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Remote Sensing and Diplomacy

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ABSTRACT. The advent of a variety of commercial and national remote-sensing satellites has eliminated a long-standing superpower monopoly on a key source of information about global events. As these systems proliferate, it will become increasingly difficult to maintain secrecy about certain sensitive activities. Nations other than the superpowers will be able independently to verify compliance with arms control accords, and to monitor global "hot spots." These new capabilities both reflect and contribute to an inevitable diffusion of power among nations. Although there will be adjustment costs, particularly for the superpowers, the enhanced global transparency is likely to promote global stability and thus to benefit humanity as a whole.

Introduction

In the last few years, it has become possible for anyone willing to spend a few thousand dollars to buy satellite imagery of virtually any spot on Earth. French, American, and Soviet companies are filling orders, many of which are being placed by the news media. The availability of this new source of information became widely known when satellite images of the nuclear power reactor at Chernobyl covered the front pages of the world's newspapers after the accident in April 1985. Although the commercial satellites provide far cruder imagery than is available from the highly secret superpower spy satellites, this publicly available imagery clearly can have substantial military, political, and economic significance, a capability that will only increase as new systems come into operation. And countries from India to Israel to Canada are developing or operating their own satellite systems.

Thus, policymakers face the prospect of a world in which many nations have their own spy satellites, and many commercial operators are willing to sell militarily significant data on the open market. In such a world, transparency rather than secrecy will be the order of the day. Although satellites do not provide a good means of observing all activities everywhere in the world, given the size of the planet we live on, they are very good at confirming or disproving information gleaned from other sources and at keeping an eye on selected trouble spots.

This new transparency is likely to have a number of consequences:

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1. It will become increasingly difficult to maintain secrecy about preparations for military activities;
2. Global access to once-secret information could restrict governmental flexibility during negotiations or crises;
3. Differing interpretations of data could exacerbate tensions within the NATO alliance;
4. Regional arms control agreements could be negotiated that would exclude the superpowers; and
5. The media could publicly verify—or counter—government claims about activities around the world.

Existing and Planned Systems

Satellites have been used since the early 1960s for national security. In the most dramatic and well-known example, the first US photo reconnaissance satellites demolished the missile gap myth. US Air Force claims that the Soviet Union had produced and deployed hundreds of SS-6 ICBMs could not be verified by aerial reconnaissance, given the small area that a U-2 could cover and the frequent cloud cover over much of the vast Soviet territory. The US spy satellites, which could photograph much wider swaths of territory from their higher altitude, took thousands of photographs at one-meter resolution and found few signs of the large missiles. In fact, analysts concluded from the imagery that the Soviets had deployed only a handful of ICBMs.

Thus, satellite reconnaissance is not new. But for the past quarter-century, the superpowers, who had the only satellites, have refrained from embarrassing each other through the public release of imagery from their spy satellites. This policy, initiated by the United States, had two purposes. It encouraged the Soviets to accept, at least tacitly, the legitimacy of satellite reconnaissance, rather than to develop means to shoot the satellites down, and it kept the world from knowing in detail the capabilities of the US system. The United States also imposed limits on the capabilities of its civilian remote-sensing satellites so that they could not reveal militarily significant information, and the Soviets did not distribute data from their remote-sensing satellites beyond the Soviet bloc. All this is now changing.

In addition to its military uses, space is also an effective platform for gathering information on civilian matters ranging from crop conditions to geological formations, oceanography, urban planning, and land use patterns. These civilian applications have spurred development of a variety of commercial and national remote-sensing satellite systems.

There are at present three satellite operators competing to sell data: one American, one Soviet, and one French. The American system, called Landsat, is the oldest, initiated as an experimental program by NASA in 1972, although it was turned over to the private sector in 1985. It is now operated by the Earth Observation Satellite Corporation (EOSAT), which hopes eventually to make a profit from the sale of satellite imagery. Landsat data have been used by private military analysts to examine Soviet military installations on the Kola peninsula.

The French SPOT system has had perhaps the most dramatic effect on interna-

tional politics. Like Landsat, SPOT imagery is available through a private firm (SPOT Image Corporation), which claims that it will sell imagery of any place on Earth. Since the first SPOT satellite went up in early 1986, SPOT images have appeared in a variety of interesting places. *ABC News* has run several stories featuring SPOT imagery, the trade journal *Aviation Week and Space Technology* has put SPOT pictures on its covers, and a British newspaper has bought SPOT imagery of Israel's nuclear reactor at Dimona.[1]

The Soviet system is both the most and the least significant of the three. Only the Soviets are offering imagery at resolutions as good as five meters, but the Soviet marketing agency *Soyuzkarta* can require several months to fill an order. For some scientific research purposes, such a delay is acceptable, but for political/military analysts—and particularly for the media—timeliness is crucial. In addition, *Soyuzkarta* will not sell imagery of socialist countries.

A number of other countries have developed national satellite remote-sensing systems, including China, Japan, and India. According to some forecasts, at least 24 Landsat-type remote-sensing satellites will be launched in the next decade. The European Space Agency (which includes most of Western Europe), Canada, and Israel have remote-sensing programs under way. These programs have a mix of civilian and military purposes. China already has and France and Israel are pursuing dedicated military reconnaissance systems, and all of the civilian systems inherently possess some reconnaissance capability.

All these satellites share certain characteristics, such as a common orbit. They travel over the poles, in order to see all of Earth as the planet rotates beneath them. Many have similar instruments and missions. It has been suggested that the civilian systems be combined in some sort of international agency, possibly modeled on Intelsat. In addition, plans being formulated by the major space agencies for an international program of environmental monitoring (variously known as the International Geosphere/Biosphere Program or Mission to Planet Earth) will require sharing of satellite data and analysis, and may encourage further development of remote-sensing technology.

The Value of Satellite Data

The security value of the data that will be available from the existing and planned systems is a matter of some debate, but it is clearly not negligible. The usefulness of the satellites depends on their resolution. Resolution has two meanings. Ground or spatial resolution refers to the size of an object on the ground that a sensor can distinguish, at least sufficiently to tell that there is something there. Spectral resolution deals with the various band of the electromagnetic spectrum (*e.g.*, blue, green or red visible light, infrared, or microwave in the case of radars) a sensor can detect.[2] The term "resolution" is usually used to refer to ground resolution. A good rule of thumb is that resolution of 20 meters or less (in other words, the ability to detect objects 20 meters in size or larger) is primarily useful for civilian purposes, while resolution of 10 meters or better starts to reveal militarily significant information. However, exceptions exist in both directions. In particular, the civilian systems, which orbit at higher altitudes and thus can observe larger areas of the planet

at a time, can provide what in military jargon is called area surveillance. It is noteworthy that since the 1985–86 series of launch system failures left the United States temporarily bereft of the ability to maintain a full complement of spy satellites, the Department of Defense has been a major consumer of Landsat and SPOT imagery. The 1988 edition of *Soviet Military Power* features several SPOT images of Soviet military installations.[3]

As mentioned above, satellites are perhaps most useful as a means of confirming information from other sources. Unless a very large number of satellites are in orbit, and a large percentage of their imagery is processed and analyzed, it is unlikely that their operators would simply stumble across anything smaller than large military exercises or invasions. However, in most cases of interest, such collateral information does exist. Countries undertake military action against other countries at times of tension, not simply out of the blue. The media often have stories or rumors that could be confirmed by satellite data. For example, *ABC News* was aware of the preparations for the Grenada invasion, but chose not to run the story when a Pentagon source claimed that the ships being mobilized were on their way to Lebanon.

And as more satellites with more capable sensors go up, it will become more difficult to avoid detection. To date, the superpowers have been able to keep many activities secret by tracking each others' spy satellites and simply covering up when a satellite was overhead. During preparations for the attempted rescue of the American hostages in Iran in 1980, American military personnel in Egypt stepped into an airline hanger whenever a Soviet satellite passed above.[4] This easy evasion will become difficult if dozens of remote-sensing satellites are circling the planet.

The proliferation of sharper eyes in the sky could in fact turn out to be a boon for international stability. Remote-sensing satellites can expose exaggerated estimates of a foe's military strength, just as the first US reconnaissance satellites revealed the fallacy of a "missile gap." Satellite data could allay unwarranted fears of a surprise attack—and reduce the temptation to try to launch one by increasing the likelihood that preparations will be discovered and the advantage of surprise lost.

US Policy Making

For many years, the United States tried to restrict the capabilities of civilian remote-sensing satellites to ensure that their publicly available data would not violate national security. Until 1986, this policy was effective because the only civilian remote-sensing system was Landsat, operated by the United States. The launch of SPOT in 1986 removed the US monopoly, and the announcement in 1987 that the Soviets would begin selling better-resolution imagery made it clear that resolution restrictions for US civilian satellites no longer made sense. In January 1988, the government announced that it would no longer limit the resolution capabilities of US commercial remote-sensing satellites.

In the United States, verification has become the crucial determinant of progress in arms control. Although the government's access to superior intelligence information (such as its spy satellites) will continue to give it the upper hand in debates over the verifiability of proposed arms control accords, other interested parties can now draw on commercially available satellite imagery to illustrate their cases. This also

enables those with access to classified information to publicize their cases without directly leaking classified information to the public. A *Newsweek* article on author Tom Clancy, whose novels deal extensively with national security affairs, noted that in at least one case the author relied on classified information when he bought commercial satellite photos of a Soviet space-defense research site for use in a forthcoming novel. The article claims that Clancy's letter ordering the photos from a private satellite operator, "shows that he must have had access to classified information available only to officials who had seen imagery from a KH-11 spy satellite," because the letter describes the number and size of the buildings at the site and gives the exact coordinates.[5] When CIA officials tried to persuade Clancy to remove the description from his novel, claiming that the information was restricted for national security reasons, he showed them the commercial photos that revealed much the same information.

The media can also use satellite imagery to illustrate both sides of debates over national security issues. Perhaps the major current issue in superpower arms control is the status of the Soviet radar at Krasnoyarsk. The US alleges, probably correctly, that the radar clearly violates the ABM Treaty's prohibition on radars that could track missiles over Soviet territory. The Soviets claim that the radar, which is still incomplete, is intended to track objects in space. *ABC News* jumped into the fray with a report on April 2, 1987 that showed a SPOT image of the radar. The story concluded that the imagery showed that the Krasnoyarsk radar does in fact violate the ABM treaty.

Thus, during negotiations or domestic debates over foreign policy, various factions may use satellite imagery to bolster their arguments. This could confuse the debate as much as clarify it. Interpretation of satellite imagery is not easy. The media have been known to make mistakes, as they did in the case of Chernobyl when several stories on television and in the press claimed that two reactors had been damaged. In fact, only one had—the reporters were misled by a second "hot spot" that was probably a reflection from a roof. It is also easy to inject one-sided information, as has often occurred in debates over national security issues using information from other sources.

This problem exists, of course, with all sources of information, but there is a strong tendency to believe pictures—even if it is necessary to take someone else's word as to what the pictures show. To the extent that independent analysts and additional countries gain the capability to accurately analyze satellite data, this problem will be ameliorated.

Alliance Relations

The political value of scarce intelligence information from satellites has been a significant source of US influence over its allies. The Western European countries and Israel have depended on the United States not only for military muscle but also for information about their security situation. The allies have frequently, if quietly, complained that the United States has been stingy in the extreme with data from its highly sophisticated military reconnaissance satellites. This reluctance to share

the goods has given these countries a strong motive to develop independent satellite capability.

Western Europe trails only the superpowers in the scope and sophistication of its satellite remote sensing programs. It is developing both commercial remote sensing and military reconnaissance capabilities. The French SPOT civilian system already sells imagery at finer resolution than is currently available from the US Landsat system.

SPOT technology is also providing the basis of a military reconnaissance satellite called Helios, scheduled for launch in 1992. Helios is expected to provide one-meter resolution and near-real time imagery—which are militarily significant capabilities. Like SPOT, Helios will be dominated by the French, long known for their hostility to American dominance of Western security decision making. Italy and Spain are also participating in the Helios project.

More broadly, Western European countries band together to share satellite technology and derived information. Through the European Space Agency (ESA), 13 countries are already collaborating on a series of remote-sensing satellites, scheduled for first launch in 1989.

The ERS series, which will include a radar with 30-meter resolution, is intended primarily for oceanographic purposes. But Western Europe's interest in satellites, particularly radar, is likely to grow for other reasons. Progress on nuclear arms control means that the conventional arms balance has become more important. Arms control, through the INF Treaty, has already eliminated intermediate-range nuclear arms in Europe. If the START negotiations are successfully concluded, large numbers of longer-range nuclear weapons will be scrapped. The US commitment to the defense of Western Europe has long been symbolized by the nuclear umbrella. While that umbrella is not about to fold up altogether, some Europeans fear that it is developing holes. With the greater importance of the conventional balance, Europeans will want to be able to assess for themselves the state of that balance.

This will also enable the NATO allies to conduct independent verification of arms control. The existing model of restrictions on non-nuclear arms, the measures agreed to under the Stockholm Conference on Disarmament in Europe (CDE), calls for advance notification of major troop movements and permits challenge on-site inspections to investigate potential violations of the treaty. By the 1990s, European nations will have the ability to detect unusual activity that would justify a challenge inspection. They are thus increasingly free of dependence on US technical means to assure Soviet compliance with such agreements.

One group of Dutch analysts found several reasons why an independent European satellite surveillance and identification capability would be desirable.[6] The report's points are couched in the delicate language of diplomacy, but can be summarized as follows:

1. It would add to transparency, and, by reassuring the European public that decisions are not being imposed on an ill-informed Europe by the United States, help to garner European public support for NATO decisions.
2. The existence of multiple and independent sources of information would contribute to the quality and even-handedness of NATO alliance decision making,

both for assessing the balance of conventional forces and for verifying arms control accords and confidence-building measures.
3. It would add to alliance surveillance capacity at a time when existing NATO capacity may be overloaded by an increasing number of agreements, and would serve as a form of burden-sharing.
4. It would provide for continued coverage of Europe if the United States were to turn its attention elsewhere, such as the Pacific Rim.
5. It would enable the Europeans to focus on specific areas of European concern.
6. The frequent cloud cover over Europe requires somewhat different technology than has been used by the United States. The US spy satellites use the visible-light part of the electromagnetic spectrum, which allows very detailed images, but cannot penetrate clouds. Radar, which sends active pulses rather than relying on reflected light, can.[7]

Clearly, it would require close cooperation among European national intelligence services to make effective use of such a system. This cooperation could, in turn, spur even more extensive forms of cooperation on security matters among NATO's European members. The group also noted that Europe could sell data to non-NATO members, or exchange data for other intelligence information. It would even be possible to exchange data with the East bloc as a confidence-building measure.

Other US allies are also developing independent satellite capabilities. The Israelis have long depended on the United States for information vital to their national security, and, like the Europeans, have been dissatisfied. The recent dramatic initiation of the Israeli space program probably represented the first in a series of steps towards independent reconnaissance capability. On September 19, 1988, Israel launched its first satellite. *The New York Times* cited Israeli Cabinet Minister Mordechai Gur, a former army chief of staff, as saying that Israel began working on a reconnaissance satellite after deciding that it could not rely on the United States to provide full intelligence.[8] Gur said specifically that the United States had failed to provide adequate information during the 1973 war.

Multilateral Satellites

The superpowers have long staunchly resisted any suggestions for the establishment of an international satellite agency, arguing in part that arms control is largely a bilateral affair and that its verification should be handled exclusively by the parties. Future arms control, however, will not be largely bilateral. Accords on chemical weapons, ballistic missile proliferation and nuclear proliferation are necessarily multilateral. Satellites have already proven useful in monitoring nuclear weapons proliferation, and have engendered some striking cases of international cooperation. In one well-known example, Soviet satellite photos in 1977 revealed secret preparations for a nuclear test in South Africa. The Soviets alerted the Americans, who used their own satellites to confirm the story and then used diplomatic leverage to induce the South Africans to desist. More recently, commercial satellite imagery has been used to follow the course of construction of the secret nuclear facilities in Pakistan.[9]

Canada has suggested that multilateral "Paxsats" could contribute to verification of multilateral arms control accords. These satellites would be developed by countries other than the superpowers, and would utilize radar technology being developed under a Canadian civilian radar program. In addition to the obvious boost to Canadian industry, were this suggestion adopted, the proposal is part of a broader Canadian effort to carve out a niche for itself in third-party verification.

Sweden is also looking into the role a neutral country could play in satellite verification and monitoring. In a press release dated September 13, 1988 from the Swedish Foreign Ministry, Minister for Foreign Affairs Sten Andersson emphasized that neutral countries should become involved in disarmament, and that this was one way in which Sweden was prepared to become involved. The Swedish ground station at Kiruna is already a major facility for the reception and analysis of SPOT data, and Sweden owns 6% of SPOT.

Economic Implications

For many years, a bitter struggle was carried on in the halls of the United Nations over the question of who had rights to the economically valuable data gathered by satellites. US policy from the early days of Landsat was to sell all data to anyone willing to pay (and initially at heavily subsidized prices). Developing countries feared that they would not be able to compete with multinational corporations from the industrialized nations, which could afford to buy and analyze data that could reveal information about oil deposits and other economically valuable data about resources in their countries. Access to such information would provide companies with a marked advantage in negotiations for prospecting and development rights. The developing countries wanted to establish a right of prior consent to the release of any information gathered about their territory. The First World argued that satellite data were relatively inexpensive and readily available to all. The West, and particularly the United States, argued that the principle of the free flow of information should prevail, especially given that the information was gathered in space, which under international law cannot be claimed as sovereign national territory. The Soviet bloc sided with the Third World.

The Western position has apparently prevailed. In 1986, the United Nations Committee on the Peaceful Uses of Outer Space adopted by consensus a set of legal principles on the dissemination of data gathered from civilian satellites, which were subsequently adopted in turn by the United Nations General Assembly. The principles make no mention of any prior consent right. According to various representatives involved in the COPUOS talks, there were two reasons for the adoption of the Western position. First, it became obvious that the United States would not back down, and there is no way to enforce restrictions on space activities over the opposition of the leading space power. Second, several other countries which had originally supported the prior consent concept decided that their interests lay more in protecting the rights of their own satellite systems than in restricting the rights of others. The issue of the legal principles governing remote sensing has thus been settled, and removed from the UN Committee's agenda.

Conclusion

The advent of widespread satellite remote-sensing capabilities both reflects and intensifies the on-going diffusion of power among nations. It is not a process that can be stopped. It is most obvious in the case of Western Europe, where Europe's growing capabilities and interest in satellite remote sensing have been in part spurred by concerns over the reliability of the American ally, and partly by the desire to be economically competitive in civilian remote sensing. The same reasoning may apply to Japan, which is developing civilian satellite remote-sensing systems but has said very little about the possibility of military reconnaissance.

There may be some uncomfortable moments as nations adjust. In particular, the superpowers will have to accept the loss of their monopoly, with the diplomatic leverage and military advantage it has brought. More open societies, such as the United States, will find the overall adjustment easier than will nations accustomed to being able to hide their secrets, at least from the public and the media. Indeed, the superpowers may eventually find themselves in competition to take the lead in promoting, rather than combatting, transparency. If both countries recognize the inevitability of the process, they may decide that it is in their long-term interest to be seen as promoters of international openness. In general, the greater transparency that the satellites will bring will contribute positively to international stability.

Notes

1. "Now You Can Buy Your Own Spy-Satellite Pictures," *Business Week* (January 26, 1987), p. 91.
2. Resolution is actually a very complex matter that depends on a number of factors. *C.f.* A.M. Florini, "The Opening Skies: Third-Party Imaging Satellites and U.S. Security," *International Security*, Vol. 13, no. 2 (Fall 1988), pp. 91–123.
3. Department of Defense, *Soviet Military Power: An Assessment of the Threat, 1988* (Washington, DC: United States Government Printing Office, 1988), pp. 40, 52, 60, 84.
4. O. Thomas, "Nations Keep an Extra Eye on Each Other," *The Christian Science Monitor* (September 28, 1988), p. 3.
5. E. Thomas, "The Art of the Techno-Thriller," *Newsweek* (August 18, 1988), p. 64.
6. "The Use of Space for Security Purposes: A Challenge for Western Europe," Advisory Council on Peace and Security, Ministry of Foreign Affairs, The Netherlands.
7. The United States may, however, have developed its own radar satellites. A June 1987 report in *Aviation Week and Space Technology* stated that the US Department of Defense was putting into operation a new radar reconnaissance satellite intended to detect and track Warsaw Pact armor.
8. J. Kifner, "Israel Launches Space Program and a Satellite: Spy Craft Are Expected to Be Main Emphasis," *New York Times* (September 20, 1988), p. 1.
9. A.M. Din, "Satellite Surveillance Goes Commercial," *International Defense Review* (June 1988), p. 620.