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National Security Space Collaboration as a National Defense Imperative

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In the late 1950s, President Dwight D. Eisenhower divided control of America's space program into three parts: National Aeronautics and Space Administration civil efforts; unclassified defense communications, navigation, and early warning programs; and classified Intelligence Community (IC) and Department of Defense (DoD) projects later incorporated into the National Reconnaissance Office (NRO).[1] In the 1960s, commercial interests joined America's space community with the launch of privately funded, produced, and managed for-profit communications satellites; commercial imaging satellites followed later. Although these four sectors (classified, unclassified, commercial, and civil) remain to this day, America's increasing reliance on space has largely removed the lines that have traditionally separated these distinct aspects of America's space community. Less than a decade into the twenty-first century, the interdependencies between them are clear, as well as the need to consider the parts of America's space program as a unified whole. The level of interconnectivity and interdependency has increased to the point where actions in one sector can conceivably affect all aspects of America's space enterprise. As a result, today America's concept of national security space no longer encompasses only classified and unclassified DoD and IC space systems; it includes all forms of space systems, as well as a growing use of foreign space capabilities.

American decision-makers and military users are as dependent on commercial and civil systems as they are on national NRO or Air Force systems. Capabilities for precise positioning, navigation, and timing, weather prediction, and global communications are the foundational applications for nearly every mission America's defense and intelligence communities undertake—supporting indications and warning, battle damage assessment, targeting, and operations planning and execution. The DoD-developed Global Positioning System (GPS) permits American and allied warfighters to determine their exact location in order to precisely target enemies on the battlefield and execute operations. Yet, GPS also helps farmers grow the food that feeds the population and assists industry in transporting materials that meet the nation's needs. Another DoD-developed space application, the Defense Meteorological Satellite Program, also supports military and non-military users with accurate life-saving weather predication data. Commercial imaging satellites are increasingly important supplements to the NRO's reconnaissance systems and have already made great contributions during crises, such as the 2005 Hurricane Katrina and 2007 California wildfire disasters, in which users required access to unclassified satellite imagery. In the information age, private global communications form the backbone of America's economic well-being. Additionally, these systems carry a large percentage of the nation's military data, critically augmenting America's military satellite communication architecture. This blending of commerce and defense data transmission demonstrates the commercial space sector's national importance. Although civil, commercial, classified, and unclassified space systems support different missions, each has unique capabilities that play vital roles in maintaining America's financial and military security.

Effectively leveraging the various parts of America's space program is a major challenge facing the national security space community. The DoD and IC recognized this emerging problem during the 1990-1991 Persian Gulf War. However, as the United States' dependence on space increases, the challenge of leveraging these systems' unique abilities will become more acute. The developmental and operational expense of space systems, and current budgetary pressures under which defense space finds itself, amplifies this challenge. The DoD and IC are integrating their architectures and collaborating to ensure the greatest amount of leveraging between both communities. National security space elements are jointly developing capabilities to fuse multi-discipline, multi-intelligence tasking with data from a broad spectrum of commercial, national, airborne and space-based sensor platforms. They are also creating interoperable computer networks that share information seamlessly, and new exploitation tools that increase the value of overhead-derived intelligence data.

The DoD and IC are also organizationally changing to apply the strengths of different agencies to some of America's most pressing national security challenges. After the 9/11 terrorist attacks, for example, combat support agencies, like the National Security Agency and National Geospatial-Intelligence Agency, embedded collection managers and analysts in major commands and deployed warfighter units, creating interactive users tools, to improve the delivery of timely intelligence to America's frontline defenders. Warfighters can leverage the global access and rapid retargeting of IC and DoD systems, the unique sources, methods, and fidelity of their data, and the timely processing and dissemination of information through mission partners. On the other hand, the IC can access the large workforce, launch, recovery, and computer infrastructures, acquisition experience, and warfighter perspective from the DoD.

One of the best examples of DoD and IC cooperation is the NRO's relationship with Air Force Space Command (AFSPC) and the Navy's Space Warfare elements. The NRO's relationship with the Air Force is one of its most enduring and valued partnerships, dating back to the NRO's founding on 6 September 1961 as a hybrid DoD/IC agency. In June 2006, the director, NRO (DNRO) and the Air Force chief of staff built on that relationship by signing an NRO-Air Force statement of intent to promote, clarify, and formalize NRO–Air Force cooperation in the areas of development, acquisition, and operation of national security space systems, and the development of space professionals. Under the agreement, the Air Force assigned a two-star general officer to serve as the deputy director, NRO (DDNRO), while the NRO detailed a senior one-

star equivalent leader to AFSPC headquarters to serve as the deputy director, Air, Space, and Information Operations. The NRO and Air Force also created a Space Assignment Board, chaired by the DDNRO and vice commander, AFSPC, to oversee assignments of all Air Force credentialed space professionals, lieutenant colonel rank and below, including those at the NRO. To strengthen the relationship between the NRO Operations Center (NROC) and the US Strategic Command (USSTRATCOM) Joint Space Operations Center (JSpOC)—both 24/7 operated watches—USSTRATCOM commander, Joint Space Operations, gained the authority to initiate contingency response actions for all Air Force and NRO orbital assets in response to immediate space threats. The NRO and USSTRATCOM also agreed that the JSpOC and NROC would serve as each other's back-up facility and establish common emergency procedures. Lastly, the NRO and Air Force agreed to conduct lessons-learned reviews on the "long history of cooperation and interdependence between the Air Force, NRO, and industry for launching national security payloads."[2]

In the wake of the NRO-Air Force statement of intent, the NRO and AFSPC strengthened US space situational awareness and defensive space capabilities—an effort that gained great urgency after the widely publicized 11 January 2007 Chinese anti-satellite test. Space debris, natural phenomena, such as solar radiation and sunspots, accidents, and deliberate attacks by adversaries threaten America's on-orbit and ground-based space systems. Protection affects every aspect of America's space community due to the interconnectivity between civil, commercial, unclassified, and classified systems. This requires a holistic approach that leverages the strengths of America's entire space community.

Increased threats to America's space systems prompted the 31 March 2008 NRO and AFSPC creation of a joint Space Protection Program to provide "decision-makers with strategic recommendations on how best to protect [America's] space systems and stay ahead of the threat." General C. Robert Kehler, as the commander AFSPC, and I as the DNRO and the IC's space protection lead, are the Space Protection Program's director, and associate director, respectively. This program's mandate is to "preserve national security space efforts through an integrated strategy and to articulate vulnerabilities, assess threat impacts, identify options, and recommend solutions leading to comprehensive space protection capabilities."[3] In the past, *ad hoc* efforts had typically composed the nation's space protection strategy with inter-agency collaboration, generally limited to individual efforts as people rotated between assignments. General Kehler and I expect the current program to consolidate DoD, IC, and other stakeholder protection programs and requirements into a central national strategy. This senior level focus will better leverage different agencies' resources and maximize the national investment in space. The Space Protection Program will use IC threat assessments of US space adversaries to conduct engineering analysis and develop tactics, techniques, and procedures that mitigate dangers, and formalize procedures and processes that avoid duplicative efforts.

As part of their space situational awareness activities, the NRO and AFSPC also support the space surveillance network to detect, track, catalog, and identify approximately 8,000 baseball-sized or larger objects orbiting the Earth. These objects include active and inactive satellites, spent rockets, and other debris, as well as the Space Shuttle, International Space Station, and active US and foreign satellites. Maintaining a detailed catalog of orbiting objects, and their locations, is necessary to prevent on-orbit collisions and provides the US space community with vital space situational awareness. Established in 1975, this network consists of ground-based radar and optical sensors around the world, which currently transmit data to the JSpOC at Vandenberg AFB, California. The NRO also supports the Talon Spectrum Red Cloud program, an Air Force tactical exploitation of national capabilities program effort to load unique data directly into the catalog of orbiting space objects that the JSpOC maintains. Currently, the catalog only receives data from sensors that are officially part of the space surveillance network. The Talon Spectrum Red Cloud initiative will enable non-traditional sensor data to reach the space catalog, which will enhance America's space tracking capabilities and improve detailed space situational awareness.

The 2006 NRO-Air Force statement of intent emphasizes the importance of building and maintaining a highly qualified competent professional space cadre. Accomplishing this goal is a critical national mission, because America is currently facing a severe shortage of skilled engineers and scientists for present and future national security space programs. The US aerospace industry fell from 1.1 million employees in 1990, to 667,000 in 2000, and 584,000 in 2003, while need for aerospace professionals rose. This trend continues despite intense recruitment efforts. Moreover, the supply of engineers aged 30 to 40, who will become government and commercial aerospace managers within a decade, is about 30 to 45 percent below demand, raising alarms of a coming critical shortage of experienced supervisors. Compounding this problem is the fact that the average US aerospace engineer is nearly 60 years old, and approximately 27 percent of engineers are eligible for retirement.[4]

The acquisition reforms that the national security space community embraced in the mid-and late-1990s have exacerbated the aerospace workforce shortage. The NRO and other national security space organizations adopted acquisition practices, like Cost as an Independent Variable and Total System Performance Responsibility, which minimized government oversight and gave prime contractors significant decision-making authority. The government established system requirements for new acquisitions and left the contractors alone, believing that private industry best practices would produce systems "faster, better, cheaper." However, these acquisition practices produced procurement failures and hindered the professional development of a generation of program managers who were not given the opportunity to develop real-world experience because the contractors did the bulk of the work. In this environment, the national security space community was not a good customer; it failed to supervise prime contractors adequately, and was insufficiently involved in subcontractor oversight. Moreover, after the NRO's 1992 reorganization into functional Imagery Intelligence, Signals Intelligence, and Communications directorates, individuals who would have spent their entire careers at the NRO, instead rotated assignments between the NRO and their parent organizations in order to gain promotion, losing valuable space professional experience in the process. New overly complex acquisition processes diffused program execution responsibility and thus advanced space practitioners without the "scar tissue" necessary to manage large procurement activities successfully.

To address this growing workforce crisis, the NRO and AFSPC

are matching space competencies to specific positions and establishing professional development regimens for space operators. Employees at the NRO follow parent service or agency requirements for training and certifications. While an NRO assignment does not postpone or eliminate a parent agency or service educational requirement, the NRO does provide its employees with supplemental training to meet unique NRO requirements, such as acquisition or systems engineering certifications, the parent agency or service does not provide. The NRO and AFSPC are collaborating to set common career standards and supervise the development of space professionals through the Space Assignment Advisory Board, established under the 2006 NRO-Air Force statement of intent. The board's overall objective is to strengthen oversight of the career development of all Air Force credentialed space professionals. It focuses on balancing the Air Force and NRO space professional staffing and experience levels to maintain the appropriate development and utilization of space professionals. Additionally, it helps sustain a sufficient pool of senior space leaders with operations and acquisitions experience at both the Air Force and NRO.

The NRO and AFSPC also support the National Space Security Institute (NSSI) in Colorado Springs. Officially activated in October 2004, the NSSI serves as the DoD's focal point for space education and training, complementing the Air University, Naval Postgraduate School, and Air Force Institute of Technology educational programs. It provides a broad cadre of space professionals with classified and unclassified instruction on America's on-orbit and ground-based space capabilities. The NSSI grew out of the Space Tactics School and the Space Operations School. The Space Tactics School, which existed from 1994 until the US Air Weapons School absorbed it in 1996, responded to lessons learned from the 1990-1991 Persian Gulf War that concluded campaign planners had not fully leveraged the nation's space capabilities. Established in 2001, the Space Operations School focused on broader space concepts and systems.

The NRO, AFSPC, and other space community organizations are also collaborating through the Space Industrial Base Council (SIBC), which the DNRO and DoD Executive Agency for Space co-chair, to maintain critical sources and services to build and sustain America's space systems. Representatives from major US government agencies with equities in America's space program compose the SIBC and analyze US and foreign markets and policies to ensure that America's civil, commercial, classified, and unclassified space communities have the resources to perform their missions. This is important because shortfalls in certain satellite components, or processes that make those components, may affect mission assurance efforts by adding unrealistic costs or time to reconstruct or find a substitute. The government needs to sustain critical suppliers, services, and processes regardless of acquisition programs in instances when the national space community is the only market.

With the support of Congress and mission partners, the NRO-AFSPC relationship is heading in the right direction to meet warfighter and IC needs. Crosscutting communications, fused multi-source data, accelerated information sharing between DoD and IC elements, and common service layers have expanded the value of NRO systems and created a more responsive organization able to confront America's most pressing national security challenges. Instead of the traditional INT-centric approach, the NRO, working with mission partners, is combining data from diverse sensors in new ways, refining products, streamlining delivery, and adding content value to provide analysts and warfighters with improved intelligence. This collaboration has already resulted in more focused, meaningful intelligence for decision-makers, analysts, and those in harms way.

Notes:

[1] R. Cargill Hall, "Sputnik, Eisenhower, and the Formation of the United States Space Program," *Quest: The History of Spaceflight Quarterly* 14, no. 4 (2007), 32-39; R. Cargill Hall, "The Eisenhower Administration and the Cold War: Framing American Astronautics to Serve National Security," *Prologue: Quarterly Journal of the National Archives,* 27 (Spring 1995), 59-72.

[2] Statement of Intent, Air Force-NRO Relationship, General T. Michael Moseley, USAF chief of staff, Donald M. Kerr, director, National Reconnaissance Office, 7 June 2006.

[3] Memorandum of Agreement, General C. Robert Kehler, USAF, commander, AFSCP and Scott F. Large, director, National Reconnaissance Office, SUBJ.: Establishment of the Space Protection Program, 31 March 2008.

[4] Patricia Maloney and Michael Leon, "The State of the National Security Space Workforce," *Crosslink* 8 (Spring 2007), 6.

Mr. Scott F. Large (BS, Engineering, University of Central Florida) became the sixteenth National Reconnaissance Office (NRO) director (DNRO) and was also appointed assistant to the secretary of the Air Force (Intelligence Space Technology) in October 2007.

Mr. Large joined the Central Intelligence Agency (CIA) in 1986 as a project management engineer in the Office of Development and Engineering developing advanced spacecraft payloads at the NRO. He held various senior development and systems engineering positions within the NRO's Imagery Systems Acquisition and Operations Directorate through 1996. Also during this time, he served one year as the executive assistant to the DNRO. In 1997, he became deputy director of the Future Imagery Architecture Program.

In 1998, Mr. Large was appointed the deputy chief for programs within the CIA Directorate of Operations' Technology Management Office. In this position, he helped administer a joint national program while assisting in the development of the program's strategic plan and program management process. In 2000, he was selected as director of the Clandestine Signals Intelligence Operations Group in the Office of Technical Collection within the CIA's Directorate of Science and Technology. While there, he led the development and execution of critical collection operations for the Intelligence Community. In September 2000, he became the deputy director of the Office of Technical Collection.

Mr. Large's last CIA assignment was as the associate deputy director for the Science and Technology Directorate, beginning in September 2001. He returned to the NRO to serve as director, Imagery Systems Acquisition and Operations Directorate, from July 2003 to November 2006. Mr. Large was the director, Source Operations and Management Directorate at the National Geospatial-Intelligence Agency until April 2007 when he again returned to the NRO to assume the position of NRO principal deputy director.