Chapter 6

National Security Needs and Issues

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INTRODUCTION

The U.S. Government operates two parallel programs of Earth remote sensing from space. Civilian systems operated by the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) provide unclassified low- and moderate-resolution information about the physical parameters of the Earth's land, water, and air. Department of Defense (DOD) classified satellites collect data for a variety of military and intelligence purposes such as early warning of missile attack, verification of compliance with international treaties, and strategic and tactical planning. While both programs may utilize similar spacecraft and basic technologies (e. g., earthward-looking sensors and ground processing), the programs differ in amount of funding, priority, and visibility.

The classified programs, among other things, provide essential data on activities in areas of the world where U.S. access may otherwise be greatly restricted. They are highly classified because they produce highly sensitive information, some of which could relate to ongoing classified military activities. * They are also highly classified because public knowledge of the capacities of the technology would be of considerable use to potential adversaries. Even nonsensitive data from the systems could, upon analysis, reveal the technical characteristics of the surveillance systems and compromise their effectiveness.

The prospect of transferring the civilian system to private ownership raises the question of what effects private ownership might have on the relationship between civilian and classified military remote-sensing systems and on the work of the military and intelligence communities. This chapter summarizes data and program support which civilian remote-sensing systems could provide to the military and intelligence communities and lists likely concerns of military and intelligence agencies over the prospect of transfer of civil activities from Federal ownership. It identifies requirements or conditions which it might be desirable to place on a private sector owner of a space remote-sensing system. Finally, it discusses the possible utility and availability for defense purposes of data from foreign space programs.

Meteorological Data

Data provided by civilian satellites operated by NOAA are an integral part of the DOD weather forecasting service. Since weather data are essential to the global operations of U.S. air and naval forces, a Defense Meteorological Satellite Program (DMSP) has been established to gather accurate, timely, and precise meteorological information. The DMSP is supplemented by the data products of NOAA meteorological satellites. Careful coordination between the programs from the design stage onward ensures that the family of polar-orbiting and geostationary satellites are integrated into a system for meeting both national civilian and military global weather data needs.

Weather satellites have proven particular] y useful for obtaining data over oceans and remote areas where there is a paucity of surface reporting stations. In addition to determining atmospheric conditions on a near-instantaneous basis, the satellites contribute to observing slower acting phenomena such as ice-floe generation and climatic trends that could affect DOD's operations.

A recent NOAA study' states that any private system supplying meteorological data would be required to provide priority service to DOD and would be subject to DOD direction when selecting and designing operational parameters.

● For many years, even "the fact of" the existence of strategic surveillance satellites was classified Only in October 1978 **was** their existence officially acknowledged by an American President.

[1] "Transfer of the Civil Operational Earth Observation Satellites to the Private Sector, NOAA, February 1983.

Land Remote Sensing

The military and intelligence communities purchase the moderate-resolution Landsat data, in both imagery and digital tape format, to supplement collections made by classified systems.

The flexibility of the Landsat data receiving system has been increased by construction of an air-transportable ground receiving and data-processing unit, which permits rapid deployment to overseas sites, if required. This equipment could, in time of emergency, be used to supplement other data-collection means. *

*"The transportable station is also of use for general purposes.

CIVILIAN REMOTE SENSING AND NATIONAL SECURITY

So long as both the military and the civilian space programs are under the direct funding and management of the Federal Government, the activities of both can be readily coordinated and controlled in the overall national interest. Over the past two decades, policies governing the operations of unclassified civilian remote-sensing satellite programs have been developed at high levels of Government under the close supervision of the National Security Council. NASA, in collaboration with other Federal agencies, academic institutions, and industry, has carried on a substantial program of experimentation and demonstration which has served a variety of civilian and national security needs. DOD has pursued its own concurrent development program, which has returned some benefits to the civilian community. [2]

General policy governing the relationship between the national security and civilian space programs of the U.S. Government was established by the provisions of the National Aeronautics and Space Act of 1958. For reasons cited at the beginning of this chapter, details of the extent and nature of collaboration are not publicly available. Policies have been implemented through interagency agreements. The sharing of facilities and equipment, the setting of permissible limits for civil sensor operation, and many details on the acquisition and processing of data have been determined by Government policymakers, out of the public view. This has caused some discontent among some U.S. data users. However, the interest in commercializing the technology, and the simultaneous emergence of a number of competitive foreign space remote-sensing systems, require reevaluation of the intragovernmental arrangements and networks which have been used over the past decade for collaboration and control of remote-sensing programs.

Any transfer of U.S. civilian remote-sensing systems would be accompanied by a review of the obligations, conditions, and stipulations to be placed on the operator to protect national security interests. In some cases, such as control of technology transfer, existing regulations should serve to oversee adequately the operations of U.S. companies. The continued supply of data from civilian systems to defense organizations, similarly, should be a straightforward matter of adjustment to possible new price structures and delivery routes.

Military and intelligence agencies face other more difficult questions—e. g., the steps to be taken to preempt and operate commercial systems in time of national emergency. These and other safeguards, such as guarantees of the long-term availability of data, require both careful planning and commitment to some Government subsidy. Defense agencies can be expected to pay a proportionate share of the system costs incurred by a private satellite owner/operator to meet special Government needs.

A less tractable problem is to keep openly available data products of U.S. civilian systems from revealing classified information about the United States' sensitive installations and activities to potential adversaries. Since the Soviet Union possesses competent space reconnaissance systems,

[2] *Civilian Space Policy and Applications* (Washington, D. C.: U.S. Congress, Office of Technology Assessment Report, OTA-STI-177, June 1982.).

the problem really applies more to other potential adversaries, including those who might consider sponsoring terrorist activities on U.S. soil. Inclinations to set a limit on sensor resolution or to screen the data for content will run counter to the private entrepreneur's desire to maximize the information content of the data, shorten the time of delivery to customers, and generally to meet the competition posed by the advanced systems of France, Japan, and other countries. It appears that by the end of the decade, high-quality imagery and data on the entire surface of the globe will be generally available from foreign systems. This development will require accommodation among the sometimes conflicting aims of the U.S. military, political, and commercial sectors.

In the event of transfer of the Landsat system to private ownership, military and intelligence agencies will want to place certain limits on the design and use of the technology and the resulting data products. Though their special interests may be unique to this particular field of space activity, meeting defense limitations should require nothing beyond licensing and regulation. Principal areas of concern of the defense and intelligence agencies include:

- limits on technology and design criteria embodied in a civilian system;
- potential limits on day-to-day operations as they relate to sensitive contents, regions, or customers;
- impact of aggressive worldwide market development that may intrude upon national security needs; and
- policies on access and cost of data.

CONTRIBUTIONS OF THE CIVILIAN REMOTE-SENSING SYSTEMS TO MEETING NATIONAL SECURITY NEEDS

Under the terms of the National Aeronautic and Space Act of 1958, the Landsat and meteorological satellite systems must provide data that are not duplicated in their characteristics by any other U.S.-funded system, classified, or unclassified. This establishes a unique role for civilian systems in contributing to the net national pool of global land and meteorological information. Table *17* summarizes the contributions they have made. The Defense Mapping Agency has used Landsat data to revise hydrographic and aeronautical charts inexpensively. For example, the Landsat multispectral scanner (MSS) sensor is able to observe underwater detail, making possible a new class of shallow sea maps of interest to the U.S. Navy.

The MSS on Landsat scans continuously a swath of about 100 miles wide on the Earth's surface and rescans the same track every 16 days. * Thus, it has become possible economically to monitor vast areas in a routine way. Subsequent improved scanners like the multispectral linear array would have the same areal coverage with improved reliability and lower costs. Higher resolution sensors sacrifice the ability to cover such wide areas as cheaply because the number of picture elements increases as the square of the improvement in resolution. Although most human works or activities are not visible on MSS Landsat scenes, they are capable of revealing agricultural and other gross disturbances of the landscape. The higher resolution thematic mapper (TM) data, on the other hand, have rather good capacity to record the presence of human activity. Landsat data or their equivalent could signal the need for more detailed investigations of an area and, to some extent, guard against surprise developments in out-of-the-way parts of the globe, thereby freeing up more expensive and sophisticated surveillance systems to concentrate on areas of high priority.

The Landsat system, used in conjunction with meteorological satellites, has shown value in observing agricultural conditions and land-use patterns, Land degradation, population shifts, and other stressful conditions resulting from a combi-

'Successful acquisition of Landsat images depends on the absence of cloud cover. Some regions of the world, especially tropical areas, are particularly hard to sense, even with repeated access.

Table 17.—Contributions of the Civilian Remote. Sensing Systems to U.S. Space Intelligence Systems

- **Complementary data:** The civilian metsat systems provide data complementary to those provided by the Defense Meteorological Satellite Program. U.S. intelligence and mapping organizations are substantial users of the unique data produced by Landsat to supplement other sources.
- Backup system: In the event of failure of a military or intelligence system, or a temporary overload, civilian metsat or Landsat data can be used instead,
- Technical emergency support: Landsat's worldwide network of communications, ground facilities, processing centers, etc., can, in an emergency, be used to support intelligence collections,
- Broadened technical base: A larger group of trained personnel and technical competence are available as needed,
- Unique data products: Information drawn from civilian sources, e.g., environmental monitoring information, can be used as a basis for further intelligence analysis,
- Cover **data:** Landsat imagery can be released and used as a basis for discussion involving the U.S. public or international forums, when the original source may be classified data which should not be compromised.
- Political leverage: Landsat and training can be used to extract reciprocal rights from foreign nations where intelligence operations may need base rights or special access.
- **General information needs:** Meteorological or Landsat technology helps to maintain cognizance of foreign remote-sensing developments by serving as the U.S. contribution at international technical symposia.
- **Political tool:** Open distribution of metsat and Landsat data has served to deflect and diffuse international criticism of U.S. space intelligence operations.

SOURCE Office of Technology Assessment

nation of environmental problems, population pressures, and political conditions, can contribute to instability and tensions and thereby may affect the overall security of the United States. Landsat data can be merged with data from other sources, including highly classified sources, to provide enhanced information on events in remote areas or regions where conventional information is scanty and unreliable. Some types of analysis, such as estimating foreign crop yields, can be made with Landsat data without necessarily revealing the precise areas of U.S. interest or requiring expensive collection activities.

Civilian/Military Interrelationships

The following paragraph items present a variety of examples of the types of relationship that DOD or intelligence agencies may wish to have with a private firm chartered to provide remote-sensing services. **This issue will be the degree to which a private owner will be able to assure direct support to Government activities, whenever these are requested by the Government.** These examples are intended to illustrate the range of potential applications, without attempting to evaluate their relative importance:

- **Provision of Primary Data in an Emergency.** —Earth-orbiting satellites are unique in their ability to view distant parts of the globe and relay the data back to the United States in near-real time. * Landsat and meteorological satellite systems also can serve as backup units in the event of a failure of one of the comparable classified satellites. In a national emergency, these civilian systems are subject to takeover by the defense forces. In the event of transfer of these systems to the private sector, it maybe appropriate to require that data format and handling characteristics be compatible with military data management approaches.
- **Controlled Distribution of Data.—Access to** civilian remote-sensing data distribution channels and the ability to influence or control data flow can be of value to the intelligence and military communities. Analysis of sales records of land remote-sensing data may show patterns of foreign purchases, tipping off specific areas of interest for resource exploitation or military purposes, for example. In time of international stress, it might be desirable to delay or deny altogether distribution of land remote-sensing data to hostile countries if these data might be used directly against the United States or its allies.
- **Guarantee of Beneficial Data Exchange.—** The open, free distribution by the United States of meteorological data has created much good will and helped to develop patterns in which the United States benefited by receiving data in return from other countries. The U.S. lead in civilian space technology over two decades allowed the United States to gain acceptance of its right to operate in space and to sense other countries. Through the World Meteorological Organization and other international organizations, the United

* When the Tracking Data Relay Satellite System is completed, it will be possible to send data from the spacecraft directly to the United States, no matter what part of the globe it is over.

States was able to advance the exchange of weather data worldwide to the benefit of many of its civilian activities as well as those of the military and intelligence agencies. This prompt and reliable supply of weather data from foreign sources is used extensively in air operations of the U.S. military. In addition, foreign data assist in ground-checking U.S. satellite data.

- **Use** in International Meetings.—The military and intelligence communities may, on occasion, be required to use classified data to assist U.S. civilian agencies in analyzing a major event for presentation in an international organization. An example might be fixing responsibility for damage from a large oil spill. In such a case, civilian imagery is obtained rapidly and presents objective information (e.g., Landsat data showed the extent of the recent Mexican oil well blowout as it affected the Texas coast). It can be used for multinational negotiations or for briefing the public without compromising more sensitive U.S. sources, if the event is sufficiently gross to be visible on Landsat imagery. As civilian instruments increase in resolving power, many more activities related to the security of nations could be revealed—troop activity in desert areas for example. The advantages and disadvantages for the United States of "open skies" and nondiscriminatory data distribution will have to be weighed. There is considerable value in having a source of open and unclassified data.

- **Continuing Source of Information on Foreign Space R&D.—As the use of remote sensing becomes** more widespread and the technology diffuses around the world, it will be increasingly important for military and intelligence agencies to be alert to new developments which can either be adopted and used for U.S. national security purposes or which, in the hands of others, could make the U.S. systems relatively less advanced. The maintenance of an open, advanced civilian program at all stages of development of satellite and remote-sensor instrument and data processing is necessary to preserving a broad technical base. Demonstrated U.S. competence in these fields assures that U.S. nationals will continue to be aware of technical advances at all stages and will be in a position to monitor developments of colleagues in other countries.

- **Civilian Program Hardware as Backup to Defense Programs.** —The command and control, communications, ground reception, and data-processing facilities needed for the civilian program are related to those used for classified remote-sensing programs. In the event of international tension, and by Presidential directive, civilian Government systems may be partially or wholly diverted to military use, To facilitate planning for such contingencies, the equipment used in civilian programs may have to be designed and constructed so as to be compatible with corresponding military components. Elements of the civilian system may also be preempted for interim backup service during, for example, the partial failure of a classified system.
- Civilian Program **Value in Providing Training and Special Skills.** —Trained personnel are a prerequisite for the management and operation of advanced technology remote-sensing programs at all levels, from equipment design, construction, and operation, to data reception, management, and interpretation. An open program helps to ensure a pool of trained personnel in each of these categories. Technically trained people constitute a pool of labor available to be drawn upon by classified programs as needed. Technical educational institutions must be operated on a largely unclassified basis and require the existence of a viable civilian program to attract students and to justify continued research and educational efforts.
- **Preferential Access to U.S. Data or Remote-Sensing Programs.—As** a new and somewhat glamorous technology combining space science and the potential for practical Earth applications, remote sensing has proven to be a means for entering negotiations with other countries. It is generally necessary to deal with foreign nationals on the basis of unclassified technology. In some cases, foreign governments stipulate the desire to deal with civilian agencies of the U.S. Government to

assure themselves of the high level and reliability of the exchanges. For example, the U.S. Geological Survey has been the prime instrument selected to manage mineral exploration by remote sensing in some Middle Eastern countries. On occasion this has resulted in finding mineral reserves that have national security implications.

- Ability to Monitor and Influence the Course of Remote-Sensing Technology Transfer. — U.S. civilian remote-sensing sponsorship and/or participation in international technical meetings enhances U.S. ability to observe and monitor closely the technological state of the art in foreign countries as a basis for judging the degree of technology transfer and determining whether such activities are to the net advantage of the United States, or should be inhibited.

POTENTIAL MILITARY AND INTELLIGENCE REQUIREMENTS

The military and intelligence agencies are by no means monolithic or uniform in their views of civilian remote sensing. Indeed, sometimes their individual goals conflict. Nevertheless, it is possible to summarize the possible requirements that various members of both communities have suggested if the proposed transfer of remote-sensing systems to private ownership proceeds:

- Continuity of meteorological data supply is an absolute necessity as a complement to military weather satellites. Orbital characteristics must be appropriate and sensors must perform as specified.
- It may be necessary to encrypt communications links and harden satellite components, or otherwise make the system conform to Government specifications on orbital parameters and sensor specifications.
- The operator must design the resolution and operating wavelength of sensors to meet military and intelligence restrictions.
- In dealings with foreign entities the operator will need to guard against unacceptable forms of technology transfer.
- Design and operations will need to take into account contingency planning requirements to assure compatibility and ability to operate in a possibly hostile environment.
- Operations will require that some private sector personnel possess special clearances and that secure facilities be available.
- Guarantees of specified types of operations with products conforming to agreed levels of quality, format, etc., may be necessary for 2 to 3 years in advance, as may guaranteed readiness of replacement satellites.
- The satellite operations may be subject to override or preemption in the event of national need, and the sale of product likewise may be "sanitized" or sales forbidden to certain foreign customers.

POSSIBLE SUITABILITY OF PROJECTED FOREIGN SYSTEMS

As discussed in chapter 3, within the next 5 years several foreign countries will possess remote-sensing satellites designed for a variety of land, ocean, and meteorological tasks. The U.S. military and intelligence remote-sensing communities can be expected to acquire and analyze quantities of data from these new systems for research purposes. To the extent that some unique kinds of information can be extracted from the data, it is possible that U.S. defense agencies may purchase some data sets for practical application.

On the one hand, continuing provision of specialized data from foreign systems, data impossible to obtain with U.S. satellites, might be advantageous to U.S. purposes. On the other hand, U.S. satellites, which collect and transmit global data back to U.S. collection points, have proven to be

the most rapid and efficient means of accomplishing a host of sensitive national security operations because they can be tightly controlled. Information about both the surface areas and the time periods of interest to **U.S.** data collections must be controlled, because either would be of considerable interest to potential adversaries. Yet it is extremely difficult to control foreign sources, even systems operated by close allies, to the degree necessary. For most important satellite missions, the U.S. military and intelligence communities are likely to insist on totally in-house operations or the use of private U.S. contractors who can be regulated and closely supervised. Thus, it is unlikely that procurement arrangements would be worked out as part of the defense alliance agreement or that the material would constitute a primary source for U.S. forces.