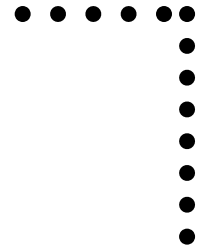


QUEST

THE HISTORY OF SPACEFLIGHT QUARTERLY



**From U-2 to Corona:
50 Years Later**

What We Officially Know

*15 Years of Satellite
Declassification*

**Critical Issues in the
History and
Historiography of U.S.
National Reconnaissance**

*An Interview with
Lt. General Forrest
McCartney*

**What Should Corona
Photograph and
How Often?**

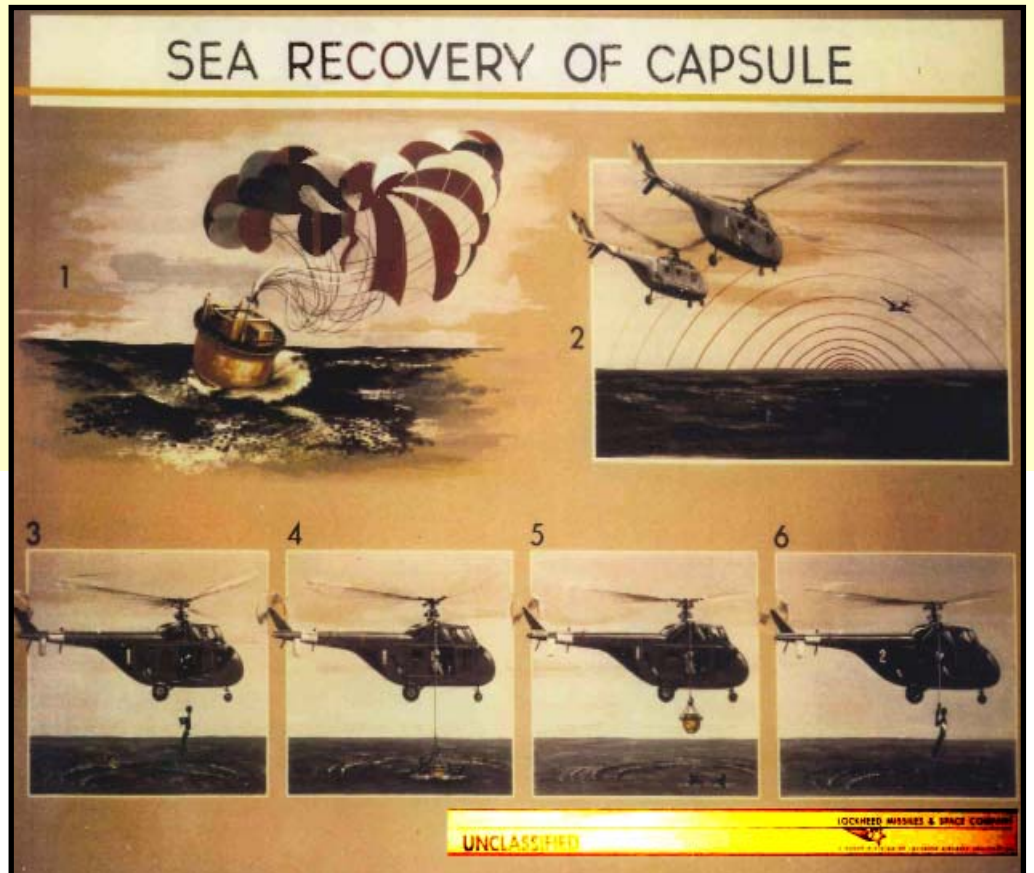
**Eisenhower's
Domestic Perspective
on WS-117L**

**50 YEARS OF SATELLITE RECONNAISSANCE AND THE
FIRST SUCCESSFUL FILM CAPTURE FROM CORONA**



"We've spent thirty-five or forty billion dollars on the space program. And if nothing else had come of it except the knowledge we've gained from space photography, it would be worth ten times what the whole program cost. Because tonight we know how many missiles the enemy has and, it turned out, our guesses were way off. We were doing things we didn't need to do. We were building things we didn't need to build. We were harboring fears we didn't need to harbor."

President Lyndon B. Johnson, 1967





THE HISTORY OF SPACEFLIGHT
QUARTERLY

Contents

Volume 17 • Number 3 2010

- 2 Letter from the Editor
5 Letter from the Publisher
6 From U-2 to Corona: 50 Years Later
By Francis Gary Powers Jr.

Features

- 7 What We Officially Know:
Fifteen Years of Satellite Declassification
By Jeffery A. Charlston
20 Critical Issues in the History and
Historiography of U.S. National
Reconnaissance
By David Waltrop
42 What Should Corona Photograph and How Often?
By James David
52 The Advanced Reconnaissance System:
Eisenhower's Domestic Perspective on WS-117L
By Robert Dienesch

Oral History

- 29 An Interview with Lt. Gen. Forrest McCartney
By David Christopher Arnold

Book Reviews

- 65 The Case for Pluto: How a Little Planet
Made a Big Difference
Book by Alan Boyle
Review by Roger D. Launius
66 Voyager: Seeking Newer Worlds in the
Third Great Age of Discovery
Book by Stephen J. Pyne
Review by Roger D. Launius
70 Red Cosmos: K.E. Tsiolkovskii,
Grandfather of Soviet Rocketry
Book by James T. Andrews
Review by Asif Siddiqi
72 Space Travel & Culture:
From Apollo to Space Tourism
Book by David Bell & Martin Parker
Review by Paul Ceruzzi

68/69 *On the Bookshelf*

Cover Image Credits

Front Cover

Artist conception of a C-130 aircraft approaching a descending Corona capsule. Credit: NRO

Back Cover (clockwise, top left)

Top Left: Artist conception of the KH-4 Corona camera in operation. Credit: NRO

Top Right: An Air Force C-119 aircraft shown reeling in a parachute with a test recovery payload attached in probable training for recovery operations of Corona film return capsules. Credit: NRO

Bottom Right: Lockheed Missiles & Space Company with an artist concept detailing the sequence of a sea recovery of a Corona capsule. Courtesy of the NRO

Bottom Left: Unidentified Corona launch from Vandenberg Air Force Base using a Thor booster. Credit: NRO



Critical Issues in the History and Historiography of U.S. National Reconnaissance

By David W. Waltrop

This is an exciting time to study the history of U.S. national reconnaissance. Not only are we celebrating the 50th anniversary of America's first signals and imagery intelligence satellites—the Galactic Radiation and Background (GRAB) experiment and CORONA, respectfully—but we are also benefitting from significant recent declassifications. In the last few years, the National Reconnaissance Office (NRO) has released more than 31,000 pages of NRO Staff and SAMOS (Satellite and Missile Observation System) records, declassified the “fact of” radar reconnaissance, and the “fact of” QUILL, the nation's first experimental radar satellite launched in 1964. In October 2008, the NRO acknowledged the locations of its ground stations at Fort Belvoir, Virginia; White Sands Missile Range, New Mexico; and Buckley Air Force Base, Colorado; and a presence at the Joint Defence Facility

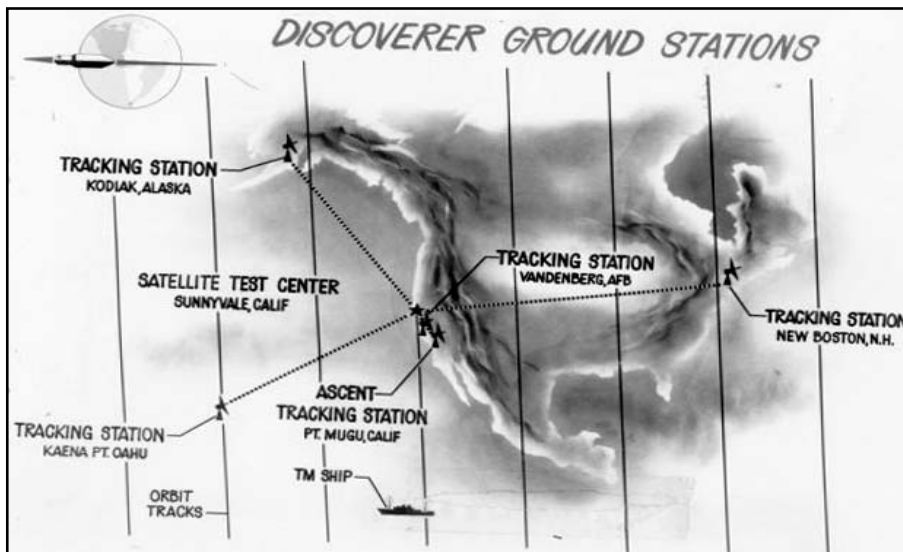
Pine Gap, Australia; and the Royal Air Force Base Menwith Hill Station, United Kingdom. Moreover, as I write this article, the NRO is beginning an effort to make additional information more readily available through its public website.¹

These developments not only indicate an increased willingness on the part of the Cold War era organization to tell its story, they also warrant a brief look at the state of national reconnaissance historiography. This article, an effort to provide such an assessment, begins with the literature on post-World War II reconnaissance, during which time Presidents Harry Truman and Dwight Eisenhower approved risky aerial missions, and unpiloted observation balloon flights, above the Soviet Union and other “denied territories.” These once-clandestine efforts sought to gather strategic intelligence on potential enemies that could reveal preparations for a surprise attack on the United States. The article then surveys the major works on the SR-71, U-2, and A-12 reconnaissance air-

craft, and the concept of freedom of space. Lastly, it examines the scholarship on the NRO, other space-related organizations, and the CORONA, GRAB, and POPPY reconnaissance satellites.²

Post-World War II Aerial Reconnaissance

Japan's attack on U.S. forces at Pearl Harbor on 7 December 1941 created a national imperative among the country's post-war leaders to prevent another surprise attack through overhead reconnaissance. Concern for a so-called “nuclear Pearl Harbor” emerged after U.S. airplanes detected increased atmospheric radiation from the first Soviet atomic test in 1949. With East-West tensions rising, war with the Soviet Union was a growing possibility, and American presidents looked to technical intelligence to provide indications-and-warnings of an attack. Traditional spycraft, which used undercover agents to gather information, proved extremely difficult



The Air Force Satellite Control Facility, 1960.

Courtesy of the Air Force Historical Research Agency collection.

behind the Iron Curtain because of tight Soviet counterintelligence, the closed nature of Soviet society, and the vastness of Soviet territory. To gain reliable intelligence, starting in the late-1940s and continuing into the 1950s, at the direction of the president, the U.S. Air Force and U.S. Navy conducted high-risk peacetime aerial reconnaissance missions of the Soviet Union, Asia, and other communist bloc nations using modified military reconnaissance airplanes. The president initially authorized these flights to only skirt the edge of enemy territory, but as the need for intelligence grew, some flights were extended to first quick shallow incursions and then deep penetrations of denied airspace.

Utmost secrecy was needed because incursions during peacetime violated treaties to which the United States was party (the president justified the legality of incursions during the Korean War on grounds that the Soviet Union was an unannounced cobelligent). Although each mission brought the possibility of a shoot down, loss of crew and airplane, and political repercussions, possibly even war, the United States continued these dangerous missions out of a critical need to gain intelligence that could forewarn or stop potentially devastating attacks on the nation. As time progressed, the Air Force and Central Intelligence Agency (CIA) developed dedicated, faster, higher-flying reconnaissance aircraft—the U-2, A-12, and SR-71—to avoid enemy defenses. While these new aircraft were more difficult to shoot down than their slower, lower-flying predecessors, the risks remained. In the meantime, work on observation balloons and reconnaissance satellites continued.

While there remains no comprehensive history of Air Force reconnaissance efforts, several works cover a variety of related national security space topics. Lee Bowen's *The Threshold of Space*, though dated, is a classic work on the genesis of military space efforts that has established persistent patterns of historical thought.³ Walter McDougall's Pulitzer Prize-winning history, *...the Heavens and the Earth*, discusses the

space race's national security aspects. Although also dated, it remains an authoritative work on the politics of space in the 1950s and 1960s.⁴ William Burrows' *This New Ocean*, a finalist for the 1999 Pulitzer Prize in history, masterfully integrates reconnaissance and national security issues into an overview narrative of space history.⁵ Mike Gruntman's *Blazing the Trail* is an overview of the military contributions of early space technology.⁶ In *The U.S. Air Force in Space*, R. Cargill Hall and Jacob Neufeld provide an impressive work on U.S. Air Force space activities.⁷ David Spires' *Beyond Horizons* is presently among the best places to start for a recently published history of the U.S. Air Force in space.⁸ Spires also produced *Orbital Futures*, a two-volume document set based on his *Beyond Horizons* research.⁹ Curtis Peebles' *High Frontier* is a briefer look at military space history.¹⁰ Peebles examines the use of balloons as reconnaissance platforms in the *Moby Dick Project*.¹¹

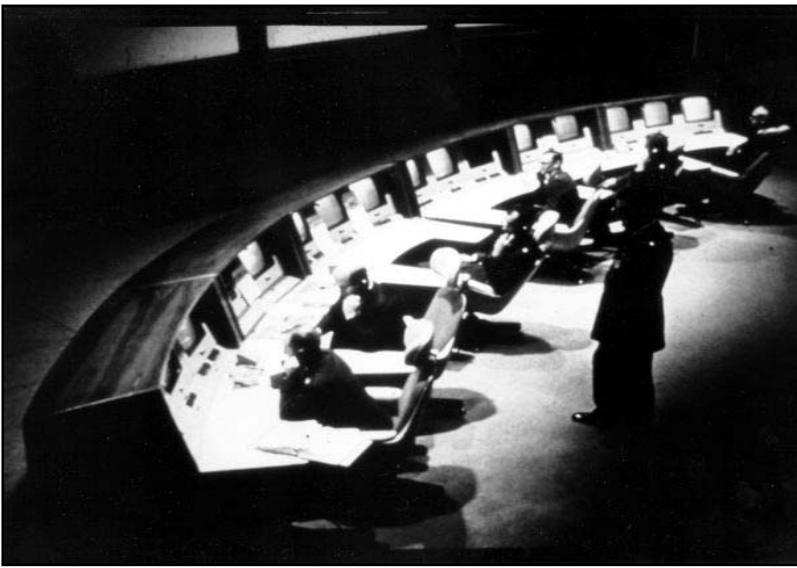
In "The Truth about Overflights," R. Cargill Hall used declassified sources and aircrew interviews to give an early history of Air Force overflights of the Soviet bloc that corrected many errors.¹² Hall showed these overflights were more complex than researchers had believed, with differing chains-of-command and purposes. He distinguishes between flights conducted under the Peacetime Airborne Reconnaissance Program (PARPRO), which were only authorized to perform reconnaissance along the periphery of enemy airspace, and deep penetration Sensitive Intelligence (SENSINT) missions that President Eisenhower ordered between 1954 and 1956—when SENSINT flights ended in favor of the U-2—to assess Soviet strategic strengths. Hall, who briefly readdressed the topic in a 2009 *Air Power History* article, showed that while PARPRO flights occasionally strayed into Soviet territory and were shot down, Frances Gary Powers' U-2 was the only U.S. aircraft to be shot down during a deep penetration flight of Soviet territory. Curtis Peebles' *Shadow Flights* is a book-length treatment of the topic.¹³

In February 2001, the Defense

Intelligence Agency and the National Reconnaissance Office (NRO) held a symposium on these early reconnaissance missions. The meeting, attended by historians and former aircrews, resulted in a two-volume proceeding edited by R. Cargill Hall and then-deputy NRO historian Clayton Laurie.¹⁴ *In The Price of Vigilance*, Larry Tart and Robert Keefe demonstrate the dangerous nature of these missions in encounters with enemy fighters, including an account of the April 2001 collision of a U.S. Navy EP-3 airplane and Chinese fighter off Hainan Island and the effort to recover the Navy personnel.¹⁵ William Burrows' *By Any Means Necessary* provides an equally dramatic depiction of early aerial reconnaissance.¹⁶ Curtis Peebles addressed the topic in his 2005 history, *Twilight Warriors*.¹⁷ Chris Pocock's *The Black Bats* on CIA reconnaissance flights over China from Taiwan in the 1950s and 1960s is the most recent addition to the literature.¹⁸

Advanced Reconnaissance Aircraft

In 1954, President Eisenhower directed the CIA to develop the U-2 reconnaissance airplane under project AQUATONE. This revolutionary aircraft used sophisticated cameras to capture images from an altitude in excess of 70,000 feet, beyond the range of anti-aircraft defenses at the time. Director of Central Intelligence (DCI) Allen Dulles told his special assistant, Dr. Richard Bissell Jr., to direct the highly classified project. Clarence "Kelly" Johnson, director of the Advanced Development Projects Division at the Lockheed Corporation, known as the "Skunk Works," conceived an early U-2 design (designated CL-282) in 1952, but the Air Force, preferring to focus on developing its strategic bomber force, expressed little interest in what they considered a flimsy glider. It was not until mid-1954 that the design gained presidential support. In March 1955, four months after Eisenhower approved AQUATONE, Lockheed and the CIA signed a contract to build the U-2. Kelly Johnson promised an ambitious schedule: deliver the first airframe within nine months and the last by November 1956.



Satellite test center, main control room, 1960.

Courtesy of the National Reconnaissance Office collection.

On 4 July 1956, the first U-2 to penetrate Soviet territory departed from Wiesbaden, Germany, then overflowed parts of Poland, Belorussia, and the Soviet Baltic, before returning to Wiesbaden. The main targets were the shipyards at Leningrad, a center of Soviet submarine activity. Soviet jets attempted to intercept the aircraft (confirming the Soviet Union could track the U-2) but could not reach its altitude. Anticipating the end of U-2 overflights because of the aircraft's increasingly vulnerability, the CIA and Lockheed began developing the A-12 Oxcart, a new reconnaissance airplane that could fly higher and faster than the U-2. The two organizations signed a contract for 12 A-12's on 11 February 1960. Three months later, on 1 May, the 24th mission over Soviet territory, a SA-2 surface-to-air missile launched from under a Soviet MiG fighter downed a U-2 piloted by Francis Gary Powers. Washington initially denied the U-2 was a reconnaissance aircraft, but Powers' capture and trial proved those denials false, and forced President Eisenhower to suspend all future flights over the Soviet Union. Despite the suspension, however, the U-2 continued flying over other areas. In 1962, Lockheed began producing three follow-on A-12 versions: the Air Force SR-71 Blackbird, the Kedlock, and the

uncrewed D-21 drone. The government canceled the A-12 and Kedlock in 1968, and the drone in 1971, after transferring its technology to the Air Force for launch off B-52s. The Blackbird operated off-and-on until 1999. The U-2 continues to operate, but the United States is considering retiring the fleet.

The U-2's shoot down effectively declassified the airplane's existence. Four years later, President Lyndon Johnson revealed the SR-71's existence. Since then, reconnaissance aircraft have been the subject of several books. In *The U-2 Affair*, journalists David Wise and Thomas Ross examine the U-2 shoot down and the resulting domestic and international repercussions.¹⁹ Francis Gary Powers, after his release from Soviet prison, published his memories in *Operation Overflight*.²⁰ Michael Beschloss' *Mayday* analyzes many of the same issues as Wise and Ross.²¹ Both accounts show the importance of Eisenhower and Khrushchev's personalities, domestic influences on superpower foreign policy, and bureaucracy's impact on decision making. However, by drawing on the considerable amount of information declassified in the 24 years since Wise and Ross wrote their book, Beschloss provides a more accurate and insightful account of the U-2 program, especially in the context of the

Eisenhower administration's foreign policy. Chris Pocock's *Dragon Lady* is another important U-2 history.²² In 1998, the CIA declassified, in large measure, Gregory Pedlow and Donald Welzenbach's history, *CIA and the U-2 Program*, which publicly detailed the AQUATONE program and CIA's role in early reconnaissance.²³ Norman Polmar's *U-2 History Declassified* describes the specifications of each U-2 version, their camera systems, and each U-2 flight.²⁴ Pocock's *50 Years of the U-2* is the most comprehensive book on the subject.²⁵

Jay Miller's *Lockheed Martin's Skunk Works* is a detailed account of the organization.²⁶ The factory figured prominently in memories by Skunk Works chiefs Kelly Johnson, and his successor, Ben Rich.²⁷ Richard Graham's *SR-71 Revealed* provides an early account, this time of the Air Force Blackbird, mostly from participant interviews.²⁸ Graham, with access to additional interviews and declassified information, revised the subject in his 2002 book, *SR-71 Blackbird: Stories, Tales, and Legends*.²⁹ In *Dark Eagles*, Curtis Peebles describes the history of several American aerial systems, including Northrop's stealth aircraft, the F-117 stealth fighter, and D-21 and Firebee drones.³⁰ In *Archangel: CIA's Supersonic A-12 Reconnaissance Aircraft*, published during the CIA 60th anniversary, CIA historian David Robarge gives the first authoritative account of the recently declassified A-12 Black Shield missions over South East Asia during the Vietnam War.³¹

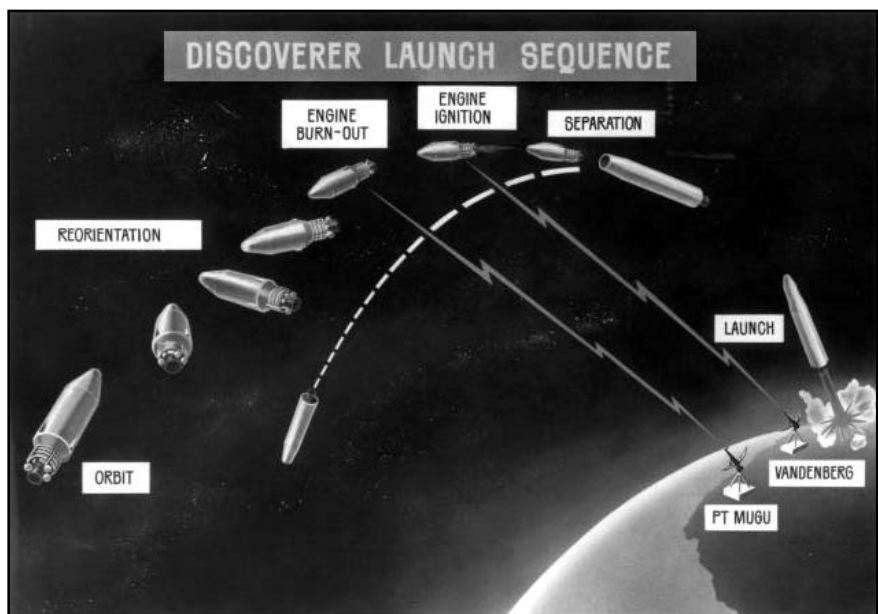
Concept of Freedom of Space

President Eisenhower proposed the Open Skies Policy in July 1955 (a year before the U-2 first overflew Soviet territory) during a meeting in Geneva with Soviet, British, and French officials. It called for the United States and the Soviet Union to permit acknowledged peacetime, aerial reconnaissance of each nation's territory. A Soviet agreement may have given American leaders the intelligence they needed to allay fears of surprise attack and possibly eliminate the need for project

AQUATONE. Soviet Prime Minister Nikola Bulganin, leader of the delegation, initially reacted positively, but Communist Party Chief Nikita Khrushchev later rejected the idea. While unauthorized peacetime aerial overflights of “denied territory” remains a violation of international law, the October 1957 launch of *Sputnik 1* established the “freedom of space” precedent. Stephen Ambrose was among the first to note the topic’s importance and complexity in *Ike’s Spies*.³² Presidential advisor Walt Rostow’s *Open Skies* (based partly on his own experiences) examined the struggle between Secretary of State John Foster Dulles and presidential assistant Nelson Rockefeller about the open skies policy.³³ Walter McDougall’s *...the Heavens and the Earth* was among the first full-length critical analysis of the issues involved.³⁴ By placing the topic in the political context of other space programs, McDougall shows that President Eisenhower sought to use a civilian satellite to establish the “freedom of space” precedent before following-on with military satellites. R. Cargill Hall, with access to new archival materials, clarified the topic in several essays.³⁵ Hall maintains that the need to establish “freedom of space,” to set the legitimacy for reconnaissance and other military satellites, was a prime focus of Eisenhower’s space policy. Dwayne Day and Michael Neufeld followed with their assessments in 1998 and 2000.³⁶ Matt Bille and Erika Lishock’s *The First Space Race* provides a more recent assessment.³⁷

Satellite Reconnaissance

In 1946, General Curtis LeMay, director of Research and Development for the Air Staff, asked the Douglas Aircraft Corporation’s RAND group to study the feasibility of orbiting an artificial satellite. Their 2 May 1946, report, *Preliminary Design for an Experimental World Circling Spaceship*, recognized the scientific and military applications of satellites, and also the political implications of being the first nation to orbit a spacecraft, and outlined the technical specifications for a small satellite weigh-



The Discoverer/Corona launch sequence.

Courtesy of the Air Force Historical Research Agency collection.

ing no more than 2,000 pounds. Although the technology to create such a vehicle did not then exist, their report predicted many eventual uses of satellites, including missile guidance, weather monitoring, global communications, and reconnaissance. In March 1956, the Air Force issued General Operational Requirement No. 80, officially establishing the need for an advanced reconnaissance satellite. Four months later, the Air Force Air Research and Development Command approved Weapon System 117L (WS-117L), a program to build reconnaissance satellites in assorted orbits. The project began in October 1956, when the Lockheed Aircraft Corporation received a contract to develop a read-out reconnaissance satellite. First designated Advanced Reconnaissance System, then SENTRY, and finally SAMOS, developers designed the system to photograph the Earth, develop and scan the pictures on the spacecraft, and transmit the electronic images to receiving stations. The contract also included a secondary system, which would return the exposed film in deorbited capsules parachuted from the satellite. SAMOS initially received priority because it offered the possibility of providing near real-time reconnaissance, but by 1958, with the SAMOS read-out

effort struggling, President Eisenhower approved a plan transferring WS-117L’s film-recovery system from the regular Air Force to a covert Air Force–CIA team led by Richard Bissell.

The new effort (called CORONA) operated satellites in polar orbits to image targets primarily in the Soviet Union and China. Air Force C-119 (and later C-130) airplanes recovered the deorbited capsules in mid-air as they drifted above the Pacific Ocean. To conceal CORONA’s purpose, and explain the construction of ground facilities and ensuing launches, the CIA initially disguised the reconnaissance effort as DISCOVERER, an Air Force biomedical program. On 18 August 1960, the Air Force launched *Discoverer 14*, which successfully returned the first photographs from space. Before the CORONA program ended in 1972, it built two closely related systems: the partially successfully KH-5 ARGON Army Mapping Camera and the unsuccessful KH-6 LANYARD high-resolution imagery satellite. On 6 September 1961, a little more than a year after *Discoverer 14*’s historic mission, acting DCI General Charles Cabell and Deputy Secretary of Defense Roswell Gilpatric established management arrangements for the National Reconnaissance



The master control room at the Satellite Test Center, 1961. At the master console in the rear, Lockheed test director, Eugene Crowther, and Air Force test controller, Maj. Joseph P. O'Toole, confer during the final seconds before a launch. Other members of the integrated Air Force-contractor team are in the foreground.

Courtesy of the Air Force Historical Research Agency collection.

Program, which consolidated many of America's space and aerial reconnaissance efforts under a covert, highly compartmented, National Reconnaissance Office.

Despite the declassification of the NRO's existence in 1992, there are almost no histories of this once covert organization. Robert Perry's declassified monograph, *Management of the National Reconnaissance Program*, remains an outstanding early work on the interagency conflicts the CIA and Air Force faced in creating America's reconnaissance program in the early 1960s.³⁸ David Waltrop's 2006 article, *The Past as Prologue*, examines those conflicts in light of the Director of National Intelligence's creation.³⁹ In *The NRO and Congress*, Clayton Laurie analyzes the complex relationship between the two organizations.⁴⁰ R. Cargill Hall's 2004 *Quest* article, "The NRO in the 21st Century," is one of the best comprehensive overviews of the NRO from its creation to the 2002 Iraq War.⁴¹ In 2010, the NRO released David Waltrop's article on Pentagon Suite 4C1000, the first NRO headquar-

ters.⁴²

Outside government circles, many often cite Jeffrey Richelson's, *America's Secret Eyes in Space* and Bill Burrows' *Deep Black*.⁴³ Bill Gertz's brief 1993 *Air Force Magazine* article, "The Secret Mission of the NRO," is among the first accounts written after the organization's declassification.⁴⁴ In 2000, Jeffrey Richelson published an article on the NRO in the *International Journal of Intelligence and Counterintelligence*.⁴⁵ A year later, he published *America's Space Sentinels* on the Defense Support Program missile early warning satellites.⁴⁶ Victor McElheny's *Insisting on the Impossible* is a biography of Edwin Land, inventor of Polaroid instant photography, presidential advisor, and reconnaissance pioneer. The autobiographies of Richard Bissell, who became the first NRO codirector after developing the U-2 and A-12 airplanes, and George Kistiakowsky, who played an important role in early reconnaissance as presidential science advisory, are very useful.⁴⁷

Government-funded nonprofits and academic organizations related to

U.S. national reconnaissance have received their share of historical scrutiny. Hans Mark and Arnold Levine's *The Management of Research Institutions* provide an early overview of these institutions in relation to post-World War II science.⁴⁸ Several works examine the RAND Corporation, among the most famous government-funded defense think tank. An early RAND history is Bruce Smith's, *The RAND Corporation*.⁴⁹ Martin Collins' *Cold War Laboratory* is a more recent account.⁵⁰ In *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology*, Merton Davies and William Harris, describe RAND's contribution to early reconnaissance.⁵¹ In *Soldiers of Reason*, *Los Angeles Times* writer Alex Abella gives the most recent history of RAND from its 1945 origins to the 2002 U.S. invasion of Iraq.⁵²

Claude Baum's *The Systems Builder* examines the System Development Corporation, RAND's air defense spin-off.⁵³ Eva Freeman's edited work, *MIT Lincoln Laboratory*, provides articles on the Lincoln's Lab's defense role.⁵⁴ The MITRE Corporation, created to conduct air defense research, published an internal history in 1979. Davis Dyer and Michael Dennis' *Architects of Information Advantage* is a more recent MITRE history.⁵⁵ The Aerospace Corporation, another major defense think tank, produced several internal histories.⁵⁶ Roger Bilstein's *The American Aerospace Industry* is a history of U.S. aerospace from a business perspective.⁵⁷ In *Spy Capitalism*, Jonathan Lewis provides an insightful look at the relationship between CIA and the Itek Corporation, the company that pioneered optics for early reconnaissance satellites.⁵⁸ Stuart Leslie's *The Cold War and American Science* examines the formation of the military-industrial-academic complex at Stanford University and MIT (Massachusetts Institute of Technology).⁵⁹ Dwayne Day wrote a series of articles on the SAMOS program, and he and R. Cargill Hall separately describe the transfer of its camera technology to NASA's

(National Aeronautics and Space Administration) Lunar Orbiter.⁶⁰

The CORONA photoreconnaissance satellite is among the best-known NRO program. In May 1995, the CIA held a public conference concurrent with CORONA's declassification, the proceedings resulted in *Eye in the Sky*, edited by Dwayne Day, John Logsdon, and Brian Latell.⁶¹ The CIA also released a collection of CORONA documents edited by CIA historian Kevin Ruffner during the conference.⁶² He also wrote "Corona and the Intelligence Community" an article on the declassification process itself, for CIA's *Studies in Intelligence*.⁶³ Robert McDonald, current director of the NRO Center for the Study of National Reconnaissance, edited two other works: *Corona: Between the Sun and the Earth* is a collection of articles by CORONA participants and historians; *Beyond Expectations* contains recollections from national reconnaissance pioneers.⁶⁴ Redacted versions of *The Corona Story*, the program's official history, and Robert Perry's multi-volume reconnaissance history are also released, and available on the NRO website.⁶⁵

Outside government, Dwayne Day wrote an overview of CORONA in two *Quest* issues, followed by articles on other CORONA aspects.⁶⁶ Curtis Peebles' *The Corona Project* is an early history of CORONA based on declassified sources.⁶⁷ Jeffrey Richelson used these and other sources to publish *Wizard's of Langley*, a work on the CIA Directorate of Science and Technology.⁶⁸ Phillip Taubman's *Secret Empire* is among the most comprehensive histories of reconnaissance.⁶⁹ David Lindgren's *Trust but Verify* examines the role of imagery analysis in arms control, although Dwayne Day has raised questions about the accuracy of some of its statements.⁷⁰ *Quest* editor David Christopher Arnold's *Spying from Space* focuses on CORONA's command-and-control system.⁷¹ Park Temple's *Shades of Grey* is another treatment of space reconnaissance history.⁷² The latest contribution to the literature is Dino Brugioni's *Eyes in the Sky*, which uses newly declassified documents to

reassess CIA cold war aerial and space reconnaissance during the 1950s and 1960s, although it does not cover the NRO's role.⁷³

In addition to CORONA, the United States developed systems to detect clouds, and other weather conditions that could impair space reconnaissance. R. Cargill Hall's *History of the Military Polar Orbiting Satellite Program* is among the best overviews of the Defense Meteorological Satellite Program (DMSP).⁷⁴ A year after publishing this seminal work, Hall summarized DMSP's origins in an article in *Quest* magazine.⁷⁵ That same *Quest* issue also includes Arnold's interview with Thomas Haig, the program's first manager.⁷⁶ In 1982, Henry Brandli published a brief article in the *Aerospace Historian* on DMSP's use in Southeast Asia during the Vietnam War.⁷⁷ Five years later, Air Force Major Michael Abel provided an account of DMSP to 1982 in a *History of the Defense Meteorological Satellite Program: Origin through 1982*. Dwayne Day wrote a history of the program for *Spaceflight* magazine.⁷⁸ In 2010, the NRO released Noel McCormick's 2005 article, *The Rescue of Apollo 11*, which explains how DMSP detected a hurricane at the *Apollo 11* splashdown zone.⁷⁹ Charles Bates and John Fuller's *America's Weather Warriors* is an early history of military weather forecasting. A decade later, Frederik Nebeker's *Calculating the Weather* built on that work to provide an overview of modern civilian and military meteorology. Helen Gavaghan discusses the military origins of TIROS and other early weather satellites in *Something New under the Sun* based on interviews with Verner Suomi, the "father of satellite meteorology."⁸⁰

In August 1959, President Eisenhower authorized the Naval Research Laboratory (NRL) to develop the GRAB experimental satellite to intercept Soviet air-defense radar emissions. Ten months later, on 22 June 1960, *Grab 1*, America's first signals intelligence satellite, lifted off from Cape Canaveral, Florida. GRAB operated from 1960 to 1962, before the POPPY program, which operated from 1962 to

1977, replaced it. The NRL published a pamphlet on GRAB in 1997 and, along with the NRO, declassified the system in June 1998.⁸¹ In "Listening from Above," published a year later in *Spaceflight*, Dwayne Day provided a fuller treatment of GRAB based on declassified sources.⁸² The NRO declassified POPPY in 2005 and produced a pamphlet, *Raising the Periscope: Grab and Poppy America's Early ELINT Satellites*, by Robert McDonald and Sharon Moreno.⁸³ Overhead signals intelligence is among this nation's most sensitive subjects. The two official pamphlets by NRL and NRO, while informative, are thus very brief. James Bamford's 1982 *The Puzzle Palace* and 2002 *Body of Secrets* are among the best available histories of the National Security Agency and signals intelligence in the open literature.⁸⁴ Robert Lindsey's *The Falcon and the Snowman*, tells the story of Andrew Daulton Lee and Christopher John Boyce, two contractors arrested for selling satellite secrets to the Soviets.⁸⁵

National reconnaissance historiography will continue to evolve as the government releases additional documents and participants involved in once-secret programs are free to discuss their activities. However, the state of declassification is mixed. Although full implementation of Executive Order 12958 on 31 December 2006, requiring the automatic declassification of executive branch records 25 years old or older, resulted in the declassification of more than 800 million pages, comparatively few are from intelligence agencies. The interagency review process to make information public mandating that agencies with equities in a document coordinate on its release requires months, years, and even decades to complete. Researchers are also anxiously awaiting additional declassifications on the KH-7 and KH-9 satellites (selected imagery and facts about these systems were released in 2002), and other systems. Moreover, post-9/11 classification policy, especially the reclassification of released documents, is one factor in the growing debate on the balance between a democratic society's right to know and

the need to protect state secrets. Regardless of how these issues play out, it seems clear that the state of national reconnaissance scholarship will be in flux for years as researchers struggle to understand these developments and press for additional declassifications.



Dr. Edwin H. "Din" Land of the Polaroid Corporation and the Boston University Optical Research Laboratory. Land had been deeply involved in the planning and development of the U-2 high altitude reconnaissance aircraft as a member of the Technological Capabilities Panel of the Office of Defense Mobilization and also headed the Land Panel, which provided technical / policy advice to the CIA on development of OXCART, the successor to the U-2 that evolved into the SR-71. Along with James R. Killian, assistant to the president for Science and Technology, Land informed CIA's Richard Bissell of the latter's new responsibilities for managing the new covert satellite development effort similar to the way Bissell had managed the covert U-2 development effort. Land also was a participant in the February 1958 briefing to President Eisenhower in which the final technical parameters for the CORONA program were approved for full scale development. He continued to exert strong and vital influence over the lifespan of the CORONA program.

Credit: NRO

About the Author

David Waltrip served as the deputy-chief National Reconnaissance Office historian from 2005 to 2008. He is currently on rotation to the NRO Office of Strategic Communications. All statements of fact, opinion, or analysis expressed in this article are those of the author. Nothing in the article should be construed as asserting or implying U.S. government endorsement of an article's factual statements and interpretations.

Notes

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2. For additional surveys on which parts of this article are based, see Stephen Johnson, "The History and Historiography of National Security Space," in *Critical Issues in the History of Space Flight*, Steven Dick, Roger Launius, eds., (Washington, DC: NASA, 2006); Dwayne Day "Rashomon in Space: A Short Review of Official Space Satellite Histories," *Quest* 8, no. 2 (summer 2000): 45-53; Dwayne Day, "The State of Historical Research on Military Space," *Journal of the British Interplanetary Society* 50 (1997): 203-206.

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