Space Reconnaissance and the Management of Technical Collection

U.S. intelligence capabilities to perform reconnaissance from space warrant special attention because they consume a major portion of the resources devoted to intelligence, embody the most advanced technology and industrial capabilities of the nation, and are a distinguishing attribute of the U.S. geopolitical profile.

Space reconnaissance assets provide access to all parts of the globe and use a variety of sensors to collect information responsive to virtually every intelligence need. They also constitute an integral part of the U.S. military force structure, providing critical information with sufficient accuracy and timeliness to support the maneuver of military forces and the targeting of their weapons. The integration of these assets into the planning and execution of military operations is not yet complete, however, and represents important work that must continue. (See the discussion of this subject in Chapter 10.)

The space systems developed by U.S. intelligence employ unusually advanced technology and require extraordinary skill and industrial capability to build and operate. No other nation is capable at present of creating similar systems. As such, these systems represent a comparative advantage that the United States is likely to retain if it chooses to do so.

There are, nonetheless, shortcomings in the current posture.

The current U.S. capability in space is vulnerable to the failure of any single system. There are a relatively small number of large and expensive systems deployed, and the failure of one causes a substantial reduction in overall capability. This structure has evolved, in part, from the need to make maximum use of each satellite platform and to reduce the cost of separate launches.

Space reconnaissance is also very expensive. Although procured in limited numbers, the large satellite systems developed by the United States and the ground stations needed to operate them require expenditures in the range of several billions of dollars per year. Their substantial cost puts great pressure on the Intelligence Community to search for alternatives, find efficiencies, and continuously scrutinize the intelligence requirements these systems address.

The Commission believes that in the future it may be possible both to reduce the vulnerability of U.S. space capabilities and their overall costs by collaborating more closely with allies in the area of space reconnaissance. In addition, the Commission believes that by taking advantage of developments in the commercial satellite industry, the costs and vulnerability of current capabilities might be further reduced. The Commission's views on these subjects are elaborated in the sections that follow.

International Cooperation in Reconnaissance Programs

Satellite reconnaissance, once the exclusive domain of the United States, the former Soviet Union, and to a lesser degree China, now is expanding to other countries. France

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and Israel have launched their own imagery satellites, and a consortium of European nations is being formed to develop a new generation of imagery systems. Still, there is little challenge to U.S. preeminence in the field. The Commission believes that the United States should use its current position to encourage other nations to enter into cooperative burden-sharing arrangements with us. At the same time, it should continue to enhance its own space reconnaissance capabilities.

To permit the United States to expand international cooperation in the space reconnaissance area, the Commission proposes a two-tiered approach to the development and deployment of satellite systems. The United States would retain in the first tier its own high-end classified systems which involve the most sophisticated technology and techniques and are used to collect against the most critical consumer needs. The second tier would be developed in conjunction with friendly and allied governments and would consist of capable, but technically less sophisticated reconnaissance systems that would emphasize the application of commercially available technology where possible as well as the application of existing industrial capability. Foreign partners would be able to build, operate, and control their own satellites and ground stations, which would form part of a larger overall system. As time goes on, even more sophisticated and capable satellites are likely to be developed. In that event, if partners are prepared to support the costs, earlier versions of the upper tier might be made available for partnership use.

The system of satellites developed through these arrangements would greatly expand the existing area of coverage and capabilities across a spectrum of needs, including those of the foreign partners involved. These arrangements would require sharing U.S. technology with foreign partners, but the cost of the system would be fully borne by the countries that participated. The arrangements would be accomplished exclusively through government-to-government agreements, rather than through commercial sales.

The Commission believes that both the United States and its foreign partners would benefit. For the United States, there would be an increase in the geographic coverage and revisit times of these systems, reducing the vulnerability of U.S. systems to single system failure. In time, there should be monetary savings that could be used to maintain the technological preeminence of the high-end capabilities. Concerns with security would be minimal because less sensitive technologies would be involved. Finally, new opportunities for international cooperation between friends and allies would be opened, strengthening the overall security posture of the United States.

Foreign partners would benefit from participation in a global space reconnaissance system with a relatively small investment of funds. They would share in U.S. technology and their industrial sectors would participate in building and operating components of the system. Foreign partners also would stand to benefit from future technological advances that were shared with participants in the system. It might also be possible for the United States to share the product, if not the technologies, from its first tier systems.

11-1. The Commission recommends that the U.S. Government more aggressively seek to develop government-to-government arrangements with friendly and allied governments in the space reconnaissance area. To permit the expansion of such efforts, the Commission recommends the development of a two-tiered approach to international cooperation in space similar to that described above.

The Policy Governing the Sale of Commercial Imagery Systems

The Commission believes that new government-to-government arrangements in space reconnaissance are likely to produce the greatest overall benefits for the United States, but the development and sale of commercial remote sensing systems by U.S. industry also may produce benefits for U.S. intelligence agencies, a point discussed more fully in the section that follows. Unless the policy governing the foreign sale of these systems permits U.S. firms to compete effectively with their foreign counterparts, however, the investment U.S. firms are willing to make in such systems is apt to be small.

In March 1994, President Clinton signed Presidential Decision Directive 23 (PDD-23) which, for the first time, established an industrial policy permitting U.S. firms to obtain licenses to market imagery products and systems commercially. The stated goal of this policy was to "enhance U.S. industrial competitiveness in the field of remote sensing space capabilities while at the same time protecting U.S. national security and foreign policy interests."

Under the terms of the directive, the U. S. Government retains "shutter control" of any commercial imagery systems licensed for sale to foreign purchasers by U.S. firms outside of a government-to-government agreement. This means the U.S. Government would retain the right to curtail the use of any imaging system sold by a U.S. firm to a foreign purchaser when it perceived its national security interests were affected. It was felt that this authority was needed in the event a domestic or foreign purchaser sought to use the system contrary to U.S. interests. Any proposed sale or transfer by a foreign recipient of sensitive components or subsystems also would be subject to U.S. Government approval.

Currently, there are four U.S. firms or consortia licensed under this policy to market imaging systems. None has launched a satellite yet, and the first such launch is not expected until late 1997.

The "shutter control" policy embodied in the President's directive appears to impose conditions that are likely to be unacceptable to countries considering the purchase of U.S. commercial systems. Potential foreign customers are faced with a choice of investing in affordable, reliable commercial systems where the U.S. has ultimate control, or investing in expensive, less reliable and unproven foreign systems over which they can retain full control. This would seem to conflict with the directive's stated objective of "enhancing U.S. industrial competitiveness." Even without the shutter control policy, the United States would determine, through the export licensing process, which foreign countries are permitted to purchase U.S. commercial systems, thereby reducing the risk of sale to countries where relationships are apt to go sour.

On the other hand, if new government-to-government arrangements in space reconnaissance are developed as the Commission recommends, they would be likely to supplant commercial sales of imagery systems to our closest allies, leaving the potential market for such sales consisting of countries which are other than our closest allies. If such arrangements were put in place, it might argue for retaining shutter control over commercial sales.

While the pros and cons must be carefully weighed, where imagery is concerned the technology genie is clearly out of the bottle. Other countries now are able to build and launch satellites that capture images from space, and the number of these countries is certain to grow. Governments unable to afford their own satellite systems will be able to purchase images produced by the systems of other nations, whether or not such images threaten U.S. security interests. In short, the Commission believes the shutter control policy may be counterproductive in terms of limiting the development and sale of commercial imagery systems by American industry, and, at the same time, provide little effective protection to U.S. security interests.

11-2. The Commission recommends that the shutter control policy embodied in Presidential Decision Directive 23 be reexamined.

Reliance on Commercial Imagery to Reduce Costs

U.S. intelligence agencies are currently working with the commercial firms licensed under PDD-23 to ascertain the extent to which they will be able rely upon future commercial imaging systems to reduce the costs of imagery collection. Until the first commercial imaging system is launched in late 1997, it will be impossible to make a realistic assessment, but several points do appear clear:

- There is apt to be a wider range of imagery products available by the end of the decade, given the ability of industry to build lower cost satellite systems using off-the-shelf components in assembly-line fashion. While the quality of these products cannot, as yet, be determined, it appears their costs will be lower than the products derived from intelligence systems.

- U.S. firms contemplating entry into the market for commercial imaging systems will be driven by the potential profitability. Whether or not the U.S. Government is a customer will be a significant factor in their business decisions.

- Commercial imaging systems may be able to satisfy some requirements of the Government, but they will be nowhere near as capable of satisfying the wide range of requirements of existing intelligence systems.

The Commission believes that developments in the commercial satellite industry offer great promise. Commercial systems could affect the size and capabilities of future systems developed by the Intelligence Community; however, they will not obviate the need to maintain separate intelligence systems for the foreseeable future. Intelligence agencies should continue to assess the utility of commercial systems and to rely upon them where possible.

Reliance on Small Satellites to Reduce Costs

As stated earlier, the United States has for the most part chosen to build a small number of large, very capable satellites as opposed to more satellites that are smaller and less capable. Smaller satellites, some argue, would be cheaper to develop than existing systems, and their reduced weight would reduce launch costs significantly. Deploying a larger

number of small satellites also would provide more frequent revisit times and improved global coverage. On the other hand, a system of small satellites may have to devote a larger fraction of its weight to "housekeeping" functions as opposed to sensor capability. In short, it may be less capable.

In 1994, the issue of smaller satellites was considered, but the DCI and the Congress agreed to adhere basically to the longstanding approach. Their agreement on satellite architecture essentially dictated what types of satellites would be built and deployed into the next century. In 1995, however, largely at the initiative of the House Permanent Select Committee on Intelligence, the issue of small satellites was reopened. This action also prompted the Commission to explore the issue.

When small satellites were evaluated in the past, they were deemed technically feasible, but the expense of designing, procuring, launching, and operating them, as well as some inflexibility in their design, led some to believe that their use would result in a substantial degradation in the overall U.S. capability. The National Reconnaissance Office, in consultation with aerospace companies, is currently evaluating these issues. Some believe a system should be built to test the small satellite concept on the most technically challenging imagery mission, and that the potential cost savings (if the test is successful) would justify building the capability now. Others believe that building such a system would not be prudent until all of the estimates and technical studies are completed, and, more important, that investing in this option prematurely might preclude funding other research and development that offer greater promise.

The Commission concluded that it is premature to endorse greater reliance on small satellites as replacements for current highly-advanced reconnaissance systems. Whether small satellites would reduce costs is still an open question—a greater number of small satellites may not be cheaper. Whether they can accomplish the missions of the current larger systems also is not yet proven. The Commission recognizes the importance of pursuing this and other technological avenues to reduce the costs of satellite collection, but it is not persuaded that a clear case for small satellites as replacements for the current high-end systems has yet been made. (This is not to say that smaller and less expensive satellites should not be developed to form the second tier of the two-tier approach to space reconnaissance, recommended earlier in this chapter.)

The Management Arrangement for Space Activities

Two organizations within the Department of Defense manage space assets: the U.S. Space Command (SPACECOM) is responsible for so-called "white world" satellites (i.e., satellites that are publicly acknowledged) for military programs, and the National Reconnaissance Office (NRO) deals with "black world" (i.e., classified) satellites for intelligence programs. SPACECOM launches and operates satellites for military communication, weather and navigation, which are designed and procured by the military services. NRO designs, acquires, launches, and operates classified reconnaissance satellites.

By most accounts, the NRO has performed its core functions exceptionally well over the years, delivering a space-based reconnaissance capability that far exceeds any

other nation's. One challenge for the future, however, is to integrate that capability with other space-based systems for navigation, weather, and communications, to ensure they operate in concert and take advantage of economies of scale.

In this regard, the Commission on the Roles and Missions of the Armed Forces last year stated that "[a]n integrated space program using the best practices of the NRO, the services, and the civil and commercial sectors would result in lower acquisition and operational costs for space systems and improve responsiveness to all users." That Commission further urged that the Secretary of Defense "integrate the management of military and intelligence space activities . . . [and] assign responsibility for developing an integrated architecture for military and intelligence space systems to a joint service office reporting to the Secretary." The current DCI has espoused a similar view.

While few who spoke to the Commission took issue with the need to integrate military and intelligence space activities where possible, there was considerable controversy with respect to whether there should be one organization to manage these activities.

Some thought having separate managers for satellite systems was wasteful, regardless of the different roles that satellite systems play. Others noted that the systems operated by the NRO are far more complex and require significantly more interaction than those operated by SPACECOM. For this reason, the contractors who build NRO systems are responsible for maintaining them "from cradle to grave," contributing substantially to mission quality and mission life.

A number of witnesses expressed concern that if NRO's operational responsibilities were merged with SPACECOM and if the NRO's acquisition role were joined with those of the military services, NRO would lose the advantage of the special procurement authorities of the Director of Central Intelligence. These authorities have contributed significantly to NRO's being able to act expeditiously and to adjust to developments that occur.

Critics of the NRO contend that its use of the DCI's special procurement authorities (which provide more flexibility than government agencies in general have to enter into sole source contracts) has eliminated any incentive to reduce costs and resulted in costly satellites being built that exceeded the real needs of the Community. They believe that merging the acquisition function with DoD "white world" space would introduce more checks and balances into the acquisition process and produce economies of scale.

To date, no decision has been made to combine the NRO's functions with those of the military services or with SPACECOM. Instead, the Secretary of Defense and the DCI appear to have adopted a less drastic, collaborative approach. Responsibility for space systems in each area has been consolidated on the Secretary's staff in a new Deputy Undersecretary for Space. In addition, a Joint Space Management Board was established by the Secretary and DCI in December 1995, to provide a mechanism to coordinate and integrate space activities.

The Commission endorses efforts by the Secretary of Defense and the DCI to achieve closer coordination and integration of space programs to save costs where possible. However, the Commission believes that the NRO should be preserved as a separate element of the Intelligence Community. Its authority to allocate resources for space

activities would be considerably limited if the Commission's recommendations, explained in Chapter 7, are adopted, but the basic responsibilities of the NRO for the research and development, acquisition, and operation of reconnaissance satellites remain valid. The ability of the NRO to utilize the DCI's special procurement authorities ought also to be preserved.

The Management Arrangements for Imagery

Imagery intelligence, or IMINT, refers to intelligence derived from images collected by electro-optical, infrared, and radar sensors. As an intelligence "discipline," it involves coordinating the collection by the various capabilities of the Intelligence Community (including satellites, aircraft, unmanned aerial vehicles), processing and analyzing these images, and disseminating the results. Tasking of imagery satellites is performed by a single interagency committee. Interpretation and evaluation, on the other hand, are conducted at numerous elements and at many different locations. Dissemination involves multiple communications systems.

The need to improve the management of imagery became apparent in 1990-91 during Operation Desert Shield/Desert Storm, when dissemination systems that were not compatible prevented satellite imagery analyzed in Washington from being moved quickly to users in the field. In addition, the military's tactical assets for imagery collection proved inadequate to supplement national systems.

In response, a task force empaneled by former DCI Gates recommended in 1992 that a new agency be formed to manage all imagery collection, analysis, and dissemination—a "National Imagery Agency." Gates and then Secretary of Defense Dick Cheney were unable to agree, however, on an organizational framework and authorities for the new agency. As a compromise, they created an office within DoD—the Central Imagery Office (CIO)—jointly staffed by CIA and DoD personnel, which had more limited functions and authorities. Most imagery elements of the Intelligence Community, including the largest imagery exploitation organization (CIA's National Photographic Interpretation Center) remained outside the new office, which had limited policy authority and no resource authority over outside elements. CIO did retain control of the tasking of imagery collectors, however, and made strides in setting standards and policy to govern imagery exploitation and dissemination.

In December 1995, the current DCI, Secretary of Defense and Chairman of the Joint Chiefs of Staff proposed the establishment of a new organization—the National Imagery and Mapping Agency (NIMA). As proposed, NIMA would be responsible for managing all aspects of national imagery and would be designated a "combat support agency" (responsible to the Chairman, JCS for the support to joint warfighting). In addition to subsuming the CIO, NIMA would encompass the Defense Mapping Agency (a principal user of imagery to make maps for military use), the National Photographic Interpretation Center of CIA, some imagery analysts from the Defense Intelligence Agency, and small elements from other DoD offices. Imagery analysts belonging to the military departments and Unified Commands would not be subsumed into the new agency, but would remain subject to the policies and standards promulgated by NIMA to govern imagery analysis and dissemination. The Director of the new agency would be a three-star general or flag officer

who would report jointly to the Secretary of Defense and the DCI. The views of Congress have been requested on the proposal; meanwhile, plans to begin operations at the new agency on October 1, 1996, are proceeding.

The Commission had extensively examined this issue prior to the recent announcement by the DCI, and, generally speaking, reached the same conclusion. Both national and military users should be better served by a national imagery agency providing streamlined management across the spectrum of tasking, processing, exploitation, and dissemination. Resource management for imagery has been dispersed and ineffective, resulting in certain critical functions being underfunded. There is also an immediate and pressing need to capitalize on emerging technologies to facilitate the analysis of imagery and ensure that it is disseminated in order to reach military combat elements in a timely and usable manner. A new agency that controls the allocation of resources for imagery should be better able to harness these new technologies to productive use.

Some have expressed concern that placing all the imagery capability of the Government within the Department of Defense will mean that non-Defense requirements will suffer. This concern is understandable, but the Commission believes it need not be a serious problem. In the SIGINT area, the National Security Agency, also an element of the Defense Department, has successfully met its national responsibilities over the years. Non-Defense users of imagery are represented on the body that tasks imagery satellites, and the dual reporting requirement of the director of the new agency is another safeguard.

Others have questioned the need for bringing the Defense Mapping Agency into the new organization, fearing that mapping—which is crucial for military operations and the targeting of precision weapons—will receive a lower priority if it is subsumed in a larger organization. Again, this concern is understandable, but the mapping function is dependent on the recovery of geospatial data from digital imagery, and mapping will constitute the largest single aspect of the new organization in terms of personnel and resources. It is unlikely to get short shrift.

While the Commission believes that NIMA is appropriately a combat support agency, it believes that latitude might be left for the Secretary of Defense to appoint a civilian or military officer as Director of the new agency. Aside from this point, the Commission strongly endorses the establishment of the new organization.

Management of Signals Intelligence

Pursuant to Executive order, the Secretary of Defense serves as executive agent of the U.S. Government for signals intelligence activities. The Director of the National Security Agency (NSA), an element of the Department of Defense, has overall responsibility for establishing and operating a “unified organization for signals intelligence activities” within the U.S. Government. He is responsible for collecting and processing signals intelligence to satisfy national requirements and priorities, as well as providing signals intelligence support to military operations. Signals intelligence activities are also carried out by elements of the military departments and, to a lesser extent, by the CIA.

In practice, NSA establishes the requirements for signals collection, tasks collectors, processes the incoming data, and communicates it to users. By all accounts, the management arrangements for signals intelligence have worked extremely well. (Because they have worked well, the Commission earlier recommended making the Director of the NSA "discipline manager" for all SIGINT resources within the National Foreign Intelligence Program.) In addition, the results of its efforts to fuse the operations of various collection systems hold the promise of achieving greater efficiencies from such systems in the future. NSA's contributions continue to be cited by national policymakers and deployed military forces alike for being of immense value.

Nevertheless, the Commission heard concern regarding NSA's ability to perform its mission with the same degree of success in the future. As noted in Chapter 9, personnel costs have reached the point where they have severely limited NSA's ability to invest in research and development and to procure systems essential to its long-term technical needs. NSA itself is concerned that the present skill mix within its workforce is not well suited to integrating new developments in technology into the ongoing work of the agency.

Clearly, the demands and complexity of modern telecommunications technology require a continuing influx of new skills and a greater interaction with the private sector than NSA has experienced in the past. Where NSA once drove technological developments, these are now being driven by the commercial sector. NSA needs to apply these commercial off-the-shelf technologies to its business without engaging in duplicative research and development.

The Commission also heard concerns that broader use of encryption technologies, especially software encryption, and the commercial pressure to limit or end export controls on such encryption, constitute a serious threat to NSA's ability to produce quality signals intelligence in the future. Another congressionally mandated commission, under the auspices of the National Academy of Sciences, is looking into these issues.

Evaluating the "technological health" of NSA exceeded the capability of this Commission. Nonetheless, it is important for NSA and for the Intelligence Community as a whole that an objective and systematic evaluation of this subject be undertaken in order to decide what personnel skills are needed, where research and development should be concentrated, and where investments should be made. The Commission is aware of a recent study of NSA's research and development program requested by the congressional intelligence committees, but it did not cover all aspects of NSA's technological health. The DCI should undertake a comprehensive review.