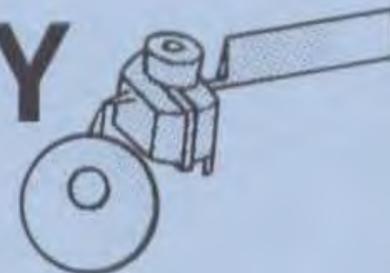




# TRUST AND VERIFY



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## Lessons of the Gulf War

With the Gulf war at an end the Middle East is facing a massive task of reconciliation and reconstruction. It remains one of the world's most unstable regions. Of the many lessons learned from the conflict, some of the most important with regard to long term arms control or confidence building may well come from the use of satellites before and during the conflict. As *Jane's Defence Weekly* (9/3/91) pointed out, in reporting the comments of US Air Force Secretary Donald Rice to the House Armed Services Committee on February 26 "The Gulf War was the first armed conflict in which the USA made widespread use of space assets."

A key lesson was pointed out by VERTIC in a press statement on 14 February, namely that satellites are not all-seeing, omnipotent or foolproof.

The statement read as follows: "The Verification Technology Information Centre has been increasingly concerned by Gulf War press reports that US intelligence satellites are capable of watching Saddam Hussein's every move, at all times.

There have been statements such as:

"Spy satellites would trace every move his blood-stained war machine made...If Hussein ordered a tank to move two yards, President Bush could be told about it in minutes." (*Today* 10/8/90)

"You could just about read the numbers on a vehicle registration plate or not quite read the time on someone's watch - but pretty close." (*Daily Telegraph* 19/1/91)

"Spies in the sky look over Saddam's shoulders...they cannot quite see what is in a newspaper being read in Baghdad but they can tell which newspaper it is." (*Daily Telegraph* 20/1/91)

"...new American satellite which...can pierce low cloud and identify an object the size of a grapefruit." (*Observer* 3/2/91)

These statements are misleading. The technology is good but it is not that good. The US Keyhole photoreconnaissance satellites have resolutions of some tens of centimetres and can cover, at any one time, an area of between 10km<sup>2</sup> and 100km<sup>2</sup> approx. There are estimated to be 6 keyhole satellites (3 KH-11 and 3 KH-12) and they pass over once per day. They can identify vehicles and buildings but they have to know where to look. They are not hovering in the sky looking down continually. They cannot see through clouds (the single US radar satellite, Lacrosse, is able to penetrate cloud cover but it cannot see so much detail). Weather permitting, it takes days to cover all the sites of interest in Kuwait and Iraq. The amount of data that emanates from the Keyhole satellite system is vast. The data have to be

analysed and interpreted before they are any use and this takes time. Much of the preliminary analysis is done by computers but the final interpretations must be carried out by skilled analysts. It is not real-time information.

Much nearer to the mark are the following quotes:

"Photographing a tank and photographing a dead body is an order of magnitude, our technology is great but not that good. So it would be an error to try and start counting bodies." General Robert Johnston, US Marine Corps at a briefing in Riyadh (BBC Radio 4 3/2/91)

"Satellite pictures have been invaluable for years for long range planning and watching what the Soviets are doing. But each satellite typically swings overhead only once a day, so they are not very responsive to the swift pace of activity on a tactical battlefield." General Michael Dugan (*Guardian* 9/2/91)

VERTIC made similar points elsewhere. For example, The *Guardian* (20/2/91) quoted VERTIC's consultant Vipin Gupta: "They don't have Superman's X-ray vision. They look straight down. It is difficult to pick out civilians and there is no way they can detect people at night. If they see Saddam getting into a car, then it's luck."

*Space News* (11-17/2/91) claimed that "Iraqis' deception methods aim to fool spy satellites", and added that "(The United States') most sophisticated spy satellites are hard-pressed to overcome the relatively simple techniques used by Iraq to hide mobile Scud missile launchers."

Beyond overstating the capabilities of satellites, though, other issues have arisen. *Space News* (4-10/3/91) asked: "What is the future role of space systems in (the US's) military doctrine? Did satellites help keep the conflict short and quick? If so, can this capability be improved? What space systems should be developed to maintain superiority of the skies? These are questions yet to be answered. Suffice to say that one of the keys to the coalition forces' quick victory was the fact that they had access to intelligence satellites while Saddam did not.

One system singled out for particular praise by US officials has been the Navstar Global Positioning System, which broadcast detailed navigational information, assisted in the aiming of artillery, helped the US M1A1 tanks rendezvous with their refuelling trucks and sent signals to receivers on the US Navy's Stand-off Land Attack Missiles (SLAMs).

The role of the Defense Support Program early warning satellites remains less clear. The degree to which they were able to monitor Scud missiles is in some doubt and their role is bound to come under much scrutiny in the coming months. Some Pentagon planners favour development of a much more advanced system.

*Space News* also raises the question of classification of space products and systems such as photo and electronic intelligence satellites, their images and electronic interceptions. Release of such material could be a useful political tool. For example, such images could have been used to counter Iraqi claims that civilians were being targeted by Allied troops. For many people, sketches and diagrams will never be sufficient to support verbal claims. The Basra mosque and the Baghdad bunker are both examples where clear satellite evidence, if it existed, could have deflected criticism.

*Aviation Week and Space Technology's* view of the Gulf's lessons (4/3/91) includes "the need for improved technology to fuse intelligence data from military spacecraft with ground-based data pertinent to battle situations. Prewar efforts to provide more imaging reconnaissance satellite data to battlefield commanders will also be accelerated. Commanders' problems with reliance on reconnaissance satellite data involved "connectivity" between Saudi Arabia and US-based imaging processing facilities rather than spacecraft capability. The Persian Gulf area experience may spur the use of small military lightsat spacecraft. A Defense Advanced Research Projects Agency multiple access communications satellite was used by Naval Space Command and the 2nd Marine Aircraft Wing to relay vital logistics information from Saudi Arabia to the US."

Perhaps slightly underrated in terms of the role they played in the allies' success were weather satellites which provided vital information to commanders in the field. The US Air Force has three Defense Meteorological Satellite Programme (DMSP) craft in orbit and as VERTIC's Vipin Gupta pointed out in an article in *The Guardian* (15/3/91) "The public was given a view of the Gulf war from the upper deck thanks to the half-hourly pictures taken by METEOSAT - a European weather-monitoring satellite. Whereas public access to other satellite systems was restricted for security reasons, METEOSAT provided timely information throughout the war. Gupta describes how METEOSAT images revealed the location of oil fires, the time smoke clouds emerged, characteristics of the clouds and the weather conditions for the battle. Much of this information will become vital to those whose job it is to extinguish the fires. The images also show that Iraq began setting fire to the oil installations in Kuwait before Tariq Aziz arrived in Moscow to discuss the peace proposals.

The role of satellites in the Gulf has also led to renewed calls for European remote sensing satellite programmes. The French Defence Minister, Pierre Joxe, said on March 3 that the international community should use space-based observation to track arms movements worldwide. (Other European officials are also discussing the possibility of a Europe-wide project. Such a project could have applications in monitoring the international arms trade as well as independently monitoring conventional or nuclear weapons agreements in Europe). Joxe also implied that satellite images caught several nations in the act of delivering unspecified arms and "strategic materials" to Iraq during the war, reports *Space News* (11-17/3/91). He did not name the countries.

France itself plans to launch the two-satellite Helios observation programme in 1993. Spain and Italy will have access to Helios in proportion to their financial contribution to the programme.

Israel, too, is learning from the war. It is expected to launch its own military remote sensing satellite shortly to cope with its requirement for current strategic intelligence

about Arab movements. Defence Minister Moshe Arens confirmed for the first time before the Knesset on March 6 that Israel is now in a position to provide its own independent surveillance satellites. During the Gulf war, Israel relied heavily on US information, including warning of Scud attacks. Two experimental satellites have already been launched, reported in earlier editions of *Trust and Verify*. During the Knesset debate, Israel's intelligence service was criticised for not giving adequate warning about Iraqi plans prior to August 2.

## EOS Gold Mine

*Space News* (4-10/3/91) put into perspective the potential for data gathering of the proposed Earth Observation System (EOS). "(It) will generate enough raw data every five days to fill the Library of Congress." One terabyte (a million times a million bits) of data will be produced every day. The information will be available for those seeking useful information and gaps in the market, according to Frederick Henderson, founder of Geosat Inc. Despite the volume of data, some trends are bound to be missed, as was the case with the ozone hole over Antarctica. The hole was discovered after analysis of data gathered by aircraft. Subsequent analysis of satellite data showed the trend was visible a long time before.

In the meantime 100 scientists are being selected to help establish the massive data network necessary for EOS. EOS will consist of six large polar-orbiting remote-sensing platforms each with a fifteen year working life. The first platform is scheduled for launch in 1988, two years after the new earth-based information hardware is in place.

Seven archive centres have been named by NASA. They will be known collectively as the Earth Observation Satellite Data and Information System (EOSDIS). The seven centres are: The Alaska Synthetic Aperture Radar Facility, University of Alaska-Fairbanks; the EROS Data Center, Sioux Falls, S.D.; NASA's Goddard Space Flight Center, Greenbelt, Md; NASA's Jet Propulsion Laboratory, Pasadena, Calif; NASA's Langley Research Center, Hampton, Va; NASA's Marshall Space Flight Center, Huntsville, Ala; and the National Snow and Ice Data Center, University of Colorado-Boulder. If fully implemented, EOS will cost \$27 billion.

## Japan Proposes International Satellite Agency

While EOS gathers pace in the United States, the Japanese aerospace industry is promoting a plan for an international organisation, modelled on Intelsat, to operate a 32-satellite earth observation system. The Japanese government, which plans to launch its own satellites during this decade, has not yet supported the idea, reports *Space News* (25/2/91 - 3/3/91).

The plan is being seen as a purely private sector development. A delegation from China is due to visit Japan this month to discuss the plan. The system would be operated by a consortium similar to the 119 member International Telecommunications Satellite Organisation, based in Washington. The Japanese see existing systems such as the French SPOT and US Landsat satellites being integrated into the new system.

## CFE Tanks In Storage

The Bush Administration is continuing to delay submission of the CFE Treaty to the Senate for ratification due to continuing disputes with the Soviet Union about destruction of equipment limited by the Treaty and the removal of more than 10,000 tanks, 4000 other AFVs and more than 20,000 artillery pieces to a depot East of the Ural Mountains. 2100 TLE's have also been transferred to Soviet Navy command. The Arms Control and Disarmament Research Unit of the British Foreign Office states in its *Notes on Arms Control* (February 1990) "This creates the absurd effect of the Soviet Navy having more tanks than the British Army". NATO is unlikely to table new proposals in the CFE 1A and CSBM negotiations until the problems have been dealt with. The CFE Joint Consultative Group, still meeting in Vienna, is charged with the resolution of these disputes.

## British Government Publishes CFE Bill

The British Government published the Arms Control and Disarmament (Inspections) Bill on February 28. It will become "An Act to facilitate the carrying out in the United Kingdom of inspections under the Protocol on inspection incorporated in the Treaty on Conventional Armed Forces in Europe, signed in Paris on 19th November 1990; and for connected purposes." An explanatory memorandum accompanying the Bill states that "The Bill creates rights of entry for the purposes of conducting challenge inspections under the Protocol (i.e. inspections by States party to the Treaty of particular areas specified by them), and confers privileges and immunities on inspectors and transport crew members in connection with all inspections under the Protocol."

"The costs arising from the Bill will be paid from existing budgets; the Bill will not bring about an increase in public expenditure," states the memorandum.

## Ex-WTO States To Assist CFE Verification

Informal discussions in Vienna and Brussels suggest that former members of the Warsaw Treaty Organisation might be willing to work with NATO in verifying Soviet compliance with the CFE Treaty. Hungary, Czechoslovakia and Poland favour a system whereby all CFE signatories would share information gathered during on-site inspections. This will be in NATO's interest since the treaty allows some group inspections and so some of the passive inspection quotas, which NATO was expecting to use, will be taken up by ex-WTO members.

## SNF On Hold

The Spring round of NATO high level meetings is unlikely to produce a unified position on negotiating any treaty on short-range nuclear forces (SNF). There appears to be little pressure within NATO to pursue negotiations, partly as a consequence of disputes with the Soviet Union over implementation of the CFE Treaty (see elsewhere in this issue). Yet NATO officials believe SNF will still be banned from Europe within one or two years.

Verification of an SNF Treaty would be complicated because of the large number of shells, missiles and free-

fall bombs that would fall into the sub-500km category. The extremely detailed CFE verification regime could therefore hold useful lessons for an SNF Treaty. A major problem will be that many SNF delivery systems are also capable of delivering conventional warheads.

The US currently has 1400 - 2000 short range nuclear missiles and artillery shells in Europe while the USSR has over 1000 Scud-Bs and Frog/SS-21s. President Bush has already announced that the aging Lance missiles and 155mm and 203mm shells will not be modernised.

Some NATO governments would prefer a non-binding political agreement on SNF, while others, such as Norway (who fear transferral of Soviet nuclear forces to the Kola Peninsula), continue to press for a formal treaty.

## Chemical Weapons Convention

A private study has suggested that the inspection regime being developed at the 40-nation Conference on Disarmament in Geneva, with regard to a chemical weapons convention would need supplementing in order to provide assurances that legitimate chemical processes are not diverted to weapons production.

The study, by Amy Smithson and Michael Krepon of the Henry L Stimson Center's Multilateral Verification Project, proposes aerial inspections of chemical facilities by aircraft equipped with a variety of sensors, used in conjunction with on-site and other inspections, reports *Defense News* (11/3/91). Optical cameras, infrared sensors and synthetic aperture radars are all suggested as possible means of enhancing the value of such overflights. These methods would not be cheap. This, coupled with US unwillingness to share sensitive reconnaissance technologies is bound to pose difficulties for those trying to include such proposals in a chemical weapons convention.

Meanwhile, Germany and the United Kingdom recently presented a report of two joint chemical weapons practice challenge inspections to the Conference on Disarmament. The report, presented on February 8, is designated CD/1056 CD/CW/WP.330.

## CTBT Verification

Aaron Tovish of Parliamentarians for Global Action has pointed out a misprint in last month's *Trust and Verify* and adds some comments of his own: "The text (in *Trust and Verify* 17) was incorrectly reported as requiring the global monitoring network to be designed to detect a .5kt explosion only within any state which has conducted more than one nuclear explosion. For the record, I quote from the draft:

"The network shall have at least the reliable capability to detect, locate and identify a tamped explosion of 500 tons or more of TNT equivalent anywhere in the world and of 5 tons or more of TNT equivalent within the limits of national jurisdiction of any state which has conducted more than one nuclear explosion."

"Clearly all parties will be monitored to the .5kt level (which could be lowered at a later date). States that have had nuclear testing programmes would be monitored more stringently, down to .005kt. This is proposed because testing programmes may have allowed states to gain knowledge in two key problem areas for verification: (1) very low-yield nuclear explosions, and (2) explosions in

cavities. Without such experience a state would be facing extraordinary risks in attempting to conceal a nuclear explosion in an excavated cavity. Explosions in the near-kiloton range would be detected by the global Network; any effort to decouple such an explosion would require an immense cavity and thereby risk detection. The development of small sub-kiloton explosions requires extensive experience at higher yields. Therefore, without the prior experience of series of nuclear explosions, a state does not represent a credible cheating threat below .5kt tamped. The most stringent definition of a nuclear testing programme that one can devise, short of calling a single test a programme, is "more than one test." It could have been reasonably put at five or ten nuclear explosions."

"Obviously the only country that is affected by this distinction is India, which conducted an underground nuclear test explosion in 1974. India prefers to be considered a non-nuclear weapon state. This paragraph does not go that far; it considers India a non-test programme state. This seems a reasonable designation for a state that has not tested in 17 years."  
Aaron Tovish, PGA, New York.

## In The News

### Too Much Tongasat

*Trust and Verify* No. 14 (October 1990) reported international concern over the activities of Tongasat, the venture headed in Tonga by US entrepreneur Dr. Matt C. Nilson. Now *Space News* (18-24/2/91) reports Dr. Nilson's defence of the organisation's activities. He says Tongasat has nothing to hide. The Tongan government was investigated by the International Frequency Registration Board, Geneva, which allocates satellite orbiting positions and registers frequency requests. Tonga had requested 27 satellite parking spots to orbit 31 communications spacecraft. Nilson said that in fact 30 filings were made for 13 positions. Some of the filings were for duplicate parking spots. Nilson added that only six positions are actually needed for adequate coverage. The IFRB were notified of this before any investigation took place, said Nilson.

### Disposal of Treaty-Generated Waste

The Annual Meeting of the American Association for the Advancement of Science in Washington discussed the problem of excess bomb-grade plutonium and uranium likely to result from nuclear arms accords such as the

pending START treaty. Proposals reported in *Defense News* (25/2/91) included using it to fuel commercial reactors and powering submarines, storing it at declared facilities, such as the Nevada test site or another facility which would come under International Atomic Energy Agency regulations in line with the nuclear Non-Proliferation Treaty. Experts also proposed methods of preventing the spread of bomb-grade material, such as controls on the export and development of material enrichment technologies.

### Biological Weapons Convention Review

The third review conference of the multilateral Biological and Toxin Weapons Convention (1972) is to be held in September 1991. The review is likely discuss possible improvements to the convention, including more extensive verification procedures.

### Soviet Withdrawals Slower Than Hoped

Soviet withdrawals from Eastern Europe, including the former East Germany, is not happening as quickly as intended. It is also likely to prove more costly than expected. Col. Gen. Matveh Burlakov, Commander of the Western Group of Forces (WGF) speaking in *Jane's Defence Weekly* (16/3/91) believes the main problem is the Polish government's refusal to allow withdrawing troops and equipment to pass through Polish territory. Only half the envisaged number of soldiers and 70% of arms and equipment due for withdrawal in January and February have been moved.

## VERTIC News

Throughout the Gulf crisis, VERTIC's technical expertise on the role of satellites in the Middle East was sought on a regular basis by the media. Even after the end of the war, VERTIC's interpretation of METEOSAT images of the Kuwaiti oil well fires was of great interest to the press. VERTIC technical consultant Vipin Gupta of Imperial College was widely quoted on the subject, (for example *Daily Telegraph* (25/2/91), *New Scientist* (2/3/91)) as well as publishing two articles ("Weather Eye on the Gulf War", *The Guardian* 15/3/91 and "METEOSAT Lifted Fog of War to Expose Reality in Gulf", *Defense News*, 18/3/91. Mr Gupta was also interviewed for an article in *The Guardian* (20/2/91) on the role of satellites with regard to so-called "smart" weapons.

Thanks to Shelley Williscroft for all her hard work with VERTIC and we wish her success in her new job.

### **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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