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Satellites and the Gulf Crisis

The crisis in the Gulf arising from Iraq's invasion of Kuwait on August 2 has raised a number of important issues with regard to the role of satellites, both as sources of information for the military forces deployed in the Middle East and as the basis of public media reports.

US officials will be relying on satellite images to enhance the effectiveness of their forces in the region. A combination of reconnaissance satellites monitoring Iraqi troop movements and communications satellites allowing regular contact between commanders in Washington and forces on the ground, have been in constant use since the beginning of the crisis.

Jeff Richelson, an independent intelligence expert believes at least four US imaging and radar satellites are in orbit, including two or three KH-11 photoreconnaissance satellites, one or two advanced KH-11s and one Lacrosse radar satellite. These satellites are likely to have modified their orbits to give greater coverage of the Gulf area.

The US is also likely to be using two electronic intelligence satellites which maintain permanent watch over the Middle East from 22,000 miles above the earth. These satellites pick up Iraqi broadcasts and relay them to stations in the US for analysis.

Communications satellites will also come into play. *Space News* (13-19/8/90) describes the two ultra-high frequency (UHF) communications satellites in geostationary orbits over the Middle East. The USS Lasalle, already in the Gulf, has super high frequency satellite terminals but the US Navy relies primarily on UHF satellites, as do other US forces such as the Army's 18th airborne corps whose paratroopers carry 100lb UHF terminals.

Space News also suggests that the US Air Force's Navstar Global Positioning System will be employed in the Gulf. This network of satellites broadcasts navigational information. Only eight of a planned 21 satellites and three spares are so far in orbit, though. Air Force weather satellites, the Defense Meteorological Satellite Programme will also provide essential information.

Soviet satellite technology has also been employed during the current crisis. At 10.45pm Moscow time on August 3, less than 48 hours after the Iraqi invasion, Cosmos 2089 was launched from Plesetsk. Saunders Kramer, a Washington space analyst, told *Space News* that he was in no doubt that it was a photoreconnaissance satellite. The craft has been passing over the Middle East about once a day at an optimum time for photographs, namely mid to late afternoon when the sun is bright but shadows allow clearer identification.

On August 8, a Soviet rocket launched a further six military communications satellites but it is not clear whether the launch was directly related to the crisis. The ability to launch satellites at short notice achieved by the Soviet Union is regarded with some envy by the US.

The Gulf crisis has also underlined the reliance of European countries on US satellite information, although European officials have indicated that it is unlikely to lead to the development of their own reconnaissance satellite. The Western European Union voted on June 7 in support of "a large scale European system of satellite verification" but the idea of a European reconnaissance satellite has subsequently received little support.

The US has been supplying its European allies with a regular flow of information but Robert Pontillion, President of the WEU assembly, told the US magazine *Defense News* that "the effectiveness of the deployment of air and naval forces to the Gulf will suffer from the lack of sufficient information sources".

A different angle on the use of satellites to cover international crises has been raised by the recent decision by the American SPOT Image Corporation in Reston, Va, not to sell images of the Gulf taken by the French-owned SPOT commercial satellite to the international media. In the past SPOT Image has made much of its ability to provide images of any part of the globe to those willing to pay on the basis of completely free access to satellite data.

However since August 7, representatives of network news organisations have had requests for information turned down. The US Government, though, still has access to SPOT images. EOSAT, owned by the US General Motors and General Electric corporations has continued to provide images. As *Trust and Verify's* Washington correspondent, Peter Zimmerman, wrote in a recent article in *Space News* (13-19/8/90), "Many news organisations have come to rely on SPOT for supplemental but important information and images. The American networks...trusted the French guarantees that no politically inspired restrictions would be placed on their purchase and use of satellite images, not even at a moment of crisis...Indeed restricting access to imagery violates United Nations principles for remote sensing satellites and, if SPOT is selling pictures to some customers and not others, American policy on non-discriminatory access to remotely sensed images."

The situation has led to renewed calls for the development of an independent satellite for use by the media, not subject to restrictions from any government at any time.

Major Pre-Treaty Verification Experiments for START

In early July one of a series of reciprocal pre-treaty START verification experiments took place aboard the US submarine Tennessee in Kings Bay, Georgia. The experiments had been set up in an agreement signed on January 22 1990 in Washington between US negotiator Richard Burt and his Soviet counterpart, Yuri Nazarkin.

The agreement was designed to allow inspection of the number of warheads carried by the US Trident 2 and MX reentry vehicles and the Soviet SS-18 and SS-N-23. It

was seen as a major step in preparing practical verification procedures in advance of a treaty, thus making actual treaty verification easier to develop once START is signed.

In this most recent experiment, 12 Soviet inspectors were allowed to look from the deck of the Tennessee into an empty Trident missile tube, then follow the missile as it was carried to a disassembly facility, reports Robert Toth in the *Los Angeles Times* (22/7/90). The payload was transferred to a room with only one door, where the inspectors were asked to wait while the warheads were shrouded under an opaque, rubberised shroud, thus hiding details of the warhead design but allowing the number of warheads to be seen.

The question must be asked: If the US can agree to on board inspections and verification experiments for ballistic missiles, why not Sea-Launched Cruise Missiles?

Similar procedures have now been used on a number of occasions both by the United States and by the Soviet Union. Soviet inspectors have verified payloads of the MX ICBM in a Wyoming silo in April and B-1 bombers at Grand Forks, N.D. in May. On the Soviet side, an SS-N-23 removed from a Delta IV submarine was shown in Murmansk on June 12 and earlier an SS-18 was viewed in Kazhakstan and Bear bombers at an air base near Kiev. Neither side has yet fully accepted the other's procedures but negotiators in Geneva hope to iron out differences and reach a compromise.

Members of the On-Site Inspection Agency set up by the Pentagon to verify compliance with the INF treaty, were present for both inspections in the Soviet Union. OSIA has been assigned verification duties for both START and CFE treaties as well as agreements limiting underground testing (the Threshold Test Ban and Peaceful Nuclear Explosions Treaties) and covering destruction of chemical stockpiles.

GDR, Canada, China - Proposals to Conference on Disarmament for Chemical Weapons Verification

As reported in the last issue of *Trust and Verify*, the GDR, as well as Britain, recently presented reports to the Geneva-based Conference on Disarmament (CD) on verification procedures for a ban on chemical weapons. The British proposals were examined last month.

The GDR presented three reports on June 12, 1990. The first, Report on a Trial Challenge Inspection in a Chemical Industry Plant (CD\996), described the inspection carried out at the WOFATOX factory of Chemiekombinat Bitterfeld.

The aim of the experiment was "to develop and evaluate an inspection methodology for challenge inspections in industrial plants, and to improve the understanding of the technical implementation of Ad-hoc type inspections." The trial had the following mandate: "Verify whether or not at the WOFATOX plant ... any organophosphorous chemical listed under schedule 1 has been produced." The inspection was therefore required to check for compliance retrospectively as well as at the time of inspection. The approach for the trial was a "layered inspection methodology" (ie step-by-step) "with increasing intrusion triggered by the results of the less intrusive inspection layers (phases) together with an assessment of these results of the circumstances and particularities encountered." Four layers were used.

1. Detection and identification of chemicals listed under schedule 1 at the inspected plant pursuant to the inspection mandate (considered mandatory for any challenge inspection in an industrial plant).

2. Assessment of the plant with the aim to conclude whether or not it may pose an immediate and high risk to the objectives of the (a chemical weapons) convention. Risk in this context was understood to comprise both the potential CW capability of the plant and its roughly estimated capacity in case it was assessed capable...A part of this phase would also be to confirm that no signs are present...of cover-up activities...

3. Resolution of any anomalies which may have been encountered in phases 1 and 2 with the aim to allow to conclusively demonstrate compliance with treaty provisions pursuant to the inspection mandate. (If anomalies are not resolved, the inspection moves to phase 4).

4. Highly intrusive inspection activities in order to conclusively demonstrate compliance or to prove a violation of treaty provisions.

The analytical methods used in the trial inspection were ion mobility spectrometry and gas chromatography. Transportable instruments were used for both. Schedule 1 chemicals were simulated by a nerve agent simulant, dispropyl-methylphosphonate (DIMP). Sampling techniques and analytical methods were developed in the laboratory in advance of the trial. Three conclusions were drawn with regard to these methods:

1. Trace identification of the simulant used in the study was possible against a background concentration at least three orders of magnitude larger than DIMP of a number of organophosphorous pesticides.

2. Traces of the simulant remain detectable and can in fact be identified in material typically used as joint packing for at least 580 hours. A method was designed to analyze DIMP traces from joints without breaking them, by "sucking-off (sniffing)" (sic) air from the head space around the joint packing.

3. In collecting wipe samples from metal surfaces, approximately 1 microgram DIMP can be detected and identified against a pesticide background concentration as above.

Computer evaluation was also used to assess whether or not a production of schedule 1 compounds is chemically possible with the material present at the plant. The expected positive result was computed.

The report concluded that the layered approach "would allow for a sound conduct of (a challenge) inspection based on the principle of using the least intrusive methods possible."

The second report, Inspection Methodology for Challenge Inspections in Industrial Chemical Plants (CD\997), gave more detailed descriptions of the trial methodology while the third, Application of Trace Analysis to Exploit memory Effects in Challenge Inspections (CD\998) described an approach developed during the inspection using a portable ion mobility spectrometer "in order to exploit memory effects of a chemical plant." The method was apparently quite successful, although "Investigations are still being conducted to further improve the concept."

Two further reports were presented to the CD on August 10, from China and Canada. The Chinese report (CD/1031) reaffirmed its government's desire "to engage in constructive consultations and co-operation with the Ad Hoc Committee and all other delegations" and reiterated

"China's consistent position to work energetically towards the early conclusion of a convention on the complete prohibition and thorough destruction of all nuclear weapons". The report also made eight points regarding operational procedures for challenge inspections.

The Canadian report (CD/1030) described a national trial inspection following the procedures associated with a routine inspection for verification of schedule 2 chemicals. The inspection team laid emphasis on the success of using existing audits at the facility to establish an "audit trail" as a means of verification.

Fears Over Cost of Verification and Speed of Arms Control Success

As part of a major feature on current verification issues, the US magazine *Aviation Week and Space Technology* (6/8/90) pinpointed two major fears circulating among negotiators, administration officials and researchers alike, namely the likely costs involved in verifying the various treaties due to be finalised this year, and the fact that the speed of arms control success might soon outpace the speed of development of verification technology.

The Bush administration has not so far produced firm estimates of the likely costs involved in verifying START and CFE treaties. However, Arnold L. Kanter, National Security Council Senior Director for Defense Policy and Arms Control gave an idea of the levels involved. At a Brookings Institution seminar in April this year, Kanter said that establishing a pair of portal perimeter monitoring systems for missile production facilities in the US and the Soviet Union under START, similar to the ones now employed for INF, would cost $500 million over 15 years. Suspect site inspections were estimated by Kanter at between $500,000 and $2 million per pair per year. He also envisaged a necessary increase of $200 million - $300 million per year in the On-Site Inspection Agency's budget

On the research and development side, US Air Force Major General John Fairfield, chair of the Verification Technology Research and Development Working Group in the Pentagon's acquisition office says that the Pentagon will ask Congress for $75 million for verification technology research, divided roughly as follows: $41 million for START, $22 million for chemical and $12 million for CFE. A Department of Defense official estimated in *Aviation Week and Space Technology* that this development of new technologies accounts for about 5-10% of the total cost of verifying arms control agreements.

On the pace of arms control success, Los Alamos arms control program director Doyle Evans said that "The evolution of the verification business is not clear and events are overrunning the organisation." Apparently there are real difficulties in producing new technologies fast enough.

TTBT/PNET Ratification Hearings

Heads of two US nuclear weapons laboratories have raised worries about the cost of verifying the pending Threshold Test Ban and Peaceful Nuclear Explosions Treaties (TTBT and PNET). They fear that costs will eat into weapons testing budgets. During Senate ratification hearings, the directors of Los Alamos and Lawrence Livermore laboratories said the cost of estimating the size of Soviet underground tests could reach $60 million a year or 10% of the total DoE testing budget. The controversial CORRTEX method of verification is at the heart of cost fears. CORRTEX measures the speed of shock waves close to an explosion. Seismic monitoring will also be used. Some experts claim that as seismic methods improve it will be harder to justify the expense of CORRTEX, currently considered to be the most accurate form of verification.

However, it is believed by some experts that the insistence on accuracy of verification which has held up ratification of these treaties for fifteen years, is an attempt to answer calls for a complete ban on testing. The Bush administration wishes to see how the verification measures for TTBT and PNET are implemented before considering further testing limits. VERTIC scientists believe that it is easier to verify a total ban on nuclear tests than to verify very low yield testing. An amendment conference of the Partial Test Ban Treaty meets in January 1991 to consider turning the PTBT into a comprehensive test ban. The US and the UK are likely to oppose such a move.

On a more positive note, arms control officials in the US believe that TTBT and PNET verification procedures will set useful precedents for the high level of confidence required for verification of forthcoming conventional, nuclear and chemical weapons treaties.

The UN and Verification

A recent paper for the Canadian Institute for International Peace and Security by A. Walter Dorn of the Canadian NGO "Science for Peace" entitled "The Case for a United Nations Verification Agency" considers possible future roles for the UN in the verification of arms control treaties.

Mr Dorn's view is that a UN agency would offer four main advantages: speed in treaty implementation, lower costs, protection of intelligence gathering and increased confidence.

The publication has been timed to preceed the publication of a report from the UN Secretary General on the role of the UN in verification, undertaken with governmental experts from 20 countries, which is due to be presented in Autumn to the General Assembly. The report, which is a consensus document and has already been completed, contains recommendations for an increased role of the UN in verification. It will analysed by *Trust and Verify* in full when it is published later this year.

In The News

CD Ad Hoc Committee on Test Ban Reports

At its 565th plenary meeting on July 17 1990 the Conference on Disarmament in Geneva adopted a decision on the reestablishment of an Ad Hoc Committee on a Nuclear Test Ban. Six meetings were held between July 20 and August 17. A number of documents and working papers were presented to the Conference as a result. The final report of the Committee agreed that it would be appropriate to reestablish the Committee to continue work in the 1991 session of the Conference.

INF Treaty Compliance

Only about a dozen "ambiguities" have been reported by the On- Site Inspection Agency (OSIA) in the verification of the INF Treaty. These range from a "minor" incident when a missile stage was found not to match measurements on blueprints, to the much documented refusal to allow US inspectors to use X-ray equipment to

survey missile stages at a plant in Votkinsk. A protest from US Secretary of State Baker resolved the problem. However, some US officials are still unhappy with Soviet assurances that 48 SS-23 missiles sold to East Germany, Bulgaria and Czechoslovakia were not disclosed because the transfer occurred before the INF treaty came into effect. This contrasts strongly with the Soviet attitude to the Pershing 1A missiles held by the Germans prior to the INF treaty signing. OSIA say that all 239 Soviet SS-23s have now been destroyed.

Small Satellites for EOS

A panel of environmental scientists have urged NASA to reconsider the use of a large part of its $30 billion project to use large, sophisticated satellites for its proposed Earth Observing System (EOS) project, reports Andrew Lawler in *Space News*, (27/8-2/9 1990). The panel has called on the agency to use smaller satellites for at least part of the mission, but rejected the idea of using large quantities of tiny spacecraft based on Strategic Defence Initiative technologies. The panel's report, "The US Global Change Research Programme" was requested in January by US presidential science adviser Allan Bromley. It was prepared by 12 scientists from the independent Natural Resources Defence Council (NRDC). The group also recommended use of data from the existing remote sensing Landsat satellites.

Los Alamos Satellite Verification Study

Los Alamos National Laboratory is developing the Array of Low Energy X-Ray Imaging Sensors (Alexis) project in order to investigate new methods of using satellite sensing in arms control verification. Alexis is a small satellite testbed due for its initial launch in August 1991. A normal incidence X-Ray telescope will be tested during the mission.

More Fears of French Bomb Test Leaks

New Scientist (1/9/90) reports that radioactive materials from underground tests may be leaking into the Pacific. The claim is made by a new report which challenges claims by the French government that radioactive debris from Moruroa does not leak into the ocean and reinterprets data from Jaques Cousteau's 1987 report highlighting damage to the atoll but concluding that there was no immediate danger to local populations.

CFE Verification Progress

Eastern and Western CFE negotiators report progress on helicopter limits and verification provisions. There will be a limit of 1,900 for attack helicopters and data exchange and verification for other types, although there are still problems with definitions and categories. On wider verification matters, the Soviet Union has agreed that the quota of on-site inspections countries are required to accept will be based partly on the geographical size of the host country. The Soviet Union had been concerned about the cost of the high number of inspections this would imply for its own territory. (Source: *BASIC Reports from Vienna*, 27/8/90)

Chemical Disposal Delay

The Washington Post (30.8/90) notes that the US Army's prototype plan for destroying chemical weapons is 32 months behind schedule and will run at least $190 million over budget, according to a congressional inquiry. Delays at Johnston Atoll disposal facility are also holding up construction of three other disposal sites. The delays will increase the cost of storing nerve agents at the four locations.

Book Review - Verification of Conventional Arms Control in Europe.

Just published by Westview Press is a SIPRI book called "Verification of Conventional Arms Control in Europe. Technological Constraints and Opportunities". Edited by Richard Kokoski and Sergey Koulik the contributers also include Johnny Skorve, Hartwig Spitzer, Jurgen Altmann, Steve Fetter and Thomas Garwin, Ivan Oelrich, Klaus Jacob, Patricia Lewis, Frances Mautner-Markhof, Thomas Stock and Jiri Matousek and Jonathon Dean.

VERTIC News

Trust and Verify is happy to announce that Dr Peter Zimmerman has been appointed as Trust and Verify's Washington-based US correspondent. He will contribute information and articles on a regular basis.

VERTIC's director Dr Patricia Lewis attended and spoke at the 2nd Workshop on Verification held at Vienna University on September 3-5. She gave talks on Production Monitoring for Conventional Forces and on CFE verification research in the UK.

Dr Lewis also spoke in Geneva on the verification of a Chemical Weapons Convention at a meeting of Parliamentarians Global Action held in the Palais des Nations.

Dr Mike Barnett, head of the Centre for Remote Sensing at Imperial College, London, and member of VERTIC's Remote Sensing working group, recently appeared on BBC Breakfast Time where he spoke about the use of satellites in the Gulf Crisis.

What is VERTIC?
VERTIC is an 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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