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Trust & Verify

Safeguarding Nuclear Materials & Verification Research

Potential UK/Russia Co-operation

There is no way of knowing whether weapons-usable nuclear material has been stolen in the aftermath of the collapse of the Soviet Union. At the time of the collapse, security at almost all of the many Soviet nuclear installations was woefully inadequate. These installations had mostly relied for their security on military guards and surveillance by state security forces, rather than technical controls such as those used in the United States or United Kingdom. In view of the political, economic and social chaos that has prevailed throughout the former Soviet Union since the break-up, including widespread organised crime, the opportunity has undoubtedly existed for theft of weapons-usable materials from one or more of hundreds of sites. The potential demand for weapons-usable material is obvious. Who could doubt, for instance, that Iraq, having spent billions of pounds trying and failing to develop nuclear weapons, would be in the market for stolen fissile material? It is also possible that a terrorist group might attempt to build a nuclear weapon if it had sufficient highly-enriched uranium.

When this new threat (often referred to as 'nuclear leakage') became apparent almost a decade ago, the US responded by establishing a range of co-operative programmes with the former Soviet states, principally Russia. As a result, US scientists and engineers and their local counterparts are currently working together to improve the security of weapons-usable material located in the former Soviet Union. Improvements so far include installation of security fences, portal monitors, sensors, video cameras and computerised material accounting systems— collectively known as measures for material protection, control and accounting (MPC&A)— and training of guards. These programmes have steadily grown and now receive hundreds of millions of dollars of funding a year. They have done much, although by no means enough, to reduce the likelihood of nuclear theft. Also important is that US/Russia collaboration in the safeguards area has broadened to include a wide range of arms control and disarmament work which has proved beneficial to both countries.

In addition to its many practical accomplishments, US-Russian collaboration on both safeguards and arms control has done much to build confidence between the two countries in the nuclear field. Scientists from the US and Russian nuclear programmes now regularly visit one another's laboratories and associated facilities; see for themselves the infrastructure and work and have been able to form working and personal relationships with their counterparts. The importance of such a process of familiarisation and confidence-building should not be underestimated: one need only recall the distrust and mutual suspicion that did so much to fuel the nuclear arms race.

Britain and other European nations, in contrast to the US, have established only very minor co-operative safeguards programmes with Russia. Currently, the only British safeguards-related assistance to Russia is a small programme funded by the Department of Trade and Industry (DTI) involving two projects.

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The first is a trilateral Anglo-Russian-American programme at the Mayak RT-1 reprocessing plant, involving DTI and British Nuclear Fuels Limited (BNFL), dealing with various issues of nuclear materials accountancy. The second is a bilateral project with the gas centrifuge enrichment plant at Angarsk, Siberia, involving DTI and Urenco Capenhurst, again dealing with material accounting issues. Total DTI spending on safeguards-related collaboration with Russia and other countries of the former Soviet Union, dating back to 1992, amounts to only around £1 million. The Ministry of Defence (MoD), which tasks the Atomic Weapons Establishment (AWE) at Aldermaston, is currently not supporting *any* collaborative work with Russia. In 1993 it provided 250 'supercontainers' for transportation of Russian warheads, for which the AWE carried out some design work and acted as prime contractor, as well as 20 heavy-duty trucks. But it has done nothing since.

There are a number of reasons for British inactivity. One factor is a longstanding reluctance to fund safeguards or other arms control activity. Another is an attitude that the whole matter can safely be left to the Americans. A third factor may be complacency about nuclear dangers. With the Cold War over and the spectre of a nuclear war having receded, it is tempting to discount the chances of nuclear leakage leading to rapid nuclear proliferation or a potential terrorist threat.

Whatever the explanation, it is strongly in the UK's interest to expand its programme of safeguards assistance to Russia. Much remains to be done and the UK has a great deal of relevant expertise both in the civil nuclear sector and at AWE.

In addition to any involvement in safeguards work, AWE should also be given approval to explore collaboration with Russian nuclear facilities on wider issues of arms control, non-proliferation and disarmament. This would fit nicely into future plans for the AWE. Its future remit is likely to involve an increasing amount of research into the verification of nuclear arms control and disarmament agreements. Such work has been included in the new contract for management of AWE, which takes effect in April 2000.

A number of dedicated arms control centres are being established at nuclear facilities in Russia, which makes the moment all the more favourable for initiating Anglo-Russian co-operation. Funded by US grant-making foundations, with a promise of further support from the US Department of Energy, such centres have been established at Russia's two main weapons design laboratories, Chelyabinsk-70 and Arzamas-16, and two of the principal nuclear power research institutes, the Institute of Physics and Power Engineering (IPPE) at Obninsk and the Kurchatov Institute in Moscow. A wide variety of work is underway or planned, ranging from verification of a fissile material cut-off treaty (at the Kurchatov Analytical Centre for Non-Proliferation and Control), to creation of a history of plutonium production in Russia (at the IPPE Analytical Centre on Non-Proliferation), to detection of signatures of undeclared nuclear weapon programmes through environmental monitoring (at the Chelyabinsk-70 Centre for Systems Research and Development).

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There are many possible areas for fruitful Anglo-Russian collaboration on arms control. One relates to future UK involvement in strategic arms reduction negotiations. At the summit meeting between Presidents Clinton and Yeltsin at Helsinki in March 1997 it was agreed that START III would include 'Measures relating to the transparency of strategic nuclear warhead inventories and the destruction of strategic nuclear warheads...' This raises a new spectrum of verification problems in connection with dismantlement of warheads. US nuclear weapons laboratories now have major programmes on warhead dismantlement transparency and this is also one of the areas to be studied at the Chelyabinsk centre. If the UK establishes a technical programme on warhead dismantlement, including co-operative work with both the US and Russia, it might play some role as an observer at the START III negotiations, in advance of a possible formal involvement in a START IV process.

Co-operation with Russian nuclear facilities need not be costly. In the case of arms control, as little as £1 million a year, divided between AWE and Russian facilities (where money goes much further), ought to establish worthwhile collaboration. It should also be possible to secure European funding for collaborative projects with Russia that utilise special British expertise in the nuclear area and which would benefit Europe as a whole.

Tom Milne, Pugwash Office, London

An Organization for the Prohibition of Biological Weapons?

The 1972 Biological and Toxin Weapons Convention (BWC) was an important step by the international community towards ridding the world of biological weapons (BW). However, the treaty lacks a verification system, a vital element for a successful regime. Currently an Ad Hoc Group (AHG), comprised of representatives of states parties to the BWC, is negotiating a verification protocol to the treaty to establish such a regime. The group has a wide variety of complex issues to tackle, some relating to the technical characteristics of biological weapons, others to the political and economic implications of verification. A key issue is the design of the verification organisation, including its size, role and the intrusiveness and types of inspections envisaged.

The verification organisation established by the Chemical Weapons Convention (CWC), the Organization for the Prohibition of Chemical Weapons (OPCW), can be seen as a useful model for a future biological weapons organisation. Based in The Hague, the OPCW is now a substantial verification organisation with a permanent staff of approximately 500, including more than 200 inspectors and inspector assistants, and an annual budget of 105,413,700 Dutch guilders ($US 49 million). The question is whether the verification of the BWC will need an organisation of similar size and sophistication. Generic arguments about organisational size are pertinent. A large organisation capable of performing comprehensive verification and commanding international attention will be more expensive but risks becoming bureaucratised. Conversely, a smaller, cheaper organisation will be forced to be more selective in its coverage, may not command as much international respect and may ultimately be unable to fulfil its mandate due to a lack of financial and human resources.

Certainly biological weapons share many of the verification challenges of chemical weapons (CW), especially the dual-use problem. Chemicals and biological agents which can be used in weapons often have legitimate peaceful uses, meaning they cannot be prohibited outright but must be regulated. However non-production of BW is much harder to verify than in the case of CW. Whereas CW production requires large volumes of raw materials and significant time to create a militarily useful stockpile, BW feedstock can be used to produce sufficient quantities of weapons material relatively quickly.

Yet the number of facilities that will need to be declared under a BW protocol is likely to be less than under the CWC. The biotechnology industry is smaller than the chemical industry and the number of suspect sites correspondingly less. Moreover, it is unlikely that a large number of former BW

US BW Policy: A Continuing Puzzle

In October 1998, John Holum, Director of the then Arms Control and Disarmament Agency (ACDA) urged the AHG to finish its work in 1999. Holum admitted that to achieve this goal 'flexibility in exploring useful solutions, plain hard work, and political compromise are still needed'. He promised that 'the United States stands ready to engage in this difficult task, and will explore the full range of suggested solutions'.

Despite these promises, the United States is not a driving force in the negotiations. Instead, interagency rivalry continues to prevent the development of a clear-cut US position. The US delegation, by far the largest taking part in the negotiations, is caught between several contradictory goals. On the one hand, the US apparently favours timely, efficient and flexible investigations of possible breaches of the BWC. On the other hand, it wants such investigations 'conducted in ways to protect legitimate proprietary and national security sensitivities', meaning that future inspections must not affect its booming biotechnology industry and biodefence facilities.

US policy is also caught between co-operative and unilateral approaches to preventing the proliferation of weapons of mass destruction. Many in the US (especially in the Department of Defense) believe that deterrence is a major part of the answer. However, this approach can confound co-operative approaches to proliferation as pursued in the AHG. Other states will be reluctant to invest political and financial resources in international regimes as long as the US maintains that it has the right to unilaterally pursue its non- and counter-proliferation policies.

Oliver Meier

production facilities or BW stockpiles will be declared. The OPCW, by contrast, is having to verify the destruction of CW production facilities and stockpiles. The implication is that a smaller verification organisation will be required for the BWC.

There is still, however, heated debate over the level of intrusiveness of a BW verification regime, which will also determine the size of the new organisation. Biotechnology industries, especially in the United States, tend to oppose an intrusive regime for fear that valuable commercial proprietary information may be compromised. While the chemical industry is mature and stable, the bio-technological industry is much younger, growing rapidly and has remarkable profit potential. Although the chemical industry generally supported the establishment of a CW verification organisation, the bio-technology industry appears less inclined to do so for BW. Major developing countries, like India and Iran, are also likely to oppose a protocol which establishes an intrusive verification regime, insisting it would infringe on their sovereignty and hinder their fledgling biotech industries. They are also concerned about the possibility of being burdened with (and presumably embarrassed by) investigative inspections every time there is an unusual outbreak of disease.

If the required declarations of facilities are limited to military research facilities and bio-safety level four (BL4) areas, the number of necessary inspections could be handled by a smaller organisation. Some observers argue that such a minimalist regime would ignore a large part of the problem and would therefore be ineffective. A larger number of facilities, they would argue, ranging from pharmaceutical production companies through university laboratories to food processing plants should be inspected on a random basis. If the scope is widened to include all possible BW production sites, not only will the cost and size of the regime increase, but the intrusiveness of the system would rise as well.

An ideal regime would be one that incorporates intrusive inspections while keeping the concerns of the biotechnology industry and developing countries in mind. A logical way to find this delicate balance would be to include the industry as much as possible in discussions pertaining to commercial confidentiality (the use of 'managed access techniques' during on-site inspections is one possibility) and to provide tangible measures to reassure developing countries that their sovereignty and national security will not be unduly compromised.

Although one of the major lessons learned from recent verification experience (especially that of UNSCOM in Iraq) is that a consistent stream of information is required in order to make the regime effective, this is likely to be impossible in the BW case due to concerns about intrusiveness. Hence continuous, remote monitoring of sites is unlikely. Instead, it is proposed that the BW organisation seek to have initial declarations of relevant facilities followed up by 'clarification inspections' in order to verify the initial information provided. In addition, inspections will take place if uncertainty or suspicion is raised regarding a facility or about an unusual outbreak of disease. The trick, in constructing the BW verification organisation will be to make it both lean and mean, smaller than the OPCW, but at least as effective in verifying biological weapons disarmament.

Sarah Croco, former VERTIC intern

The Ad Hoc Group Moves Towards Endgame

The AHG charged with negotiating a verification protocol for the Biological Weapons Convention finished its fifteenth session on 23 July 1999. The talks revealed that most delegations have now tabled their main proposals. Negotiations have begun on narrowing the differences on many issues reflected in the rolling text—some 300 pages including annexes. Most of the negotiating time at this session was spent on Definitions of Terms and Objective Criteria and Measures to Promote Compliance.

Germany, on behalf of the EU, presented an EU Common Position. The document, approved on 17 May 1999, calls it 'imperative to complete all stages necessary for the adoption of the Protocol by a special conference of States Parties in 2000'. One possible date for such an event is the 75th anniversary of the 1925 Geneva Protocol, which banned the use of chemical and bacteriological weapons. The UK offered last year to host the signing ceremony in London.

The Netherlands officially made the first bid to host the future verification organisation. Offering The Hague, already the seat of the Organisation for the Prohibition of Chemical Weapons, Dutch Foreign Minister van Aartsen said the city was 'the *bio*-logical choice for the headquarters of the BW organisation'. The sixteenth session of the AHG is meeting from 13 September to 9 October, while the seventeenth is provisionally scheduled for 22 November-10 December, 1999.

Oliver Meier

Book Review

Landmine Monitor Report 1999: Toward a Mine-Free World

edited by the Landmine Monitor Core Group
(Human Rights Watch, Washington DC, April 1999).
(the report can be downloaded or ordered at http://www.icbl.org/lm/1999/)

'Societal verification' has largely been a theoretical concept up to now. Giving citizens a role in monitoring compliance with arms control agreements is viewed by some as a necessary addition to existing international verification arrangements. Others see it as impossibly utopian. The publication of *Landmine Monitor Report 1999*, by a consortium of non-governmental organisations called Landmine Monitor, is the first comprehensive attempt to put societal verification into practice. Landmine Monitor sees itself as a supplement to official ('track one') transparency and verification mechanisms, an 'effort by civil society to hold governments accountable to the obligations that they have taken on with regard to antipersonnel mines'. Despite shortcomings—many of which can be fixed in forthcoming annual reports—this first *Landmine Monitor Report* can be considered a success. It provides a comprehensive overview of the state of implementation of the Landmine Convention and is an indispensable resource for officials, activists and researchers.

The 1997 Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personal Mines (APMs) and on Their Destruction (Ottawa Convention) possesses only a rudimentary verification mechanism. States must declare their holdings of APMs, the location of minefields, the location of mine production facilities and their status of operation, progress made in destruction of APMs and technical details about mines produced. If a state party believes that another state party is violating the Convention, it may activate a clarification mechanism, which can result in the dispatch of an independent fact-finding mission. However, in contrast to most other multilateral arms control and non-proliferation arrangements, the Ottawa Convention does not have an organisation that monitors implementation of the treaty.

Landmine Monitor intends to help fill this gap. It will report annually on 'implementation of and compliance with the 1997 Mine Ban Treaty, and more generally... assess the efforts of the international community to resolve the landmines crisis'. The first product of these efforts—a report of more than a 1,000 pages—was presented to the First Meeting of States Parties in May 1999 in Maputo, Mozambique. The report assesses in detail the compliance of all countries with the provisions of the treaty—those that have signed, ratified or acceded to the Convention, as well as non-signatories. Appendices were supplied by some governments and international organisations, while others (including one by VERTIC) provide background to legal and political problems.

The report concludes that the implementation of the Landmine Treaty is generally proceeding well, even though some major states still refuse to join it. It observes that '*Nowhere* in the world in 1998 and early 1999 were mines being laid on a very large scale and sustained basis' (p. 3). It also notes a new development: more landmines are being taken out of the ground than planted. However, the authors also conclude that 'at least' three countries—Angola, Guinea Bissau and Senegal—have violated the Convention by using landmines even after they joined the regime. All signatories are found to be complying with the bans on production and transfers. While it is too early to tell whether states parties will be able to fulfil their obligation to destroy existing stocks, good progress is generally being made.

The authors of the *Landmine Monitor Report* try to be open about the difficulties they have had in compiling data. Lack of time and resources clearly had negative impacts, which hopefully can be avoided as the report is updated annually from now on. But there are some conceptual shortcomings as well. First, the methods used to compile data are not completely transparent. Reports on states' mines policies are footnoted, but the only systematic effort to address the issue is a sentence in the introduction saying that the authors relied on publicly available material and some investigative missions. Likewise, the selection of documents in the appendices seems based more on availability than clear criteria. This lack of transparency exposes the report to being attacked as biased in its selection of information. Greater openness about methodology and information gathering is therefore important.

Second, it is also problematic that the content of the different country chapters differs widely: some contain extensive descriptions of a variety of landmine-related policies, while others are short. Those countries that are most transparent (and which generally pose fewer problems with regard to

landmines) have longer chapters. This could not only be perceived as misrepresentation of the problem, but makes it also hard to compare different countries. The *Landmine Monitor Report* seems strongest where it compiles data from different countries or regions and summarises developments.

The inclusion of non-states parties in compliance reporting marks a big difference between the Landmine Monitor and official verification mechanisms which only monitor the behaviour of member states. This is an important advance. Reporting violations of the norm against landmines puts political pressure on states that have refused so far to become parties to the Ottawa Convention. Whether this precedent can be applied to other regimes remains to be seen. States might rightly assert that they are not legally obliged to comply with treaties they have not signed—and distance themselves from these regimes altogether.

Despite these problems, the report as a whole is an impressive first attempt to globally monitor at 'track two' level a disarmament treaty's implementation. Many of the imperfections of the report are not unknown to international verification organisations: lack of resources and time pressures make it difficult to give a complete picture of progress in disarmament. This does not make verification less important, but only emphasises the need to invest more in measures to strengthen the agreements we have.

Oliver Meier

Verification Watch

Butler Slams Russia and Kofi Annan over UNSCOM

Richard Butler, former Executive Chairman of the UN Special Commission for Iraq (UNSCOM), has criticised Russia and UN Secretary-General Kofi Annan for contributing to the inability of the commission to carry out its mandate. It was not simply Iraq's recalcitrance that made UNSCOM's work so difficult, he says, but the fact that a key member of the UN Security Council became Iraq's 'most aggressive advocate'. Butler recalls how Russia argued Iraq's case that the so-called 'presidential sites' should be off-limits to UNSCOM inspectors, despite a Security Council resolution, supported by Russia, which had permitted no such exceptions. Russian Foreign Minister Yevgeny Primakov admitted that Russia hoped sanctions on Iraq would be dropped because Iraq owed Russia $US7 billion for arms purchases dating back to the Iran-Iraq war. In addition, Butler cites intelligence reports that Primakov had been receiving 'personal payments' from Iraq.

'Deeply alarming, too', he says, 'was the behavior of... Kofi Annan, who repeatedly tried to deal with the problems raised by an outlaw regime by papering them over with diplomacy'. Butler is critical of several aspects of Annan's behaviour:

- his willingness to accede to Iraq's extraordinary request for UN assistance in mapping its presidential sites
- his lack of awareness of a secret June 1996 agreement between Iraq and Butler's predecessor, Rolf Ekéus, which had exempted Iraqi 'special sites' from inspections
- his apparent failure in February 1998 to negotiate (or even attempt to negotiate) an end to that agreement in return for a new agreement allowing UNSCOM access to 'presidential sites'
- his reluctance to authorise an early test of the February 1998 agreement
- his tendency to attempt to place the best possible light on Iraqi behaviour.

Butler denies accusations by former UNSCOM inspector Scott Ritter that US unwillingness to strongly support UNSCOM was a factor in the commission's difficulties. He did not, however, address allegations that US intelligence used UNSCOM's information-gathering activities as a guise for its own national espionage purposes, an issue that also contributed to sealing UNSCOM's fate.

Meanwhile, France has circulated a detailed proposal in the UN Security Council to end the current impasse between the Council and Iraq that has ended UNSCOM's inspection mission. France has proposed a new 'control commission' which would not seek to uncover past Iraqi activity directed at acquiring weapons of mass destruction, but would monitor the situation from now on. In return for Iraq's agreement to permit this new system to be established, sanctions

would be lifted for 100-day periods at a time, extendable depending on Iraqi compliance. France proposes a 'serious and efficient long-term armaments control system with investigative capacities identical to those of UNSCOM but with renewed structures and working methods'. The US and UK suspect that in addition to inadvisably drawing a line across past Iraqi activities, such a system would in practice be a weakened version of UNSCOM. Deliberations in the Security Council continue.

Sources: Richard Butler, 'Why Saddam is winning the war', *talk*, vol. 1, no. 1, September 1999, pp. 196-201 and 239-240; Craig Whitney, 'France heads for UN clash over U.S.-led Iraq bombing', *International Herald Tribune*, 20 August 1999, pp. 1 and 5.

Tokyo Forum's Views on Verification

The Tokyo Forum for Nuclear Non-Proliferation and Disarmament, a group of arms control and disarmament specialists convened by the Japanese government, released its report, 'Facing Nuclear Dangers: An Action Plan for the 21st Century' in Tokyo on 25 July. The report highlights verification concerns in several areas:

- with regard to a proposed zone free of weapons of mass destruction in the Middle East, the report notes that such a zone would require 'much tighter and more intrusive verification arrangements than the improved IAEA safeguards regime, including challenge inspections'; in addition, monitoring would require external support by international organisations, individual states or combinations of the two
- in calling on North Korea to implement its full-scope safeguards agreement and to accept an Additional Protocol to that agreement, the report notes that 'strict, verifiable implementation of these safeguards is the only way to resolve the continuing uncertainties over the North Korea nuclear program and prevent a new crisis'
- in supporting negotiation of a Fissile Material Cut-off Treaty (FMCT) as soon as possible, the report warns that the treaty's verification measures should not undermine the NPT/IAEA safeguards system, including its Additional Protocol, and calls for greater transparency to permit the establishment of a 'reasonable (sic) defined data baseline of existing fissile material stocks' in the nuclear weapon states
- to make 'no first use' pledges credible, the report urges greater transparency and verifiability to affirm reduced launch readiness
- to help allay concerns that 'sub-critical' tests are undermining the purposes of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), the report proposes 'practical monitoring and transparency measures'.

One of the few new ideas to emerge from the report is the call for the creation of a permanent secretariat and consultative commission for the Nuclear Non-Proliferation Treaty (NPT), which currently lacks such institutions.

Source: The Tokyo Forum for Nuclear Non-Proliferation and Disarmament, 'Facing Nuclear Dangers: An Action Plan for the 21st Century', Tokyo, 25 July 1999.

Verification Quotes

For God's sake, I thought, here we are trying to disarm a regime, and a person who should be a prime mover in this grand enterprise was on the take.

Richard Butler, former Executive Chairman of the UN Special Commission for Iraq, on allegations that former Russian prime minister Yevgeny Primakov was bribed by Iraq to press the Security Council for UNSCOM to be neutered and sanctions against Iraq lifted, quoted in *talk*, vol. 1, no. 1, September 1999, p. 200.

Inspect what the UN could not. Saddam's arms.

Advertising poster in the London Underground for Madame Tussaud's, featuring a wax model of Iraqi President Saddam Hussein.

I am not pedantic about whether these weapons are surrendered or decommissioned or destroyed with some form of verification. That is the significant point, that they are no longer available for use and a political party would not go back to a nice, neat stockpile of weapons if something goes wrong.

British Prime Minister John Major, December 1994, on his view of paramilitary decommissioning in Northern Ireland, quoted in David Sharrock and Mark Devenport, *Man of War, Man of Peace: The Unauthorised Biography of Gerry Adams*, Pan Books, London, 1997, p. 368.

Sudan Accedes to Chemical Weapon Convention

Sudan acceded to the Chemical Weapons Convention (CWC) on 24 May—the anniversary of the US bombing of an alleged chemical weapon manufacturing plant on the outskirts of Khartoum. By becoming a CWC party Sudan not only commits itself not to allow its territory to be used to manufacture chemical weapons but opens its territory

to the treaty's on-site inspection provisions, which are designed to deal with such allegations. Meanwhile, it has been revealed that a month before the US attack, CIA analysts concluded that more evidence was needed that the plant was indeed manufacturing chemical weapons. The attack proceeded before such evidence was obtained.

Sources: *International Herald Tribune*, 20 August, p. 4 and 23 August, p. 1; for background see *T& V*, September 1998.

Monitoring Missions Update

- The UN Security Council has established the UN Observer Mission in the Democratic Republic of the Congo (MONUC) to monitor the peace agreement reached in July between the various parties involved in the civil war and external intervention in the Congo. The mission will initially comprise 90 military personnel and be mandated only until October. A second stage would involve an increase to 500 monitors. Eventually, should the peace process proceed well, a peacekeeping force of up to 25,000 is envisaged (*Jane's Defence Weekly*, 18 August 1999, p. 19).

- The UN Security Council in June created the UN Election Monitoring Mission in East Timor (UNAMET) to observe the independence referendum in the territory and the political and human rights situation prior to resolution of the territory's status. Prior to and following the referendum on 30 August, UNAMET struggled to fulfil its mandate as pro-Indonesian militia attacked independence supporters and UN personnel alike. A week after the referendum UNAMET staged a partial withdrawal and was holed up in its headquarters in Dili awaiting the arrival of a UN peacekeeping force (*International Herald Tribune*, 24 June 1999, p. 5; *Time*, 13 September 1999, pp. 46-48).

- The Organization for Security and Co-operation in Europe's Office for Democratic Institutions and Human Rights (OSCE/ODIHR) has established an Election Observation Mission in Kazakhstan for the 10 October 1999 Election of Deputies to the Majilis. The mission is intended to provide an impartial assessment of the electoral process and an evaluation of the degree to which Kazakhstan complies with internationally accepted standards, in particular those in the OSCE Copenhagen Document of 1990 (Press Release, Office for Democratic Institutions and Human Rights, 'Decision To Deploy an OSCE/ODIHR Election Observation Mission To Kazakhstan', Warsaw, 1 September 1999).

- A monitoring force has been proposed to verify the cease-fire and surrender of arms by militants involved in an uprising in the Solomon Islands in the South Pacific. An agreement brokered by former Fijian Prime Minister Sitiveni Rabuka specifies that Fiji and other Pacific Island nations provide civilian police to conduct the monitoring (*Jane's Defence Weekly*, 25 August 1999, p. 15).

Science & Technology Scan

Benford's Law: A Verification Tool?

Benford's Law is able to predict the distribution of sets of numbers representing phenomena as diverse as stock market prices, census data and the drainage areas of rivers. Research dating back over 100 years has shown that any set of numbers which is neither completely random nor artificially constrained, conforms to the rule that around 30 percent will start with a one, 18 percent with a two and so on. Just 4.6 percent will start with a nine. For years Benford's Law was perceived as little more than a mathematical curiosity. But in 1992 Mark Nigrini, of Southern Methodist University, Dallas, USA, showed how the rule can be used to detect fraud in key features of accounts such as sales figures and expense claims. Businesses and governments are now investigating putting the law to other uses, for example to reveal suspicious data in clinical trials and as a 'reality check' on economic and demographic models. It is also possible that the rule could be used to verify the authenticity of data reported under international

agreements such as national greenhouse gas inventories reported under the Climate Change Convention and weapons holdings reported under arms control and disarmament agreements.

Source: *NewScientist*, 10 July 1999, pp. 27-30.

Chinese and Belgian Mine Detection

Scientists at an engineering research institute at the People's Liberation Army's General Armament Department in Nanjing have developed a mine detector that can be used under various climatic and geological conditions. The one-kilogram detector has three probes that can function in temperatures from 40 degrees below zero centigrade to 50 degrees above zero. Using the new device, Chinese troops have cleared mines from a 2,000 square kilometre area without a single mishap. The scientists claim it can find various types of landmines that contain just a tiny amount of metal.

Source: *Xinhua* News Agency, 27 July, 1999:
see www.unfoundation.org/unwire/unwire.cfm

Meanwhile, the ITC research institute in Enschede in Belgium claims to have developed a method of detecting land mines quickly and precisely from the air. Deminers on the ground can then more efficiently deactivate the mines. The new method uses infrared cameras, radar and digital cameras for aerial photography from a small freight aircraft. The craft flies as low and as slowly over the ground as possible to allow the sensors to work. The equipment records disturbances in the ground structure or the colour of the vegetation or locates the small bits of metal always found in a landmine. The metal is detected through temperature differences between it and the surrounding soil and vegetation.

Two major tests have been conducted. In May an aircraft flew over a Belgian military field in which 356 landmines had been hidden in an area measuring 1,000 by 500 metres. Ninety-eight percent of the mines were reportedly quickly detected. In November 1998, flights were conducted over four test areas of 650 square kilometres in Mozambique. The location of each minefield was reportedly identified to within ten centimetres, including some mines not previously suspected.

Source: Bart Beirlant, 'Aircraft Track Down Land Mines', *Groot Bijgaarden De Standaard* (in Dutch, FBIS translation), 8 August 1999, p. 1.

Plutonium Detector Developed

A new radiation detector based on optical fibres could improve plutonium detection. The detector, developed at the US Department of Energy's Pacific Northwest National Laboratory in Richland, Washington, consists of optical fibres that emit light when bombarded with neutrons emitted by plutonium. The key advantage of the new detector is that it is light and flexible. Traditional detectors are bulky, cannot be safely shipped by air and can be damaged by vibrations. The laboratory has licensed the technology to Canberra Industries of Meridien, Connecticut. The company has produced a prototype detector, and the International Atomic Energy Agency has installed a unit at the border between Austria and Hungary.

Source: *NewScientist*, 4 September 1999, p. 10.

New Nuclear Test Detection Methods

The Pacific Northwest National Laboratory has also developed two new methods of detecting nuclear tests:

- the Automated Radioxenon Sampler/Analyzer (ARSA)
- the Radio-nuclide Aerosol Sampler/Analyzer (RASA).

Both are designed to contribute to the radio-nuclide network of the International Monitoring System (IMS) to be run by the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) being established in Vienna. ARSA automatically analyses air samples on-site for radioactive xenon 133 and xenon 135, both products of nuclear explosions. This is a vast improvement on the old system whereby samples had to be sent to laboratories for analysis. Since the half-life of the radioactive materials is only nine hours, the delay would often mean the loss of incriminating evidence. RASA is designed to detect fission products that attach themselves to dust particles. It is also automated, making it more than 100 times as sensitive as previous methods. Both systems will transmit the data instantaneously over telephone lines to the CTBTO.

Source: Michael Valenti, 'Nowhere to hide', *Mechanical Engineering Magazine*, July 1999; see
www.memagazine.org/contents/current/features/hide/hide.html

Cheaper and better Landsat images

The US government is about to keep a seven year-old promise by offering new Landsat images of earth at low prices, following a failed attempt to commercialise remote-sensing data in the 1980s and 1990s. The Landsat 7 satellite, launched in April 1999, will also provide more thorough coverage of the earth than its predecessors, with increased spatial resolution. Routine image collection by Landsat 7 is expected to begin in early September. The Earth Observation Satellite Company (EOSAT), which marketed Landsat images in the mid-1980s, charged

up to $US 4,000 for a single 185 kilometre by 170 kilometre 'scene'. Raw Landsat 7 images will now be sold through the US Geological Survey EROS Data Center in South Dakota for just $US 475 a scene. This puts Landsat imagery within reach of financially-constrained UN agencies and non-governmental organisations alike. Equally important is the commitment to collect cloud-free images of the entire land surface of earth, with regular seasonal updating. Targets of interest can be photographed every 16 days, a period suitable for monitoring a large number of international agreements, including some in the arms control and disarmament area.

Meanwhile, under pressure from scientists and industry, the Indian government is to review its restrictions on dissemination of geographical data collected by its satellites and agencies such as the Survey of India (SOI). At present, high resolution maps produced by SOI and satellite images showing military installations are not available to the public because of national security concerns. The use of aerial photography is also banned unless authorised by the defence ministry.

Source: *Nature*, vol. 400, 19 August 1999, p. 702 and vol. 401, 9 September 1999, p. 102.

VERTIC News

Workshop on Visiting Mechanisms in International Law, Geneva, 23-24 September

The Workshop on 'Visits Under International Law: Verification, Monitoring and Prevention', which VERTIC is co-sponsoring with the Geneva-based Association for the Prevention of Torture (APT), will be held on 23 and 24 September in Geneva. The workshop is designed to familiarise those involved in preventing torture with the on-site inspection and other verification and monitoring arrangements used in fields such as arms control and disarmament and the environment. VERTIC's Executive Director will give a paper on 'Arms Control and Disarmament Inspection Regimes' which is also being published as a *VERTIC Briefing Paper*. A copy may be obtained from VERTIC. For further details on the workshop contact: The Association for the Prevention of Torture, Route de Ferney 10, Case postale 2267, CH-1211, Geneva 2, Switzerland; tel: +41 22 734 20 88; fax: +41 22 734 56 49; email: apt@apt.ch; website: www.apt.ch

VERTIC Workshops on the Kyoto Protocol

VERTIC will host two side events at the next Conference of the Parties to the Framework Convention on Climate Change in Bonn from 25 October to 5 November.

The first workshop, on 'Uncertain Inventories: Implications for the Kyoto Protocol', will be held on Saturday 30 October, from 1000–1200. There will be four speakers. Susan Subak of the US Natural Resources Defence Council (NRDC) will speak on the source of uncertain inventories and the implication for measuring compliance with the Kyoto Protocol. John Lanchbery, former VERTIC Director of Environment Programmes, will speak on uncertainties associated with estimating emissions from ecological systems. Jake Werkesman of the Foundation for International Environmental Law and Development will cover the legal and compliance aspects and Fiona Mullins of Environmental Resources Management will comment on the implications for trading greenhouse gas emissions. Clare Tenner of VERTIC will chair the meeting.

The second workshop is being co-hosted with the Institute for European Environmental Policy (IEEP) and the Foundation for International Environmental Law and Development (FIELD) on Tuesday, 2 November, from 1800 to 1900. It will focus on the European Monitoring Mechanism—the EU system for monitoring member states implementation of the Convention on Climate Change. Clare Tenner will discuss compilation and assessment of member states' greenhouse gas inventories.

Successful VERTIC/UNIDIR Getting to Zero Seminar, Geneva, 29 July

As planned, VERTIC held a seminar in Geneva on 29 July, in co-operation with the UN Institute for Disarmament Research (UNIDIR), to launch its four 'Getting to Zero' reports. VERTIC's 'Getting to Zero' project, funded by the Ploughshares Fund and the W. Alton Jones Foundation, was conducted over three years and examined the verification requirements of complete nuclear disarmament and the maintenance of such a verification regime into the indefinite future. The four papers, presented to the seminar by their authors, were:

- Patricia Lewis, 'Laying the Foundations for Getting to Zero: Verifying the Transition to Low Levels of Nuclear Weapons'

- Tom Milne, 'Verifying the Transition from Low Levels of Nuclear Weapons to Zero' (co-authored with Henrietta Wilson)
- George Paloczi-Horvath, 'Virtual Nuclear Capabilities in a World Without Nuclear Weapons'
- Suzanna van Moyland, 'Sustaining a Verification Regime in a Nuclear Weapon-Free World'.

Trevor Findlay chaired the session.

There were approximately 50 participants, including representatives of delegations to the Conference on Disarmament (CD), academics and non-governmental organisations. It was especially pleasing that the five declared nuclear weapon states were represented, some by several delegates. A lively discussion followed each presentation. VERTIC is grateful to UNIDIR for its assistance in arranging and co-sponsoring this successful event, which brings VERTIC's 'Getting to Zero' project to a conclusion. The four 'Getting to Zero' papers are available from VERTIC.

House of Commons Report Cites VERTIC

The UK House of Commons Environment, Transport and Regional Affairs Committee published its report on Multilateral Environmental Agreements in July. The sections of the report dealing with implementation, monitoring and compliance contain several favourable references to VERTIC's submission to the committee. Those of its recommendations relevant to VERTIC's work are encouraging and include the following:

- there should be greater involvement of NGOs in international environmental negotiations, including briefings with government before, during and after negotiations
- the UK should take all possible actions in pursuit of its international environmental obligations to serve as an example to other countries
- the UK should devote more resources to ensuring that parties comply with their reporting obligations, where necessary by providing financial and technical assistance to countries having difficulties
- the use of independent monitoring mechanisms to supplement national reporting on the implementation of multilateral environmental agreements should be promoted
- the evolution of compliance mechanisms to provide a more effective means of ensuring the protection of the global environment should be encouraged.

VERTIC has brought the report to the attention of relevant government Ministers and will be following their progress in implementing the recommendations.

VERTIC Research Report published

VERTIC Research Report no. 5 'Monitoring the Landmine Convention: Ratification and National Implementation Legislation' is now available. This report is an expanded version of VERTIC's contribution to the Landmine Monitor Annual Report, which is reviewed in this issue of *Trust & Verify*.

New Board Member

Dr Bhupendra Jasani of the Department of War Studies, King's College London, has been appointed to VERTIC's Board of Directors. Professor Jasani is a leading expert on the military use of space and arms control verification from space. He has a BSc in physics and mathematics, an MSc in nuclear physics and a PhD in nuclear physics and medicine. He has previously held posts with the British Medical Research Council, the Stockholm International Peace Research Institute (SIPRI) and the Royal United Services Institute for Defence Studies (RUSI).

Staff News

Trevor Findlay chaired the joint VERTIC/UNIDIR Workshop on Verification of Nuclear Disarmament in Geneva on 29 July. On 10 August he and Oliver Meier met with Andrew Barlow of the Arms Control and Disarmament Research Unit at the Foreign and Commonwealth Office (FCO) to discuss verification issues. From 30 August to 1 September he participated in a conference in Bonn, Germany on 'The Contribution of Disarmament and Conversion to Conflict Prevention and it Relevance for Development Cooperation', organised by the Bonn International Center for Conversion (BICC). He chaired a panel on 'Conflict Prevention and Settlement and the Concept of Preventive Conversion'. On 9 and 10 September he attended the annual conference of the Uranium Institute in London. His written work during the period included a briefing paper for the International Security Information Service (ISIS) on 'Verifying Nuclear Disarmament' and the final version of a briefing paper on 'Arms Control and Disarmament Inspection Regimes' for an International Workshop on Visiting Mechanisms co-sponsored by VERTIC with the Association for the Prevention of Torture (APT) in Geneva from 23 to 24 September. He reviewed *Cambodia Confounds the Peacemakers 1979-1998* by MacAlister Brown and Joseph J. Zasloff (Cornell University Press, Ithaca and London, 1998) for *Contemporary Security Policy*.

Oliver Meier joined VERTIC as its new Arms Control and Disarmament Researcher in July. Oliver was previously Senior Analyst for the Berlin Information-center for Transatlantic Security (BITS) and was based since April 1998 in Geneva. He received his

PhD in political science from the Free University of Berlin and has been a Research Associate with Trier University and a Visiting Fellow at the Center for International Security and Arms Control at Stanford University.

Oliver attended a Pugwash workshop on nuclear forces on July 9-10 in Como, Italy and a workshop on the BTWC Protocol organised by the Federation of American Scientists on 'Establishing Programs for Scientific/Technical Cooperation through International Organizations' on July 16 in Geneva. Oliver also participated in the VERTIC Workshop on its 'Getting to Zero' project in Geneva on 29 July. He and Trevor Findlay met with Andrew Barlow of the Foreign and Commonwealth Office on 10 August to discuss verification of a future agreement on ending production of fissile materials. On 13 August, he was interviewed on BBC World's Focus on Asia programme about India's draft nuclear doctrine. Oliver is currently preparing a *VERTIC Briefing Paper* on the implementation of the International Monitoring System for the CTBT as well as other publications in preparation for the October 1999 Article XIV CTBT Special Conference. He has also co-written a discussion paper for a Pugwash workshop on biological weapons in Geneva on 26 September, as well as finishing a chapter on German arms control and non-proliferation policy for a forthcoming book on Germany's post-unification foreign policy to be published by MacMillan.

Clare Tenner attended a workshop on 12 July at the Institute of European Environmental Policy (IEEP) on the European Monitoring Mechanism. She has also been organising VERTIC workshops to be held at the fifth Conference of the Parties to the Climate Change Convention in Bonn in October. Clare and Trevor Findlay have been working together on a *VERTIC Briefing Paper* on verification of international environmental agreements, which will be published shortly. On 6 September Clare met with Charly Moore of the W. Alton Jones Foundation and on 9-10 September she attended the Uranium Institute Annual Symposium in London.

Angela Woodward, in addition to managing VERTIC's administration, spent July and August implementing a new accounting package (Quickbooks) which will simplify VERTIC's bookkeeping and the production of management accounting reports. She also re-established and re-organised VERTIC's publication marketing and sales system. During August she established new office systems for the financial reporting of grant monies to VERTIC's funders. She also sub-edited *VERTIC Research Report* no. 5 and contributed commentary on aspects of international law to the report.

VERTIC

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 treaties or other agreements that have international or national security implications. 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. A Board of Directors is responsible for general oversight of VERTIC's operations and an International Verification Consultants Network provides expert advice. VERTIC is funded primarily by grants from foundations and trusts.

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