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19 June 2008

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Center for the Study of National Reconnaissance

Bulletin

Summer - Fall 2001
No. 2001-2

"In these times of vast military machines and nuclear-tipped missiles, the ferreting out of this information is indispensable to free world security. . . Aerial photography has been one of the many methods we have used to keep ourselves and the free world abreast of major Soviet military developments. . . The satellite represents the greatest future in the reconnaissance area."

Dwight D. Eisenhower
34th President of the United States

CONTENTS

No. 2001-2 Summer-Fall

FEATURES

ANNOUNCEMENTS

DEPARTMENTS

CALENDAR OF EVENTS

Event	Date
2002 Pioneer Recognition Ceremony	24 September 2002
Corona Mobile Exhibit	Available on Request

The Center for the Study of National Reconnaissance (CSNR) publishes the *CSNR Bulletin* (ISSN1534-505X) for the education and information of the national reconnaissance community. Employees and alumni of the NRO may submit items for publication.

The CSNR is the policy research and analysis team of the NRO Office of Policy. As its mission, CSNR studies the discipline of national reconnaissance, as well as policy issues associated with openness and declassification issues. Under the direction of the NRO Director of Policy, CSNR makes policy recommendations to the Director of National Reconnaissance.

The information in this newsletter may not necessarily reflect the official views of the Intelligence Community or the Department of Defense.

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EDITOR'S NOTE

The second issue of the Center for the Study of National Reconnaissance (CSNR) Bulletin continues our effort to facilitate the understanding of the discipline of national reconnaissance by the customers of the National Reconnaissance Office (NRO), as well as its employees and other constituencies. This issue reflects on the closing of the NRO's 40th Anniversary year and contains perspectives on the evolution of national reconnaissance, especially during the more recent years. We have attempted to provide insight into the earlier theory and practice of national reconnaissance, and how that has been challenged during the initial post-Cold War period prior to the terrorist attacks on New York's World Trade Center and The Pentagon.

This issue opens with policy analyst Catherine Williams' article about the recent report by the Congressionally-directed Space Commission that examined the national security space community. Williams points out how she believes the changes recommended by the commission will influence the organizational relationships of the NRO and impact on the direction of how the discipline evolves. She explains the background and context of the commission's work and the impact of other recommendations by the parallel NRO Commission. She sees the findings of these two commissions as having potentially long-term influences on both the discipline of national reconnaissance and the future of United States space-based activities, developments, and organization.

The practice of national reconnaissance that these two commissions examined was structured by the technological and geo-political environment of the initial post-Cold War period in the 1990s. In the second article, NRO Historian R. Cargill Hall describes the trends in national reconnaissance during that decade. The practice of national reconnaissance during the 1990s was dependent on the doctrine that was developed during the earliest days of the Cold War. One individual who played a major role in defining the discipline during those early years was General James "Jimmy" Doolittle. In the third article, policy analyst Joseph J. Helman describes Doolittle's influence on the then-evolving discipline of national reconnaissance.

Doolittle's contribution to helping define the discipline of national reconnaissance set the stage for the development of an initial national reconnaissance capability. Then the engineers and practitioners were challenged to become the pioneers who would make national reconnaissance a reality. Keith Hall, NRO Director (DNRO), selected four individuals whom he honored as "National Reconnaissance Pioneers" for the year 2001. The Bulletin's assistant editor, Tom Nath, briefly describes the contributions of these four pioneers to the discipline.

It was the contribution of these and other pioneers of national reconnaissance who created a space-based reconnaissance capability that became the foundation for future commercial space enterprises. The final article describes two items that are representative of the people and their work that made this a reality. These are a pioneer commemorative coin that symbolizes the people and two examples of satellite imagery that symbolize the link between the Cold War's national security satellite imagery and today's commercially-marketed satellite imagery.

I hope the Bulletin continues to expand your understanding of the discipline of national reconnaissance and continues to provide a link with the NRO and its people. I continue to invite you to send me any feedback or comments about the CSNR Bulletin (our contact information is on page 3).

Robert A. McDonald
Editor

SPACE COMMISSION RECOMMENDS SWEEPING CHANGES TO NATIONAL SECURITY SPACE MANAGEMENT

By Catherine Williams

The Commission to Assess U.S. National Security Space Management and Organization (often referred to as the Space Commission) released its final report in January 2001, and the Secretary of Defense has directed implementation of many of its recommendations. The Space Commission, which Congress established in the FY 2000 National Defense Authorization Act, was chartered to "review the management and organization of Department of Defense (DoD) space capabilities to determine if they are adequate for the full exploitation of space for national defense." Donald Rumsfeld served as Chair of the Commission (until his appointment as Secretary of Defense), and Table 1 lists the Commission's full membership.

Table 1: Space Commission Members

NAME	POSITION / AFFILIATION
Donald Rumsfeld	*Current Secretary of Defense*
Duane P. Andrews	Assistant Secretary of Defense for C3I*
Robert V. Davis	Deputy Under Secretary of Defense for Space*
General Howell T. Estes	Commander-in-Chief, North American Aerospace Defense Command and Commander-in-Chief, U.S. Space Command*
General Ronald R. Fogleman	Chief of Staff, U.S. Air Force*
Lieutenant General Jay M. Garner	Assistant Vice Chief of Staff, U.S. Army*
William R. Graham	Science Advisor for Presidents Reagan and Bush*
General Charles A. Horner	Commander-in-Chief, U.S. Space Command*
Admiral David E. Jeremiah	Vice Chairman, Joint Chiefs of Staff*
General Thomas S. Moorman	Vice Chief of Staff, U.S. Air Force*
Douglas Necessary	Staff Member, House Committee on Armed Services*
General Glenn K. Otis	Commander, NATO's Central Army Group*
Malcom Wallop	U.S. Senator from Wyoming*

* indicates former title

The Space Commission report asserted the importance of space activities to the security of the United States and our allies. Moreover, it proposed a new and comprehensive national security space management and organizational approach to protect U.S. interests in space. This new approach attempts to merge disparate space activities and adjust chains of command across all areas of national security space–the Office of the Secretary of Defense, the military departments, the NRO, and the U.S. Space Command.

The majority of the changes involve realigning Air Force headquarters and field commands to organize, train, and equip more effectively for space operations. These changes enable the Air Force to become the lead for space activities in the DoD. This includes elevating command of Air Force Space Command to a four-star billet, discontinuing the practice of assigning only flight-rated officers to the position of Commander-in-Chief of U.S. Space Command, and designating the Department of the Air Force as the Executive Agent for Space within DoD (including Department-wide responsibility for planning, programming and acquisition of space systems).

Additionally, under the Space Commission's approach, the Under Secretary of the Air Force serves as the Acquisition Executive for space-related programs and has milestone decision authority for all DoD and space program acquisitions. Centralizing these functions under a single, empowered decision maker streamlines system acquisitions

and greatly improves program oversight. The National Security Space Architect is realigned to report directly to the Under Secretary of the Air Force/Director of the NRO. This aligns Air Force and NRO programs and permits both organizations to use each other's "best practices."

In October 2001, the Secretary of Defense directed the implementation of the "initial step" recommendations, and several have been enacted. The first action was to confirm Mr. Peter B. Teets as the Under Secretary of the Air Force/Director of the NRO in December 2001. In addition, departmental memoranda detailing the roles and responsibilities for the Executive Agent for Space and the delegation of Milestone Decision Authority were put into coordination. The Under Secretary of Defense/ Comptroller established a Major Force Program for space to serve as an accounting mechanism and increase the visibility of the resources allocated for space activities. There also are several interagency working groups (led by Air Force and NRO personnel) working to refine the scope of integration, and to identify process "best practices" to facilitate integration efforts. They are focusing on space operations, launch, acquisition, security, requirements, personnel management, and concepts and doctrine.

The results of these studies are expected in the spring of 2002. In addition, the Under Secretary's staff is defining organizational constructs and assessing candidate Air Force and NRO acquisition programs that may be appropriate for integration.

At this time, it is difficult to determine what effect these sweeping changes will have on the discipline of national reconnaissance and the organization of the NRO. It is certainly possible that better space management by the Air Force could allow the NRO to off-load some of its commodity programs to the Air Force.[1] The NRO then could focus its resources on unique, specialized systems that penetrate the most difficult targets. This "back to black" concept, or a reemphasis on program secrecy, is touted by many as a way for the NRO to regain its agility and creativity. It is possible that the NRO would be insulated from the day-to-day space management activities and would operate much like it did in the 1970s.

On the other hand, it is also possible that the NRO could be given a much larger (and more visible) role in the national security space community. Some have speculated that there is a logical division of space mission areas in which the Air Force should accept responsibility for "infrastructure" (e.g. launch, communications), and the NRO should assume the entire national security space intelligence, surveillance, and reconnaissance (ISR) mission. Essentially acting as a full combat support agency, the NRO would be responsible for the acquisition and operation of the relevant DoD systems, in addition to its own.

It is still too early to speculate on what the final outcome for the NRO will be. In fact, it could be a combination of both of these scenarios. Regardless, it is clear the Space Commission recommendations will have profound effects on the evolving discipline of national reconnaissance and the NRO, and on the future use of U.S. national security space systems, by altering the organizational and bureaucratic aspects of national reconnaissance.

Although the Space Commission activities were separate and independent from the NRO Commission, both reviews identified similar overarching findings.[2] For example, both commissions recognized the importance of Executive Branch leadership in national security space planning and advocacy. Second, both identified the inherent need for a strong Secretary of Defense-Director of Central Intelligence relationship to ensure effective space management. Other common themes included the need for increased resources, stable funding, and a reinvigoration of the nation's focus on innovative space research and development.

Finally, both commissions acknowledged the importance of legacy NRO systems and the advantages of streamlined NRO business practices. If you are interested in reading the full Space Commission report, it is available on-line at: www.spacecom.af.mil/hqafspc/library/default.htm.

Catherine Williams is a policy analyst in the NRO Office of Policy's Center for the Study of National Reconnaissance, and has been responsible for much of the NRO's commission-related work.

[1] Commodity programs are those whose products and services are widely used by DoD and Intelligence Community customers, and are less sensitive (e.g., 1-meter-resolution imagery systems and some communications systems).

[2] The NRO Commission report was released in November 1999 and summarized in Issue 2001-1 of the CSNR Bulletin.

National Reconnaissance in the Post-Cold War Era

By Cargill Hall*

In the mid 1970s the film-limited Corona-type capsule recovery satellites were succeeded by near-real time electro-optical imaging satellites, limited now almost solely by auxiliary power. The Grab Signals Intelligence satellites likewise led to successors far more technically sophisticated and powerful. Contemplating these changes in 1977, Miles Copeland, a retired intelligence officer, reflected: "a satellite circling the world ... will pick up more information in a day than the espionage service could pick up in a year." Indeed, by the 1980s improved technology applied in space and on earth opened the way to using overhead intelligence for tactical support of military forces. Though tested successfully in the 1991 Gulf War, that support was found wanting in various respects. A system architecture designed to furnish national leaders strategic intelligence was not so easily adapted to support combat commanders engaged in the field.

For the NRO and the entire Intelligence Community, 1991 marked a sea state change in intelligence requirements, customers, and technology applications. The Gulf War early in the year focused national attention on delivering tactical intelligence to warfighters quickly and in the form they desired. Responding to the lessons of the Gulf War, the NRO established the Operational Support Office (OSO) in 1992 that addressed directly tactical military concerns. Service Tactical Exploitation of National Capabilities (TENCAP) organizations working with the NRO and its mission partners created new and improved mobile vans and receiving equipment that brought satellite imagery and signals intelligence directly to deployed American forces at the corps, division, and even brigade level, as well as to combatant ships at sea.

In 1996, the Secretary of Defense and the Director of Central Intelligence, with the approval of Congress, consolidated existing assets and established the National Imagery and Mapping Agency (NIMA) to improve still further intelligence support to warfighters. But the demise of the USSR, which also occurred in 1991, reduced the strategic threat and caused some U.S. officials to question openly whether America's reconnaissance satellites were not surplus Cold War artifacts that could be correspondingly reduced in number, if not eliminated entirely.

Operation Desert Storm

As events transpired, post Cold War threats to the nation's security unfolded in ways not foreseen. The uncertainties in international affairs increased. International terrorists and drug and crime cartels became more sophisticated and virulent. They, too, made use of the emergent electronic highway, the internet, and new encryption technology to secure communications. Rogue states frequently aided these forces, while they exported arms and worked to perfect and hide from view weapons of mass destruction. Vehicular bombing attacks killed U.S. citizens at home and abroad. American leaders now focused intelligence collection assets, including NRO satellites, to monitor this mushrooming array of dynamic, unpredictable, and globally dispersed targets.

The NRO reconnaissance satellites also were recruited to help federal and international agencies deal with natural and man-made disasters (volcanic eruptions, earthquakes, and oil spills for example), smuggling, and diplomatic and peacekeeping activities among other evolving intelligence requirements. Security policy changes allowed the NRO to downgrade and declassify certain intelligence-derived products, making them widely available and increasing their value to the government and the public. The Departments of the Interior, Agriculture, Commerce, Energy, and Transportation joined the NRO's growing list of customers. By the turn of the Millennium, the nation's civil and military leaders had answered the question posed

* Adapted from the monograph, *NRO at Forty: Ensuring Global Information Supremacy*, R. Cargill Hall

just a few years before: In no way could reconnaissance satellites be considered surplus to anything, much less a declining asset.

The NRO, itself, also changed significantly in the last decade of the twentieth century. The existence of the NRO was made known publicly in 1992, and some of the early NRO space projects were declassified. The competitive NRO Programs A, B, and C were combined into a single team of teams and organized functionally into directorates: Imaging, Signals Intelligence, Communications, and Space Launch. Competition in the future would take place among the industrial contractors that built the reconnaissance satellites. The NRO Headquarters staff at the Pentagon, together with office elements located elsewhere around the country, moved to a new headquarters complex. These corporate changes were overshadowed in 1995 when auditors discovered NRO obligated funds (committed but not yet spent) carried forward from one fiscal year to the next by the formerly separated alphaberic programs. The amount of this "forward funding," over three billion dollars, had not been reported to the Comptroller at NRO Headquarters. It caused a media sensation and hurt seriously the NRO's credibility among government officials at home and abroad.

Natural Disaster

NRO Satellite Launch, Eastern Test Range, 8 May 1998

Keith R. Hall, NRO Director, appointed by the Secretary of Defense and Director of Central Intelligence and approved by Congress in March 1997, set to work to ensure financial accountability and speed delivery of intelligence products to the NRO's civil and military customers. Together with other NRO leaders, DNRO Hall completed plans for the future overhead imaging and signals intelligence satellites that will replace existing NRO overhead assets. With these changes in place, NRO personnel were positioned to ensure global information supremacy for the United States in the future. In that endeavor, each will contribute to an intelligence enterprise with a heritage second-to-none.

Cargill Hall has been the NRO Historian since March 1998. He previously served as the Manager of the Contract Histories Program in the Air Force History Support Office. His career as a historian spans over 40 years and includes over 40 publications.

General James "Jimmy" Doolittle: A Leader in the Evolution of National Reconnaissance

By Joseph J. Helman

General James "Jimmy" Doolittle

In the realms of military and civilian aviation and national security, few individuals have a record of achievement that can match General James "Jimmy" Doolittle. His accomplishments as a pilot, scholar, military officer, business executive and presidential advisor spanned nearly seven decades. While Doolittle's military accomplishments are well known and have been publicly acknowledged and documented, his contributions to national reconnaissance are virtually unknown because of the secrecy of the endeavors that could not be acknowledged at the time.

The Evolution of Peacetime National Reconnaissance

Following the end of World War II, the United States and Soviet Union engaged in a "Cold War" that became the defining element of international politics for four and a half decades. The tools, tactics, and information required to defend and advance American national interests and objectives were quite different in this Cold War than in previous military conflicts. One of the most important requirements was the need for timely, accurate, and reliable information on Soviet strategic capabilities. In order to obtain this information, a transition from wartime reconnaissance to peacetime strategic reconnaissance was necessary in terms of intelligence collection tools and methods.

The first decade of the Cold War, characterized by fear and uncertainty regarding Soviet military capabilities and intentions, was highlighted by bellicose Soviet claims regarding their strategic weapons systems. The possibility of a surprise nuclear attack on the United States made clear the urgent need for peacetime strategic reconnaissance. In response, U.S. airborne and space-based national reconnaissance systems were built to gather information regarding Soviet strategic capabilities, particularly with regard to what was referred to during the Eisenhower and Kennedy administrations as the "missile gap."

In the nuclear age, nations needed reliable information of force levels and technological capabilities if both sides were to reduce fears of surprise attack, and reduce the dangers of an arms race resulting from mistrust and misperceptions of capabilities and intentions. Extremely high-altitude aerial reconnaissance and overflight of adversary territory with a small number of specially designed and fabricated aircraft capable of avoiding interception, and hopefully detection, was viewed as the best way to obtain this information and achieve a level of confidence and resulting strategic stability ("Richard Leghorn," 2002).

Influencing the Development of National Reconnaissance

In March 1951 Jimmy Doolittle was appointed Special Assistant to the Air Force Chief of Staff, serving as a civilian advisor on scientific matters that led to various Air Force ballistic missile and space programs. Doolittle

viewed the use of space for national purposes as being consistent with progress in military and civilian aviation. He said, "My belief was that space was a natural extension of aeronautical thinking and planning (Doolittle, 1991)."

Doolittle earned the respect, trust, and confidence of President Dwight D. Eisenhower, who served as Supreme Allied Commander in Europe, and like Doolittle, appreciated the importance of imagery and signals intelligence during war and peace. Consequently, after Eisenhower was elected President in 1952, he called upon Doolittle to chair and serve on many presidential panels and advisory boards related to intelligence and national reconnaissance. These panels included: the Beacon Hill Study Group, 1952; the Technological Capabilities Panel, 1954-1955; the Air Force Scientific Advisory Board (chairman), 1955-1958; the President's Foreign Intelligence Advisory Board, 1955-1965; the Defense Science Board, 1957-1958; the President's Science Advisory Committee, 1957-1958; and the National Advisory Committee for Aeronautics (chairman), 1956-58 (NACA was the predecessor to NASA).

Doolittle established the Intelligence/ Reconnaissance Panel on the Air Force Scientific Advisory Board, which advised the Air Force on the potential usefulness of new technologies. He also contributed to the formation of the Beacon Hill Study Group. The Beacon Hill group was formed by the Air Force to explore new methods for conducting reconnaissance of the Soviet Bloc. The panel was comprised of fifteen consultants from academe and industry, and they assembled in Boston at a secretarial school on Beacon Hill (which became the classified name for the project). During early 1952 the group traveled to various airbases, laboratories and businesses for briefings on the latest technologies and projects, specifically with regard to new approaches to aerial reconnaissance (Doolittle, 1991). The panel's final report, delivered in June 1952, advocated radical new approaches to obtaining the information necessary for national intelligence estimates of enemy capabilities and intentions. One of the report's key recommendations called for the development of a high-altitude reconnaissance aircraft. This recommendation contributed to the research, development, and deployment of the highly successful U-2 reconnaissance aircraft.

Doolittle also was called into service by President Eisenhower to serve on the Steering Committee of the influential Technological Capabilities Panel (TCP). The President's concern was growing with regard to the capability of the Soviet Union to launch a surprise nuclear attack against the United States. This concern was heightened by confirmed reports about a new Soviet bomber known by its NATO designation as Bison. The President asked the TCP to advise him on "the country's technological capabilities to meet some of its current problems," specifically with regard to methods for reducing the risk of surprise attack on the United States (Pedlow and Welzenbach, 1998).

The U-2 Reconnaissance Aircraft

One of the three TCP subcommittees was given the task of reviewing the nation's intelligence capabilities and existing organizations (this group was known as Project Three, chaired by Edwin Land, founder and CEO of the Polaroid Corporation). The Project Three study group was not impressed with the capabilities and resources of the Intelligence Community, particularly with regard to the Central Intelligence Agency (CIA) (Pedlow and Welzenbach, 1998). In response to their report, in 1954 Eisenhower directed Doolittle to lead a "comprehensive study of the activities of the Central Intelligence Agency." (Doolittle, 1954; "Edwin Land," 2002)

In his study of the CIA, Doolittle observed that continued reliance on human sources of information would not provide the quantity or quality of intelligence necessary to meet U.S. national security requirements. He noted that infiltration by human agents was extremely difficult due to tight security controls that were utilized by the Soviet Union and its allies. Additionally, Doolittle argued that, "the information we have obtained by this method of acquisition has been negligible, and the cost in effort, dollars, and human lives [has been] prohibitive." In response, Doolittle recommended that:

> ...much more effort should be expended in exploring every possible scientific and technical avenue of approach to the intelligence problem. We believe that every known technique should be intensively applied and new ones should

> be developed to increase our intelligence acquisition by technical collection systems. From such sources may come early warning of impending attack. No price is too high to pay for this knowledge (Doolittle, 1954).

In the report Doolittle was also critical of Director of Central Intelligence (DCI) Allen Dulles' failure to embrace technology and technical collection systems for intelligence collection and national reconnaissance requirements. For example, Dulles had expressed reluctance to have the CIA undertake the U-2 project, which he viewed as a military mission. Dulles was more inclined to support traditional human methods of intelligence collection as opposed to technical methods. However, within days of the delivery of Doolittle's report to the President, DCI Dulles changed his position and agreed to accept the U-2 program. In the end, the strong advocacy of Doolittle, the TCP Project Three Study Group (led by Edwin Land) and James Killian, later the President's Science Advisor, persuaded Eisenhower that technical approaches to national reconnaissance requirements were critically important and technically feasible.

Doolittle made another important contribution to the success of the U-2 program. Among the many new challenges faced by the airplane's designers was the need for a special fuel that would not boil off and evaporate at the very high altitudes at which the aircraft was designed to operate. After World War II Doolittle returned to Shell Oil, and among his projects was the development of high performance jet fuel. In response to the U-2's special fuel requirements, Doolittle directed the development of a low-volatility, low-vapor pressure kerosene fuel. The result was a dense mixture known formally as LF-1A, JP-TS, or JP-7, which had a boiling point of 300 degrees Fahrenheit at sea level (Pedlow and Welzenbach, 1998).

Foundations of Leadership

The most well known and documented of Doolittle's many wartime accomplishments was his leadership of the Tokyo Raiders. In April 1942 Doolittle led a flight of sixteen B-25 bombers that took off from the flight deck of the aircraft carrier Horner, and conducted a daring attack against multiple targets in the Japanese homeland, including Tokyo. This represented the first attack by U.S. forces against the Japanese homeland. Although the mission had limited strategic value, it had immeasurable value in terms of lifting the morale of the American public and military forces that was badly shaken in the wake of the surprise attack at Pearl Harbor.

In January 1942 Doolittle was assigned to the Headquarters of the Army Air Force where he was assigned the task of planning the first aerial raid on the Japanese homeland, which occurred four months later. From July 1942 until the end of the war in 1945 Doolittle commanded U.S. Air Forces in North Africa, Europe and the Far East, including directing the strategic bombing of Germany. When air operations ended in the European theater, he moved with the Eighth Air Force to Okinawa for the remainder of the war.

Doolittle was born in Alameda, California, on 14 December 1896. He was in his third year at the University of California when the United States entered World War I. He enlisted as a flying cadet in the Army Signal Corps. He received his commission and served during the war as a flight instructor. He remained in the Army after the war, completed his Bachelor of Arts degree in 1922, and went on to earn a Master of Science and Doctor of Science degree at the Massachusetts Institute of Technology in 1924 and 1925 respectively. His doctorate was in the field of aeronautics, and he was among the first recipients to earn this degree in the United States (Doolittle, 1991).

Between 1922 and 1930, Doolittle successfully completed a number of aviation firsts for which he won a variety of honors and awards. In 1922 he made a record-setting cross-country flight from Florida to California with only one refueling stop. In 1925 he set a world speed record for seaplanes, and in 1932 he set the same record for land planes. In 1928 he assisted in the development of what became the universally used artificial horizon and directional gyroscopes, and the following year he performed the first ever takeoff and landing rely solely on instruments, referred to as "blind flying."

Doolittle resigned his regular commission in 1930, but remained in the Army Air Corps reserve for the next decade. During this time he worked for the Shell Oil Company, and served as the manager of its Aviation Department and also remained very active in the civilian and military aviation field. Doolittle returned to active duty in 1940, and for the next eighteen months he worked on the conversion of automobile manufacturing facilities for the production of military aircraft (Arlington National Cemetery website, 2002). In May 1946 he returned to reserve status and civilian life, but continued to serve his country as a member of various military and civilian advisory panels.

Doolittle was awarded the Medal of Honor, presented personally by President Franklin D. Roosevelt, for his courage and leadership in the Tokyo Raiders mission. He was also the recipient of the Distinguished Service Medal (with Oak Leaf Cluster), Silver Star, Distinguished

Flying Cross (with two Oak Leaf Clusters), the Bronze Star, and many other citations and awards. In 1989, President George Bush awarded Doolittle the Presidential Medal of Freedom for his lifetime of extraordinary service to the country.

Conclusion

Doolittle's contributions can be found throughout the military, technology, and the policy realms of national reconnaissance. However, his contributions are largely unknown because of the secrecy surrounding many of these efforts. The national reconnaissance systems and capabilities that were developed in the second half of the 20th Century, and the enormously valuable contributions they made to U.S. national security and international stability, were achieved in part because of the efforts and vision of General James H. "Jimmy" Doolittle.

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Dr. Joseph J. Helman is a policy analyst in the NRO Office of Policy's Center for the Study of National Reconnaissance. His previous assignments include providing analytical and programmatic support to the Office of the Assistant Secretary of Defense (C3I), the Air Staff, and other organizations in the Department of Defense and Intelligence Community.

THE 2001 NATIONAL RECONNAISSANCE PIONEERS

By Tom Nath

The Director of the NRO selected four National Reconnaissance Pioneers for the year 2001: Donald L. Cromer, A.J. "Tony" Iorillo, Vincent S. Rose, and John Walton. Each of these individuals made significant and lasting contributions to the discipline of national reconnaissance.

Then-Colonel Cromer (retired as Lieutenant General, USAF) directed the design, development, and acquisition of a new imaging satellite that became a critical element of U.S. national reconnaissance. His work led to vital new imaging capabilities, and his efforts in this and other NRO programs from 1970-1998 were essential to the evolution of NRO systems.

Mr. Iorillo conceived a new concept in spacecraft control and operation, which became a fundamental design for many NRO spacecraft. He also was a leader in the Hughes design and development effort that fielded the critical, near-real-time optical-imagery-transmission relay system. He guided corporate and government-funded research efforts on critical technologies that produced significant advances in national reconnaissance capabilities. His efforts contributed to the successful achievement of a challenging and important vision: near-real-time optical imaging, with data relayed directly from space to a ground processing system. He was involved in national reconnaissance from 1965-1994.

Mr. Rose designed the first electronic intelligence (ELINT) payload used in reconnaissance satellites. His achievements enabled the earliest receivers to collect radar emissions across broad frequency ranges that produced "horizon to horizon" area coverage capabilities. His exceptional designs gave the U.S. its first space reconnaissance collection success, and he contributed to the development of advanced ELINT receivers, antennas, and associated elements for four decades, from 1957-1997.

Mr. Walton, as manager of the General Electric system integration organization for the first near-real-time electro-optical reconnaissance satellite, made possible the combined, successful operation of the earth and space-based program elements. He served as a key architect and leader in its definition, development, and deployment, and established and implemented management processes for the system integration and execution of this large, complex, multi-contractor acquisition program. Walton provided leadership to decision-making forums in defining and evaluating program cost, schedule, and performance data, and facilitated a cohesive government and contractor team. His revolutionary methodology addressed the entire life cycle of program events, and has been applied to other NRO programs. He worked in national reconnaissance from 1970-1995.

The 2001 National Reconnaissance Pioneers are scheduled to be inducted in the NRO Hall of Pioneers in the fall of 2002. This event will represent the second induction ceremony of the National Reconnaissance Pioneer Recognition Program. The inaugural ceremony took place in September 2000, when the first class of 46 Pioneers and the 10 Founders of National Reconnaissance were recognized by Director of Central Intelligence (DCI) George Tenet and Director of the National Reconnaissance Office (DNRO) Keith Hall.

Tom Nath is a policy analyst in the NRO Office of Policy's Center for the Study of National Reconnaissance.

The Pioneer Medallion

REMEMBERING THE PAST - SATELLITE IMAGES & COMMEMORATIVE COIN

By Cherie Jones, Jack Munson and Matt Sanderl

The Center for the Study of National Reconnaissance placed two items in the NRO's 40th Anniversary Time Capsule, which was dedicated during the 40th Anniversary Closing Ceremony on 7 September 2001: a satellite imagery comparison fact sheet and a Pioneer Commemorative Coin. The image fact sheet compares a 1960s Cold War national security satellite image with a 1990s commercial satellite image. The coin is a token of recognition and commemoration for those involved with the Pioneer Program. The time capsule also contains artifacts, books, and other items and information about the first forty years of national reconnaissance.

"Corona was the world's first photo-reconnaissance satellite, and it operated during the height of the Cold War to collect pictures over the denied areas behind the Iron and Bamboo Curtians. . . Corona played a major role in determining how we would think about national security during the second half of the twentieth century and then set the stage for how we are going to confront information in the domains of foreign intelligence and remote sensing in the next millennium. . . Corona laid the technological foundation for what is now an exploding field of remote-sensing. . . The data output from these new remote-sensing satellites should be expected to have enormous impact on environmental planning, resource management, agriculture, and worldwide mapping. . . All of this is an outgrowth of what was once a lone, highly classified, but daring enterprise into space imaging."

(*Corona Between the Sun & the Earth - The First NRO Reconnaissance Eye in Space*. R.A. McDonald, ed. Bethesda, Maryland: ASPRS, 1997, pp. 1,263, & back cover.)

Corona Image of the Washington Monument
Mission 1101, 15 September 1967

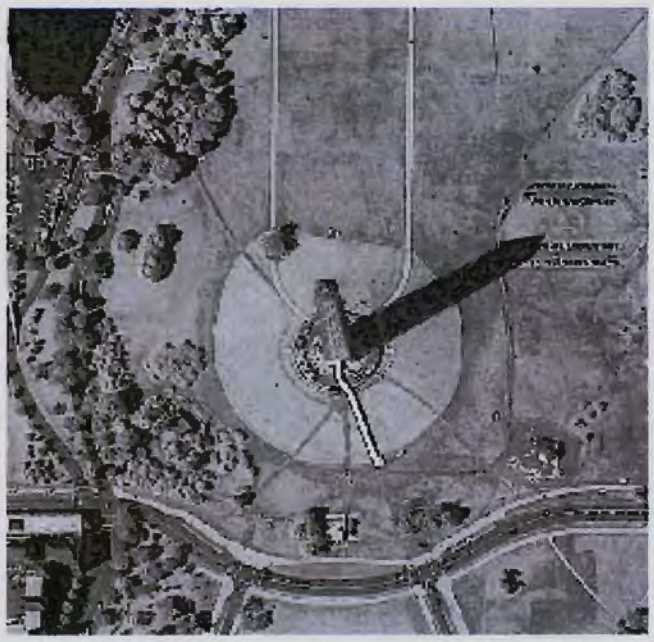
Satellite Image Comparison

The satellite imagery comparison fact sheet compares one of the earliest national security images with a 1990s commercially-available image. The images are from the formerly-classified 1960s Corona program and the 1990s Space Imaging Ikonos system.

Corona was the world's first photo-reconnaissance satellite system. It acquired imagery in secret during the Cold War and was developed and operated by the NRO. Ikonos was the first high-resolution operational commercial satellite system. Space Imaging is a U.S. company based in Thornton, Colorado.

The NRO's first 40 years of developing and engineering in national reconnaissance has provided the technological foundation for a U.S. commercial imaging satellite enterprise. In 1967 Corona already was producing images with as good as a 1.83-meter resolution, which set the stage

for the development of commercial systems with a 1-meter resolution capability.



Ikonos Image of the Washington Monument
24 September 1999

The images in the fact sheet are displayed with brief quotes from two books published by the professional U.S. imaging and geospatial information society. The fact sheet also has a table that compares the capabilities of these two systems. We have reproduced the imagery, quotes, and table below.

Commemorative Coin

The CSNR, which manages the Pioneer Recognition Program for the Director of the NRO, developed a commemorative coin for the Pioneer Recognition Program. The coin serves as a remembrance of this recognition for the Pioneer. It also is given to the Pioneer's family members as an additional token of appreciation for their support. This coin also can be presented to staff personnel in recognition of their support to the program.

The use of military coins has evolved over the years, and they have served varied traditions and purposes such as awards, appreciation, recognition, and commemoration of events. One account from World War I reportedly has a military coin saving the life of an American pilot who had been forced down and captured by the Germans.

Table 2: System Specifications

	CORONA	IKONOS
Launch Date	15 September 1967	24 September 1999
Launch Vehicle	Thor	Athena II
Launch Vehicle Manufacturer	McDonnell Douglas	Lockheed Martin Corporation
Resolution	6 ft/1.83m	3.28 ft/1 m
Altitude	185 km/115 miles*	681 km/423 miles
Inclination	60-110 degrees*	98.1 degrees
Orbit Type	Sun-synchronous	Sun-synchronous
Delivery	Recovery of Film Capsule	Digital Transmission

*These specifications are given in ranges or averages because there were multiple Corona missions.

The pilot was carrying a bronze medallion-like coin with his squadron's emblem on it. He kept this coin in a small leather pouch that was around his neck. When the pilot was captured in a French town near the front, the Germans discouraged his escape by confiscating all his personal identification. However, they let him retain the leather pouch with its coin. During a bombardment one night, the pilot escaped to a French outpost, but he had no identification and was suspected of being a saboteur. The French were preparing to execute him when he remembered the pouch and its coin. He showed the coin to his French captors who recognized the squadron insignia. This delayed the execution long enough to confirm his identity and save his life. This resulted in the tradition of always carrying a coin for unit identification (Brooks, 1994).

"Commercial observation satellites are emblematic of information age technologies at the start of the new millennium; they promise to bolster global transparency by offering unprecedented access to accurate and timely information. ... [T]he users of satellite imagery can look forward to having access to the data from more than two or three dozen civil and commercial observation satellites, offering a range of image types and resolutions ... Commercial earth-observation satellites now blur ... long-standing differences between civil and military imaging satellites."

(*Commercial Observation Satellites–At the Leading Edge of Global Transparency*, J. C. Baker, K. M. O'Connell, R. A. Williamson, eds. Bethesda, Maryland: RAND & ASPRS, 2001, pp. 1, 3, & 4.)

The use of coins for recognition and commemoration has spread to many other organizations and offices within the government, corporate, and civilian communities. The President, Secretary of Defense, Director of Central Intelligence, Director of the National Reconnaissance Office, and other senior government officials all have been known to collect and present coins (Jaffe, 2001; and U.S. Army Regulation, 2001).

The coin contains two symbols. One side of the coin is a depiction of the Pioneer medallions that are displayed in the NRO Hall of Pioneers. The reverse is a depiction of the CSNR logo.

References

Brooks, Maj J.F. "Coining a Tradition." Soldiers Magazine, Vol. 49, No. 8, August 1994.

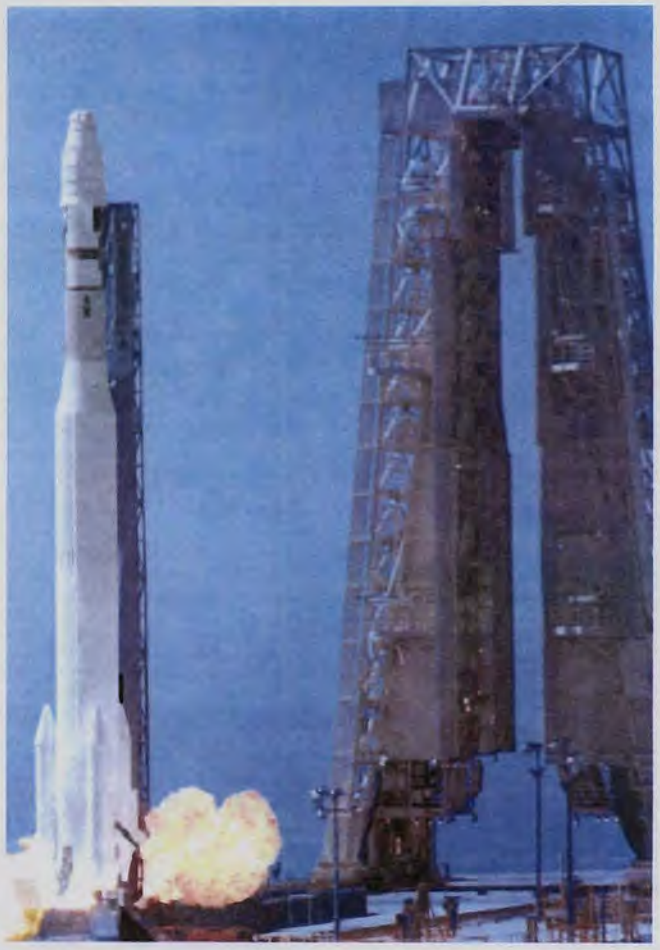
"History of the Challenge Coin" (http://www.militarycoins.com/history.html), accessed 28 August 2001.

Jaffe, G. "In Peacetime, the U.S. Military Covets Collectible Coins, Not Combat Medals." Wall Street Journal, 6 August 2001.

Space Imaging Web Site (http://www.spaceimaging.com/aboutus/satellites/ikonos/ikonos.html), accessed 5 September 2001.

U.S. Army TRADOC Regulation 672-6, "Military Coins," 6 February 2001.

Cherie Jones, Jack Munson, and Matt Sanderl are research and policy analysts in the NRO Office of Policy's Center for the Study of National Reconnaissance.



Corona Launch, 25 May 1972

The Pioneer Coin

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IN MEMORIAM

Merton Davies

– Founder of National Reconnaissance

Merton E. Davies, 83, a National Reconnaissance Pioneer, died on 17 April 2001 in Santa Monica, California, of complications from surgery. The NRO honored Mr. Davies, an engineer, reconnaissance system designer, imagery interpreter, and space cartographer with the RAND Corporation, at the 2000 Pioneer Recognition Ceremony at the NRO. He served the country for three decades and made significant national security contributions.

Merton Davies and his wife, Lois, in front of the NRO 40th Anniversary Commemorative Plaque at NRO Headquarters, 26 September 2000

Mr. Davies was born in St. Paul, Minnesota, and grew up in Palo Alto, California. He studied mathematics at Stanford University, receiving his undergraduate degree in 1937 and continuing his graduate studies afterward. He was unable to join the Army Air Corps in 1940 because he was too tall to fit into the aircraft, and instead joined Douglas Aircraft as a mathematician and worked on World War II fighter plane programs. He joined the RAND Corporation when it separated from Douglas in 1948, and remained at the RAND Corporation for the rest of his career. Throughout his career, Davies continued to serve on NRO and other advisory panels that established reconnaissance requirements and advised on competing reconnaissance systems.

Mr. Davies participated in all early Air Force reconnaissance studies and planning. He invented the spin-pan camera, and collaborated in RAND's film-recovery satellite proposal that ultimately became the Corona program. Davies served on the U.S. delegation to the 1950s Surprise Attack Conference, where he described the feasibility of aircraft and satellite reconnaissance. He also explored the civilian space arena beginning in the 1960s, participating in various projects for the National Aeronautics and Space Administration (NASA). Davies provided recollections about his career in national reconnaissance and the space arena for the NRO's Pioneer/Founder Recollections publication.

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IN MEMORIAM

Chandler "Chad" Keller & Ruben Ornedo

Chandler "Chad" Keller and Ruben Ornedo, two NRO contractors with the Boeing Company, were killed in the September 11 terrorist attacks. The two men were on American Airlines Flight 77 that crashed into the Pentagon. Chad Keller, who was 30, joined Boeing Space Vehicle Contractor (SVC) in 1996. Ruben Ornedo, 40, joined Boeing SVC in 1985.

On 5 November 2001, DNRO Keith Hall presented the Defense Freedom Medal, the civilian equivalent of the Purple Heart, to the families of the two men. The families also received American flags that flew over an NRO facility, lapel pins from a recent NRO launch, and photographic montages of the two men.

Chandler "Chad" Keller (Left)
Ruben Ornedo (Right)

On 10 October, friends and co-workers gathered at Cape Canaveral Air Force Station, Florida, to dedicate a memorial to the two men consisting of two black olive trees and a granite marker. The granite market reads, "Peace and Freedom Trees, Planted in Memory of Ruben Ornedo & Chad Keller, who lost their lives supporting our National Security, September 11, 2001, Flight 77 – Pentagon, On the wings of Eagles they fly, Aquila Launch Team, 2001."

WHERE ARE THEY NOW? ALUMNI NOTES AND NEWS

This Bulletin feature contains notes and news from NRO alumni, including current activities and whereabouts, personal news, and messages for other alumni. Please complete and send in the form at the back of this publication if you would like to contribute to this section in the future.

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IN MEMORIAM

Lynn Havach

– Deputy Director,
NRO Office of Corporate Communications

Lynn Havach, the NRO's Deputy Director of Corporate Communications, died on 11 April 2001 after suffering a heart attack while running. He served the nation for over 30 years, including service with the U.S. Army in Vietnam and assignments with the National Imagery and Mapping Agency and the Defense Intelligence Agency. Mr. Havach served as the principal speechwriter for former DNRO Keith Hall, and was a key contributor to the 2000 Pioneer Program and other events surrounding the NRO's 40th Anniversary. He was a valuable and respected member of the NRO community.

Lynn Havach (right) enjoying DNRO Hall's speech at the Pioneer Hall ribbon-cutting ceremony, 12 September 2000

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