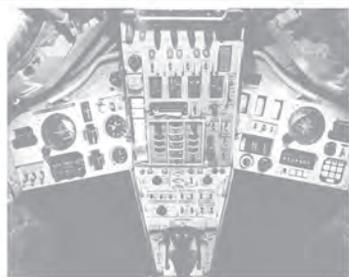




NATIONAL RECONNAISSANCE ALMANAC

SECOND EDITION





NATIONAL RECONNAISSANCE ALMANAC

SECOND EDITION



CENTER FOR THE STUDY OF
NATIONAL RECONNAISSANCE

JANUARY 2016

Center for the Study of National Reconnaissance

The Center for the Study of National Reconnaissance (CSNR) is an independent National Reconnaissance Office (NRO) research body reporting to the Director/ Business Plans and Operations, NRO. Its primary objective is to ensure that the NRO leadership has the analytic framework and historical context to make effective policy and programmatic decisions. The CSNR accomplishes its mission by promoting the study, dialogue, and understanding of the discipline, practice, and history of national reconnaissance. The Center studies the past, analyzes the present, and searches for lessons-learned.

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Foreword

The Center for the Study of National Reconnaissance (CSNR) produced this almanac to celebrate the history, achievements and evolution of the reconnaissance discipline – from individuals who forged its beginnings to those who further shaped the vision to meet the changing threats to national security during the past 55 years. This publication reveals the founding of the National Reconnaissance Office (NRO) and its continued prosperity as a leading intelligence organization today. The CSNR believes you will find this almanac informative, engaging, and practical.

We have identified important dates in the history of reconnaissance and, to provide context, other key events in national security, technology, and space exploration. Through this historical compilation, the CSNR seeks to offer you an opportunity to increase your understanding of national reconnaissance and to develop an appreciation for the contributions of the many engineers, scientists, and other risk-takers whose efforts and achievements paved the way for space-based reconnaissance systems.

The CSNR undertakes projects such as this almanac as an enabler of NRO goals and objectives. We believe having an appreciation for our national reconnaissance heritage can inspire today's workforce to continue contributing innovations that fulfill the current mission of the NRO. The NRO will continue a 55-year tradition of innovation as it adjusts to the challenges of the 21st century.

Robert A. McDonald, Ph.D.
Director, Center for the Study of National Reconnaissance
Business Plans and Operations



▲ NRO's classified payload on NROL-22 launches from Complex 6 at Vandenberg Air Force Base on 27 June 2006.



▲ Left: A small cylindrical sphere, Grab was the first satellite to collect Soviet electronic intelligence. Middle: President Eisenhower examines the Corona bucket. Right: Professor Thaddeus Lowe's reconnaissance balloon used during the American Civil War provided one of the first instances of aerial reconnaissance.

The Concept and Origins of Reconnaissance

Reconnaissance refers to the conduct of an exploratory survey to gather information. Since their beginnings on Earth, both animals and humans have used their senses to acquire data from a distance for daily survival – to locate food, take shelter, or avoid danger. Over time, humans have learned techniques and developed technologies to extend their innate information gathering capabilities. Early examples of expanded human reconnaissance include: animal tracking; making use of natural or man-made observation posts; and using faster or higher endurance transportation to increase speed and expand range for scouting activities.

Early military forces used reconnaissance to gather information about the location, force size, activities, and resources of enemies or potential adversaries. Reconnaissance methods became more sophisticated as technologies evolved. During the Civil War, both the Union and Confederacy used manned balloons as platforms for aerial reconnaissance of the battlefield and enemy territory. With the invention of photography in the early 19th century, aerial observation platforms could collect, retain, and share more accurate and complete information without reliance on human observation and memory.

At the beginning of the 20th century, advancements in photography along with the invention of the airplane greatly improved the military's

ability to conduct aerial reconnaissance. World War I served as a proving ground for these extended range, higher quality information collection platforms. Information gleaned by U.S. reconnaissance activities generally flowed to tactical commanders in the field, either directly or through military intelligence components.

The use of reconnaissance for non-military purposes also began to evolve in the early 20th century. Balloons and kites collected information about the weather and natural disasters, such as the San Francisco earthquake on 18 April 1906.

As technology advanced, humans began to utilize more of the electromagnetic spectrum with such inventions as radio, radar, and sonar. Scientists developed instruments to intercept the signals transmitted by these devices and to exploit information from the intercepted data: the direction from which the signal originated, the type of signal, or its content. During World War II, aerial and electronic reconnaissance provided both sides with significant military intelligence.

The Cold War created a new reconnaissance challenge for the U.S. To obtain information about its strategic rival behind the Iron Curtain with its vast area of denied territory, the U.S. initially relied on strategic reconnaissance flights over the periphery of the Union of Soviet Socialist Republics (U.S.S.R.) using military aircraft such as the RB-47E, as well as ground-based electronic intercept stations. These methods had limited success. Eventually, the U.S. turned to the high-altitude U-2 aircraft to overfly and collect photography of the U.S.S.R. At the same time, the U.S. was developing a new method of reconnaissance to achieve its intelligence objectives.

Emergence of the space age brought about new reconnaissance capabilities. The early 20th century vision and genius of Robert Goddard, known as “the father of modern rocket propulsion,” pioneered the concept of placing objects in space. For nearly 50 years, scientists built on Goddard’s ideas. The U.S. had an active civilian and military space program. The first successful U.S. satellite launch occurred on 31 January 1958 when the Army Ballistic Missile agency used a modified Redstone rocket to send Explorer 1 into orbit. Thirteen months later, following the 21 January 1959 on-pad failure of Discoverer 0 vehicle, the U.S. Air Force (USAF) launched the Discoverer I, the first object intended for a polar orbit. The Discoverer series became the “scientific cover” under which the Corona program developed.

The U.S. launch successes, together with the termination of U-2 airborne surveillance operations over the U.S.S.R., fueled the U.S. vision for a space

reconnaissance program. In June 1960, the U.S. Navy (USN) launched the first successful reconnaissance satellite, a Sigint vehicle developed by the Naval Research Laboratory (NRL). The Galactic Radiation and Background (Grab), was designed to collect Soviet electronic intelligence and orbited for several months. Two months later, the Central Intelligence Agency (CIA) and USAF succeeded with their jointly managed Corona program to return from space and recover the first photoreconnaissance film. The summer successes of 1960 signaled the beginning of space reconnaissance.

To further enhance space reconnaissance, President Eisenhower, on 31 August 1960, transferred the Air Force's photoreconnaissance Samos satellite project to the newly established Air Force Office of Missile and Satellite Systems (SAF/MSS). Air Force Under Secretary, Joseph V. Charyk, led the office and reported to the Secretary of Defense. A year later, the Kennedy administration established the National Reconnaissance Program (NRP), placing all reconnaissance satellite and airborne overflight activities into the program. The SAF/MSS was absorbed by a new organization when on 6 September 1961, the CIA and DoD signed a charter that formed the highly secretive, covert National Reconnaissance Office to manage the NRP.

The new organization sought ways to improve its reconnaissance surveillance mission. Yearning to achieve information beyond the wide-area surveillance of its current Corona satellites, the NRO contracted with industry partners for a film-return satellite that could pin point areas and gather information on specific and targeted objects. On 12 July 1963, within three years of its founding, the NRO launched the Gambit-1 satellite with its KH-7 camera system. This was the first successful system to conduct close-in surveillance of the Soviet Union's denied territories with its stereo pointing, high-resolution cameras. Of its 38 missions until 4 June 1967, 36 achieved orbit. A year before Gambit-1 retired, the NRO also launched the Gambit-3 (Gambit-cubed) with its KH-8 camera with vastly superior resolution over the Gambit-1 KH-7 camera. Its high-resolution, close-in capability was a complement to the Hexagon KH-9 satellite system that NRO developed to perform wide-area searches like Corona - but with improved resolution. With Hexagon's first launch on 15 June 1971, it continued to operate with Gambit-3 for 13 years to give optimal coverage of denied areas and contributed to the U.S. negotiations for international arms-limitation treaties. Tragically, Hexagon's twentieth and final mission, launched on 18 April 1986, never reached space with the failure of its Titan 34D rocket.

Despite the abrupt end to this last generation of film return systems, their overall success during a period of over 20 years had a significant



▲ Hexagon KH-9 sits atop a Titan ready for lift-off.

impact on the fate of manned surveillance systems, particularly those that the USAF sought to implement. Under the overt mission of performing military-related experiments, the Air Force, in 1963, introduced to Defense Secretary Robert McNamara a concept for a 41 foot long laboratory with an affixed Gemini spacecraft housing a two-man crew that would make the journey into space aboard a Titan III. This Manned Orbiting Laboratory or MOL would conceivably become the world's first manned space station and an ideal test bed for the effects of long-duration space missions. What lay behind this outward purpose of the MOL was also a covert one. The Air Force approached the NRO about including payloads of communication devices, radar equipment, and optical cameras that could be operated by the laboratory crew for the purpose of reconnaissance surveillance. The NRO was particularly interested in an onboard high-resolution optical camera and established the Dorian project to further examine its feasibility on a manned mission. While studies revealed Dorian resolution would greatly exceed that of both Corona and Gambit and would benefit with an onboard crew to readily make camera corrections, critics cited concerns over crew safety, rising costs, and mission duration. Even a successful November 1966 unmanned test flight and reentry of the improvised Gemini B could not sway the nay-sayers. As former NRO Deputy Director Jimmie D. Hill later cited, when asked about MOL/Dorian deficiencies, "The problem was that during the development of the MOL program . . . the technology evolved to where we could make (unmanned) satellites live for months, if not years. So what had started out to be something that would enhance your ability by having a man on board actually evolved into something that would cause you to terminate the mission at the end of a month . . . ". Added to the technology boon for unmanned space satellites was the MOL's lagging schedule and ballooning budget that resulted in its cancellation on 9 June 1969 by President Richard M. Nixon. Dorian, subsequently, also faded away.

The improved technology for unmanned optic imagers in the early days of the NRO also proved beneficial for experimental radar imaging efforts. Dr. Robert A. McDonald, Director for NRO's Center for the Study of National Reconnaissance (CSNR) in the Foreword to a 2011 CSNR booklet explained about a little known radar experiment that the NRO conducted in 1964:

"The development of synthetic aperture radar (SAR) imaging for intelligence purposes began before the establishment of the National Reconnaissance Office (NRO). Under the NRO's coordination, scientists and engineers steadily overcame the technological and bureaucratic barriers to achieve radar imaging's potential. On

21 December 1964, Quill, the world's first satellite-borne SAR launched from Vandenberg Air Force Base, California. Quill was a successful experimental program. It is remarkable that it was built using technology already available, saving both time and money” (McDonald, 2011).

The NRO, known for its early and innovative experiments and successes in reconnaissance surveillance, has emerged into the 21st century by continuing to meet U.S. intelligence, military and homeland security requirements by providing improved capabilities on its current and evolving assets. The focus of the organization has transitioned and expanded over its last 55 years from monitoring Cold War adversaries to providing timely information to the warfighter, situational awareness for first responders, and treaty enforcement across the globe. Space has become the location of choice from which nations, organizations, and industry can conduct long-range reconnaissance of the Earth's surface for both military and civil applications.

Today, the NRO continues its job of launching and operating the nation's reconnaissance satellites to gather information that will reduce the unknown, protect vital national interests, and support human survival. Continued advancements in technology have provided information about the activities, resources, and meteorological and hydrographic data from around the globe.



▲ An illuminated launch pad, against the November 1966 night sky, captures the MOL prepared for an unmanned flight to test the ablative shield.

National Reconnaissance and Space Exploration Timeline

July 14, 1914

U.S. government issued patent to Dr. Robert Goddard for liquid-fueled rocket design, laying the foundation for future spaceflights.



July 26, 1947

President Truman signed the National Security Act, establishing the U.S. Air Force as a separate service and forming the CIA, the National Security Council, and DoD.

November 24, 1954

President Eisenhower approved the U-2 concept and appointed the CIA to manage its development.



October 4, 1957

U.S.S.R. launched Sputnik 1, the first artificial, earth-orbiting satellite and setting the "international precedence for freedom of space."

NATIONAL RECONNAISSANCE AND



December 21, 1964:

NRO's experimental synthetic aperture radar (SAR) imaging satellite, Quill, became the world's first satellite-borne SAR.



November 20, 1965

CIA's A-12 supersonic reconnaissance aircraft made its final validation flight, setting speed and altitude records of Mach 3.29 and 90,000 feet.



July 20, 1969

U.S. astronauts Neil Armstrong and Buzz Aldrin became the first to walk on the moon.

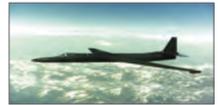


May 26, 1972

Information gathered from Corona's last mission permitted the U.S. to conclude the initial signing of the Strategic Arms Limitation Treaty.

October 1, 1974

NRO abolished Program D, transferring responsibility for U-2, A-12, and SR-71 to the U.S. Air Force.



April 12, 1981

NASA launched the first space shuttle from Cape Canaveral.





February 28, 1958
President Eisenhower endorsed the film recovery satellite program (to be known as Corona) for photoreconnaissance.

October 1, 1958
The National Aeronautics and Space Act created the National Aeronautics and Space Administration (NASA).



May 1, 1960
Soviet missiles shot down Gary Powers' U-2 reconnaissance plane near Sverdlovsk, U.S.S.R.

June 22, 1960
The Naval Research Lab and USAF launched an Eliot satellite (Grab), the first U.S. reconnaissance satellite.



August 19, 1960
USAF C-119 recovered Corona Mission 9009 film capsule, containing the first reconnaissance photos from space.



September 6, 1961
DoD and CIA established the National Reconnaissance Office to oversee the National Reconnaissance Program.

SPACE EXPLORATION TIMELINE

September 18, 1992
The Department of Defense, in an official release, publically acknowledged the existence of the NRO.



October 15, 2008
NRO declassified the fact of domestic NRO Mission Ground Stations and NRO presence at specific overseas locations.



Jul. 8, 2011:
NASA retired its Space Shuttle program with Atlantis' final visit to the International Space Station.



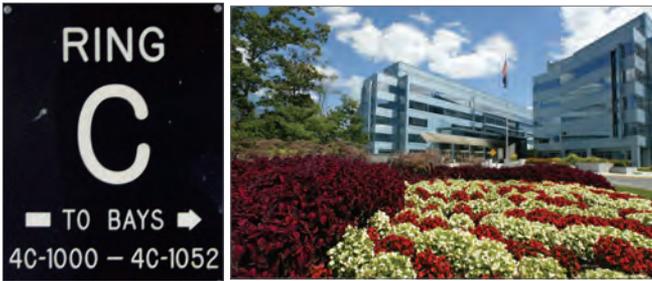
Nov. 12, 2014:
The European Space Agency announced successful landing of its probe, Philae, on a comet's surface.



Sept 17, 2011:
NRO celebrated its 50th anniversary with the public declassification and unveiling of its Gambit and Hexagon film return systems.



Oct 22, 2015:
The NRO announced the declassification of the Dorian program with the release of a compendium of Dorian records at a panel discussion of MOL astronauts held at the National Museum of the U.S. Air Force, Wright-Patterson AFB, OH.



▲ Left: The NRO was quite literally an office in the Pentagon. It managed all the disparate programs out of Pentagon Suite 4C1000. Right: The NRO relocated its various programs and facilities to its new consolidated headquarters in Chantilly, VA in 1996.

The NRO – Its Early Years

The establishment of the NRO on 6 September 1961 and its early management structure intended to build upon the early collaboration between the USAF and the CIA. At its beginning, the NRO was jointly directed by USAF and CIA officials, with both reporting to the Director of Central Intelligence and the Secretary of Defense. This union provided both challenges and triumphs for the early pioneers of the organization who operated in the highly secretive, covert organization. Less than six months after being named NRO co-director, however, Richard Bissell stepped down. The DoD and CIA retained as sole director Joseph Charyk who continued to also serve as Under Secretary of the Air Force. There was no deputy director until March 1963 when a third charter established that the NRO would be led by a DoD appointed director and a CIA-appointed deputy.

The early NRO had a small headquarters staff that operated from Room 4C1000 at the Pentagon. The Director and Deputy Director of the NRO managed four alpha-designated program offices:

Program A managed the U.S. Air Force satellite reconnaissance efforts;

Program B oversaw the CIA satellite reconnaissance program;

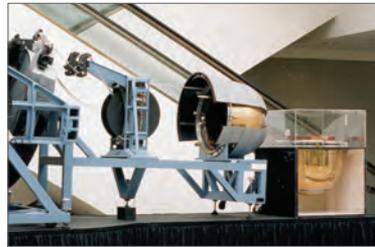
Program C operated the U.S. Navy satellite reconnaissance program;

Program D operated aerial reconnaissance platforms like the U-2, A-12, and SR-71.

On 1 October 1974, the NRO abolished Program D, transferring control of the program's aerial reconnaissance assets to the Department of the Air Force. On 31 December 1992, the NRO disestablished the remaining three alpha-designated program offices and replaced them with functional directorates and program offices (e.g., imagery intelligence, signals intelligence, communications, and space launch). To facilitate this reorganization, the NRO relocated its various program activities, initially consolidating them at interim facilities in the Northern Virginia area. In 1996, the NRO opened a permanent, integrated headquarters facility at the Westfields Business Park in Chantilly, Virginia.

Four years before moving into its new Westfields headquarters complex, the NRO began the process of transforming from a secret organization to an acknowledged agency of the Department of Defense. A 18 September 1992 press release contained the first public acknowledgement of the existence of the NRO.

Some of the formerly classified activities of the NRO became public when President William J. Clinton authorized the Director of Central Intelligence to declassify two programs. Corona, the first imagery reconnaissance satellite was declassified in 1995. Grab, the first Sigint-reconnaissance satellite was declassified in 1998. During its 50th anniversary events on 17 September 2011, the NRO unveiled to the public and displayed prototypes of the Gambit-1 and Hexagon, the last film return satellite systems that together flew over two decades to provide high resolution imagery over denied territories. With their operations becoming obsolescent and ceasing over 30 years ago, former DNRO Bruce Carlson formerly approved their declassification, along with Gambit-3,



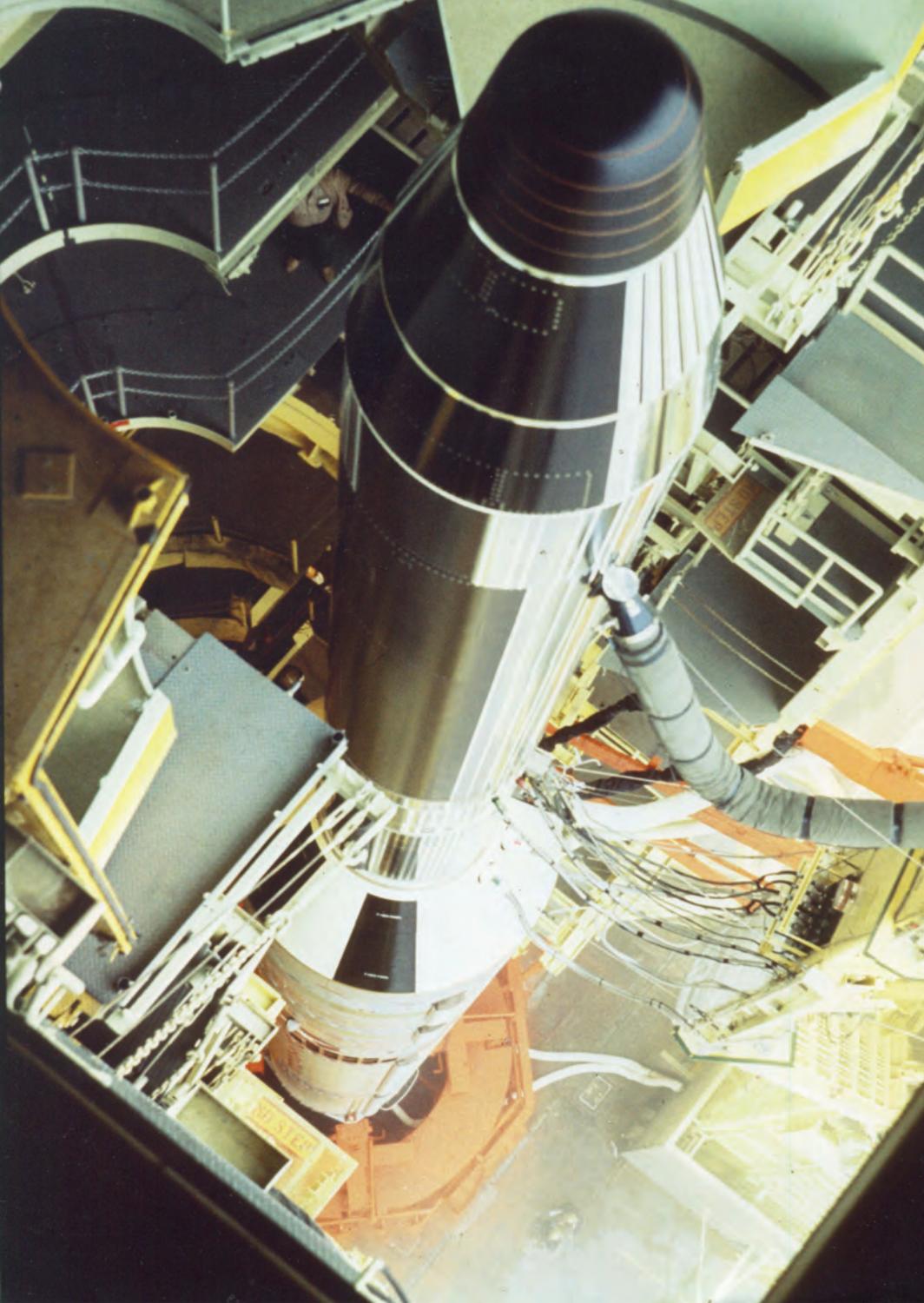
▲ Top: Corona was the first imagery reconnaissance satellite. Bottom: Grab was the first Sigint reconnaissance satellite.

on 2 June 2011. The satellite display and subsequent release of voluminous programmatic documents was one of NRO's largest declassification efforts. Just over a year later, NRO released programmatic Quill information to the public in documents explaining the 1964 successful experimental launch of the world's first synthetic aperture radar (SAR) satellite. In yet another public venue on 22 October 2015, NRO announced the declassification of the NRO's Dorian program and its association with the USAF Manned Orbiting Laboratory (MOL).

These programs, and succeeding NRO programs, have provided U.S. leadership with reliable intelligence in support of national security. Early in the NRO's history, President Lyndon Johnson recognized the value of the NRO's overhead reconnaissance systems when, in 1967, while speaking about the U.S. space program, he said: "We've spent between 35 and 40 billion dollars on space. But if nothing else had come from that program except the knowledge that we get from our satellite photography, it would be worth ten times to us what the whole program cost. Because tonight, I know how many missiles the enemy has that I would not know (otherwise)" (Johnson, 1967).

In recent decades, the NRO has been introduced to more challenges as the world has become more globalized. The Internet and international transportation networks have interconnected countries and persons around the globe, making monitoring the world an increasingly difficult task. No event speaks to this challenge more than that of the terrorist attacks inside the U.S. on 11 September 2001 – or 9/11. With the U.S. troop deployment response to 9/11, NRO leaders realized the immediate need to provide more tactical support to the warfighter. In a 2003 address to the National Space Symposium, DNRO Peter Teets summarized, "In the late 1950s, it was a rare combination of new threats, events, and circumstances that encouraged unprecedented innovation in defense and intelligence technologies. The results—realization of highly capable space systems to meet critical national security needs—were beyond expectation. We are, again, at the brink of another national need for transformation via space capabilities, in the face of a new threat to our homeland. Through innovation, integration, and perspiration, we'll deliver that new potential."

As the NRO moves beyond celebrating 55 years of success, it continues to step up to future challenges and transformational opportunities, taking with it lessons learned from significant historical accomplishments. It has transitioned from operating reconnaissance systems whose primary mission was to collect strategic military, political, and economic information about its principal Cold War adversary, the U.S.S.R., to a new and emerging



▲ Gambit-3 stands tall aboard a Titan IIIB.

mission. Today this mission includes developing information about emerging threats that are more diverse and widely dispersed. International terrorists, drug traffickers, and non-state actors intent on proliferation of weapons of mass destruction, have become critical NRO missions. By developing highly accurate military and intelligence targeting data, supporting international peacekeeping and humanitarian relief operations, and assessing the impact of natural disasters, the NRO continues to provide the nation with strategic and operational support that goes above and beyond. It is this vision that Director NRO Betty Sapp expresses in the simple but powerful Latin words, “Supra Et Ultra.”

References

- Berkowitz, B. with Suk, M. (2015). *The National Reconnaissance Office at 50 Years: A Brief History*, Washington, DC: CSNR (U.S. Government Publishing Office).
- Johnson, L. B. (1967). Remarks as quoted in R. A. McDonald, “NRO’s Satellite Imaging Reconnaissance: Moving from the Cold War Threat to Post-Cold War Challenges,” *Defense Intelligence Journal*, 8-1, 66, 1999.
- McDonald, R. A. (2011). “Foreword.” In J. A. Charlston, et. al., *Quill—A 1964 NRO Experiment in Off-the-Shelf Radar Technology*, Chantilly, VA: CSNR
- McDonald, R. A. and Widlake, P. (2012). “Looking Closer and Looking Broader: Gambit and Hexagon—The Peak of Film-Return Space Reconnaissance After Corona.” In *National Reconnaissance—Journal of the Discipline and Practice*, Spring 2012, Issue 2012-U1
- Outzen, J. (2012). *Critical to US Security: The Gambit and Hexagon Satellite Reconnaissance Systems Compendium*. Washington, DC: CSNR (U.S. Government Publishing Office)
- Outzen, J. (2012). *Trailblazer 1964: The Quill Experimental Radar Imagery Satellite Compendium*. Washington, DC: CSNR (U.S. Government Publishing Office)



▲ In New York City, two towers of light pay tribute to the innocent victims killed in the 9/11 terrorist attacks. In response to those attacks, the NRO, together with other intelligence and DoD agencies, supported the U.S. and allied warfighters with collaborative, “multi-INT” that combined overhead intelligence with other data collection.

Directors of National Reconnaissance



Dr. Richard M. Bissell, Jr.
6 Sep 1961 – 28 Feb 1962
(Co-Director)



Dr. Joseph V. Charyk
6 Sep 1961 – 28 Feb 1962
(Co-Director)
29 Feb 1962 – 1 Mar 1963



Dr. Brockway McMillan
1 Mar 1963 – 1 Oct 1965



Dr. Alexander H. Flax
1 Oct 1965 – 17 Mar 1969



Dr. John L. McLucas
17 Mar 1969 – 20 Dec 1973



Mr. James W. Plummer
21 Dec 1973 – 28 Jun 1976



Mr. Thomas C. Reed
9 Aug 1976 – 7 Apr 1977



Dr. Hans M. Mark
3 Aug 1977 – 8 Oct 1979



Dr. Robert J. Hermann
8 Oct 1979 – 2 Aug 1981



Mr. Edward C. Aldridge, Jr.
3 Aug 1981 – 16 Dec 1988



Mr. Martin C. Faga
28 Sep 1989 – 5 Mar 1993



Mr. Jeffrey K. Harris
9 May 1994 – 26 Feb 1996



Mr. Keith R. Hall
28 Mar 1997 – 13 Dec 2001



Mr. Peter B. Teets
13 Dec 2001 – 25 Mar 2005



Dr. Donald M. Kerr
26 Jul 2005 – 04 Oct 2007



Mr. Scott F. Large
19 Oct 2007 – 18 Apr 2009

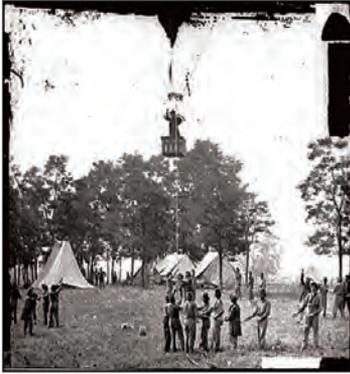


**Gen. Bruce A. Carlson,
USAF (Ret)**
12 Jun 2009 – 5 July 2012



Ms. Betty J. Sapp
06 July 2012 – Present

Key Events in the Exploration of Space and the Evolution of Space-Based Reconnaissance



▲ Top: Professor Thaddeus Lowe conducted aerial reconnaissance from a balloon during Battle of Fair Oaks in Virginia. Bottom: Robert Goddard obtained patents for liquid-fueled and multi-staged rocket designs.

1862

May 31: Professor Thaddeus Lowe conducted aerial reconnaissance from a balloon during Battle of Fair Oaks in Virginia.

1903

Dec. 17: Orville and Wilbur Wright demonstrated first flight of powered, heavier-than-air aircraft at Kitty Hawk, North Carolina.

1906

Apr. 18: George Lawrence's "Captive Airship," comprised of a kite "train" with an attached camera, photographed San Francisco's earthquake devastation.

1909

Apr. 24: A news photographer, flying with Wilbur Wright in Italy, took first motion pictures from an airplane in flight.

Aug. 2: The U.S. Army accepted its first Wright Brothers airplane, making it the first airplane put into service by any government.

1914

Jul. 7: Robert Goddard obtained patents for multi-staged and liquid-fueled rocket designs.

1915

Mar. 3: The U.S. government formed the National Advisory Committee for Aeronautics (NACA), regarded as the predecessor to NASA.

1918

Oct. 2: The U.S. successfully flight-tested the Kettering Bug, the first pilotless aircraft, in Dayton, Ohio.

1943

Apr. 19: RAF photo interpreter Constance Babington Smith identified the V-1 pulse-jet weapon in an aerial reconnaissance photo take of test facility at Peenemunde, Germany.

1945

Mar. 19: The Germans abandoned their V-2 program, leaving rocket technology for capture by Allied Forces.

1946

Apr. 16: The U.S. Army first launched captured German V-2 rocket at White Sands, New Mexico during missile testing.

May 2: RAND report, "Preliminary Design of Experimental World-Circling Spaceship" affirmed feasibility of launching space satellites.

1947

Jul. 26: President Truman signed the National Security Act, establishing the U.S. Air Force as a separate service and forming the CIA, the National Security Council (NSC) and the DoD.

1950

Oct. 9: The U.S. Air Force established Project Gopher for development of a polyethylene high-altitude reconnaissance balloon.

1952

Jul. 5: The U.S. Air Force directed Strategic Air Command (SAC) to modify B-47B bomber to perform photoreconnaissance missions; the first mission took place in October.

Oct. 15: A B-47B aircraft crew photographed northeastern Siberian air bases during the first Presidentially-authorized overflight of the U.S.S.R.

Nov. 2: The CIA established a photo interpretation unit within its Office of Research and Reports.

1954

Mar. 1: RAND issued "FEED BACK Report" recommending the USAF develop a surveillance satellite program.

May 8: The USAF used a RB47E to conduct photoreconnaissance in extreme northwestern Soviet Union.

Jul. 1: The USAF established the Western Development Division (WDD), considered the birthplace of U.S. missile and satellite development, in Inglewood, California.



▲ Top: A U-2 spy plane, used for overflights of the U.S.S.R., prepares for take-off. Bottom: The high-altitude, camera-carrying Genetrix balloon, approved to fly over interior regions of the U.S.S.R, helped to close the sizable intelligence gap.

1954 cont.

Nov. 24: President Eisenhower approved the U-2 concept and appointed the CIA to manage its development.

Dec. 9: The CIA signed a contract to develop U-2, termed the “biggest intelligence bargain in history.”

1955

Apr. 18: Two Soviet MiGs shot down a U.S. RB-47E reconnaissance aircraft near the Chukotskiy Peninsula.

May 26: NSC’s first space policy declared a U.S. satellite, built as part of International Geophysical Year objectives, would be for “peaceful uses of space” that would test the international principle of “freedom of space.”

Jul. 21: Soviets rejected President Eisenhower’s Open Skies proposal at Geneva, providing impetus for U-2 operations and missions over U.S.S.R.



▲ Before the U-2 was shot down in 1960, the U.S. was already developing a replacement for the U-2 aircraft under the OXCART and SR-71 programs.

Aug. 4: U-2 prototype flew its first test flight, just eight months after its contract was signed with Lockheed.

1956

Jan. 10: Genetrix camera carrying balloons began a series of 516 releases over the next month, collecting intelligence over denied areas.

Jun. 26: RAND issued “Physical Recovery of Satellite Payloads” report recommending substituting film recovery for electronic scanning and readout in orbit.

Jul. 4: Hervey Stockman piloted the first U-2 overflight over denied Soviet airspace, flying over Leningrad; Soviet radar detected the flight.

Jul. 10: Soviet officials protested American U-2 violation of Soviet airspace resulting in President Eisenhower temporarily suspending the Soviet overflights.

Oct. 29: The USAF awarded a contract to Lockheed for the WS-117L program, an outgrowth of RAND studies and the only reconnaissance satellite effort at that time in the U.S.

1956 cont.

Nov. 27: Requirement clearly defining an effort for a reconnaissance satellite system emerged from the WS-117L; Pentagon approved the operational requirement four months later.

1957

Mar. 6: Merton Davies conceived a “hot idea” for attaching a spin-pan camera to a satellite after discussions with Fairchild Camera employee, Frederic Wilcox.

May 15: The U.S.S.R. launched R-7 ICBM, giving Soviet Union the lead in space race.

Oct. 4: U.S.S.R. launched Sputnik-1, the first artificial, earth-orbiting satellite setting the “international precedence for freedom of space.”

Dec. 6: The U.S. Navy’s Vanguard, anticipated as the first satellite to launch in the Western world in response to Sputnik, exploded two feet above launch pad.

Dec. 17: The U.S. successfully launched first Atlas ICBM, eventually leading to its use for payloads in space.

1958

Jan. 31: The U.S. Army’s Jupiter-C launch vehicle placed Explorer I, America’s first satellite, into orbit.

Feb. 28: President Eisenhower endorsed film recovery satellite program for satellite photoreconnaissance.

Mar. 10: The name “Project Corona” arose from WS-117L’s secret satellite Program IIA.

Aug. 19: National Intelligence Estimate (NIE) on Soviet strength contributed to a “missile gap” question that lingered until Sept. 1961 when publication of NIE-11-8/1-61, based on Corona imagery, confirmed that Soviet missile production lagged far behind originally forecast figures.

Oct. 1: National Aeronautics and Space Act established NASA as U.S. civilian space agency.

Dec. 3: Press release provided cover for the secret CIA’s Corona program, disassociated it from the Air Force WS-117L program, and attributed development and future launches to the Discoverer series for scientific exploration.

1959

Jan. 2: The U.S.S.R. launched Luna 1, first Soviet attempt to reach the moon. Instead it passed within 5,995 km of the moon's surface two days later and went into orbit around the Sun.

Jan. 21: First Corona launch failed.

Aug. 14: U.S. Explorer VI transmitted the first image of the Earth from space using a television scanner.

Aug. 24: President Eisenhower approved the Grab Elint satellite reconnaissance program.

1960

Apr. 1: U.S. launched TIROS, the first experimental meteorological satellite, with weather imaging capability that would later support Corona.

Apr. 13: The U.S. Navy successfully launched and orbited Transit 1B, the first navigation satellite.

May 1: Soviets used SA-2 surface-to-air missile (SAM) to shoot down Francis Gary Powers' U-2 reconnaissance plane near Sverdlovsk, U.S.S.R.

May 24: Midas II, a U.S. early warning satellite, launched but transmission failed after two days.



▲ **Top:** An exhibit displays the Soviet's Sputnik-1, the first, Earth-orbiting satellite in space. **Bottom:** The NRL's Grab satellite prepares to launch 500 miles above the Earth for orbit to collect signals emanating from ground-based Soviet radar antennas.

1960 cont.

Jun. 22: U.S. Naval Research Laboratory and USAF launched Elint satellite, Grab, the first U.S. reconnaissance satellite.

Aug. 10: U.S. launched Discoverer XIII, the first successful diagnostic flight in Corona series.

Aug. 11: A USN team retrieved Discoverer XIII's recovery capsule containing an American flag, the first recovery of a man-made object from orbit.

Aug. 19: A USAF C-119 caught Discoverer XIV's recovery capsule in mid-air; it contained the first reconnaissance photographs from space.

Aug. 20: The U.S.S.R. made its first successful space recovery, Vostok prototype (Sputnik V); all animals and plants aboard survived the flight.

Aug. 25: The National Security Council assigned responsibility for Samos satellite reconnaissance program to SECAF.

Aug. 31: SECAF established Samos Project Office on West Coast and Office of Missiles and Satellite Systems (SAF/MSS) in Washington D.C. to direct Project Samos; both were predecessor organizations of the NRO.

Dec. 7: USAF launched Corona Mission 9013, the first successful mission with KH-2 camera.

1961

Feb. 1: The USAF successfully launched a three-stage, solid fuel Minuteman ICBM.

Apr. 12: Soviet Air Force Lieutenant Yuri Gagarin became first human in space.

May 5: LCDR Alan Shepard became first American in space during a brief sub-orbital flight.

Aug. 30: USAF launched Corona Mission 9023, the first mission with a KH-3 camera.

Sept. 6: DoD and CIA established the National Reconnaissance Office (NRO) to oversee the National Reconnaissance Program.

1962

Feb. 20: Lt. Col. John Glenn, Jr. became the first U.S. astronaut to orbit the Earth, circling three times in a span of five hours.

Apr. 26: U.S.S.R. launched a Zenit 2 under designator Kosmos 4, the first Soviet photoreconnaissance test satellite to orbit; it failed to return satisfactory images.



Apr. 30: CIA's A-12, a high-altitude, supersonic "Blackbird" aircraft intended as a follow-on to the U-2, made its first official test flight.

Jul. 17: Robert White piloted the U.S. X-15 to lower reaches of space; first winged aircraft to reach stratosphere.

Jul. 23: DNRO Joseph Charyk organized the NRO into Program A (Air Force), Program B (CIA), Program C (Navy), and Program D (aircraft).

Jul. 28: The U.S.S.R. launched a Zenit 2 (Kosmos 7) which orbited for 10 days and provided Soviets with the first clear photoreconnaissance images from space.

▲ A C-119 catches the Corona recovery vehicle. Corona was a technological marvel that scientists and engineers developed beyond expectations. The Corona saw several firsts: first recovery of an object in space, first midair recovery of an object sent into space, and first intelligence photograph of a target imaged from space.

Aug. 23: NRO launched first successful Defense Meteorological Satellite Program (DMSP) satellite.

Aug. 29: U-2 imagery revealed SA-2 and surface-to-air missile sites under construction in Cuba.

Oct. 14: U.S. U-2 reconnaissance aircraft acquired imagery of Soviet SS-4 medium-range ballistic missiles at San Cristobol, Cuba.



▲ A U-2 reconnaissance photo reveals a Soviet SA-2 surface-to-air missile (SAM) deployment site just prior to the events of the Cuban Missile Crisis in 1962.

Dec. 13: NRO successfully launched second signals reconnaissance satellite, Poppy 1.

1962 cont.

Oct. 22: After disclosing to leaders of Britain, France, Germany, and Canada reconnaissance photos of Soviet nuclear-capable missiles in Cuba, President Kennedy televised to the American people that “closest surveillance” of the island yielded “unmistakable evidence of offensive missile sites.”

Oct. 28: Soviet officials ordered removal of nuclear-capable missiles from Cuba.

1963

Jun. 16: Soviet Valentina Tereshkova became first woman to orbit Earth; aboard Vostok 6, she orbited Earth 48 times in a three-day flight.

July 12: NRO launched the first Gambit 1 equipped with the first stereo pointing, high resolution KH-7 camera.

1964

Apr. : NRO established Project Dorian to assess its reconnaissance camera's feasibility for use and flight aboard the USAF's anticipated MOL, a Manned Orbiting Laboratory with astronauts controlling the camera.

Dec. 21: The world's first satellite-borne radar imager, Quill, made orbit and returned first images as part of a NRO demo mission.

Dec. 22: The SR-71, the USAF's "Blackbird," a slightly larger and heavier version of the CIA's A-12, made its first official test flight.

1965

Aug. 25: President Lyndon B. Johnson approved MOL for USAF development.

Nov. 20: The CIA's A-12 made its final validation flight, setting speed and altitude records of Mach 3.29 and 90,000 feet.

1966

Jan. 7: Lockheed delivered first SR-71 aircraft to SAC.

July 29: NRO launched the first Gambit-3 with improved KH-8 camera and film resolution.

Aug. 23: NASA's Lunar Orbiter 1 satellite took first pictures of Earth from the moon using Samos camera.

1967

Jun. 4: The last of the Gambit 1 satellites lifted off from Vandenberg Air Force Base atop an Atlas Agena D.

Jun. 26: The U.S.S.R. launched Kosmos-189, the first Soviet Elint satellite, but it failed to orbit.

1969

Jun. 9: President Richard M. Nixon cancelled the MOL program, essentially ending Dorian as well, in favor of unmanned satellite reconnaissance endeavors.

Jul. 20: U.S. astronauts Neil Armstrong and Buzz Aldrin became the first to walk on the moon.

1970

Apr. 24: China joined U.S., U.S.S.R., France, and Japan to establish a satellite reconnaissance program with the DFH-1 launch.

Nov. 6: The USAF launched Defense Support Program (DSP) satellite, the first operational missile warning satellite.

1971

Jun.15: A Titan IIID booster lifted the first Hexagon satellite into space.

1972

May 25: NRO launched Mission 1117, the final Corona photoreconnaissance satellite.

1973

May 14: NASA launched Skylab 1, the unmanned Orbital Workstation (OWS) and the United States' first space station.

Dec. 17: DoD approved Global Positioning System (GPS) development.

1974

Feb. 12: Manned Skylab 4 returned from its nearly 3 month rendezvous with the OWS, signaling the end of the Skylab program.

Oct. 1: NRO and CIA abolished Program D, transferring responsibilities for U-2, A-12, and the SR-71 to the USAF.

1975

Feb. 17: The U.S. Apollo and Russian Soyuz space crafts docked together during the first international manned space mission.

1977

Jan. 16: FBI arrested Christopher Boyce, who (with Andrew Daulton Lee) sold secrets to the Soviets on a Sigint satellite reconnaissance system leading to their conviction in Spring 1977.

1978

Feb. 22: The USAF launched first GPS Block 1 constellation satellite.

Oct. 1: President Carter publicly acknowledged the use of photoreconnaissance satellites for treaty monitoring.

1981

Apr. 12: NASA launched the first Space Shuttle from Cape Canaveral.

1982

Sept. 1: The USAF activated Space Command to consolidate operational space activities.

1983

Jun. 18: Astronaut Sally Ride became the first U.S. woman in space when she flew aboard the Space Shuttle Challenger.

1984

April 17: A Titan IIIB successfully launched the last Gambit-3.

Aug. 11: Jane's Defense Weekly published classified photo of first Soviet aircraft carrier.



▲ An aerial view of the current NRO Headquarters captures the four distinct towers at NRO's Westfields' complex in Chantilly, VA. With its programs centralized to streamline operations, the NRO came "out of the shadows" when the DoD publically acknowledged its existence in 1992.

1986

Jan. 28: Space Shuttle Challenger exploded just after liftoff, killing all seven crew members.

April 18: The catastrophic explosion of the Hexagon on launch signaled the end for the last of the film return satellites.

Aug. 7: U.S. Court sentenced Bruce Ott to 25 years for his attempt to sell classified information on SR-71 "Blackbird."

Oct. 27: U.S. charged Allen John Davies with attempting to pass classified reconnaissance technology to Soviets, resulting in a five year sentence.

1989

Nov. 9: German citizens began to break down the Berlin Wall following East Berlin's lifted travel restrictions.

1990

Jan. 26: U.S. Air Force retired the SR-71 reconnaissance aircraft from SAC service in ceremonies at Beale AFB, California.

1991

Dec. 25: The Soviet Union collapsed with the resignation of General Secretary Mikhail Gorbachev.

1992

Mar. 24: The U.S., the States Parties of Ukraine and 23 other nations signed the Open Skies treaty, allowing unarmed aerial-reconnaissance missions by signatory nations.

Sept. 18: The DoD officially acknowledged existence of the NRO.

1994

Apr. 28: CIA officer, Aldrich Ames received life in prison for giving imagery satellite and humint documents to Russia over a 9 year period. His wife, Rosario, received 63 months in prison for her role.

1995

Feb. 24: President Clinton declassified Corona imagery.

Jul. 17: The first GPS satellite constellation became fully operational.

1996

Dec. 18: For the first time, NRO declassified a launch with public acknowledgment that the upcoming launch of Titan IV would carry an NRO satellite into space.



▲ An aerial view of the Pentagon shows extensive damage to its corridors following the 9/11 attack.

1997

Mar. 1: The NRO declassified certain offices, personnel, and sites involved in space launch and approved releasing, for some launches, the fact that they carry NRO satellites.

1998

Jun. 17: As part of its 75th anniversary celebration, the Naval Research Laboratory announced DCI George Tenet's declassification of limited information about the Grab satellite.

2000

Oct. 25: DCI George Tenet approved declassification of imagery acquired by KH-7 camera and the KH-9 mapping camera.

2001

Feb. 18: FBI arrested Robert Hanssen, a one-time FBI liaison officer to the NRO, for handing Russia large amounts of national security intelligence.

Sept. 11: Using commercial aircraft in a suicide attack that killed over 3,000, Al Qaeda terrorists destroyed two World Trade Center towers, damaged the Pentagon, and hijacked a fourth plane that passengers downed in Pennsylvania.

Oct. 7: Operation Enduring Freedom began in Afghanistan.

2002

Sept. 20: National Geospatial-Intelligence Agency (then called NIMA) formally transferred imagery acquired by KH-7 camera and the KH-9 mapping camera to National Archives.

2003

Feb. 1: Space Shuttle Columbia (Mission STS-107) suffered catastrophic failure 15 minutes before touchdown at Kennedy Space Center; the seven crew members died.

Feb. 5: Secretary of State Colin Powell used satellite reconnaissance imagery at U.N. Security Council to contend that Iraq failed to comply with disarmament obligations.

Mar. 19: Operation Iraqi Freedom began.

2004

May 11: DCI George Tenet approved Poppy declassification.

Dec. 17: President George W. Bush signed the Intelligence Reform and Terrorist Prevention Act creating the position of Director of National Intelligence.

Dec. 26: An unexpected tsunami devastated Indonesia, generating requirements for space-based imagery to aid search and rescue teams.

2005

Apr. 21: Ambassador John D. Negroponte became the first Director of National Intelligence.

2006

Jul. 5: North Korea conducted seven missile tests, including the long-range Taepo-Dong 2 missile that failed shortly after launch.

2007

Jan. 11: China successfully carried out its first test of an anti-satellite weapon, shooting down an aging Chinese weather satellite.

2008

Feb. 20: U.S. Navy successfully shot down an errant NRO satellite carrying toxic hydrazine fuel.

May 25: Phoenix Lander, a robotic spacecraft, descended onto Mars' northern polar region where it later confirmed that water, in the form of ice, exists on Mars.

Jun. 9: NRO declassified the fact of radar satellite reconnaissance.

Oct. 15: NRO declassified the fact of domestic Mission Ground Stations and NRO presence at RAF Menwith Hill, UK and the Joint Defence Facility Pine Gap near Alice Springs, Australia.

2009

Jan. 17: NRO launched a payload for the first time aboard a Delta IV heavy launch vehicle.

Nov. 27: In a memo to NRO, PDDNI Gompert approved declassifying the "fact of Quill as a radar imager effective 25 Nov. 2009.



▲ The USAF's X-37B Orbital Test Vehicle (OTV-1) resembles a miniature space shuttle.

2010

Jan. 12: An earthquake struck Haiti, prompting need for space-based imagery to identify stable landing and rescue sites.

Apr. 15: President Obama presented the administration's proposal to cancel NASA's moon-mission program, Constellation.

Apr. 22: The USAF launched its first X-37B Orbital Test Vehicle (OTV-1), an unmanned orbital space plane resembling a miniature Space Shuttle and the first vehicle since NASA's space shuttles to have reentry and landing capability.

Jul. 25: Website Wikileaks released thousands of documents related to the U.S. and the war in Afghanistan.

Aug. 31: President Obama announced the end to the combat mission in Iraq.

2011

May 2 (PKT local): A U.S. Navy Seal team killed Al Qaeda leader, Osama bin Laden, in a raid on his Pakistan compound in Abbottabad.

Jun. 2: DNRO Bruce Carlson approved the declassification of film-return programs, Gambit-1, Gambit-3, and Hexagon for release during NRO's 50th Anniversary commemoration on 17 Sep. 2011.

Jul. 8: NASA retired its Space Shuttle program with the launch and final round trip of Atlantis to the International Space Station (ISS).

Sep. 17: NRO commemorated its 50th Anniversary with the public release of formerly classified Gambit and Hexagon film-return program materials and public display of Gambit and Hexagon artifacts at the Smithsonian National Air and Space Museum.

Sep. 25: USAF launched its Space Based Space Surveillance (SBSS) satellite to observe and track satellites and very small space objects.

Sep. 29: China's first space station and a test bed for Chinese manned docking exercises, Tiangong-1, lifted off from Jiuquan Satellite Launch Center.

2012

Jan. 26: The NRO opened a public exhibit of Gambit and Hexagon film-return satellite-reconnaissance program artifacts at the National Museum of the U.S. Air Force (NMUSAF) in Dayton, OH. This was the largest collection of declassified National Reconnaissance artifacts.

Jul. 9: NRO released programmatic Quill documents to the public.

Sep. 13: In NRO's first "ride share" mission, an Atlas V rocket boosted NROL-36's classified payload and in its extra capacity bulkhead, 11 tiny satellites or "cubesats" developed by labs, universities, and other government entities for research, ranging from space weather to maritime shipping container tracking.

2012 cont.

Oct. 7: Space X, partnering with NASA, launched “Dragon,” the first commercial vehicle to support ISS with a round trip resupply mission.

Oct. 14: Felix Baumgartner set a sky-diving world record when he jumped from a capsule tethered to a high altitude balloon 24 miles above the earth.

Oct. 29: Devastating Hurricane Sandy came ashore in northern NJ after skirting along the East Coast where it damaged NASA’s Wallops Flight Facility in Virginia.

2013

Jun. 5: NSA contractor and former CIA employee, Edward Snowden, released Top Secret information on NSA’s phone surveillance program.

Dec. 14: China’s unmanned Chang’e 3 space probe touched down on the moon’s surface, the world’s first soft landing probe on the moon in nearly 4 decades.

2014

Mar. 18: Russian President Vladimir Putin signed treaties annexing Ukraine’s Crimea Peninsula.

Oct. 28: Orbital Science’s Antares rocket, on a resupply mission to the ISS, exploded shortly after liftoff at NASA’s Wallop Island facility.

Nov. 12: The European Space Agency announced successful pin point landing of its probe, Philae, on the surface of a comet.



▲ Senior NRO Historian, Dr. James Outzen, of NRO’s Center for the Study of National Reconnaissance (CSNR), speaks during the 26 January 2012 exhibit opening of — Gambit 1 KH-7, Gambit 3 KH-8 and Hexagon KH-9 artifacts — at the NMUSAF, Wright-Patterson AFB near Dayton, Ohio. (U.S. Air Force Photo)

Dec. 17: President Obama announced changes to the U.S. policy with Cuba and began normalizing relations after five decades of embargo.

2015

Mar. 27: The Russian Soyuz spacecraft, bound for the ISS, carried three men aboard, two of them designated for a one year mission. NASA astronaut Scott Kelly and Russian cosmonaut Mikhail Kornienko, residing on the ISS until March 2016, will help NASA understand how the human body adapts to long term life in space so NASA can prepare future astronauts for extended missions like the Mars journey.

Jun. 28: SpaceX resupply mission to the ISS ended with the catastrophic explosion of its vehicle shortly after launch, prompting concern for the astronauts and cosmonauts' continued presence on the ISS.

Jul. 14: NASA's New Horizons spacecraft photographed Pluto's surface at its closest approach to the small planet as part of a six-month-long "reconnaissance flyby" study of Pluto and its moons. The spacecraft took over 9 years to reach its position near Pluto.

Aug. 14: In a symbolic gesture to begin restoring relations with Cuba, U.S. Marines raised the American flag over the newly reopened U.S. Embassy in Cuba.

Oct. 22: The NRO announced the declassification of the NRO's Dorian program and its association with the USAF Manned Orbiting Laboratory (MOL) program with the release of a compendium of Dorian records at a panel discussion of MOL astronauts held at the National Museum of the U.S. Air Force, Wright-Patterson AFB, OH.



▲ In Havana, Cuba, Secretary of State John Kerry (left) and other dignitaries pay tribute to the American flag as U.S. Marines raise it over the building that reopened again as the U.S. embassy. President Eisenhower severed diplomatic ties with Cuba in 1961 with hostilities remaining through the Cold War era and into the 21st century. It was not until 17 December 2014, when President Barack Obama announced a change of policies with Cuba, that the United States began normalizing relations with the small country.



▲ NRO's classified payload for NROL-26 lifts off from Cape Canaveral Air Force Station (AFS) on 17 Jan 2009.

Founders of National Reconnaissance

“These scientists, engineers, and innovators — through their technical expertise — shaped the emerging discipline of national reconnaissance and provided the confidence for creating the NRO in 1960-61.”

Keith Hall, Former DNRO

William O. Baker, Ph.D.

Service to National

Reconnaissance: 1950–1980

Shaped the course of signals intelligence, communications, and encryption/decryption technologies as scientific counselor to NSA, CIA, USN, and NRO. As a “Land Panel” member, helped pave the way for the first near-real-time reconnaissance satellite system.

Merton E. Davies

Service to National

Reconnaissance: 1948–1975

Invented the Spin-Pan camera and collaborated in the film recovery satellite proposal for Corona. Davies later served on NRO and other advisory panels that established reconnaissance requirements.

Sidney D. Drell

Service to National

Reconnaissance: 1960–2000

Achieved recognition in the area of reconnaissance for his contributions in various areas of physics, from ballistic missile launches to photographing the Earth from space.

Richard L. Garwin, Ph.D.

Service to National

Reconnaissance: 1957–2000

Served as a key scientific advisor to NRO’s Program B, and established standards and found solutions for electromechanical design of modern long-life spacecraft.

Amrom H. Katz

Service to National

Reconnaissance: 1941–1976

Co-directed a project on peacetime overflight reconnaissance, and co-proposed film-recovery satellites. This proposal was eventually established as the Corona Project.

James R. Killian, Jr., Ph.D.

Service to National

Reconnaissance: 1950–1973

Chaired the Technological Capabilities Panel for President Eisenhower that recommended building the U-2 aircraft and reconnaissance satellites. He was subsequently involved in shaping the agreements between the Department of Defense and CIA that structured the NRO.

Edwin H. Land

Service to National

Reconnaissance: 1952–1980

Invented instant photography and founded the Polaroid company. Later served on the Technological Capabilities Panel for assessing technical capabilities supporting intelligence collection, subsequently chairing the “Land Panel” for reconnaissance capabilities. He advocated for early reconnaissance programs like U-2 and Corona and played a vital role in advising President Nixon on capabilities of electro-optical imagery (EOI).

Frank W. Lehan

Service to National

Reconnaissance: 1965–1975

Was instrumental in the decision to proceed with an important signals intelligence satellite system, and contributed to the reflector designs for that system.

William J. Perry, Ph.D.

Service to National

Reconnaissance: 1955–1997

Chaired the “Perry Panel” that advised NRO’s Program B on all overhead signals intelligence collection systems. He later served as Under Secretary of Defense for Research and Engineering and Secretary of Defense.

Edward M. Purcell, Ph.D.

Service to National

Reconnaissance: 1950–1965

Worked on all early overhead reconnaissance projects (including U-2, A-12/SR-71) that operated at extreme altitudes. His most significant contribution used new materials and methods to ensure these vehicles, if not invisible to radar, were hard to observe with radar.

For the successful continuity of NRO as a key intelligence contributor from its infancy to its far-reaching growth in the 21st century, the NRO recognized the following leader in a special ceremony on February 22, 2013 as a Founder of National Reconnaissance for the 21st Century.

Jimmie D. Hill

Service to National

Reconnaissance: 1965-1996

Laid the foundation for the 21st century NRO as a dynamic Staff Director and Deputy Director from 1978-1996. By fostering an innovative management and operational environment, he ensured the NRO successfully emerged from the Cold War era to successfully maintain its critical strategic importance in a new era of tactical relevance and positive responsiveness to national and defense security requirements.

Pioneers of National Reconnaissance

A Pioneer of national reconnaissance is an individual who made a lasting and significant contribution that changed the direction or scope of the discipline of national reconnaissance. Each year, the National Reconnaissance Office honors a select group of individuals as Pioneers of National Reconnaissance.



▲ Pioneers of National Reconnaissance, Class of 2000

Class of 2000

James G. Baker, Ph.D.

Pioneered the use of computer algorithms to model lens design and developed U-2 camera lenses.

C. Lee Battle, Jr., Colonel, USAF

Originated and applied the principles of "Battle's Laws" to successfully guide day-to-day management of Corona.

John T. Bennett

Developed innovative system designs for signals intelligence spacecraft that advanced the nation's national reconnaissance capabilities.

John W. Browning, Colonel, USAF

Pioneered a new and powerful signals intelligence capability and dramatically enhanced signals intelligence collection.

Jon H. Bryson, Colonel, USAF

Directed the development, acquisition and operation of an on-orbit satellite system that helped reduce signals intelligence data processing and dissemination times.

A. Roy Burks

Successfully conquered technical challenges dealing with Corona and effectively managed the vital relationship among government, military and contractor employees.

Class of 2000 cont.

Frank S. Buzard, Colonel, USAF

Led Corona's system integration and operations, ensuring the program stayed on track. Managed Corona's follow-on program.

Comelius W. "Connie" Chambers

Provided the cornerstone design for the vehicle protective measures during the early development of space reconnaissance technologies.

John O. Copley, Colonel, USAF

Pioneered improvements in payload design and ground data processing and exploitation of signals intelligence satellites.

Robert H. Crotser

Wrote cost and schedule management handbook, still used today, to deliver Program B's electro-optical imaging satellite on time and under budget.

John J. Crowley

Established an enduring partnership between NRO's CIA and USAF elements, and advanced development on four successful satellite programs.

James C. de Broekert

Major contributor to the successful development of the first low-earth-orbiting electronic intelligence systems.

Gary S. Geyer, Colonel, USAF

Pioneered near real time delivery of products to military and civil users with his work in signals intelligence collection, data processing, and dissemination.

Thomas O. Haig, Colonel, USAF

Directed the program that developed the National Reconnaissance Office meteorological satellite system significantly increasing the quantity of cloud-free pictures.

Frederick H. Kaufman

Produced two important Sigint satellites, to include the first communications cross-link system in space, as director of a team for Program B.

Robert J. Kohler

Developed unique imaging techniques and introduced photographic edge measurement and sharpening tools for evaluating and enhancing overhead imagery.

Ellis E. Lapin

Contributed to the on-orbit reliability of the NRO's satellite imagery reconnaissance systems by managing the design and development of the spacecraft and hardware.

Lloyd K. Lauderdale, Ph.D.

Program Manager for the CIA Program B team that developed an advanced signals intelligence satellite from concept through first launch.

Class of 2000 cont.

Richard S. Leghorn, Colonel, USAF

Major contributor to Corona camera development and co-founder and first president of Itek Corp. that built the first U.S. space camera. He is often credited with originating the “Open Skies” concept.

Walter J. Levison

Designed the cameras for the Genetrix balloon and Corona satellite photoreconnaissance programs.

Howard O. Lorenzen

Early advocate of signals intelligence satellites, he directed the development of Grab, the nation’s first such program at the Naval Research Laboratory.

Francis J. Madden

Directed the design and production of the Corona cameras and helped solve technical problems that threatened the camera in space.

James T. Mannen, Colonel, USAF

Introduced procedures that improved target tasking and significantly increased ground resolution and on-orbit system reliability.

Paul W. Mayhew, Ph.D.

Helped lead the development of the payload electronic, mechanical, and radio frequency elements, from concept to verified designs.

Reid D. Mayo

Conceived and designed the nation’s first operational space-bound reconnaissance system — the Grab signals intelligence satellite.

James E. Morgan

Developed the target tasking and data dissemination architectures for key programmatic systems.

Mark N. Morton

Directed the General Electric team that developed, tested, and built the Corona reentry vehicle and its successful recovery sequence.

Alden V. Munson, Jr.

Introduced and developed an automatic, operational electronic intelligence collection and data processing system that directly supported U.S. military in the field.

Charles L. Murphy, Colonel, USAF

First Field Technical Director at the Corona Advanced Projects Integration Facility, a crucial link between Corona operations and the Intelligence Community.

Frederic C.E. “Fritz” Oder, Colonel, USAF

Directed the first U.S. satellite reconnaissance enterprise, the WS-117L Program, a significant contribution to early military and national reconnaissance satellites.

Class of 2000 cont.

John Parangosky

Forged government and contractor team successes and the overall technical success of the Corona program with his strong team building skills.

Julius P. “Val” Peline, Ph.D.

Served as a Lockheed system test director and program manager for a key imaging intelligence satellite program.

Robert M. Powell

Devised a novel payload-pointing mechanism that greatly extended the lifetime of satellites in orbit.

Edward H. Reese

Led the architecture and development of the ground data system for electro-optical imaging processing and added subsequent improvements used today.

Osmond J. “Ozzie” Ritland, Major General, USAF

Managed service infrastructure for early overflights of the U.S.S.R. as the USAF manager for the U-2 program, and later supported Corona as Vice Commander of the Air Force’s Air Research and Development Command’s Western Development Division.

Lee W. Roberts, Colonel, USAF

Directed improvements in an important Program A satellite reconnaissance effort that produced high-resolution imagery of earth’s surface.

Charles R. “Charlie” Roth

CIA manager in Program B for government/industry team that produced the first electro-optical reconnaissance satellite system.

Robert W. Roy, Colonel, USAF

Oversaw launches at Vandenberg Air Force Base, managed the construction of launch pads, and established launch requirements and procedures that became standards.

Charles P. Spoelhof

Directed efforts that helped revolutionize film recovery with the application of thin-based Mylar film in NRO camera systems. He also served as optical engineer for U-2, A-12, and Samos camera design.

Forrest H. Stieg

CIA engineer and spacecraft operational specialist in Program B, devised a process for selecting an optimum orbit that balanced signals collection with vehicle longevity.

Marvin S. Stone, Ph.D.

Revolutionized overhead Sigint collection with innovative electronic and radio frequency technologies while serving as a payload systems engineer and project manager for Program B.

Class of 2000 cont.

Don F. Tang

Established a “collection scale” for determining which signals could be collected at a reasonable cost, setting the stage for the development of all future Sigint systems.

Albert D. “Bud” Wheelon, Ph.D.

Served as the first CIA Deputy Director of Science and Technology and was responsible for U-2 overflights, the development of the Oxcart A-12, and three major satellite reconnaissance systems.

Peter G. Wilhelm

Invented new devices and techniques that contributed to increased capabilities and improved performance on early signals intelligence satellites.

Roy H. Worthington, Colonel, USAF

Directed the integration and launch of some 200 satellites from the Western Test Range. He supervised new factory-to-launch procedures for moving satellites from R&D to operations.

Robert W. Yundt, Colonel, USAF

Directed Program A’s Signals Intelligence Project Office and developed a low altitude multi-purpose Sigint satellite that became vital to the NRO’s early efforts in Elint collection.



▲ Pioneers of National Reconnaissance,
Class of 2001

Class of 2001

Donald L. Cromer, Lt. General, USAF (Ret)

Pioneered the design, development, and acquisition of a new imaging satellite system that became a critical part of U.S. national reconnaissance.

A.J. “Tony” Iorillo (not pictured)

Pioneered a new concept in spacecraft control and operations, which contributed to successful near-real-time optical imaging, with data relayed directly from space to a ground processing system.

Vincent S. Rose

Pioneered the design of the first Elint payload used in Sigint reconnaissance satellites, allowing receivers to collect radar emissions across broad frequency ranges.

John Walton (awarded posthumously)

Pioneered a revolutionary methodology that addressed the entire life cycle and integration for the first near-real-time EOI reconnaissance satellite and continues to be applied to current NRO programs.



▲ Pioneers of National Reconnaissance,
Class of 2002

Class of 2002

Vance D. Coffman, Ph.D.

Pioneered the development of a new satellite attitude control capability that provided major improvements in satellite-collected images.

Lee M. Hammarstrom

Pioneered improvements in satellite, ground station, and processing that enhanced the accuracy, timeliness, and volume of Elint products. He later led the NRO's Technology Office and served as NRO Chief Scientist.

Robert L. Paulson, Colonel, USAF (Ret)

Pioneered the continued design, development, and sustainment of a key IMINT satellite system saving it from cancellation, and going on to develop its complex ground architecture as well.



▲ Pioneers of National Reconnaissance,
Class of 2003

Class of 2003

Carl L. Ferdensi, Jr.

Pioneered improvements in telemetry processing for foreign instrumentation signals intelligence (Fisint) data, aiding decisions on Soviet military capabilities.

David Raspet, Colonel, USAF

Pioneered advanced methods of integrating spacecraft into launch vehicles, ensuring sustained operation of reconnaissance satellites.

James W. Stoner, Ph.D.

Pioneered techniques for near-real-time processing of Elint signals and developed capabilities to process large volumes of data.

Charles C. Tevis (awarded posthumously)

Pioneered the concept of a centralized facility for all-source information and analysis through his contributions in the founding of the Defense Special Missile and Astronautics Center (DEFSMAC) Where he served as inaugural director under appointment by SECDEF.



▲ Pioneers of National Reconnaissance,
Class of 2004

Class of 2004

M. Sam Araki

Pioneered the development of the world's first stabilized space platform, Agena, which the NRO used for the Corona and other satellites.

Harvey Cohen, Lt Colonel, USAF (Ret) (not pictured)

Pioneered innovative National Reconnaissance Office security practices and procedures that helped keep NRO's collection system covert during the Cold War.

Robert G. Kaemmerer

Pioneered the development of the most sophisticated family of intelligence satellite systems during the Cold War.

James W. McAnally

Pioneered the development of a new imagery satellite reconnaissance system used during the Cold War to the present, supporting a wide range of operations.



▲ **Pioneers of National Reconnaissance,
Class of 2005**

Class of 2005

Robert Eisenhauer

Pioneered techniques that changed wide-area Sigint reconnaissance technology and dramatically improved the accuracy and dissemination timeliness of satellite intelligence products.

Roger C. Marsh

Pioneered the construction of a secure facility and widely-dispersed operation into the present NRO headquarters.

Edward A. Miller, Ph.D.

Pioneered the first man-made object to be recovered from earth orbit—the recovery vehicle for Corona.

Wayne L. Proffitt

Pioneered the design of the mechanism that enabled satellites to point their communications dishes at relay satellites and maintain continuous contact while still imaging.



▲ **Pioneers of National Reconnaissance,
Class of 2006**

Class of 2006

Ingard M. Clausen

Pioneered efforts that laid the groundwork for the Corona system's ability to endure the harsh environment of space and withstand the heat of reentry into the Earth's atmosphere.

Fred V. Hellrich

Pioneered innovations that provided revolutionary improvement in the productivity, accuracy, and timeliness of electronic intelligence product.

David L. Klinger, Ph.D.

Pioneered the development and deployment of a new technology that substantially enhanced the ability of the NRO to collect overhead intelligence.

Jane A. Wood

Pioneered the development of a budget and accounting system that accurately tracked expenditures for complex satellite programs.



▲ Pioneers of National Reconnaissance,
Class of 2007

Class of 2007

Paul G. Kaminski, Ph.D.

Pioneered the development of a new type of reconnaissance satellite system and introduced innovative tools for analysts to exploit information from this complex system.

Sun Yet Wong

Pioneered new technologies that improved the effectiveness of satellite systems. Developed STARDYNE, which enabled the NRO to analyze complex spacecraft and special payloads.



▲ Pioneers of National Reconnaissance,
Class of 2008

Class of 2008

Raymond E. Anderson, Colonel, USAF (Ret)

Pioneered the use of solid-state recorders in reconnaissance satellites to extend their operational life spans.

Howard G. Brotherton

Pioneered advances in momentum management and developed techniques that advanced the state of automation for critical satellite missions.

Hilliard W. Paige, Sr.

Pioneered the concept of using ICBM reentry technology for the recovery of reconnaissance film capsules from space, which proved instrumental in the successful development of the Corona recovery system.



▲ **Pioneers of National Reconnaissance,
Class of 2009**

Class of 2009

James P. Campbell, Ph.D. (awarded posthumously)

Pioneered, from conception through deployment, a new innovative imaging reconnaissance capability to include ground architecture and spacecraft that demonstrated unprecedented extended operational life.

Lacy G. Cook

Pioneered development and application of a unique technology that enabled a new capability to fit into the limited space of an existing NRO satellite, resulting in providing unprecedented information to national policy makers.

Michael F. Maguire

Pioneered and pushed the state of the art for one of the last film-based NRO reconnaissance systems, resulting in a national reconnaissance space constellation with greater reliability and operational longevity.



▲ **Pioneers of National Reconnaissance,
Class of 2010**

Class of 2010

Robert H. Dumais

Pioneered intelligence utility of a new capability for an imaging satellite system that led to improved quality imagery products from space.

Jack A. Gibbs, Brigadier General, USAF (Ret) (awarded posthumously)

Pioneered the effective use of high-altitude airborne reconnaissance for denied area intelligence collection during the Cold War through application of innovative engineering on U-2 operations and assessment for lower radar “detectability.”

Richard J. Randazzo, Colonel, USAF (Ret) (awarded posthumously)

Pioneered improved satisfaction of mission requirements and increased coverage of high priority targets through his introduction and application of new operational techniques for NRO imaging systems.



▲ Pioneers of National Reconnaissance,
Class of 2011

Class of 2011

Dr. Thomas A. Brackey

Pioneered breakthroughs in hardware, communications technology, and operational concepts for enabling near real-time data collection and dissemination.

Colonel Joseph J. Eash III, USAF (Ret)

Pioneered the way for highly sensitive NRO mission development for aircraft and satellites with his application of special innovative technologies.

Dr. Michael N Parker

Pioneered missile-tracking techniques, through his work in geolocation, that directly supported arms limitation treaty negotiations

Dr. John W. Shipley

Pioneered a concept, approach, definition, and design for developing a successful and revolutionary NRO collection asset.

Mr. Richard Van Wagoner

Pioneered antenna and system design and performance evaluation that contributed to SIGINT's successful mission execution and quality collection.



▲ Pioneers of National Reconnaissance,
Class of 2012

Class of 2012

Dr. Robert P. O'Donnell

Pioneered dramatic breakthroughs in signals and imagery intelligence collection from space by developing analysis and simulation techniques which made possible the precision pointing and flexible structure deployment and control of a new generation of collection satellites.



▲ Pioneers of National Reconnaissance,
Class of 2013

Class of 2013

William G. Montgomery

Pioneered innovations in precision control and pointing accuracies, thereby enhancing volume, resolution, and accuracy and balanced performance contributions for a new generation imagery collection system.

Donald N. Simkins, Ph.D.

Pioneered innovative processing techniques to advance geo-location algorithms and to expand and improve the collection, exploitation, and display of target information.



▲ Pioneers of National Reconnaissance,
Class of 2014

Class of 2014

Thomas C. "Chris" Fitzsimmons

Pioneered the development, production, and test of lightweight optical and structural components to implement on electro-optical imagery reconnaissance systems without degradation to image quality.

John R. Stavlo

Pioneered a first-of-a-kind precision pointing and tracking control system, using his devised, closed loop simulation and modeling technique, to dramatically enhance sigint collection sensitivity.

Table of Selected NRO Launches

This is a partial list of unclassified space launches from 1959 until 2015.

The list has been verified by the Office of Space Launch at the NRO.

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-------------|----------------|----------------------------|---------|----------------|-------------|---------|
| 02/28/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | N/A | Success | Success | Success |
| 04/13/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | N/A | Success | Success | Success |
| 06/03/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | N/A | Success | Failure | — |
| 06/25/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 08/13/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/19/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/07/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/20/59 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 02/04/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 02/19/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 04/15/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/22/60 | Grab/Dyno 1 | Thor-Able Star | Cape Canaveral Air Station | SIGINT | Success | Success | Failure |
| 06/29/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | N/A | Success | Failure | — |
| 08/10/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/18/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/13/60 | Corona | Thor-Agena A | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/11/60 | Samos 1 | Atlas-Agena A | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 10/26/60 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 11/12/60 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | Failure |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-------------|----------------|----------------------------|---------|----------------|-------------|---------|
| 11/30/60 | Grab/Dyno | Thor-Able Star | Cape Canaveral Air Station | SIGINT | Failure | — | — |
| 12/07/60 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/20/60 | Corona | Thor-Agena B | Vandenberg Air Force Base | N/A | Success | Success | Success |
| 01/31/61 | Samos 2 | Atlas-Agena A | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 02/17/61 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/18/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | N/A | Success | Success | Success |
| 03/30/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 04/08/61 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/08/61 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | — | Failure | — |
| 06/16/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/29/61 | Grab/Dyno 2 | Thor-Able Star | Cape Canaveral Air Station | SIGINT | Success | Success | Success |
| 07/07/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/21/61 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 08/03/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | |
| 08/30/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/09/61 | Samos 3 | Atlas-Agena A | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 09/12/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/17/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | Failure |
| 10/13/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/23/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 11/05/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/15/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|----------|----------------|----------------------------|---------|----------------|-------------|---------|
| 11/22/61 | Samos 4 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 12/12/61 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/22/61 | Samos 5 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 01/13/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Failure | |
| 01/24/62 | Poppy 1 | Thor-Able Star | Cape Canaveral Air Station | SIGINT | Failure | — | — |
| 02/27/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/07/62 | Samos 6 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 04/18/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/26/62 | Poppy 2 | Scout | Vandenberg Air Force Base | SIGINT | Failure | — | — |
| 04/26/62 | Samos 7 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/28/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/15/62 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/30/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/02/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/17/62 | Samos 8 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/23/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/28/62 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/18/62 | Samos 9 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/21/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/28/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/02/62 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/05/62 | Samos 10 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|----------|-------------------------------|---------------------------|---------|----------------|-------------|---------|
| 08/29/62 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/01/62 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/17/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/29/62 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/09/62 | Argon | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/26/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | N/A | Success | Success | Success |
| 11/05/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/11/62 | Samos 11 | Atlas-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/24/62 | Corona | Thor-Agena B | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/04/62 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/13/62 | Poppy 3 | Thor-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 12/14/62 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/07/63 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/28/63 | Corona | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 03/18/63 | Lanyard | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 04/01/63 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/26/63 | Argon | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 05/18/63 | Lanyard | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/12/63 | Corona | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/15/63 | Poppy 4 | Thor-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 06/27/63 | Corona | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/18/63 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|-------------------------------|---------------------------|---------|----------------|-------------|---------|
| 07/31/63 | Lanyard | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/25/63 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/29/63 | Argon | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/6/63 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/23/63 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/25/63 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/29/63 | Argon | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/09/63 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Failure | — | — |
| 11/27/63 | Corona | Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/18/63 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/21/63 | Corona | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/11/64 | Poppy 5 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 02/15/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/25/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/11/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/24/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Failure | — |
| 04/23/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/27/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/19/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/04/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/13/64 | Argon | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/19/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|-------------------------------|---------------------------|---------|----------------|-------------|---------|
| 07/06/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/10/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/05/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/21/64 | Argon | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/14/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/23/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/05/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/08/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Failure | - | - |
| 10/17/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/02/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/18/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/04/64 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/19/64 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/21/64 | Quill | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/15/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/23/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/25/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/08/65 | Poppy 6 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 03/12/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|-------------------------------|---------------------------|---------|----------------|-------------|---------|
| 03/25/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/28/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/29/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/18/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/27/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/09/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/25/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/12/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Failure | - | - |
| 07/19/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/03/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/17/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/02/65 | Corona | Thor-Agena D | Vandenberg Air Force Base | N/A | Failure | - | - |
| 09/22/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/30/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/5/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/28/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/08/65 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/09/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|-------------------------------|---------------------------|---------|----------------|-------------|---------|
| 12/24/65 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/19/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/02/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/15/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/09/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/18/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Failure |
| 04/07/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/19/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/03/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Failure | - | - |
| 05/14/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/24/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/03/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/21/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/12/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/29/66 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/09/66 | Corona J1 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/16/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/16/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/20/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|---|---------------------------|---------|----------------|-------------|---------|
| 09/28/66 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/12/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/02/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/08/66 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/05/66 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/14/66 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/14/67 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/02/67 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/22/67 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/24/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/30/67 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/26/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Failure | - | - |
| 05/9/67 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/22/67 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/31/67 | Poppy 7 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 06/4/67 | Gambit-1 | Atlas-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/16/67 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/20/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/7/67 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|---|---------------------------|---------|----------------|-------------|---------|
| 08/16/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/15/67 | Corona J3 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/19/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/25/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/2/67 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/05/67 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/09/67 | Corona J3 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/18/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/24/68 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/13/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/14/68 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/17/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/1/68 | Corona J3 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/05/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/20/68 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/06/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/07/68 | Corona J3 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/10/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/18/68 | Corona J1 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|---|---------------------------|---------|----------------|-------------|---------|
| 11/3/68 | Corona J3 | Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/6/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/04/68 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Failure | | Success |
| 12/12/68 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/22/69 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Failure | Success |
| 02/05/69 | Corona J3 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/04/69 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/19/69 | Corona J1 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/15/69 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/02/69 | Corona J1 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/03/69 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/24/69 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/23/69 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/22/69 | Corona J1 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/30/69 | Poppy 8 | Thorad-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 10/24/69 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Failure | Success |
| 12/4/69 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/14/70 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/04/70 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/15/70 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|-----------|---|---------------------------|---------|----------------|-------------|---------|
| 05/20/70 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/25/70 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/23/70 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/18/70 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/23/70 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/18/70 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/21/71 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 02/17/71 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Failure | - | - |
| 03/24/71 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/22/71 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/15/71 | Hexagon-1 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 08/12/71 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 09/10/71 | Corona J3 | Long Tank Thrust Augmented Thor-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/23/71 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/14/71 | Poppy 9 | Thorad-Agena D | Vandenberg Air Force Base | SIGINT | Success | Success | Success |
| 01/20/72 | Hexagon-2 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 03/17/72 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/19/72 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 5/20/1972 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Failure | - |
| 05/25/72 | Corona J3 | Thorad-Agena D | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/07/72 | Hexagon-3 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|------------|----------------|---------------------------|---------|----------------|-------------|---------|
| 09/01/72 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/10/72 | Hexagon-4 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 12/21/72 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/09/73 | Hexagon-5 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 05/16/73 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/26/73 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Failure | - |
| 07/13/73 | Hexagon-6 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 09/27/73 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 11/10/73 | Hexagon-7 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 02/13/74 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 04/10/74 | Hexagon-8 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 06/06/74 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 08/14/74 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 10/29/74 | Hexagon-9 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 04/18/75 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/08/75 | Hexagon-10 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 10/09/75 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 12/04/75 | Hexagon-11 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 03/22/76 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 07/08/76 | Hexagon-12 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 09/15/76 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/13/77 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LAUNCH VEHICLE | SITE | MISSION | LAUNCH VEHICLE | UPPER STAGE | MISSION |
|-------------|------------|----------------|---------------------------|---------|----------------|-------------|---------|
| 06/27/77 | Hexagon-13 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 09/23/77 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 03/16/78 | Hexagon-14 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 03/16/79 | Hexagon-15 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 05/28/79 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/18/80 | Hexagon-16 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 02/28/81 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 01/21/82 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 05/11/82 | Hexagon-17 | Titan IIID | Vandenberg Air Force Base | IMINT | Success | | Success |
| 04/15/83 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/20/83 | Hexagon-18 | Titan 34D | Vandenberg Air Force Base | IMINT | Success | | Success |
| 04/17/84 | Gambit-3 | Titan IIIB | Vandenberg Air Force Base | IMINT | Success | Success | Success |
| 06/25/84 | Hexagon-19 | Titan 34D | Vandenberg Air Force Base | IMINT | Success | | Success |
| 04/18/86 | Hexagon-20 | Titan 34D | Vandenberg Air Force Base | IMINT | Failure | | - |

All launches between 1986 and late 1996 remain classified. After 20 December 1996, the fact that the rockets launched carrying NRO payloads was unclassified, but the satellites remain classified.

| LAUNCH DATE | PROGRAM | LV TYPE | SITE | INT | NROL |
|-------------|--------------|-----------|----------------------------------|--------------|---------|
| 12/20/96 | (Classified) | Titan IV | Vandenberg Air Force Base | (Classified) | NA |
| 10/23/97 | (Classified) | Titan IV | Vandenberg Air Force Base | (Classified) | NA |
| 11/07/97 | (Classified) | Titan IV | Cape Canaveral Air Force Station | (Classified) | NA |
| 01/29/98 | (Classified) | Atlas IIA | Cape Canaveral Air Force Station | (Classified) | NA |
| 05/08/98 | (Classified) | Titan IV | Cape Canaveral Air Force Station | (Classified) | NA |
| 08/12/98 | (Classified) | Titan IV | Cape Canaveral Air Force Station | (Classified) | NA |
| 10/03/98 | (Classified) | Taurus | Vandenberg Air Force Base | (Classified) | NA |
| 05/22/99 | (Classified) | Titan IV | Vandenberg Air Force Base | (Classified) | NA |
| 08/17/00 | (Classified) | Titan IV | Vandenberg Air Force Base | (Classified) | NROL-11 |

Table of Selected NRO Launches (cont.)

| LAUNCH DATE | PROGRAM | LV TYPE | SITE | INT | NROL |
|-------------|--------------|------------|----------------------------------|--------------|---------|
| 12/06/00 | (Classified) | Atlas IIAS | Cape Canaveral Air Force Station | (Classified) | NROL-10 |
| 05/18/01 | (Classified) | Delta II | Cape Canaveral Air Force Station | (Classified) | NROL-17 |
| 09/08/01 | (Classified) | Atlas IIAS | Vandenberg Air Force Base | (Classified) | NROL-13 |
| 10/05/01 | (Classified) | Titan IV | Vandenberg Air Force Base | (Classified) | NROL-14 |
| 10/10/01 | (Classified) | Atlas IIAS | Cape Canaveral Air Force Station | (Classified) | NROL-12 |
| 09/09/03 | (Classified) | Titan IV | Cape Canaveral Air Force Station | (Classified) | NROL-19 |
| 12/02/03 | (Classified) | Atlas IIAS | Vandenberg Air Force Base | (Classified) | NROL-18 |
| 08/31/04 | (Classified) | Atlas IIAS | Cape Canaveral Air Force Station | (Classified) | NROL-1 |
| 02/03/05 | (Classified) | Atlas III | Cape Canaveral Air Force Station | (Classified) | NROL-23 |
| 04/29/05 | (Classified) | Titan IV | Cape Canaveral Air Force Station | (Classified) | NROL-16 |
| 10/19/05 | (Classified) | Titan IV | Vandenberg Air Force Base | (Classified) | NROL-20 |
| 06/27/06 | (Classified) | Delta IV | Vandenberg Air Force Base | (Classified) | NROL-22 |
| 12/14/06 | (Classified) | Delta II | Vandenberg Air Force Base | (Classified) | NROL-21 |
| 06/15/07 | (Classified) | Atlas V | Cape Canaveral Air Force Station | (Classified) | NROL-30 |
| 12/10/07 | (Classified) | Atlas V | Cape Canaveral Air Force Station | (Classified) | NROL-24 |
| 03/13/08 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-28 |
| 01/17/09 | (Classified) | Delta IV-H | Cape Canaveral Air Force Station | (Classified) | NROL-26 |
| 09/20/10 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-41 |
| 11/21/10 | (Classified) | Delta IV-H | Cape Canaveral Air Force Station | (Classified) | NROL-32 |
| 12/08/10 | (Classified) | Falcon 9 | Cape Canaveral Air Force Station | (Classified) | NA |
| 01/20/11 | (Classified) | Delta IV-H | Vandenberg Air Force Base | (Classified) | NROL-49 |
| 02/06/11 | (Classified) | Minotaur I | Vandenberg Air Force Base | (Classified) | NA |
| 03/11/11 | (Classified) | Delta IV | Cape Canaveral Air Force Station | (Classified) | NROL-27 |
| 04/14/11 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-34 |
| 04/03/12 | (Classified) | Delta IV | Vandenberg Air Force Base | (Classified) | NROL-25 |
| 06/20/12 | (Classified) | Atlas V | Cape Canaveral Air Force Station | (Classified) | NROL-38 |
| 06/29/12 | (Classified) | Delta IV-H | Cape Canaveral Air Force Station | (Classified) | NROL-15 |
| 09/13/12 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-36 |
| 08/28/13 | (Classified) | Delta IV-H | Vandenberg Air Force Base | (Classified) | NROL-65 |
| 12/05/13 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-39 |
| 04/10/14 | (Classified) | Atlas V | Cape Canaveral Air Force Station | (Classified) | NROL-67 |
| 05/22/14 | (Classified) | Atlas V | Cape Canaveral Air Force Station | (Classified) | NROL-33 |
| 12/12/14 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-35 |
| 10/08/15 | (Classified) | Atlas V | Vandenberg Air Force Base | (Classified) | NROL-55 |

Selected Sources for National Reconnaissance Research

Available through the Center for the Study of National Reconnaissance.

Books

- Andrew, C. M. (1996). *For the President's Eyes Only: Secret Intelligence and the American Presidency from Washington to Bush*. New York: Harper Perennial.
- Beschloss, M. R. (1986). *Mayday: Eisenhower, Khrushchev, and the U-2 Affair*. New York: Harper and Row.
- Berkowitz, B. & Suk, M. (2015). *The National Reconnaissance Office at 50 Years: A Brief History*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Bissell, R. M., Jr., Lewis, J. E., & Pudlo, F. T. (1996). *Reflections of a Cold Warrior: From Yalta to Bay of Pigs*. New Haven, CT: Yale University Press.
- Brugioni, D. A. (1990). *Eyeball to Eyeball: The Inside Story of the Cuban Missile Crisis*. New York: Random House.
- Charlston, J.A., with Butterworth, R.L. & Perry, R.L (2011). *Quill: A 1964 NRO Experiment in Off-the-Shelf Radar Technology*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Gates, R. M. (1996). *From the Shadows: The Ultimate Insider's Story of Five Presidents and How They Won the Cold War*. New York: Simon & Schuster.
- Goddard, G. W., & Copp D. S. (1969). *Overview: A Lifelong Adventure in Aerial Photography*. Garden City: Doubleday & Co. Inc.
- Haines, G. K. & Leggett, R. E., (Eds.). (2001). *CIA's Analysis of the Soviet Union, 1947-1991, A Documentary Collection*. Washington D.C.: CIA Center for the Study of Intelligence.
- Hall, R. C. & Laurie, C. D. (Eds.). (2003). *Early Cold War Overflights: 1950-1956*. Washington, D.C.: Office of the Historian, National Reconnaissance Office.
- Haulman, D. L. (2003). *One Hundred Years of Flight: USAF Chronology of Significant Air and Space Events, 1903-2002*. Maxwell AFB, AL: Air University Press.

- Killian, J. R., Jr. (1985). *The Education of a College President, A Memoir*. Cambridge, MA: MIT Press.
- Kistiakowsky, G. B. (1976). *A Scientist at the White House: The Private Diary of President Eisenhower's Special Assistant for Science and Technology*. Cambridge, MA: Harvard University Press.
- Lindgren, D. T. (2000). *Trust But Verify: Imagery Analysis in the Cold War*. Annapolis, MD: Naval Institute Press.
- Mark, H. (1987). *The Space Station: A Personal Journey*. Durham, NC: Duke University Press.
- McDonald, R. A., (Ed.). (2002). *Beyond Expectations – Building an American National Reconnaissance Capability: Recollections of the Pioneers and Founders of National Reconnaissance*. Bethesda, MD: American Society for Photogrammetry and Remote Sensing.
- McDonald, Robert R. A., (Ed.). (1997). *Corona: Between the Sun and the Earth – The First NRO Reconnaissance Eye in Space*. Bethesda, MD: American Society for Photogrammetry and Remote Sensing.
- Outzen, J. D. (Ed.). (2012). *Critical to US Security: The Gambit and Hexagon Reconnaissance Systems*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2015.) *The Dorian Files Revealed: A Compendium of the NRO's Manned Orbiting Laboratory Documents* (includes Berger, C.'s "A History of the Manned Orbiting Laboratory Program Office" of MOL Program Office Department of the Air Force). Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2012). *The Gambit Story*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2012). *Hexagon (KH-9) Mapping Camera Program and Evaluation*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.

- Outzen, J. D. (Ed.). (2012). *The Hexagon Story*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2012). *A History of the Hexagon Program*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2012). *A History of Satellite Reconnaissance: The Perry Gambit & Hexagon Histories*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2012). *A History of Satellite Reconnaissance: The Robert L. Perry Histories*. Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Outzen, J. D. (Ed.). (2012.) *Trailblazer 1964: The Quill Experimental Radar Imagery Satellite Compendium*. (Supplemental Disk available separately). Chantilly, VA: Center for the Study of National Reconnaissance, National Reconnaissance Office.
- Pedlow, G. W. & Welzenbach D. E. (1998). *The CIA and the U-2 Program, 1954-1974*. Langley, VA: Central Intelligence Agency.
- Perry, R. (1962). *Origins of the USAF Space Program, 1945-1956*. Washington D.C.: U.S. Air Force Systems Command.
- Powers, F. G. & Gentry C. (1970). *Operation Overflight: The U-2 Pilot Tells His Story for the First Time*. New York: Holt, Rinehart and Winston.
- Rostow, W.W. (1982). *Open Skies: Eisenhower's Proposal of July 21, 1955*. Austin: University of Texas Press.
- Ruffner, Kevin C., (Ed.). (1995). *Corona: America's First Satellite Program*. Washington, D.C.: CIA Center for the Study of Intelligence.

Reports

- Davies, M. E. & Harris, W. R. (1988). *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology* (R-3692-RC). Santa Monica, CA: The RAND Corp.
- Davies, M. E., Katz, A. H., Buchheim, R. W., Garber, T. B., & Huntzicker, J. H. (1957, November 12). *A Family of Recoverable Reconnaissance Satellites* (RM-2012). Santa Monica, CA: The RAND Corp.
- Griggs, D., Clauser, F., Ridenour, L., Peebles, G., Lagerstrom, P, Lipp, J. et al. (1946, May 2). *Preliminary Design of an Experimental World Circling Spaceship* (SM-11827). Santa Monica, CA: The RAND Corp.
- Hall, R. C. (2001, September). *A History of the Military Polar Orbiting Meteorological Satellite Program*. Washington, D.C.: Office of the Historian, National Reconnaissance Office.
- Katz, A. H., (Ed.). (1963, August). *Selected Readings in Aerial Reconnaissance: A Reissue of a Collection of Papers from 1946 and 1948* (RAND P-2762). Santa Monica, CA: The RAND Corp.
- Leghorn, R. S. (1959). *“Political Action and Satellite Reconnaissance.”* Cambridge, MA: Itek Corp.
- Lipp, J. E., Salter, R. M., Jr., Wehner, R. S. Carhart, R. R., & Culp, C. R. (1951). *Utility of a Satellite Vehicle for Reconnaissance* (R-217). Santa Monica, CA: The RAND Corp.
- Lipp, J. E. & Salter, R. M. (Eds.). (1954, March 1). *Project Feedback Summary Report* (R-262). Santa Monica, CA: RAND Corp.

Articles

- Araki, S & Treat, S. (2012, Spring). “Hexagon – ‘No Single Failure Shall Abort the Mission’ – Managing System Integration for the NRO’s Wide-Area Search Satellite from the Lockheed Missile and Space Company’s Perspective.” *National Reconnaissance Journal of the Discipline and Practice*. Issue 2012-U1.

- Behling, T. & McGruther, K. (1998-99, Winter). "Planning Satellite Reconnaissance to Support Military Operations." *Studies in Intelligence*.
- Berkowitz, B. (2012, Spring). "The Soviet Target - Highlights in the Intelligence Value of Gambit and Hexagon, 1963-1984." *National Reconnaissance Journal of the Discipline and Practice. Issue 2012-U1*.
- Brugioni, D, A. (1983, March). "Hiding the Aircraft Factories." *Air Force Magazine*, 66:3.
- Brugioni, D. A. & McCort, R. F. (1988, February). "Personality: Arthur C. Lundahl." *Photogrammetric Engineering and Remote Sensing*, 54:2.
- Brugioni, D. A. (1996, March). "The Art and Science of Photoreconnaissance." *Scientific American*, 274.
- Drell, S. D. (1998, April 17). "Physics and U.S. National Security." *Reviews of Modern Physics*, 70:2.
- Garwin, R. L., Gottfried, K., & Hafner, D. L. (1984, June). "Antisatellite Weapons." *Scientific American*, 250:6.
- Hall, K. R. (1999, Summer). "The National Reconnaissance Office: Revolutionizing Global Reconnaissance." *Defense Intelligence Journal*, 8:1.
- Hall, R. C. (1995, Spring). "The Eisenhower Administration and the Cold War: Framing American Astronautics to Serve National Security." *Prologue*, 27:1.
- McDonald, R. A. (1995, June). "Corona: Success for Space Reconnaissance, a Look into the Cold War and a Revolution for Intelligence." *Photogrammetric Engineering and Remote Sensing*, 61:6.
- McDonald, R. A. (1999). "NRO's Satellite Imaging Reconnaissance: Moving From the Cold War Threat to Post-Cold War Challenges." *Defense Intelligence Journal*, 8:1.
- McDonald, R.A. & Widlake, P. (2012, Spring). "Looking Closer and Looking Broader: Gambit and Hexagon - The Peak of Film-Return Space Reconnaissance After Corona." *National Reconnaissance Journal of the Discipline and Practice. Issue 2012-U1*.

- McDonald, R. A. (2015). "I Can See it From Afar; I Can Hear it From Afar—Intelligence From Space." *National Reconnaissance Journal of the Discipline and Practice, Advanced pre-print, August 2015* (Originally prepared as an article for use by the Association of Former Intelligence Officers, AFIO, as part of it's the Guide to the Study of Intelligence.)
- Ragusa, P. (2012, Spring). "Gambit-3: Engineering an Innovative High-Resolution Reconnaissance Satellite - Program Management from the Lockheed Missile and Space Company's Perspective." *National Reconnaissance Journal of the Discipline and Practice. Issue 2012-U1.*
- Ruffner, K. C. (1996). "Declassification's Great Leap Forward: Corona and the Intelligence Community." *Studies in Intelligence, 39:5.*
- Schultz, S.D. (2012, Spring). "Why Gambit and Hexagon? U.S. National Security and the Geopolitical Setting, 1957-1960." *National Reconnaissance Journal of the Discipline and Practice. Issue 2012-U1.*
- Smith, F. D. (1995, October). "The Eyes of Corona: The World's First Satellite Reconnaissance Program." *Optics & Photonics News, 6:10.*
- Tenet, G. J. (1998-99, Winter). "An Intelligence Success Story - The U-2 Program: The DCI's Perspective." *Studies in Intelligence.*
- Welzenbach, D. E. (1994, October). "Din Land: Patriot from Polaroid." *Optics & Photonics News, 5:10.*
- Welzenbach, D. E. (1986, Spring). "Observation Balloons and Reconnaissance Satellites." *Studies in Intelligence, 30:1.*
- Wheelon, A. D. (1997, February). "Corona: The First Reconnaissance Satellites." *Physics Today, 50:2.*
- Wheelon, A. D. & Graybeal, S.N. (1961, Fall). "Intelligence for the Space Race." *Studies in Intelligence, 5.*

Acronyms

| | |
|----------------|--|
| AFB | Air Force Base |
| AFS | Air Force Station |
| BPO | Business Plans and Operations |
| CIA | Central Intelligence Agency |
| CSNR | Center for the Study of National Reconnaissance |
| DCI | Director of Central Intelligence |
| DEFSMAC | Defense Special Mission and Aerospace Center |
| DMSP | Defense Meteorological Satellite Program |
| DNRO | Director, National Reconnaissance Office |
| DoD | Department of Defense |
| DSP | Defense Support Program |
| ELINT | Electronic Intelligence |
| EOI | Electro Optical Imaging |
| ESA | European Space Agency |
| FISINT | Foreign Instrumentation Signals Intelligence |
| GPS | Global Positioning System |
| GRAB | Galactic Radiation and Background Satellite |
| ICBM | Intercontinental Ballistic Missile |
| IMINT | Imagery Intelligence |
| INT | Intelligence (Often used at end of descriptor: i.e. Sigint, Imint) |
| ISS | International Space Station |
| KH | Keyhole |
| MIDAS | Missile Detection and Alarm System |
| MOL | Manned Orbiting Laboratory |
| NACA | National Advisory Committee for Aeronautics |
| NASA | National Aeronautics and Space Administration |
| NGA | National Geospatial-Intelligence Agency |
| NIE | National Intelligence Estimate |
| NIMA | National Imagery and Mapping Agency |

Acronyms (cont.)

| | |
|----------------|--|
| NJ | New Jersey |
| NRL | Naval Research Laboratory |
| NROL | National Reconnaissance Office Launch |
| NRP | National Reconnaissance Program |
| NSC | National Security Council |
| OTV | Orbital Test Vehicle |
| OWS | Orbital Workstation |
| PDDNI | Principal Deputy Director of National Intelligence |
| RAF | Royal Air Force |
| PKT | Pakistan Time |
| SAC | Strategic Air Command |
| SAF/MSS | Secretary of the Air Force/Office of Missile and Satellite Systems |
| SALT | Strategic Arms Limitation Talks |
| SAM | Surface-to-Air Missile |
| SAR | Synthetic Aperture Radar |
| SBSS | Space Based Space Surveillance |
| SecAF | Secretary of the Air Force |
| SecDef | Secretary of Defense |
| SIGINT | Signals Intelligence |
| TIROS | Television Infrared Observation Satellite |
| UK | United Kingdom |
| USAF | United States Air Force |
| USN | United States Navy |
| USSR | Union of Soviet Socialist Republics |
| WDD | Western Development Division (United States Air Force) |



▲ A Delta IV Heavy lifts a classified satellite toward space as part of NROL-49 on 20 January 2011.

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