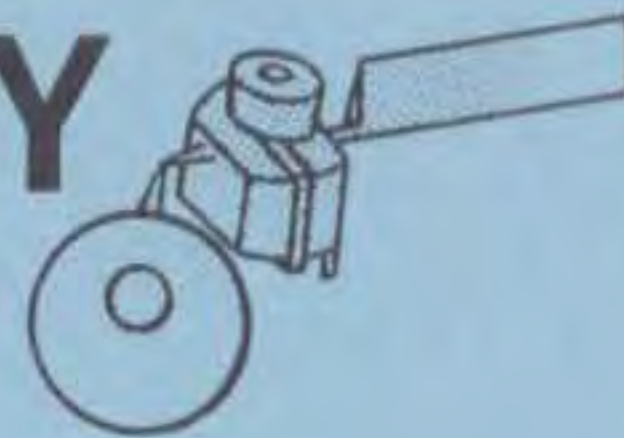




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NRDC / Soviet Academy Experiment: A Major Step In SLCM Verification

As reported in the July edition of "Trust and Verify", a ground-breaking experiment at the beginning of July designed to prove the verifiability of an agreement on the limitation or reduction of Sea-Launched Cruise Missiles (SLCMs) was carried out in the Black Sea between the 4th and 6th July.

Non-governmental teams from the US Natural Resources Defence Council (NRDC), (a private scientific watchdog organisation) and the Soviet Academy of Sciences took part in a series of experiments aboard the Soviet Cruiser, Slava. The two organisations involved have already jointly demonstrated the feasibility of verifying a nuclear test-ban.

The object of the experiments was to prove whether nuclear-tipped SLCMs could be detected by such an inspection and therefore distinguished from conventionally armed SLCMs when both may be present on a ship. In the past the USA has been reluctant to discuss limitation of SLCMs, claiming that such a treaty would not be verifiable. The USSR wants specific numerical limitations on both nuclear and conventional SLCMs. The US administration is thought to be worried by the possibility that the experiment will lead to pressure for similarly intrusive experiments on US Naval vessels. The US Navy policy is to "neither confirm nor deny" the presence of nuclear weapons aboard its vessels.

The Black Sea experiments were observed by a US Congressional delegation, although the US Government were officially opposed to them. Scientists, governmental officials and reporters from West Germany, Spain, Italy, Japan and China were also present.

At the Black Sea port of Yalta, the American team carried portable passive gamma-ray detectors aboard the Soviet cruiser, while the Soviet team brought along six sets of equipment including one for detecting neutrons. The cruiser was armed with SS-N-22 Sunburn Cruise Missiles, one of which was nuclear-tipped.

In their experiment, the US team detected gamma rays characteristic of uranium-235 and plutonium-239, believed to be present in all nuclear weapons. Gamma rays from uranium-238 and plutonium-241, isotopes found in weapons-grade uranium and plutonium, were also detected, as were rays from uranium-232, which would not be present in freshly-mined uranium. Steve Fetter, a physicist from the University of Maryland, and one of the NRDC team, said that the latter finding proves that the USSR uses enriched uranium from spent reactor fuel to arm warheads.

In a second experiment, Soviet scientists from the Kurchatov Institute installed neutron detectors in helicopters and flew over the ship out at sea, passing about 30-70 metres from the missile. Neutrons from the

plutonium-240 contained in the warhead were detected. Fetter pointed out that all the instruments used were standard and widely available to scientists, proving the existence of technology with the potential to verify a SLCMs agreement. Most important, the experiment is believed to have proved that the presence of nuclear weapons aboard surface ships can be detected, contrary to US Government claims. Equally important was the proof that the Soviet Union is prepared to allow intrusive inspections aboard its ships, with no guarantee of reciprocity, something the US has always steadfastly rejected.

In an interview with "Trust and Verify", physicist Steve Fetter described the experiments in more detail.

"There were seven experiments in all. Four using hand-held detectors and three using detectors on a helicopter, a ship and a truck respectively. The US team used two high purity germanium detectors and one large sodium iodide detector while the Soviet team employed one lithium drifted germanium detector, one small sodium iodide detector, a helicopter-based neutron detector, a sodium iodide detector on a troop ship and a truck-based sodium iodide telescope.

In all the experiments using hand held equipment, the apparatus was held directly over the missile launch tube and in each case successfully detected the nuclear warhead.

In the helicopter experiment, readings were taken at distances between 30 and 70 metres from the warhead. At 70 metres the nuclear warhead was still just detected. The truck-based gamma-ray telescope reading was just significant at a distance of 12 metres."

The experiment using a detector on a passing troop ship was less successful. Passing at a distance of some tens of metres, the nuclear warhead was not detected. "It seemed to be more of a ship detector than a warhead detector." The Slava is a conventionally powered ship. Asked whether nuclear powered ships would present problems for detection of nuclear warheads, Fetter said "The Soviets claim to have successfully used helicopter-based detectors near nuclear powered ships including the US ships Virginia and Mississippi. We may discuss further experiments of this kind when we meet in November."

A further potential complication for detection of nuclear warheads on ships might be surreptitious shielding of warheads from detectors. According to Fetter, this need not necessarily be a problem. "With hand-held neutron detectors at short distances it is probably not possible to shield warheads because neutron shielding material is not very dense and there is not space for sufficient material between the missile and the missile tube. It may be possible to shield nuclear warheads from gamma-ray detectors at short distances. About 10cm of lead next to the missile might shield it but it would be theoretically possible to detect the shield itself."

A joint statement on the results of the tests was released on July 8th. Its positive tone and the clear success of the experiments bode well for the future of such co-operative

activities. It remains to be seen whether the US and Soviet Governments will act upon the results.

The full text of the statement is as follows:

"For the first time, Soviet and American scientists used radiation detectors to explore the possibility of verifying the presence of nuclear weapons on surface ships. Short range passive methods of measurement were used by both sides, supplemented by long-range helicopter and truck-based passive detectors used by the Soviets. Both the Soviet and the American equipment conclusively detected the presence of uranium-235 and plutonium, either of which can serve as indicators of nuclear weapons, which confirms the possibility of verifying the presence of nuclear warheads on board ships. These results have shown that the programme of experiment agreed on by both sides has been successfully implemented. This experiment is the first step toward solving the complex task of creating technical means, applicable by both sides, of verifying the presence of sea-based nuclear weapons.

The results of the Black Sea experiment were discussed at a scientific conference in Moscow on 7 July 1989. Both sides have agreed on

- Conducting a scientific conference in the United States not later than November 1989 on reviewing in detail the data obtained during the experiment and discussing possibilities for future collaboration;
- To issue a joint Soviet-American report on the results of the Black Sea experiment;
- To consider the possibility of a cruise (May-July 1990) on board the research vessel Akademik Boris Petrov to conduct joint experiments using a greater variety of equipment;
- To consider the possibility of creating a specialised laboratory equipped by Soviet and American scientists to detect sea-based nuclear warheads.

NRDC's Jacob Scherr who took part in the experiment told "Trust and Verify": "Although the experiments generated some media attention, they did not lead to any official response from Congress. However our visits to Kyshtym Industrial Complex (ed. where the Soviet government has decided to shut down all five nuclear reactors producing plutonium for nuclear weapons) and Saryshagan (ed. where a Soviet laser is based) did lead to some discussion. As for future experiments, the Soviets have proposed to us that they come to the US in November to discuss the findings of the experiment and to plan the next stage in our programme".

VERTIC has a video of the NRDC trip to the Soviet Union. Contact the VERTIC office for more information.

Chemical Weapons: Progress or Deadlock?

The most recent round of talks on the banning of chemical weapons at the Conference on Disarmament in Geneva ended on July 29th. There has been considerable optimism as a result of developments during the talks but a number of problems remain unresolved, largely as a result of two major obstacles. First, it is easy to make and conceal stocks of chemical weapons and second, many of the countries making rapid progress in the development of such weapons are nations who would not be prepared either to allow intrusive inspections of their chemical plants for reasons of sovereignty.

The superpowers, however, have made progress independently of the 40-nation talks. The USA and the USSR meet regularly at the talks and recently announced agreements on a tentative timetable for destroying chemical weapons stocks and on the concept of "challenge inspections". However other nations do not seem to have been impressed by the progress and the US State Department have said that no agreement would be implemented unless "all the major players" had agreed to participate.

One major sticking point between the USSR and the USA had previously been the point at which challenge inspections should take place. The USSR have long been of the opinion that such inspections should take place only after an agreement has been reached, while the USA has been in favour of pre-treaty inspections. At the beginning of August, the USSR accepted the principle of pre-treaty verification and inspection of chemical stockpiles (shortly after accepting a similar principle for pre-treaty verification of missiles covered by the START negotiations - see elsewhere in this issue and in Trust and Verify No.2). The Soviet move should go a long way to satisfying the USA's desire to ascertain the exact size of the Soviet stockpile, American officials have argued that a treaty cannot be concluded without this accurate information. The Soviet Union claims to have no more than 50,000 tons of chemical armaments while some US intelligence figures put the total at more than 300,000 tons.

The exchange of data will take place in two stages. First, information will be given on the location of chemical weapons storage and production sites and the kinds of arms kept there. Second, both sides will provide a detailed breakdown of stockpiles at specific sites. Inspections will take place after the second phase of data exchange and before the signing of a treaty.

The problem of verifying a chemical weapons treaty is one which has kept scientists very busy over the eight years that the subject has been under discussion at the Conference on Disarmament. A comprehensive ban would prohibit the development, production, stockpiling, acquisition, retention or transfer of chemical weapons, including lethal and incapacitating chemicals and their precursors.

Frank Barnaby recently outlined some of the issues in an article in *Physics World* (July 1989) entitled *A Farewell to Arms*. He points out that "the verification of a comprehensive chemical weapons (CW) treaty will have to deal with: obligations to be checked by systematic international on-site verification; verifying the destruction of existing stockpiles of chemical weapons by continuous monitoring with on-site instruments and the continuous presence on-site of international inspectors; and verifying the destruction of chemical-weapon production facilities by monitoring with on-site instruments and periodic international on-site inspections."

It will also be necessary to verify the non-production of materials at certain facilities and to institute challenge inspections to deal with suspected non-compliance which may not have been revealed during earlier inspections.

The article states that new equipment will be needed for certain verification tasks such as the analysis of effluent from chemical facilities, but adds that the technology to build such equipment already exists.

A further problem for any verification regime is that certain chemicals that could be used for warfighting purposes could in theory be used for perfectly reasonable scientific or medical purposes. Clearly thorough data exchange on the production and use of chemicals falling in this category would be vital to the success of any treaty.

It is likely the monitoring of any comprehensive chemical ban would require even more complex arrangements than those set up to monitor the Nuclear non-proliferation treaty, including the creation of an agency along the lines of the International Atomic Energy Agency.

Despite the many complications, progress is being made. Useful experiments have been carried out by Norway (on the verification of the alleged use of chemical weapons CD/936 21 July 1989); the Netherlands (on verifying the non-misuse of chemicals and equipment and the non-production of certain chemicals - CD/924 and CD/925 23 June 1989), the USA (on verifying the non-misuse of chemicals produced for civilian use CD/922 22 June 1989) and the UK (on challenge inspections of military facilities CD/921, 14 June 1989). There appears at least to be general agreement that the necessary technology exists for verifying a comprehensive ban but political obstacles are likely to remain for the foreseeable future.

Soviet Union Accepts Pre-START Verification Measures

As predicted in the last issue of Trust and Verify, USSR President, Mikhail Gorbachev, has accepted the principle of trial monitoring of a new Strategic Arms Limitation Treaty (START), as suggested by the US, with the proviso that the tests affect both camps equally and that they include certain weapons not contained in the US proposal, namely bombers, air-launched cruise missiles and sea-launched cruise missiles.

Both sides now agree that misunderstandings can be avoided by such inspections. Some analysts predicted that the US proposal would obstruct current talks. Gorbachev's positive response seems to indicate otherwise. Deputy Soviet Foreign Minister, Victor Karpov, indicated that the inspections "should not prevent the normal development of negotiations in Geneva or be a precondition for work on the draft text and protocols."

Some concern remains on the Soviet side that the Bush proposal is "formulated to be one sided". Mr. Karpov said "If we can have inspectors at production plants for the MX or the Midgetman, then we would be ready to have a team at our plant" (producing the mobile SS24). Of course, such inspections would become important if, as proposed by the Soviet Union at the end of July, an agreement can be reached on the scrapping both of the US plan to deploy its Midgetman missile on railway wagons and of the Soviet development of the SS24.

Mr. Karpov stressed that US proposals for prompt exchange of data on strategic weapons, trial monitoring of ballistic missile warheads and advance notification of strategic arms exercises were all seen to be "reasonable" proposals, as were proposals on the tagging of missiles and the banning of missile flight tests. Clearly the two sides are still a little way from a formal agreement on pre-treaty verification but the signs of an early agreement are promising.

The START talks themselves received a boost at the beginning of August, just before the end of the current seven week round, when Mr. Yuri Nazarkin, head of the Soviet Delegation spoke of the usefulness of such pre-treaty verification experiments. Chief US Negotiator Richard Burt spoke of having laid the ground for "productive discussion" in the next round of talks, due to begin on September 25th, after the meeting of US Secretary of State James Baker and Soviet Foreign Minister Eduard Shevardnadze, scheduled to take place in Washington on September 19th and 20th.

US officials have expressed a hope that after the Baker-Shevardnadze meeting, the Soviet Union will agree to discuss the Bush verification package, saying that there have already been strong indications that Soviet officials are keen. The seven point package is as follows:

1. Advance notification of strategic manoeuvres
2. Agreement not to develop submarine-launched ballistic missiles with short flight times
3. Agreement "now" to ban certain methods of encoding data on missile tests
4. Immediate exchange of data on strategic forces
5. Advance demonstration of inspection techniques dealing with the number of warheads a missile is allowed to carry
6. Technical demonstration of "tagging", a method of identifying missiles during short-notice inspections
7. Monitoring of some ICBM production plants.

However it was made clear by both sides that major differences still exist over the inclusion of SLCMs in any START agreement, over the way in which ALCMs would be counted and, crucially, over the interpretation of the 1972 ABM Treaty and over the production of space based (Star Wars) defences. (For a detailed analysis of the feasibility of SLCM verification, see Trust And Verify issue 1 (June 1989).

IN THE NEWS

West German INF Team

A team of 50 West German arms control inspection and verification experts will soon be accompanying American and Soviet teams as they carry out their duties under the INF agreement. The team will be funded from money set aside in the defence budget for 1990 for the purpose of arms control and reduction activities. This is the first time money has been set aside for such a purpose. (Jane's Defence Weekly, 29 July 1989).

New Soviet Offer On Air-Launched Cruise Missiles

The Soviet Union has made a new offer on the limitation of air-launched cruise missiles (ALCMs) which is close to an earlier offer made by the US Air Force but not yet endorsed by President Bush.

ALCMs are considered to be one of the sticking points in the conclusion of a Strategic Arms Limitation Treaty (START) and the new offer will be considered during a review of US positions to be concluded in time for the Baker-Shevardnadze meeting on September 19th-20th.

Up to now the US position has been that strategic bombers should be counted as carrying 10 nuclear-tipped missiles, even though they could in fact carry more. Moscow has previously demanded that each bomber be counted as carrying a maximum possible number. The new offer, tabled just before the recess of the Geneva negotiations on August 7th, suggested that bombers be counted as carrying no more than the actual number of missiles installed in a given period.

When the US Air Force proposed a similar idea General Larry D. Welch the Air Force Chief of Staff told the Senate defense appropriations committee, "we are quite willing to allow...whatever kind of intrusive inspection is required to verify that...(including) physical access to the B52 bomber. At the time the plan was opposed by civilian officials at the Defense and State Departments. Now an unnamed senior US official has said that "this issue is ripe for another look".

Semipalatinsk Nuclear Test Site

Jane's Defence Weekly (5/8/89) reported details of the Semipalatinsk nuclear weapons test site as revealed by the Soviet Defence Ministry. An official statement said "the Semipalatinsk nuclear test site was created in 1948, in accordance with a decree of the USSR Council of Ministers...The first such experiment was carried out on 29 August 1949. Since 1964 the USSR has carried out only underground tests. By 1 January 1989, the USSR had carried out a total of 300 underground nuclear explosions".

Test Pact In Sight?

The Soviet Union believes an agreement to limit nuclear tests is within reach but that the US are making their decisions on the matter too slowly. Six weeks of talks between the two sides ended on August 9th. Discussions have been taking place on verifying compliance with the 1974 treaty limiting underground tests to 150 kilotons, and the 1976 treaty on peaceful nuclear explosions. The US Senate still has not ratified the 1974 and 1976 treaties.

The US has insisted on the use of the non-seismic measuring device, Cortex, placed in the ground adjacent to the explosion, which measures explosions according to the speed at which a cable is crushed. The Soviet Union has accepted this on the condition that there also be seismic devices, placed hundreds of miles from the test sites, saying that seismic measurements are more accurate.

Congress Representatives Inspect Pullback In East Germany

On August 7th a team of US representatives of the House Armed Services Committee were allowed to visit a Soviet Headquarters in Wunsdorf, GDR. During the visit it was revealed that some elements of the six tank divisions to be withdrawn under the unilateral plan announced by President Gorbachev at the UN will remain, namely some artillery and air defence weapons and some soldiers. These will be added to existing units in East Germany as part of restructuring measures.

The visit was part of a tour of close inspections of sites in East Germany and the Soviet Union at the invitation of the Soviet military. The representatives witnessed training and drills as well as the pullback of tank divisions.

However there is some concern about the Soviet restructuring measures. Senior US Army officials have said that the so-called "non-offensive" motorised rifle divisions, which use artillery and anti-aircraft weapons, represent a very potent force.

There was also some disagreement over aircraft; the Soviet Union says that 81 combat aircraft have been removed, but the US officers say that the number of planes has increased, with MIG-29 interceptors moving in to replace SU-24 attack aircraft.

As for the restructuring, the US officials pointed out that monitoring was difficult because so much equipment was moved at night. Soviet officials point out that the most significant aspect of the restructuring is that their "most threatening" weapons, the tanks, are being withdrawn as promised.

The whole exercise shows the value of On-Site Inspections. By going in person, despite the representatives not being trained inspectors, they were able to gather a good deal of information. The exercise is obviously in the spirit of openness and pre-treaty verification.

First Ever Tour of Soviet ICBM Launch Centre

On Tuesday 15th August, a delegation of US Congressmen were allowed to tour an underground Intercontinental Ballistic Missile (ICBM) launch centre about 390 kilometres from Moscow and to see an SS-11 ICBM in its silo. The missile is the oldest in the Soviet arsenal, and is in the process of being phased out. The invitation has therefore been interpreted as a means of showing Glasnost in action without revealing more recent military secrets. The SS-11 is an equivalent of the US Minuteman-1 (now upgraded to the Minuteman-3).

VERTIC News

Dr. Patricia Lewis returned from her trip to the United States on August 21st. She had been participating in the UN study to discuss the role of the UN in treaty verification. She also visited Washington DC, Philadelphia and Wellfleet (where she held talks with Jane Sharp).

New Scientist magazine (29 July 1989) refers to the work of VERTIC in an article entitled Arms and the Ban, by Dan Charles. "Independent scientists have rushed in where the government's specialists fear to tread. In Britain they are led by the Verification Technology Information Centre which co-ordinates work by 31 scientists at various British universities. Much of their research is aimed at verifying non-nuclear disarmament or a ban on nuclear tests. Similar initiatives have begun in other European countries, including West Germany and the Netherlands".

VERTIC continues its work on the Partial Test Ban Amendment Conference, reported in Trust and Verify No.2.

What is VERTIC?

VERTIC is a unique independent organisation aiming to research and provide information on the role of verification technology and methods in present and future arms control agreements. VERTIC co-ordinates six working groups comprising 21 UK consultants and 11 overseas advisors. VERTIC is the major source of information on verification for scientists, policy makers and the press. VERTIC is funded primarily by grants from foundations and trusts and its independence is monitored by an Oversight and Advisory Committee.

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