Chapter 5

OTHER APPLICATIONS OF AERIAL SURVEILLANCE

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Summary

President George Bush's call in 1989 for a multilateral Open Skies Treaty resulted not only in Open Skies negotiations, but in a reexamination of the use of cooperative aerial surveillance for a wide variety of international applications. These applications include measures for confidence building (as in Open Skies) and monitoring (search, inspection, and warning).

Limited aerial surveillance in conjunction with on-site inspections (OSIs) is currently being used to observe large-scale military exercises in Europe under the Vienna Document of 1990. An extensive aerial surveillance regime is also being negotiated as aside agreement to the Conventional Armed Forces in Europe (CFE) Treaty that was signed on November 19, 1990. CFE overflights would be used as a complement to OSI and national technical means (NTM) of verification in monitoring treaty-limited items (TLIs).

Other possible applications for aerial observation can be found in a wide variety of potential international agreements. Agreements that limit objects or activities, that require measurements of chemical effluents in the air, or that provide for warning of threatening actions might utilize periodic overflights. Cooperative aerial surveillance, like NTM and OSI, is simply another form of observation. Whether to include aerial surveillance in a negotiated package depends on the characteristics of the items or activities being observed, the costs and benefits of the package, as well as its negotiability.

Introduction

Some Open Skies participants advocate expanding Open Skies to include not only the former members of the now dissolved Warsaw Treaty Organization (WTO) and the members of the North Atlantic Treaty Organization (NATO), but all European nations and perhaps others as well. At the same time, the CFE negotiators have committed their nations to further talks incorporating extensive aerial monitoring of compliance into the recently signed CFE Treaty. This chapter discusses a variety of conceivable future negotiations that might include aerial surveillance, e.g., an extension of Open Skies, CFE, and a Chemical Weapons Convention. While exploring some of the possible applications of aerial surveillance, OTA neither advocates nor rejects them.

Conference on Security and Cooperation in Europe and Open Skies

As mentioned in chapter 4, the Soviets (as well as some other participants) would like to invite those European nations not already included to join in the Open Skies negotiations. However, the NATO position is that an expansion of the talks at this time would only complicate the proceedings. Still, NATO stated in its initial proposal that it would be willing "to consider at an appropriate time the wish of any other European country to participate in the Open Skies regime."[1] As a first step, this could mean expanding participation to include not just the NATO and WTO states,[2] but the neutral and nonaligned (NNA) states as well.[3] These 34 nations already hold talks under the umbrella of the Conference on Security and Cooperation in Europe (CSCE).

The extension of Open Skies to all CSCE members would not be unprecedented. In 1986, the CSCE-sponsored Conference on Confidence- and Security-Building Measures and Disarmament (CDE)

[1]See app. D, article I, section 3, paragraph 5.

[2]The NATO countries are Belgium, Canada, Denmark, France, West Germany, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Turkey, the United Kingdom, and the United States. The Warsaw Pact states were Bulgaria, Czechoslovakia, East Germany (until unification), Hungary, Poland, Romania, and the Union of Soviet Socialist Republics.

[3]There are four neutral countries (Austria, Finland, Sweden, and Switzerland) and eight nonaligned countries (Cyprus, the Holy See, Ireland, Liechtenstein Malta, Monaco, San Marine, and Yugoslavia). The U.S. Government does not recognize the incorporation of the Baltic republics into the Soviet Union. Albania is the only other European nation not represented.

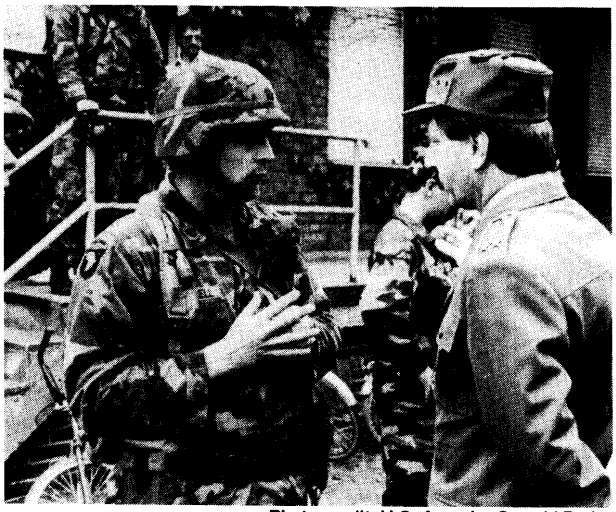


Photo credit: U.S. Army by Oswald Butler

U.S. Army officers listen to a Warsaw Pact observer of the 1987 NATO Reforger exercise in then-M&t Germany.

produced the so-called Stockholm Document[4] which permitted, among other things, aerial inspections of large-scale military activities with no right of refusal (except in the case of *force majeure),* but only in host-owned and host-operated aircraft (including helicopters). No sensors were to be installed on the aircraft and inspectors were to carry only binoculars and hand-held cameras.[6] Strict quotas were set on inspections (both air and ground). Each state would be subject to at most three inspections per year. No single state could inspect another state more than once per year. The Stockholm Document was superseded by the Vienna Document of 1990, which reaffirmed its predecessor and added further confidence- and security-building measures. As of June 15, 1990,40 inspections had been conducted.[7]

Either the Vienna Negotiations on Confidence- and Security-Building Measures (CSBM) or a revived CDE maybe the most appropriate established forum for Open Skies under the CSCE framework. (The CDE was split into the CSBM and the CFE talks-both opening on March 9, 1989.)[8] The CSCE, however, except in the case of CFE, has traditionally limited its territorial jurisdiction to the European continent, thus excluding North America. Alternately, the Open Skies talks could simply take more petitioners under their umbrella. Eventually, the concept of Open Skies could be broadened by inviting individual states into the system on a case-by-case basis, by taking all comers, or by moving the talks to the United Nations.

Conventional Armed Forces in Europe

The CFE nations are negotiating, somewhat in parallel with Open Skies, an aerial inspection protocol that was intended to be part of the monitoring arrangements for the Conventional Armed Forces in Europe Treaty. The 7 (now 6) WTO states and the 16 NATO nations—the same group as in Open Skies-opened CFE negotiations in March 9, 1989 with the goal of equalizing and reducing conventional force levels in the Atlantic Ocean to the Ural Mountains (ATTU) region. They signed a treaty during the CSCE Paris Summit of November 19-21, 1990. This treaty included provisions for brief host-operated helicopter flights over inspection sites,[9] but set aside more extensive and intrusive aerial monitoring provisions to be negotiated with

[4]The Stockholm Document entered intoforce on Jan. 1, 1987. Its official title is the Document of the Stockholm Conference on Confidence- and Security-Building Measures and Disarmament in Europe Convened in Accordance With the Relevant Provisions of the Concluding Document of the Madrid Meeting of the Conference on Security and Cooperation in Europe. For full text, see app. 10A in Stockholm International Peace Research Institute, *Sipri Yearbook 1989: World Armaments and Disarmament (New* York, NY: Oxford University Press, 1987).

[5]Ibid., paragraph 76 of the Stockholm Document.

[6]Ibid., paragraph 87 of the Stockholm Document.

[7]See U.S. Arms Control and Dis armament Agency, "Strengthening Stability Through Openness: The Vienna Negotiations on Confidence- and Security-Building Measures," July 1990, pp. 16-19.

[8]There is some overlap between CSBM and CFE, but in general CSBM deals with pan-European confidence- and security-building measures (including inspections and observations) andCFE focuses on NATO-WTO conventional force reductions.

[9]These overflights are described in the CFE Protocol on Inspection, section VI, paragraphs 16-21. Although the parties involved in an overflight can agree to other terms, the standard provisions permit the inspecting country to specify in advance whether an inspection is to be conducted by foot, cross-country vehicle, helicopter, or a combination of all three. If the area to be inspected is less than 20 square kilometers and an overflight is requested, the host country must provide a helicopter large enough to carry two inspectors and one escort and fly them over the site for not more than 1 hour total. The pilot must allow the inspectors "a constant and unobstructed view of the ground" during which time the inspectors can use any of their equipment (portable passive night vision devices, binoculars, video and still cameras, dictaphones, etc.). The host country may delay, limit, or refuse flights over sensitive points, but must permit the rest of the site to beoverflown.

other loose ends in discussions dubbed "CFEIA."[10] Apparently, the parties believed that the CFE verification regime consisting of NTM, limited helicopter flights, and other cooperative measures including OSIs was sufficient for ratification. This implies that the aerial monitoring provisions of CFdE IA will be supplementary, and not essential.

Although CFE and Open Skies overflights are being negotiated by the same set of states (NATO and former WTO) and may end up with very similar operational procedures and technologies, crucial differences exist between the two aerial surveillance regimes.

The most significant difference is that, unlike Open Skies, CFE surveillance flights will help monitor compliance with specific treaty provisions, in addition to building confidence in general. Monitoring tasks might involve counting legal TLIs,[11] searching for and documenting illegal TLIs, observing exercises and troop movements, inspecting closed-out facilities and eliminated TLIs, and pre-OSI surveys. According to a Canadian diplomat, the Soviets have tried to limit the scope of the protocol solely to observing compliance; i.e., confinning that legal TLIs are located at permitted sites. The other CFE participants argue that the overflights must be able to search for violations of the treaty beyond declared sites, and in this way, also act as a deterrent to such violations.[12] CFE flights, like Open Skies flights, could, of course, also build confidence, but as the result of confined treaty compliance.

The primary CFE TLIs are battle tanks, armored combat vehicles (ACVs),[13] artillery, combat aircraft, and attack helicopters. To monitor such small TLIs will most likely require more advanced sensor capabilities (most notably, higher imaging resolution) than a minimal Open Skies regime.[14] As discussed in chapter 3, it takes one grade of resolution to detect an object (e.g., "There's something there.' '), another to recognize the object (e.g., ' 'It's a tank.' '), and quite another to identify it from technical details (e.g., "That tank is a Polish T-72. ''[15]

Photo credit: Department of Defense

One CFE TLI is the battie tank. Defined by weight and weapon capability, battie tanks wiii be iimited to 20,000 per aiiiance within the treaty's area of application.

A second major difference between Open Skies and CFE overflights is their respective territorial coverage: while CFE encompasses only the ATTU region of Europe, Open Skies includes all the territory of the participants. Most importantly, it also includes Soviet territory east of the Ural mountains. (Soviet military equipment reportedly has been transferred beyond these mountains to avoid being destroyed under the recently signed CFE Treaty.[16])

[10] Article XIV, paragraph 6 and article XVIII. (CFE IA has also been referred to as CFE 1A in the West and Vienna-1A by the Soviet official news agency TASS. See for example, ''I@pov Meets NATO Official for CFE Talks, " Moscow TASS in English, Dec. 3, 1990, in Foreign Broadcast Information Service, *Soviet Union Daily Report, FBIS-SOV-90-233,* Dec. 4, 1990, p. 1.)

[11] Also referred t. as ''treaty-limited equipment'' or TLE, this second term neglects the possibility that facilities and structures might also be limited.

[12] *The Arms Con trol Reporter: A Chronicle of Treaties, Negotiations, Proposals, Weapons, and Policy* (Brookline, MA: Institute for Defense and Disarmament Studies, 1990), p. 409.B.18.

[13] The term ACV includes armored personnel carriers (APCs), armored infantry fighting vehicles (AIFVs), and heavy armament combat vehicles (HACVs).

[14] As was stated in ch. 4, peter Jones believes that an all-weather, round-the-clock warning of massing forces has become the underlying standard Of adequacy in the Open Skies talks. [See Peter Jones, "CFE Aerial Inspections and Open Skies: A Comparison" in Heather Chestnutt and Michael Slack (eds.), *Verifying Conventional Force Reductions in Europe: CFE Z and Beyond* (Toronto, Ontario: Center for International and Strategic Studies, York University, 1991), p. 90.] The Soviets have not formally accepted this mission for Open Skies and argue more for symbolic flights. In either case, the requirement of CFE sensors to distinguish among types of TLIs and to count numbers accurately suggests a more extensive and sophisticated regime than that of Open Skies.

[15] See table *3-2* for targets and necessary ground resolution.

[16] ''Figures Row Suspends CFE,'' *Jane' s Defence Weekly, Mar. 2,* 1991, p. 290.

Box S-A—Airborne Monitoring of Chemical Weapons—Three Cases

The size of the chemical stockpiles to be monitored and their supporting infrastructure are important considerations when evaluating the potential success of aerial monitoring in supporting the goals of an agreement.

A group could both make and store sufficient amounts of chemical agent for its terrorist acts (measured in gallons) in just about any building. Overhead imaging sensors would reveal no clues to this activity and door-to-door searches would be impractical and prohibitively expensive (as well as illegal in many countries). Extremely sophisticated air sniffers and samplers might narrow the area of search but probably not appreciably so. Thus, the role for aerial surveillance appears dubious.

However, in the ease of chemica1 stockpiles sufficient for waging war between nations (rneasured in hundreds or thousands of tons), the potential role for aerial monitoring grows. Such a capability entails not only substantial chemical weapon production and storage facilities, but also the development of reliable delivery systems and, to some extent, operational training, Clearly, the number of potentially observable secondary characteristics grows with the size of the chemical stockpile and its support infrastructure.

If the negotiators of a potential chemical arms accord are concerned only with revealing militarily significant quantities of chemical weapons in time for other signatories to take appropriate counteractions, then aerial surveillance might be useful. Overflights in this case would no longer be looking for laboratories hidden in basements,but for large-scale chemical plants and storage areas, test ranges, and chemical offensive exercises, Thus, unlike the terrorist case, an aerial monitoring system, in conjunction with national technical means (NTM) of verification and on-site inspection (OSI), might be useful.

The enormous chemical stockpiles of the Soviet Union and the United States (measured in tens of thousands of tons) were designed to be used in a massive Central European conflict between two well-protected alliances.[1] They were meant at least as much to slow down and impair military activities on a continental scale as to inflict casualties. Although any nation possessing chemical weapons might use them in war, such huge quantities are held only by the world's two military superpowers. The United States and the Soviet Union have other means of mass destruction, as well as awesomely powerful conventional capabilities, that can compensate for large [interstate-size) covert chemical stockpiles secreted by the other. They also both have extensive intelligence assets that can warn them of threatening activities. Therefore, the requirements placed on an aerial monitoring regime might not need to be as stringent as for the other cases.

[1]The purpose of the United States stockpile is to deter Soviet first use.

Furthermore, overflights would commit the North American participants-the United States and Canada—to receiving overflights, something CFE would not do. That the United States and Canada would share some of the overflight burdens could make Open Skies a politically desirable adjunct to CFE aerial monitoring.[17] *(Figure 5-1 illustrates the over*lapping territorial coverage of overflights of three negotiating fora in Europe.)

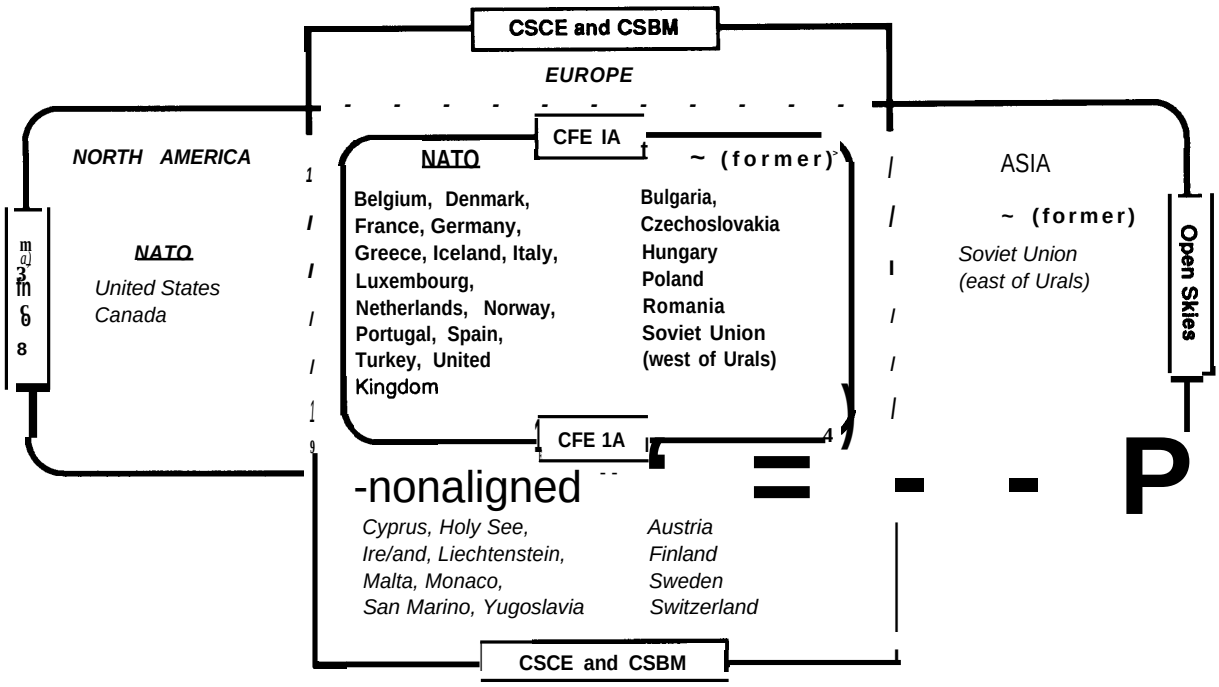
The few publicly revealed disagreements over the CFE aerial monitoring protocol resonate with those of Open Skies. For example, NATO again advocates using its own aircraft for its inspections; the former WTO nations insist that the host country's aircraft be used.[18] But because the procedures needed to achieve the goals of CFE overflights can be defined more concretely than those of Open Skies, perhaps these disagreements can be more easily resolved.

Aerial monitoring provisions beyond those now being discussed in CFE IA could also be negotiated in the CFE follow-on talks proposed by NATO on August 30, 1990. The so-called CFE II talks would provide an opportunity to fine-tune the original CFE

[17]Joe Clark, Canadian Secretary of State for External Affairs, "Foreword: Open Skies, " in Michael Slack and Heather Chestnutt (eds.), *Open Skies: Technical, Organizational, Legal, and Political Aspects* (Toronto, Canada: Centre for International and Strategic Studies, York University, February 1990), pp. *vi-vii.*

[18]Timothy J. Pounds, ''Context for Technologies That Monitor CFE Compliance," *Verification TechnologiesReview,* vol. *2, No. 4,* July/August 1990, p. 7.

Figure 5-l—Territory Subject to Overflights in Various Talks



The United States Government does not recognize the incorporation of the Baltic republics into the Soviet Union. Albania is the only other European nation not represented.

SOURCE: Office of Technology Assessment, 1991.

IA overflight procedures, as well as add new capabilities to advance the goals of the CFE process.[19]

Chemical Weapons Convention

The talks on reducing and barming chemical weapons currently under way both at the multilateral Conference on Disarmament (CD) and bilaterally between the United States and the Soviet Union offer other opportunities for the introduction of aerial monitoring (although provisions for overflights are not now being negotiated). There has also been some international discussion of creating chemical-weapon-free zones in Central Europe, the Balkans, and Southeast Asia.

Since 1980, the 40 member states of the chemical Weapons Ad Hoc Committee at the CD, under the auspices of the United Nations, have been working to draft a ban on chemical weapons.[20] These discussions have led to several inspection demonstrations using chemical sampling and sniffing technologies, but none of these demonstrations has involved an airborne platform.[21] Similarly, the U.S.-USSR negotiations on chemical weapons, which began on June 28, 1984, are incorporating intrusive monitoring techniques.[22]

A notional agreement restricting chemical weapons could, among other things, authorize cooperative overflights to:

[19]Because of rapidly changing events in Eastern Europe, the alliance basis for the CFE talks will probably not survive until a second CFE agreement can be signed. If this is the case, CFE might become a discussion between NATO and the individual nations of the WTO, or it could be moved to another forum altogether.

[20]*Arms Control Reporter 1990,* op. cit., footnote 12, p. 704.A.1.

[21]The U.S. chemical industry is already subject to aerial inspection by Environmental Protection Agency aircraft. (Amy Smithson and Michael Krepon, "Strengthening the Chemical Weapons Convention Through Aerial Monitoring," Occasional Paper #4, The Henry L. Stimson Center, Washington, DC, April 1991, p. 8.)

[22]*Arms* control *Reporter* 1991), op. cit., footnote 12, p. 704.A.4.

- directly monitor compliance with the agreement (as in CFE);
- observe and warn of prohibited activities, e.g., illegal build-ups of weapons, redeployment of weapons, or training exercises (as in CDE);
- collect information (such as optical and infrared photographs) on sites that could help prioritize and focus OSIs;[23]
- document destroyed production plants;[24] or
- build confidence and trust (as in Open Skies).

The following example of one possible use of aerial surveillance in support of a chemical weapons agreement will focus on the first of these roles. These overflights might be conducted by individual states or collectively as a group with common aircraft and sensors.

If the goal of a chemical weapon overflight agreement is monitoring compliance, the characteristics of the TLI are a key issue. Unlike the battle tanks and combat aircraft of CFE, however, chemical agents (liquids and gases) and chemical munitions (relatively small shells and bombs containing chemical agents) do not readily lend themselves to direct observation from the usual airborne imaging sensors.

If the monitoring regime allowed chemical samplers or sniffers, it might be possible to collect a minute sample of a chemical agent, although the release of agents into the atmosphere would be tightly controlled for obvious reasons. Even if a violation were detected, supporting indirect evidence from other sensors or a follow-up inspection on the ground might be desirable, if for no other reason than to verify that the airborne chemical agent did not float in from some other country or was not planted by the inspecting team.

The difficulty of uncovering direct evidence of a violation means that the presence of covert production, storage, and, conceivably, deployment areas may have to be inferred from the discovery of secondary characteristics of chemical agents and munitions. These characteristics or indicators might include unusual safety or security measures; industrial structures similar to chemical or pesticide plants; chemical storage tanks; proximity to shell casing or missile manufacturing plants or storage sites; or the presence of precursor chemicals or byproducts in the air.

Precursors are chemicals that are combined to create a toxic agent; byproducts are chemicals that remain after the agent is complete. Some of these chemicals are used in a variety of products that have nothing to do with chemical warfare. Because some may be relatively harmless, controls on their escape into the atmosphere might be less secure. The presence of one or a few comparatively rare precursors or byproducts could be added to the list of secondary characteristics of weapon production.[25]

In cases where only indirect evidence of a violation is exposed, some other mechanism must be established for determining noncompliance. This mechanism might take the form of a human suspect-site or invitational inspection.[26] Thus, a potential role for overhead imaging sensors and sniffers in a chemical weapon accord would be to detect possible covert production or storage of chemical weapons by examining secondary characteristics, and then to pass the information along to an inspection team that would investigate the site more closely.

Other Potential Applications

Several other potential arms control agreements might conceivably benefit from aerial surveillance: a Short-Range Nuclear Forces (SNF) accord, a Strategic Arms Reduction Talks follow-on agreement (START II), or regional conventional arms reduction talks similar to CFE. Inspection teams in airplanes could try to count, identify (by remotely reading tags or sensors), and document legal TLIs, as well as search for covert ones. (By looking for illegal TLIs, the overflights could help deter their very construction.) Discovery of unusual activities or objects could be used to target suspect-site inspections or cue NTM. Tethered aerostats could temporarily monitor the perimeter of an OSI site for illegal movements while preparations were made for an inspection or until a ground perimeter could be

[23] Smithson and Krepon, op. cit., footnote 21, pp. 15 and 18-25.

[24] Ibid., p. 2A-25.

[25] Conceivably, some rare precursors or byproducts could be banned along with their warfare product.

[26] For a discussion of on-site inspection types, benefits, and costs, see: U.S. Congress, Office of Technology Assessment, *Verification Technologies: Measures for Monitoring Compliance With the START Treaty-Summary*, OTA-ISC-479 (Washington, DC: U.S. Government Printing Office, December 1990).

established. Similarly, restrictions on military force movements, deployments, and exercises could be observed from the air.

Regional warning and confidence-building agreements might also involve aerial surveillance in order to add stability to and reduce tensions in some of the world's hot spots (e.g., the Korean Peninsula, South Asia, and the Middle East). Furthermore, aerial surveillance could be used by United Nations peace-keeping forces to extend their ability to observe and document (and thus deter) violations of the terms of United Nations involvement (e.g., a cease-fire agreement) .27 Aerial surveillance has already been used in similar circumstances in Yemen and the Sinai.[28] In the case of the Sinai, since 1974 American and other reconnaissance aircraft (airplanes and helicopters) have helped to ensure compliance with demilitarized and force-limited buffer zones between Israeli and Egyptian forces. They have also periodically undertaken surveillance of sites prior to ground inspections.[29] Mutual aerial mapping ventures might also provide the basis for settling disputed borders.

Beyond the military arena, airborne chemical and radiation detectors could be employed cooperatively to measure pollution or radiation levels as part of a regional or international prohibition or cleanup effort.[30]

Finally, one of the more unusual ideas for aerial surveillance is the plan of one company to lease to television networks art airplane equipped with side-looking airborne radar (SLAR), infrared, and low-light TV sensors, and film-editing facilities.[31] This commercial airplane could cover fast-breaking news events globally in a way previously only enjoyed by the superpowers. Thus, aerial surveillance might not only take the virtual monopoly on overhead monitoring away from the superpowers and give it to other states,[32] but it might take away from governments in general.

Conclusion

A wide variety of agreements that require monitoring or confidence building could take advantage of sensors on aircraft. Yet, just because cooperative overflights might have some utility does not mean that they are necessarily the best choice for the job. As was discussed in chapter 2, aerial observation is not cost-free, nor does it always have unique qualities that can not be provided by some other means, especially NTM or OSI. The choice of one type of monitoring measure or combination of measures depends on many factors, including the capability of each measure, the robustness of NTM, the degree of cooperation between the negotiating parties, the political advantages of open cooperation, the intrusiveness of the measure, and financial costs. Aerial surveillance is not a panacea; it may be a useful tool.

[27]See Michael Krepon and Jeffrey P. Tracey, " 'Open Skies' and UN Peace-Keeping," *Survival,* vol. XXXII, No. *3, May/June* 1990, pp. 251-63.

[28]Allen V. Banner, ''Overhead Imaging for verification and Peacekeeping: Three Studies," Canada, External Affairs and International Trade, Arms Control Verification Occasional Papers No. 6, March 1991, p.29.

[29]Brian *S.* Mandrell, *The Sinai Experience: Lessons in Multimethod Arms Control Verification and Risk Management, Arms* Control Verification Studies No. 3 (Ottawa, Ontario, Canada: Camdian Department of External Affairs, 1987), pp. 5,8, 13, 17,22,25,45.

[30]WU-2A aircraft, variants of the U-2, were dispatched in the late 1950s and early 1960s to sample at high altitude the spread of nuclear debris following tests. David Donald, *Spyplane* (Osceola, WI: Motorbooks International, 1987), p. 29.

[31]*Aviation Week and Space Technology,* "Upscale Eye-in-the-Sky," Aug. 20, 1990, p. 13.

[32]For countries that do not have extensive NTM capabilities, aerial surveillance fills an informational void that previously could only be filled by One of the superpowers. This leads to the philosophical question of whether it is in the superpowers' ownational security interest to negotiate away their near monopoly on overhead reconnaissance in exchange for the principle oenhanced regional or international security.