SATELLITES FOR WAR AND PEACE

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Abstract

Space systems and, in particular, military space observation satellites were used and contributed extensively in the United Nations forces victory in the Gulf war. This and other developments, such as the creation of an "Open Skies" regime, the enlargement of the "Open Skies" concept by the Soviet Union, the acceptance of the military observation's legality by the Soviet doctrine, and the START Treaty, provided additional confirmation of the military space observation's customary legality. The purpose of this study is therefore to present these developments of war and peace, examine their influence towards the acceptance of the military space observation's customary legality, and reiterate the need for its codification.

A. INTRODUCTION

Observation of the Earth from space for military purposes (military space observation) is largely practiced and its importance for monitoring compliance with arms control agreements and maintaining peace and stability on Earth is aknowledged. Recently, space systems and, in particular, military space observation satellites were used and contributed extensively in the United Nations forces' victory in the Gulf war.

Although the United Nations forces have relied heavily on those systems and their services, military space observation has not been formally recognized to be free and legal nor is it fully regulated or protected by any international agreement. In doctrine it has even been maintained that military space observation is not customarily legal.[1]

In a study presented last year by this author, however,[2] the military space observation's customary legality was demonstrated. The presence of all three elements necessary for custom formation was shown: (A) the existence of a long duration, extended among Nations, and characterized by conformity of conduct international practice ("longua consuetudo"); (B) the acceptance or belief in the legality of this practice ("opinio juris"); and/or (C) the conviction that military space observation and its (customary) legality are necessary ("opinio necessitatis").[3]

Recent developments provide additional confirmation of the military space observation's legality are: the proposal to create an "Open Skies" regime, the enlargement of the "Open Skies" concept by the Soviet Union, the acceptance of the military observation's legality by the Soviet doctrine, the extended use of satellites during the Gulf war (operations Desert Shield and Desert Storm), and the signing of the START agreement. Thus, the aim of this study is to present the above developments of war and peace, examine their influence towards the acceptance of the military space observation's customary legality, and reiterate the need for its codification.

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B. THE "OPEN SKIES" REGIME

The "Open Skies" idea was first proposed in 1955 by President Eisenhower. It was reiterated on May 22, 1989, by President Bush. The President declared:

> "Now, let us again explore that proposal, but on a broader, more intrusive and radical basis, one which I hope would include allies on both sides. We suggest that those countries that wish to examine this proposal meet soon to work out the necessary operational details, separately from other arms control negotiations. Such surveillance, complementing satellites (emph.ad.), would provide regular scrutiny for both sides".[4]

In another declaration, President Bush said on satellites and "Open Skies":

> "Satellites are a very important way to verify arms control agreements, but they do not provide constant coverage of the Soviet Union. An open skies policy would move both sides closer to a total continuity of coverage while symbolizing greater openness between East and West."[5]

The basic purpose of the Open Skies concept is to encourage reciprocal openness on the part of the participating States and to allow the aerial observation of military activities and installations on their territories, thus enhancing confidence and security. Open Skies would complement both National Technical Means (NTMs) of data collection and information exchange, and verification agreements established by current and future arms control agreements. All members of the NATO and the Warsaw Pact were invited to participate in the Open Skies regime, to be created by a multilateral treaty, and to submit to inspection all their territories in North America, Europe and Asia.[6]

More precisely, the Open Skies regime had to be based on the following guidelines:

— The commitment of the parties to greater transparencey through aerial overflights of their entire national territory, in principle

without other limitations than those imposed by flight safety or rules of international law.
— The possibility for the participants to carry out such observation flights on a national basis or jointly with their allies.
— The commitment of all parties to conduct and to receive such observation flights on the basis of national quotas.
— The establishment of agreed procedures designed to ensure transparency and flight safety.
— The possibility of the parties to employ the result of such overflights to improve openness and transparency of military activities as well as ensuring compliance with current or future arms control measures.

The "Open Skies" regime would apply only to airspace. It does not mean "openness of the air space of a State for activity in it by other States", but "openness of a State's military activities for agreed air surveillance".[7] State sovereignty in air space is not abolished. However, "Open Skies" is an important concession of state sovereignty to military aerial surveillance.

At the Ottawa Conference of February 11-13, 1990, Soviets opposed the "Open Skies" extensive aerial surveillance of their territories. The major "stumbling block" was the Soviet proposal for the two alliances to share a pool of reconnaissance aircraft and to share the data gathered from the flights.[8] During the three week (April and May) Budapest talks on "Open Skies", however, the ex-Warsaw pact countries did not agree on all points with the Soviets, but they did agree on several key provisions that are being resisted by the West. It should be pointed out that, overall, Soviets and their ex-allies did not disagree on the idea of aerial surveillance. What they disagreed upon with the West is a number of technical issues concerning, i.e., number of overflights, cameras to be used, areas to be overflown, etc.[9] According to press reports, the consensus on the desirability of "Open Skies" was already reached at the Ottawa meeting.[10]

Although the "Open Skies" proposal mentions the importance without suggesting anything concrete for military space observation, the proposal may have its implications for the activity. In order to evaluate these implications, one has to consider that sovereignty has never been exercised in outer space, that "outer space has long been open for exploration and use by all states", and that military observation has long been exercised from outer space. Therefore, if States consent to break even the sanctuary of territorial airspace and open their military activities to aerial observation, this confirms that military space observation, exercised from an international milieu, is more than accepted. Moreover, if States want to institutionalize military aerial observation through the "Open Skies" regime, this, consequently, creates for them the obligation to do the same with military space observation.

The last important element of the "Open Skies" regime to be considered for outer space is its "multilateral nature". If a multiparty agreement is proposed for legalizing and undertaking military aerial observation, then the type of this agreement should be accepted for legalizing and regulating military space observation.

C. THE SOVIET "GLOBAL OPEN SKIES" or "OPEN OUTER SPACE"

In the Conferences on "Open Skies", Soviets proposed that openness should also be extended to outer space and that the regime of "open outer space" be established.[11] According to Vereshchetin, the reference is here to the openness of the military activities of States for surveillance and control on a mutual and equal basis by other States, to openness that would extend to observation from space of military activities on land, at sea, in the air, and in outer space itself. The reference is to openness accessible not only to "national technical means" of the USSR and the USA, as stipulated in some bilateral agreements in force between them, but to other interested States as well.[12]

Moreover, in the 1990 session of the Conference on Disarmament, the USSR developed the concept of "Open Outer Space" as a compendium of initiatives submitted by various States and regarding confidence- and security-building measures. The "Open Outer Space" model included:
— the strengthening of the 1975 Registration Convention;
— "Rules of the Road" - Code of Conduct;
— the use of satellites for verification, control and data transmission purposes; and
— the setting up of an International Space Inspectorate.[13]

D. THE SOVIET DOCTRINE

In his article "Towards Global 'Open Skies'", Professor Vereshchetin questions the rationality of States "rejecting suggested drafts of multilateral agreements on conducting surveillance and verification from outer space and in it", "while discussing the possibility to open their military activity for air verification" and wonders "why should the limits of openness, transparency and confidence coincide with boundaries between air space and outer space (emph.ad.)?" He also indicated that "'bipolarity' in using 'national technical means' to control the compliance with international obligations was more than once under severe criticism both at international forums and in the literature. At that, mention was made of the advantages, with regard to the security of States, if such an activity is effected on a multilateral basis. At eliminating 'bipolarity' in monitoring from outer space are aimed the proposals to institutionalize this activity and to establish with this purpose in mind an international agency."[14]

In these comments it is correctly pointed out that the behavior of some (Western) States regarding air and space surveillance is not consequent, and that space monitoring on a multilateral basis - exactly in the spirit of the Open Skies proposal - provides more advantages for the security of States. It should be stressed, however, that these States never wanted a boundary between air and outer space and never opposed space surveillance. Their sole objection, and not of all the Western countries, is the creation of another "international agency".

Concerning the delimitation of air and outer

space. Professor Vereshchetin adds that the Western States' opposition "becomes more paradoxical if we recall that this boundary (between air and outer space) is not fixed by any treaty". If this position is compared with the longtime Soviet opposition to the delimitation of outer space[15] and to military space observation, then we realize a welcome change of doctrinary position on these issues.

This doctrinal change is confirmed in the proposed concept of "Global 'Open Skies'"; "Globality" of open skies means for Vereschetin:
— "Inclusion in the 'Open Skies' concept of both air space and outer space";
— "carrying out monitoring the whole of the territory of the globe (including the air and near-earth space); and
— "maximal internationalization of the monitoring methods and means".[16]

E. THE GULF CRISIS: OPERATION "DESERT SHIELD"

1. Photo reconnaissance satellites (recsats).

a. Western Satellites.

Shortly before the invasion of Kuwait, a KH-11 satellite picked up on 100,000 Iraqi troops along Kuwait's border and a new "logistics train" that gave Saddam Hussein everything he needed to invade. Unfortunately, miscalculations and misperception did not permit any action preventing the invasion.[17] The United Nations thus came to undertake operation Desert Shield.

The Gulf crisis marked the first time U.S. reconnaissance satellite operations have been placed essentially on a wartime footing. Space based photography was so intensive during the crisis that it pushed the CIA's processing and analysis facilities to the limits of their capability. All the major Presidential policy decisions during the crisis were supported by CIA imaging satellite data and National Security Agency radio intelligence intercepts, which also involve satellite systems.[18] Defense Mapping Agency personnel also were doing extensive work with reconnaissance satellite imagery to calculate the precise coordinates of potential Iraqi targets. This was being done to update the guidance systems of Tomahawk cruise missiles on U.S. Navy ships and for planning potential bombing strikes by U.S. Air Force and Navy air crews.[19]

The Iraqi crisis area was observed by more U.S. imaging reconnaissance satellites than the U.S. had ever had in orbit at one time. As many as five imaging spacecraft were providing imagery on the Saudi/Iraqi/Kuwait border area. Two of the reconnaissance spacecraft were the KH-11-7 and the KH-11-8 satellites.[20]

Photo reconnaissance satellites are in near-polar orbits; each orbit takes approximately 90 minutes, so each satellite orbits the Earth 16 times a day. As the Earth rotates, the satellite passes over a particular spot on only some of the orbits and is over the area only a few minutes; thus, these satellites cannot hover over a target.[21] The photo recsats had however been stabilized on ground tracks so one of the two spacecraft would pass directly over the Persian Gulf area every two days. Moreover, the digital optical systems on the KH-11s have a significant slant-range capability. This means that they can provide useful imagery on targets well to the east or west of their ground tracks. It is likely that on days when the two spacecraft did not pass directly over the Gulf area, they could still pass close enough to provide useful imagery by pointing their optics to the left or right of the ground track.[22]

b. Soviet satellites.

The USSR had also geared its reconnaissance satellites to monitoting the Gulf area. The spacecraft involved were:[23]
- Cosmos 2,037 was a long duration, digital imaging, advanced Soviet reconnaissance satellite, launched several weeks prior to the Iraqi invasion and continued providing intelligence imagery of the area[24] for some more weeks since it had a total life of 59 days.[25]
- Cosmos 2,072, a long-duration recsat, was launched on April 13, provided a continuous coverage of the area.[26]
- Cosmos 2,086 was launched on July 20, and for the first several days performed routine surveillance. On July 28, when the Soviets began to fear an Iraqi invasion of Kuwait, the Soviets lowered the spacecraft's orbit. This had the effect of changing the Cosmos 2,086 orbit so it would make a photographic pass directly over the crisis area once per day. The satellite was returned to Earth on August 3, a day after the invasion.[27]
- Cosmos 2,089 was launched on August 3 to replace the one returned to Earth. It is a Soviet fourth-generation high resolution satellite which returns film capsules to Earth, while the spacecraft continues the mission. Within a week of its launch, the Soviets manoeuvered the spacecraft for daily photographic passes over the Gulf.[28]
- Cosmos 2,099, launched on August 31, 1990, flew a two week routine mission.[29]
- Cosmos 2,101, a fourth generation Soviet reconnaissance spacecraft, was launched on October 1, 1990.[30]
- Cosmos 2,102, similar to the previous, was launched on Oct. 16, manoeuvered close to the area at a very low earth orbit. On October 25, Soviets commanded the satellite to lower altitude and obtained higher resolution pictures. On November 2, the satellite was again raised to a higher orbit.[31]

2. Radar Reconnaissance Satellites.

The Lacrosse imaging radar spacecraft, in a near-polar orbit, was also providing extensive radar imagery for the U.N. forces. This type of imagery is not affected by the day/night cycle or obstacles such as clouds and sand. In the case of the Gulf area, the data was enhanced by the dry, sandy terrain of the crisis area and the radars ability to spot Iraqi tank forces.[32]

3. Signals Intelligence Satellites.

"Sigint" satellites, operating from a geosynchronous orbit 36000 km above the equator, a classified number of electronic ears - including the giant MAGNUM, which uses antennas one-third the size of a soccer field - eavesdroped on Iraqi communications.[33] Besides the MAGNUM, the U.N. forces used the U.S. CHALET geostationary satellite and the U.S. Navy's WHITE CLOUD three satellite system, operating in polar orbits. Some observers have argued that the advanced KH-11s carry also "sigint" packages.[34]

4. Remote Sensing.

Besides the use of the American LANDSAT remote sensing images, American military reportedly bought 184 out of the 222 presented SPOT satellite images, whose resolution is less than 10 meters. These images provided basic information for the planning of missions. It has been reported that the Baghdad bombings and the bombings to prevent the spill of oil into the Gulf were based on Spot images. Data from remote sensing and reconnaissance satellites were filled in a digital form in the computers of the 70 most sophisticated bombers which carried out precision bombings.[33]

5. Meteorological Satellites.

The Air Force Space Command maintains 2 Defense Meteorological Satellite Program (DMSP) Block 5D-2 spacecrafts, operating at all times in 530-mile-high polar orbits, to provide detailed information to U.S. military forces around the world. Some of the pictures taken by the Block 5D-2 satellite were published in AW&ST;[34] the first was taken in August 3 and the second in September 3, 1990.

Each spacecraft flew over the Gulf region twice per day, providing day/night meteorological and night lighting information. Each image spanned about 1860 mi, with views extending from Cairo, Egypt, and Tel Aviv, Israel in the west to the Gulf of Oman in the east. Easily visible under the moonlight were major geographical features in relation to the lights of civilian, industrial and military installations, gas flares at oil installations, urban areas, and positions where Iraqis held important military installations, such as three lakes near the Scud bases.[37]

The Block 5D-2's sensors measure temperature and moisture content of the atmosphere and soil, the location and intensity of the Earth's aurora. These details help military radar operations and communications affected by auroral events.[38] Another sensor measures the sea-surface temperatures in order to aid U.S. Navy vessels (and allied vessels). DMSP spacecraft sensors were also used for three-dimensional cloud analysis to form computer models for use in specialized military operations. The work of the Block 5D-2 satellites was completed by the National Oceanic and Atmospheric Administration (NOAA) satellilte systems, known as NOAA and GOES, and by the EUMETSAT's METEOSAT satellite.[39]

6. Navigation satellites.

Orbiting 20000 km above the Earth, fifteen Navstar Global Positioning System (GPS) satellites broadcast continuous navigational data that enables telephone sized receivers on earth to calculate longitude and latitude to within 10m.[40] The U.N. forces have used extensively the Navstar positioning system; they had only to turn on the SLGR receivers and their positioning data were displayed.[41]

F. WAR: OPERATION "DESERT STORM"

1. Reconnaissance satellites.

Recsats were used as the primary source of information for bomb damage assessment and attack mission planning. The U.S. had been operating six or seven operational military imaging spacecraft - more than at any other time. During the early days of the war, these satellites provided specific bomb damage assessment data on the destruction of strategic targets such as large nuclear and chemical facilities. The spacecraft also provided high-resolution imagery of more tactical targets, such as airfield damage, as well as broader area surveillance to help characterize damage to Republican Guard emplacements on the Iraq/Kuwait border.[42]

2. Early Warning Satellites.

Two early-warning satellites were used for Scud attack warning, and at least the one, parked over the Indian Ocean at all times, used its infrared eye to scour Iraqi territory every 12 seconds for the hot flare of a missile launch. First, the satellite sent its data simultaneously to an Air Force ground station in Woomera, Australia, and to the U.S. Space Command's Missile Warning Center near Colorado Springs. Computers in Colorado instantly sorted through the information, identified individual missiles, projected target areas and flashed the results by satellite back to the gulf. All this happened in time for air-raid sirens to sound four to five minutes before the missiles complete their seven-minute journey.[43]

Another more direct route had increased the odds of intercepting the Scuds. According to Time and AW&ST, Patriot batteries were receiving unprocessed alerts directly from the early-warning satellites.[44]

Besides early-warning, these satellites provided some additional imaging intelligence information. In fact, the two satellites use advanced infrared telescopes with 6,000 infrared detectors, compared with the 2000 detectors used in older models. The 4,000 extra detectors enabled the spacecraft to see not only Scud launches but also infrared details as small as the afterburner plumes from fighters operating over the Persian gulf. Afterburner data were studied for their intelligence value.[45]

3. Communications Satellites.

In both operation "Desert Shield" and "Desert Storm" communication satellites played a very important role. All satellite data analyzed in the USA were beamed by communications satellites to commanders in the Gulf area,[46] who received them via mobile receiving stations.[47]

During operation "Desert Storm" some of the information was transmitted to the Persian Gulf forces in near real time. Essential information on the enemy order of battle was provided by a system designated "Constant Source". The system was based on portable ground stations that could be used with KH-11 digital imaging spacecraft, with advanced versions of the KH-11 and with the Lacrosse imaging radar spacecraft. The resulting data could be sent directly to the commanders.[48]

Besides American satellites, the United Nations forces used the British "Skynet" and the "NATO" military telecommunications satellites, the

"Syracuse" military package aboard the French Telecom 1 satellite, and a large number of civilian telecommunications networks. Such civilian networks were INTELSAT, INMARSAT, EUTELSAT, ARABSAT, and PANAMSAT.[49]

G. THE STRATEGIC ARMS REDUCTION TALKS or START TREATY

The Treaty signed by Presidents Bush and Gorbachev on July 31, 1991, will allow the superpowers to keep only 9,000-odd nuclear warheads, while scrapping some of their long-range nuclear weapons.[50] Reductions will take place over a period of 7 years, and will result in parity between the strategic nuclear forces of the two sides at levels approximatively 30% below currently deployed forces. The Treaty includes a wide variety of very demanding verification measures designed to ensure compliance and build confidence.[51]

Besides the on-site verification methods in order to inspect missile warheads, monitor weapons assembly plants, view bombers and mobile missiles at close range, and the exchange of missile flight tests data,[52] the Treaty provides for the use of National Technical Means and of cooperative measures to improve their effectiveness of intelligence collection.[53] National Technical Means (NTMs) are a mixture of satellites, radars and other devices, and during negotiations were expected to be one of the backbones of the verification system.[54]

NTMs' technology has made important progress and new techniques and equipment were expected to be used for the verification of the START Treaty. The Global Positioning System satellites were equiped with new sensors and the system is already used for monitoring compliance with the old Partial Test Ban Treaty.[55] Moreover the Defense Depatment's On-Site Inspection Agency (OSIA), created to monitor the INF Treaty, could be using the Navstar for short-notice inspections of fielded ICBMs under the START Treaty. Inspectors assigned to count reentry vehicles in a specific missile might have trouble in winter weather conditions being sure that they were at the right silo in a Soviet missile field. A GPS receiver would provide location information precise enough to eliminate doubt.[56]

H. CONCLUSION

This study has shown the importance of military space observation for peace and war (or the maintenance of peace through war) and confirmed the activity's customary legality. More analytically:

a. The fact that all NATO and ex-Warsaw pact countries accept the principle of aerial inspection of their territories and, thus, make concessions in their sovereignty, and, also, perceive "Open Skies" as a complementary method to satellite verification of arms control agreements, shows that not only the space powers but also the non-space ones accept the legality of and the need for military space observation.

b. Soviet arms control proposals and Soviet doctrine show not only that this country has already abandoned its opposition to military space observation but, also, the Soviet willingness to regulate this activity.

c. Crisis and war events in the context of a United Nations "collective security" action show the importance of military satellites for "collective security". In fact, since military observation satellites, and all satellites in general, were used in the Gulf war by the United Nations forces and no country, not even Iraq, protested against their use, one may argue that the members of the United Nations, since that war, accept as legal the use of military space observation in peacetime (before the outbreak of hostilities: operation "Desert Shield") and in war (operation "Desert Storm").

d. The Soviet-American START Treaty for one more time confirmed the legality of their observation satellites and has contributed to the codification of their legality. As in the INF Treaty, the START Treaty is asking for cooperative measures in order to facilitate verification by satellites.[57]

Having these conclusions in mind, it may be suggested that:

a. It would be useful that the military space observation's legality be codified by an agreement, which would institutionalize the "immunity" of all countries' observation satellites. Such a measure would clarify the rules for space activities, increase security and build confidence in space, and open the way to new arms control agreements, such as the prohibition of weapons in space.

b. How such an agreement, codifying military observation satellites' legality, could be negotiated and under which form should be elaborated? The "Open Skies" process shows perhaps the way to the solution. "Open Skies" was initiated as a multilateral process and was expected to become a multilateral agreement. Why then could not a multilateral agreement clarify the "rules of the road" in space and regulate military observation from space? While this minimum approach could be the starting point, States could also refrain for the time being from proposing the creation of new international organizations in order to manage military space observation.

Notes

1. Dutheil de la Rochere J.: "Les sources du droit de l'espace", in: Dutheil de la Rochere J.: Droit de l'espace, Paris, Pedone, 1988, p. 26.

2. "The Customary Legality of Military Space Observation and Proposals Towards its Codification", Proceedings of the 33rd Colloquium on the Law of Outer Space, Washington D.C., AIAA, 1991, pp. 305-315.

3. See the very interesting comments of Eduardo Jimenez de Arechaga, ex-President of the International Court of Justice about custom formation and the position of the Court on this matter, in Cot J.-P., Pellet A. and Tavernier P.: La Charte des Nations Unies, Economica-Bruylant, Paris, 1985, pp. 1254-5. These comments confirm the validity of the used method inn order to demonstrate the military space observation's customary legality.

4. Weekly Compilation of Presidential Documents, May 22, 1989, Vol. 25, No 20, p. 702.

5. Ibid., June 5, 1989, Vol. 25, No 22, p. 815.

6. "Open Skies: Basic Elements", Agreed by the North Atlantic Council Meeting in Ministerial Session at NATO Headquarters, Brussels on 14th and 15th December 1989, in NATO Review, No 6, December 1989, pp. 27-28.

7. Vereschchetin V.S.: "Towards Global 'Open Skies'", Proceedings of the 33rd Colloquium on the Law of Outer Space, Washington D.C., AIAA, 1991, p. 259.

8. Facts on File, Vol. 50, No 2569, Feb. 16, 1990, p. 97.

9. AW&ST, 6/8/1990, pp. 59, 60.

10. Supra No 8.

11. See Shevardnadze's address at the Conference, Izvestia, Feb. 13, 1990, in Vereschetin, supra No 7.

12. Ibid..

13. See Suss B.: "Possible Steps at Strengthening and Developing the International Legal Regime Regarding Immunnity and Protection of Objects in Outer Space", paper presented at the 33rd IISL Colloquium on the Law of Outer Space, Dresden, 6-12/10/1990, p. 6.

14. Supra No 7, pp. 259-260.

15. See Vereschetin, Vasilevskaya & Kamenetskaya: Outer Space - Politics and Law, Progress Publishers, Moscow, 1987, pp. 55-65. See also Vasilevskaya E.; Delimitation of Air Space and Outer Space, in Space and law, edited by the USSR Academy of Sciences, Moscow, 1985, pp.29-56.

16. Supra No 7, p. 260.

17. Newsweek, January 28, 1991, p. 37.

18. AW&ST, 3/9/1990, p. 30.

19. Ibid., 3/9/90, p.30.

20. Ibid.. Another shuttle intelligence payload, launched in August 1989, into a low-altitude, high inclination orbit was also believed to be an advanced KH-11 returning imagery of the crisis area; see ibid.. 3/9/90, p.31 and AW&ST; 4/2/91, p. 25.

21. Smith M.: "Military and Civilian Satellites in Support of Allied Forces in the Persian Gulf War", CRS Report for Congress, The Library of Congress, Feb. 27, 1991, p. 9.

22. AW&ST, 3/9/90, p.30.

23. Ibid., p. 31.

24. Ibid.

25. AW&ST, 19/11/1990, p. 24.

26. Ibid.

27. AW&ST, 3/9/90, p. 31.

28. Ibid.

29. AW&ST, 19/11/90, p. 24.

30. Ibid.

31. Ibid.

32. AW&ST, 3/9/90, p. 31.

33. Time, 4/2/91, p. 39.

34. Supra No 21, p. 10.

35. Le Monde, 28/5/91.

36. 26/11/1990, p. 28.

37. Ibid., p. 29.

38. Ibid.

39. Supra No 21, p. 6.

40. Time, 4/2/91, p. 39.

41. Supra No 21, p. 5.

42. AW&ST, 4/2/91, p. 25.

43. Time, Feb. 4, 1991, p. 39.

44. Ibid.

45. AW&ST, 4/2/91, p. 26.

46. AW&ST, 26/11/1990, p. 29.

47. AW&ST, 3/9/90, p. 30.

48. Ibid.

49. Supra No 21, pp. 3-4.

50. The Economist, August 3, 1991, p. 42.

51. US Department of State Dispatch, Vol. 2, No 3, August 19, 1991, p. 620.

52. The Washington Post, 1/9/1991, p. A23.

53. Supra No 51, p. 621.

54. AW&ST, 6/8/1990, p. 48.

55. Ibid., p. 56.

56. Ibid., p. 57.

57. See Tavernier & Kuskuvelis: "The Intermediate-Range Nuclear Forces Treaty and the Space Military Regime", Proceedings of the 31st Colloquium on the Law of Outer Space, AIAA, 1988, p. 74-83.