government of Georgia in September 2000.

Source 'International Atomic Energy Agency Searches for Discarded Radioactive Sources in Republic of Georgia', IAEA Press Release, Vienna, 19 May 2000; 'Aerial Survey of Radiation Sources in Georgia', IAEA Press Release, Vienna, 23 June 2000.

## Joint proposal on US implementing legislation for BWC Protocol

The Federation of American Scientists (FAS) and the Pharmaceutical Research and Manufacturers of America (PhRMA) have published a joint paper on key requirements for US implementing legislation for a Protocol to strengthen the 1972 Biological Weapons Convention. Such legislation will be necessary if, and when, the US ratifies the Protocol that is currently under negotiation in Geneva.

In the past the US government has used industry concerns about the loss of confidential business information during inspections as an argument for not supporting an intrusive verification regime. In their joint paper, both organisations support declarations and challenge investigations as elements of an effective Protocol. The two organisations, however, take different views on *non-challenge* visits. While FAS argues that such visits are important for strong verification, PhRMA believes their value does not override the risk to confidential business information and facility reputations. The joint paper outlines key elements that both FAS and PhRMA believe should be part of US implementation legislation to protect American industry interests, while being in conformity with the Protocol.

- US legislation (and the Protocol) should clearly define managed access provisions, and should give the site manager the right to make decisions on managed access during on-site activities at non-government facilities.
- Industry should have the right to review and approve US declarations regarding non-government facilities before their

submission to the future international verification organisation.

- Industry should actively participate in 'developing criteria for evaluating nominated inspectors' by the international organisation, while the US government should publicly announce lists of inspectors and consider industry concerns about inspectors nominated by the organisation.

Meanwhile, a large part of the Western biotech industry has articulated its opposition to several on-site measures envisaged under a compliance Protocol for the BWC. In a joint paper, distributed during the twentieth session of the Ad Hoc Group in Geneva, the Forum for European Bioindustry Coordination, PhRMA and the Japan Bioindustry Association declared that compliance measures under the BWC Protocol should be based on simple declarations, containing no confidential business information, and that clarification procedures for such declarations should not involve *any* on-site activities. These organisations also do not believe that *any* routine on-site activity, such as random visits, is 'a useful concept' in the BWC case. Even challenge inspections—to investigate suspected violations of the BWC—should, they say, be conducted under strict managed access and give the inspected facility the right to determine what is confidential or proprietary information. The paper effectively withdraws the earlier support of some industry associations for many important on-site activities, notwithstanding that they promise to work co-operatively with governments and negotiators in the future.

Source 'Proposals for US Implementing Legislation for The Biological Weapons Convention', FAS and PhRMA websites at [www.fas.org](http://www.fas.org) and [www.phrma.org](http://www.phrma.org); 'Compliance Protocol to the Biological Weapons Convention: A Joint Position of European, United States and Japanese Industry', Informal Paper, Geneva, 30 June 2000.

## CTBT news

The US Senate Appropriations Committee has allocated just \$15 million for the work of the Preparatory Commission for the CTBT Organization in 2001—\$6.5m short of the \$21.5m that the Clinton administration requested. The final amount will only be determined after the House of Representatives and the Senate have approved the bill.

Morocco has ratified the CTBT and deposited its instrument of ratification. Chile, Iceland and Portugal have deposited their instruments, while Belarus ratified the Treaty on 12 May, but it has not yet deposited its instrument of ratification. The Treaty has now been signed by 155 states, 60 of which have deposited their instruments of ratification. To date 30 of the 44 states that need to ratify the Treaty before it can enter into force have done so.

Fiji has agreed to the establishment of two radionuclide and seismic monitoring stations on its territory, which will be part of the CTBT's International Monitoring System.

Source Foreign Operations, Export Financing, and Related Programs Appropriations Act, 2001, US Senate, S.2522, [www.thomas.loc.gov](http://www.thomas.loc.gov); 'Belarus Ratifies Nuclear Test Ban Treaty', Xinhua News Agency, 13 May 2000; 'Nuclear Monitoring station on Fiji', *Jane's Defence Weekly*, 29 March 2000, p. 22.





## Verifiers, I've shrunk the technology!

Researchers at Johns Hopkins University's Applied Physics Laboratory (APL) have been developing miniaturised spacecraft components since 1995, including a remote sensing camera weighing just half a kilogramme (kg). Such shrinking of spacecraft components and instruments makes it possible to build highly capable satellites at a fraction of their current weight and size—maybe just 30 kgs and 60 centimetres tall. Up to 20 such satellites could be launched at once, reducing launch and spacecraft development costs. Microsatellites could provide better information because they would be well suited to formation flying and the creation of a constellation of communication satellites with a single launch. One application of formation flying is stereoscopic imaging of ground targets, which could yield higher resolution images. APL believes that microsatellites are feasible within two to three years.

Meanwhile the Israeli Ministry of Defence plans to launch a lighter version of its *Ofeq*-class satellite in 2001. The Israel Institute of Technology (Technion) is leading efforts to determine whether high quality cameras can be installed and operated on a satellite with a payload of less than 90 kgs. The Israelis have already determined that such microsatellites could be launched from an aeroplane, which would drastically reduce costs, and they are also exploring whether clusters of satellites could be launched on one missile.

On the subject of microtechnology, researchers at the US Department of Energy's Oak Ridge National Laboratory in Tennessee are working on a hand-held bomb detector that works by detonating molecules of explosive and detecting the

subsequent tiny explosions. The team is currently refining the 'nanobomb detector' to make it simpler and more reliable. They expect to have a device the size and shape of a mobile phone and running on ordinary AA batteries ready for testing within three years. Although the first planned use of the detector is airport security, the team is keen for the technology to be transferred to landmine detectors. Once mass-produced this new device should be affordable to all and should speed up the landmine detection rate.

And finally, the ultimate in micro-technology—'smart dust'. Researchers at the University of California at Berkeley, currently funded by the US Defense Advanced Research Project Agency, are developing computers so small they can be scattered like dust. The team aims to demonstrate that a complete sensor/communications system can be integrated into a cubic millimetre package. This would include a sensor, power supply, analogue circuitry, bi-directional optical communication, and a programmable microprocessor. Applications would include treaty monitoring. The team is also developing a tiny spy plane, less than one-foot long, and tiny synthetic insects that can disseminate smart dust. It aims to reach its cubic millimetre goal by July 2001.

Source 'New satellites may pave way for low-cost space missions', *Defense News*, 3 July 2000, p. 15; 'Israel conducts tests on defence microsatellites', *Jane's Defence Weekly*, 29 March 2000, p. 24; 'Its in the bag', *New Scientist*, 10 June 2000, p. 36; robotics.eecs.berkeley.edu; 'What marvels science has in store', *Herald Free Tribune*, 22 May 2000.

## Japan's undeclared whale catches verified

A team of marine biologists has carried out independent verification of Japan's whaling activities. Using novel techniques, they have shown that, contrary to official reports, some of the whale meat on sale in Japan comes from unreported catches of the endangered 'J' stock of North Pacific minke whales. According to the 1946 International Convention for the Regulation of Whaling, sale of whale meat in Japan is legal if it comes from the annual catch of minke whales allowed for 'scientific study' or from 'bycatch', such as whales killed accidentally by fishing equipment. The Japanese government says that no more than 15% of such sales come from the J stock. But from 1993–99 marine biologists enlisted locals to buy whale meat at markets, in contrast to official surveys that use fisheries agents (who are likely to be recognised by sellers). On analysing the mitochondrial DNA of 574 samples they found that nearly one-third came from the J stock. These unreported catches could put the J stock population in jeopardy. The Japanese delegation to the International Whaling Commission has refused to accept the findings.

Source 'Caught out', *New Scientist*, 1 July 2000, p. 11.

## Verification Quotes

'In matters of verification, efficiency should always be pursued, but never at the cost of effectiveness'

IAEA Director General Mohamed ElBaradei in his statement to the NPT Review Conference in New York on 24 April 2000.

'The world body tried to hijack the election monitoring process. Instead of sending observers, the UN wanted to send an irrelevant technical team, which wanted to coordinate the whole process'

Zimbabwean President Robert Mugabe on his refusal to allow the UN to co-ordinate foreign observers monitoring the presidential elections on 24–25 June 2000. Quoted in the *Sunday Mail (Harare)*, 9 June 2000.

'I believe we must work to broaden and strengthen verifiable arms agreements. The alternative is a world with no rules, no verification and no trust at all'

President Bill Clinton, video message to the opening of the Carnegie International Non-Proliferation Conference 'New Challenges in Asia and America', Washington, DC, 16–17 March 2000.



## VERTIC appointments

VERTIC has appointed Ellen Peacock as its new Information Officer/Networker. She has a BA (Hons) degree in Information and Library Management from the University of Northumbria at Newcastle. Formerly Deputy Librarian at the International Institute for Strategic Studies (IISS) in London, Ellen will deal with VERTIC's media relations, publicity and networking activities, as well as helping organise conferences and workshops.

VERTIC has also appointed a researcher to conduct a one-year research project on on-site inspection modalities and techniques across the range of arms control and disarmament agreements. John Hart, formerly a researcher at the Stockholm International Peace Research Institute (SIPRI) and the Monterey Center for Nonproliferation Studies, has a BA (Hons) from the University of Texas and an MA in International Policy Studies from the Monterey Institute for International Studies.

In addition VERTIC has two new interns for the summer months. Rosanne Milano, an international relations student from Boston University, US, is researching the verification provisions of the Conventional Armed Forces in Europe (CFE) Treaty. Radhika Gupta, a development studies student from India, who is completing her studies at the London School of Economics and Political Science (LSE), is researching verification of the Clean Development Mechanism of the Kyoto Protocol to the Climate Change Convention. Both are also assisting with office duties.

## Independent Commission on the Verifiability of the CTBT

As announced in the last issue of *Trust & Verify*, VERTIC has established an Independent Commission on the Verifiability of the CTBT and will act as its Secretariat. The list of Commissioners is currently being finalised and will be announced in August. Drafting of the Commission's report will begin thereafter. The Commission will meet in London on 26–27 October 2000 to complete the report. A call for papers is included in this issue of *Trust & Verify*. For further information see the Commission's website at [www.ctbtcommission.org](http://www.ctbtcommission.org).

## Study on aerial imagery and the BWC

VERTIC will conduct a study on the potential for improving verification of the Biological Weapons Convention by using aerial imagery. The research, being done in close co-operation with members of the Biological Working Group at the Federation of American Scientists (FAS), will, in particular, look at how the Open Skies mechanism could be used to promote compliance with the BWC.

## Staff news

**Trevor Findlay** gave a paper on the Monitoring of Peace Accords at a seminar on the Military Dimensions of Intervention, held by the University of Wales, Aberystwyth, on 18 May. On 1 June he met with Mats Berdal of the International Institute for Strategic Studies (IISS) to discuss mutual research interests. On 15 June, with Oliver Meier, he met with Peter Marshall and other officials at Blacknest, AWE Aldermaston, to discuss the CTBT Commission and the AWE's new Verification Research Programme. On 19 June he met with Hilary Palmer, VERTIC's US fundraising advisor. On 26 June he met with Commander Rob Greene of the New Agenda Coalition to discuss mutual co-operation. Along with Oliver Meier and Angela Woodward, he participated in the Mountbatten Centre for International Studies/Programme for Promoting Nuclear Nonproliferation/Foreign and Commonwealth Office (MCIS/PPNN/FCO) Nuclear Non-Proliferation Study Group to discuss the outcome of the NPTRC. On 5 July, he took part in a seminar on peace operations by Dr Erwin Schmidl and others at King's College London.

On 11 July Trevor and other VERTIC staff met with Juliet Prager and John Guest of the Joseph Rowntree Charitable Trust, and, on 13 July, he and Clare Tenner met with Charly Moore of the W. Alton Jones Foundation. A luncheon meeting was later held with Charly Moore and the Climate Change staff of the Foundation for International Environmental Law and Development (FIELD). Trevor's other activities during the period included finalising, with Angela Woodward, VERTIC's report for *Landmine Monitor 2000*, organising the Commission on Verifiability of the CTBT and editing chapters for VERTIC's *Verification Yearbook 2000*.

**Oliver Meier** attended both the 22nd Annual Meeting of the European Safeguards Research and Development Association (ESARDA) and a seminar on 'Strengthening of Safeguards: Integrating the New and the Old' in Dresden from 8–11 May. On 12 May he participated in the meeting of the International Safeguards Division of the Institute for Nuclear Materials Management (INMM) in Dresden. On 25 May Oliver, along with Trevor Findlay and Angela Woodward, attended a presentation by John Simpson on the outcome of the NPTRC at Chatham House. On 15 June he participated, along with Trevor Findlay in a private discussion meeting with the Indian Defence Minister, Georges Fernandes, at IISS. On 16 June Oliver participated in the London Seminar of the Harvard Sussex Program on CBW Armament and Arms Limitation at the FCO. On 28 June, he and Trevor Findlay attended the ISIS/CDS seminar on 'National Missile Defence: Implications for International Security' at King's College London and a private discussion meeting



with Michael Mandelbaum at IISS on the consequences of the November US elections for American foreign policy. On 3 July he and Trevor Findlay participated in a private discussion meeting with Ambassador Jayantha Dhanapala, head of the UNDDA, at IISS.

**Ellen Peacock** began updating VERTIC's database of experts and media contacts. She also carried out an audit of VERTIC's website with a view to making changes to the present content and introducing new material. In addition Ellen became involved in organising the CTBT Commission and VERTIC workshops and seminars.

**Clare Tenner** participated in a workshop, 'Transition Country Perspectives on the Kyoto Protocol', on 17 May in Bratislava, Slovakia, which was organised by the Organisation for Economic Co-operation and Development (OECD)'s Environment Directorate. On 22–23 May Clare attended a strategy meeting for Climate Network Europe, a coalition of non-governmental organisations working on climate change issues. She gave a presentation on developments in the verification and compliance systems for the Kyoto Protocol.

On 30 May Clare, together with other members of Climate Action Network (CAN) UK, met with members of the UK government delegation to the climate negotiations to discuss the forthcoming meetings of the Subsidiary Bodies to the

UNFCCC. Clare attended the meetings of the Subsidiary Bodies from 12–16 June in Bonn, Germany, and the preceding week of informal discussions and workshops. During the meetings she gave a presentation to delegates on behalf of CAN on eligibility criteria for participation in the Kyoto Mechanisms. With other members of CAN, she met with the UNFCCC Executive Secretary and the chairpersons of negotiating groups on mechanisms and compliance. She also contributed to the CAN newsletter, ECO, no. 2, 9 June 2000, and gave a daily briefing to CAN members on progress in the group negotiating Articles 5, 7 and 8 of the Kyoto Protocol.

On 19 and 20 June Clare attended a conference entitled 'Kyoto, the End of the Beginning?' held at the RIIA in London. Throughout May and June, she worked on preparations for the VERTIC workshop on 28 July: 'Developing Verification Systems for the Kyoto Protocol'. She completed two chapters for VERTIC's *Verification Yearbook 2000* and wrote VERTIC *Briefing Paper 00/3* for the Bonn meetings.

**Angela Woodward** managed the administration of the Centre and completed VERTIC's contribution to *Landmine Monitor 2000* on the UN's role in compliance mechanisms for the 1997 Landmine Convention. She attended the second meeting of the Standing Committee of Experts on the General Status and Operation of the Convention in Geneva from 29–30 May, and the MCIS/PPNN/FCO meeting on 27 June.



VERTIC is the Verification Research, Training and Information Centre, an independent, non-profit making, non-governmental organisation. Its mission is to promote effective and efficient verification as a means of ensuring confidence in the implementation of international agreements and intra-national agreements with international involvement. VERTIC aims to achieve its mission through research, training, dissemination of information, and interaction with the relevant political, diplomatic, technical, scientific and non-governmental communities.

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