

## GATHERING AND DISSEMINATION OF SPACE-BASED DATA IN TIME OF ARMED CONFLICT

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### Abstract

Armed conflict today and in the past has played a very large role in world affairs. It has been directed against the scourge of terrorism, to stop genocide and crimes against humanity, to halt aggression, to bring down tyrannical regimes and to support broadly based humanitarian operations. While uncertainty exists as to the precise manner in which these issues are yet to be resolved, and a more peaceful condition descends upon the Earth's inhabitants, several basic facts stand out.

From a practical perspective satellites carrying remote sensing equipment and engaging in direct television broadcasts have provided earth-based data allowing for highly efficient tactical military operations. The relevant data has been acquired by military agencies and by private commercial companies. Their combined efforts when accompanied by the interpretation and transmission of information to using military entities have contributed materially to the success of fighting forces. Upon a termination of hostilities ongoing surveillance will contribute to a more benign

phase of international relations.

From a legal point of view support for fact gathering from outer space, and the transmission of both data and information, can be based on the sovereign right of a State to protect itself against warlike adversaries. Customary international law supports the inherent right of national continuity as well as the protection of Human Rights

Space activities can be both benign and beneficial as well as destructive.

### 1. Introduction

More than 40 years have elapsed since the American CORONA spacecraft, after having achieved orbit, and after having photographed earth objects, parachuted a film canister to a waiting Air Force plane for delivery to earth. This event proved that many benefits could result from remote sensing for non-military purposes as well as adding ever-expanding dimensions to military capabilities.

This exciting experiment produced many practical opportunities and policy options. Despite ensuring intensive world-wide inquiries and proposals a full comprehension of the extent and meaning of

space-based capabilities continues to engage the attention of private individuals and governments.

The fundamental challenge is to achieve the measurable benefit and enhanced security of mankind at an affordable cost. Different means to obtain these goals have been suggested. In some countries a preference exists for exclusive governmental engagement in such activities; in others there has emerged a two-pronged approach in which both private commercial and government activities are carried on concurrently. Additionally, international organizations can serve collective interests. For example, the European Union is supporting the development of a Global Monitoring for Environment and Security (GMES) program and the European Space Agency (ESA) has long been engaged in remote sensing policies. A major effort is supervised by the Committee on Earth Observation Satellites (CEOS), founded in 1984 and now consisting of 23 national space agencies and 21 other national and international organization associates.

In the recent past there has been a heightened concern for security flowing from terroristic activities and potential. States have been obliged to identify terrorists and pin them down. Since terrorism has deep roots the efforts to bring it under control will have to be serious and long-range commitments.

Following 9/11 many means have been employed including searches on the ground, in the air, and from space-based satellites. The latter, equipped with a variety of sensing devices, such as high resolution cameras, radar, thermal detection facilities, and electronic equipment, have effectively collected data on earth-based activities.

When such operations are carried on by commercial entities it is usually referred to as remote sensing. When engaged in by military satellites it is commonly called military surveillance. The same technology can serve dual purposes. This has been referred to as a "hybrid" condition.<sup>1</sup> Phrased differently is the observation that "the distinction between military and [civilian] space systems has become blurred with dual purpose technology."<sup>2</sup> Both systems have contributed to the verification of arms agreements, transparency, confidence building, and nuclear disarmament.<sup>3</sup> Both serve the areas of environmental monitoring, identification of pollution, location of natural resources, and weather forecasting. They provide the basics for a successful Geostationary Positioning System (GPS). Both systems have proven invaluable in the war against terrorism.

With the adoption in the United States of a Commercial Remote Sensing Policy Act in April 2003 governmental agencies are required to look first to the commercial sector to meet geospatial data needs. The use of such facilities has contributed very materially to the defeat of enemy forces and is contributing to the extermination of terroristic activities.

## 2. Lawfulness of Remote Sensing-Intelligence Gathering

The question can be asked whether such space activities are lawful or unlawful and particularly whether the collection of data and its conversion into analyzed information, followed by its use in military operations, constitutes a violation of the international law of outer space.

With the acceptance of the 1967 Principles Treaty, with its reference in

Article IV to the exclusively peaceful uses of the Moon and other celestial bodies, it was sometimes suggested that military activities in outer space might violate the agreement. However, quite soon it was accepted that a distinction had to be made between the gathering of data for legitimate defensive purposes and from preparing for or engaging in an armed attack.

With the recognition that the acquisition of ground-based data relating to the disposition of foreign military forces would deter potential aggressors, observations that such conduct was unlawful came to an end. This result was buttressed by the fact that the most powerful of the space-resource nations were engaged in this form of surveillance and that it was serving a highly salutary goal.

The presence of space-based satellites had a calming effect on cold war tensions and contributed to a degree of Iraqi restraint in the 1990s. While the original concern is still voiced occasionally it has failed to become persuasive. Hybrid space practices are now deemed lawful. Firms engaged in remote sensing activities are subject, pursuant to Article VI of the 1967 Principles Treaty, to the supervision of countries in which they are organized.

### 3. The Practice of the United States

In the United States the first response to commercial remote sensing was to make it a largely governmental activity with the function assigned to NASA. Private firms were not able at first to generate the capital to embark on this high-risk, high-cost activity. Until 1997 NASA was able to sell its product on the open market. At that time the policy was modified by legislation encouraging private undertakings, which, pursuant to the statute, were not to cause

harm to the “domestic, national security, and foreign policy interests of the United States.”

While NASA was struggling with the problem of providing data to commercial users other federal agencies were engaged in acquiring data useful for security purposes. Each has separate responsibilities. Coordination of efforts with numerous other agencies and department is required. The following is a brief assessment of American activities.

#### A. National Reconnaissance Office (NRO)

The NRO, created in 1960, but whose existence was classified until 1992, designs, builds, purchases, and operates reconnaissance satellites. Its annual budget is about \$7 billion. As a military component of the 14-member governmental intelligence community it is expected to acquire information for the United States government and its armed forces. While it is under the immediate directorship of the Under Secretary of the Air Force it receives guidance from the Director of Central Intelligence.

In 2003 NRO was responsible for two launches. In September TITAN IV, using a Lockheed Martin Titan IVB rocket, was launched from Cape Canaveral. In December ATLAS IIA, using a Lockheed Martin ATLAS IIAS rocket, was launched from the Vandenberg Air Force Base in California.

Using optical and radar procedures the NRO is able to produce ground information useful in combat operations. This requires “horizontal integration,” which has been described by Peter B. Teets, the present head of NRO as “merging all kinds of

intelligence, surveillance and reconnaissance information from all sources and getting it directly to our fighting forces wherever they are, and in real time.”<sup>4</sup> In the interview Mr. Teets stated: “In Afghanistan and Iraq, never before had our space assets been used so thoroughly and effectively by our military forces. Space systems were terrific force multipliers – not just the reconnaissance activity, but also the communications capability, the weather satellites, and the GPS positioning and navigational system.”<sup>5</sup>

The interview also disclosed that while the horizontal integration process had not functioned perfectly that there was a substantial improvement from 1990 Desert Storm operation and the 2003 Operation Enduring Freedom in Iraq. Effectiveness requires a connection between the reconnaissance systems employed on aircraft and space-based radar in order to disclose ground-based facts.<sup>6</sup>

During the 2002-2004 military operations it was revealed that from time to time United States satellites encountered electromagnetic interference in space. This caused on-board computers to malfunction. It was not clear whether this condition was produced by man-made or by natural phenomenon. In order to rectify this situation the United States has embarked on a surveillance-enhanced project referred to as a space-based Space Surveillance System consisting of a constellation of satellites using electro-optical sensors. When perfected it is expected that it will be easier for American satellites to neutralize the intentional jamming of transmissions.

Resolving this problem will aid in perfecting a concept referred to as “network-centric warfare.” In broad terms this would allow a networked force to exploit a combination of emerging tactics, techniques, and procedures

so that there would be a real-time “decisive warfare fighting advantage.”<sup>7</sup>

#### B. The National Geospatial-Intelligence Agency (NGA) and Commercial Contracts

The NGA, previously known as the National Imaging and Mapping Agency (NIMA), is charged with providing geospatial intelligence services to policy makers, both civilian and military. As a member of the U.S. intelligence community it is a Department of Defense Combat Support Agency. It is the functional manager of the National System for Geospatial Intelligence (NSGI). It can enter into contracts for remote sensing information with commercial firms.

In 2003 NIMA reported a five-year contract with Digital Globe, Inc. for high resolution 0.5 meter imagery. The contract was valued at \$500 million.

This was followed by an agreement with another Colorado-based firm, Space Imaging, LLC, which in 1999 became Space Imaging Middle East (SIME) with headquarters in the United Arab Emirates. This company owns IKONOS, an advanced commercial satellite imagery system. Its versatility has been demonstrated by passing over one region of Earth two times a day. It provides data on agriculture, environment, transportation, and consumer markets. It can collect data on 20,000 square kilometers in one pass, render visible land at a 1-meter resolution every three days, and a 2-meter resolution on a daily basis. It orbits Earth every 98 minutes at an altitude between 400-680 kilometers.

SIME’s capabilities are augmented by the Indian Remote Sensing satellite system which has been operational since the 1980s

and by LANDSAT 5 which was launched on March 1, 1984.

The 1999 SIME contract prohibits the sale of imagery to identified States which are supportive of terroristic activities. Disclosure is denied which would violate United Nations or bilateral trade restrictions. The agreement provides that "image collection or distribution . . . [must] be constrained when there was an immediate or substantial threat to significant national security or foreign policy commitments of the United States."

While the United States has engaged in and has supported worldwide remote sensing operations it has also been attentive to the concerns of countries with which it has adopted a special relationship. Israel, for example, has asked the United States to limit access of data on Israel with a resolution of one meter or below gathered from that country. The United States, while sympathetic to Israel's security, has also decided that it must not unduly restrict the competitiveness of American firms engaged in remote sensing in foreign countries. American firms are engaged in competition with French SPOT satellites. Since SPOT Imagery Company, a French semicommercial firm, is able to record and sell data with a resolution of 1-meter or better, American firms have not been prohibited from offering the same services.

The sale by American firms of data and analyzed information to other countries will depend on the development of foreign capabilities. At present the following have developed projects or are in the process of doing so: Canada (Radarsat), China, France (Pleiades, SPOT), Germany (TerraSAR), India, Italy (Rapid Eye), Japan, Russian Federation, and the United Kingdom.

For the United States to be aware of the potential capabilities of remote sensing carried out by foreign potential competitors it will be necessary to evaluate their capabilities. Trustworthy facts will have to be recorded in current data bases. Ongoing appraisals of quality will be required to understand how American remote sensing capabilities compare with those of competitors.

### C. The National Oceanic and Atmospheric Administration (NOAA)

In the United States the National Oceanic and Atmospheric Administration, a part of the Department of Commerce, also plays a key role in remote sensing. To assist in establishing and managing an American civilian remote sensing program, including interpreting the current "National Security Presidential Directive-15 Commercial Remote Sensing Space Policy," NOAA in 2002 created an Advisory Committee. It has been engaged in studying the relations between governmental and commercial providers, licensing procedures and practices, compliance procedures, guidance on exports, the nature of foreign competition, and the protection of national security. The group has been obliged to consider "Presidential Decision Directive-23 Foreign Access to Remote Sensing Space Capabilities."<sup>8</sup> Its membership consists of experts drawn from academe, the government, industry, professional groups, and think tanks. Their meetings reflect the widely diversified entities having an interest in remote sensing and also the very substantial number of federal agencies and departments playing a role in the establishment of public policy. A study by the Congressional Research Service pointed to the difficulties encountered by 19 civilian federal agencies dealing with the civilian use

of data and information. Sharing of data was identified as a major problem.<sup>9</sup>

Although management problems must be overcome, from an operational point of view NOAA has been able to acquire and disseminate spectacular colored charts dealing with atmospheric and oceanic situations. NOAA's presence in the Department of Commerce is evidence of its primary focus on remote sensing.

#### 4. Global Positioning Systems (GPS)

If remote sensing is to be effective in providing aircraft and other means of transportation, including aircraft engaged in the support of military operations, with accurate location positions it is essential that a State possess a state of the art GPS. The United States GPS, which was tested in the 1991 Desert Storm Operations, became a necessity in the successful attacks on Iraq in Operation Enduring Freedom in 2002.

The scientific instrumentation employed on GPS satellites allows for obtaining orbiting positions in relation to the Earth with almost perfect accuracy. The pinpoint locations are established in three dimensions: latitude, longitude, and altitude. A GPS can transmit position-fixing signals directly to GPS terminals located on bombs and missiles.

During the recent anti-terror military activities in Afghanistan reliance was placed on commercial and governmental sources for remote sensed data. It was discovered that data, when introduced into existing processing and distribution systems, was not used optimally. The systems were not well adapted to handle input received from the commercial non-governmental platforms.

To remedy this situation NGA, through its NextView program, entered into a contract with Lockheed Martin Corporation to develop a GeoScout procedure for a more effective infrastructure. This was employed in the Iraq war with good results.

The 2002 attack on the house in Baghdad thought to be occupied by Saddam Hussein and his two sons has been identified as a "transitory target of opportunity . . . [which] relied heavily on real-time targeting from space and use of GPS-guided bombs."<sup>10</sup>

The effectiveness of this system is influenced both by the potential for jamming and by the countermeasures perfected by the countries launching and using the GPS. In Iraq jamming proved to be ineffective when "weapons were launched on true course by precisely positioned aircraft, flew relatively short distances to targets, and were kept on course by their inertial systems."<sup>11</sup>

In deciding to adopt a jamming policy the United States by 2002 "was adept at jamming GPS signals over a localized area, reducing the threat that an adversary might use GPS in battle,"<sup>12</sup> This resulted from the early American decision to freely open GPS to all potential users without cost. By relying on it they became the target for jamming.

However, it has been noted that there is a clear limit on the effectiveness of GPS satellites. It is the "threat from a rising noise floor, or level of interference with . . . [its] signals, caused by having to share the spectrum with communications, unlicensed unintended emitters, and ultra-wide-band (UWB) devices."<sup>13</sup>

## 5. Possible Future Competition: GALILEO

European States composing the European Union, following a decision taken in March 2002, are engaged in the manufacture and launch of GALILEO, a new geostationary positioning system. When operational it will undoubtedly serve important purposes, such as being a standby in the event that the American system were to fail. European security would be enhanced. American concerns center on the view that a new system would add to the clutter of objects in orbital positions, which are not unlimited. Noise pollution impacting on GPS at the present would also affect the operational success of GALILEO.<sup>14</sup>

## 6. Conclusion

The hybrid quality of the means used to acquire earth-based data has been of substantial benefit to peoples and nations. States have pursued different approaches with the United States favoring acquisition of data by commercial firms as well as by the government. In the security area it has employed a wide-ranging group of federal agencies and departments, calling for a high degree of cooperation and coordination. In recent years the United States has also entered into contracts with private firms for the supply of military intelligence, with substantial improvements in the war with Iraq as compared with the 1990 Gulf War. Other space-resource countries rely for their data on governmental agencies. International organizations are also engaged in activities impacting on the efficient acquisition of space-based data.

In recent military operations the United States has perfected its acquisition of earth-based data through combining its

sensing activities with GPS. This has improved both accuracy and efficiency.

The linkage permits the acquisition of raw data and its quick translation into analyzed information and immediate transmission to those who will benefit from the early availability of the finished product. This combination will continue to offer a clear cut understanding of the extent and disposition of military capabilities. This will continue to invite caution on the part of potential adversaries.

If, as was particularly demonstrated in Operation Enduring Freedom, military intelligence is possessed by the dominant force or forces, this will reduce the length of the hostilities, and, absent insurgents and guerillas, will facilitate an earlier return to normal relationships.

Both governmental outer space imaging operations and those of American private firms have contributed materially to the security of the United States. Protection has been afforded against the activities of terrorists. Saddam Hussein is in custody of the United States as prisoner of war. Judicial proceedings are pending.

In time of peace as a result of the linkage between GPS and commercial remote sensing many benefits will be available. This will contribute to the conservation and optimal use of human and material resources. Civilized societies will be the ultimate beneficiaries.

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## NOTES

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