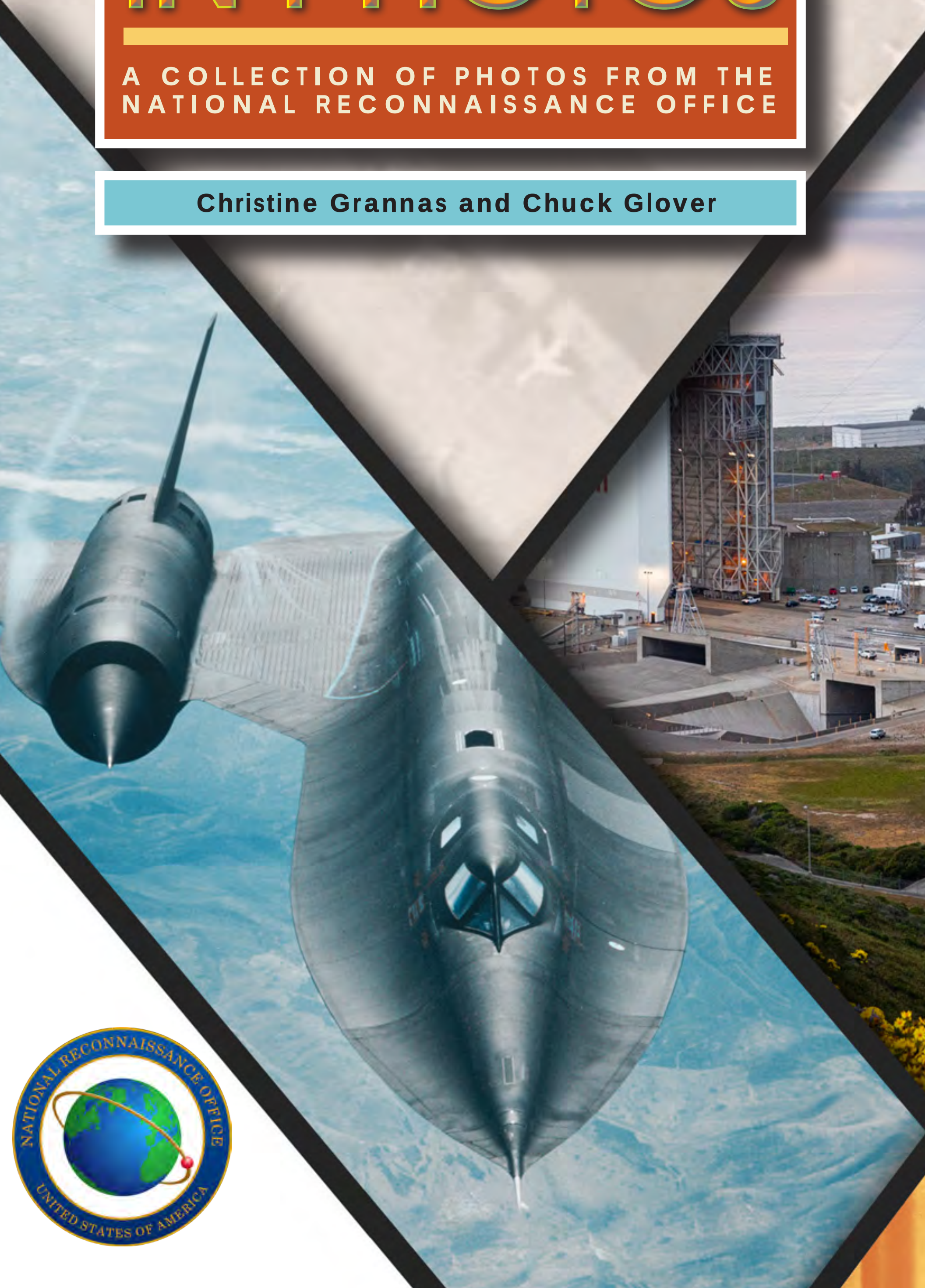
NRO HISTORY IN PHOTOS

A COLLECTION OF PHOTOS FROM THE NATIONAL RECONNAISSANCE OFFICE

Christine Grannas and Chuck Glover



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CENTER FOR THE STUDY OF
NATIONAL RECONNAISSANCE

MAY 2024

Poppy - Thor-Agena - pre-launch - 15 June 1963.

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 Directorate, NRO. The CSNR's primary objective is to advance national reconnaissance and make available to NRO leadership 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 CSNR studies the past, analyzes the present, and searches for lessons for the future.

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C-119J aircraft - Hickam AFB.

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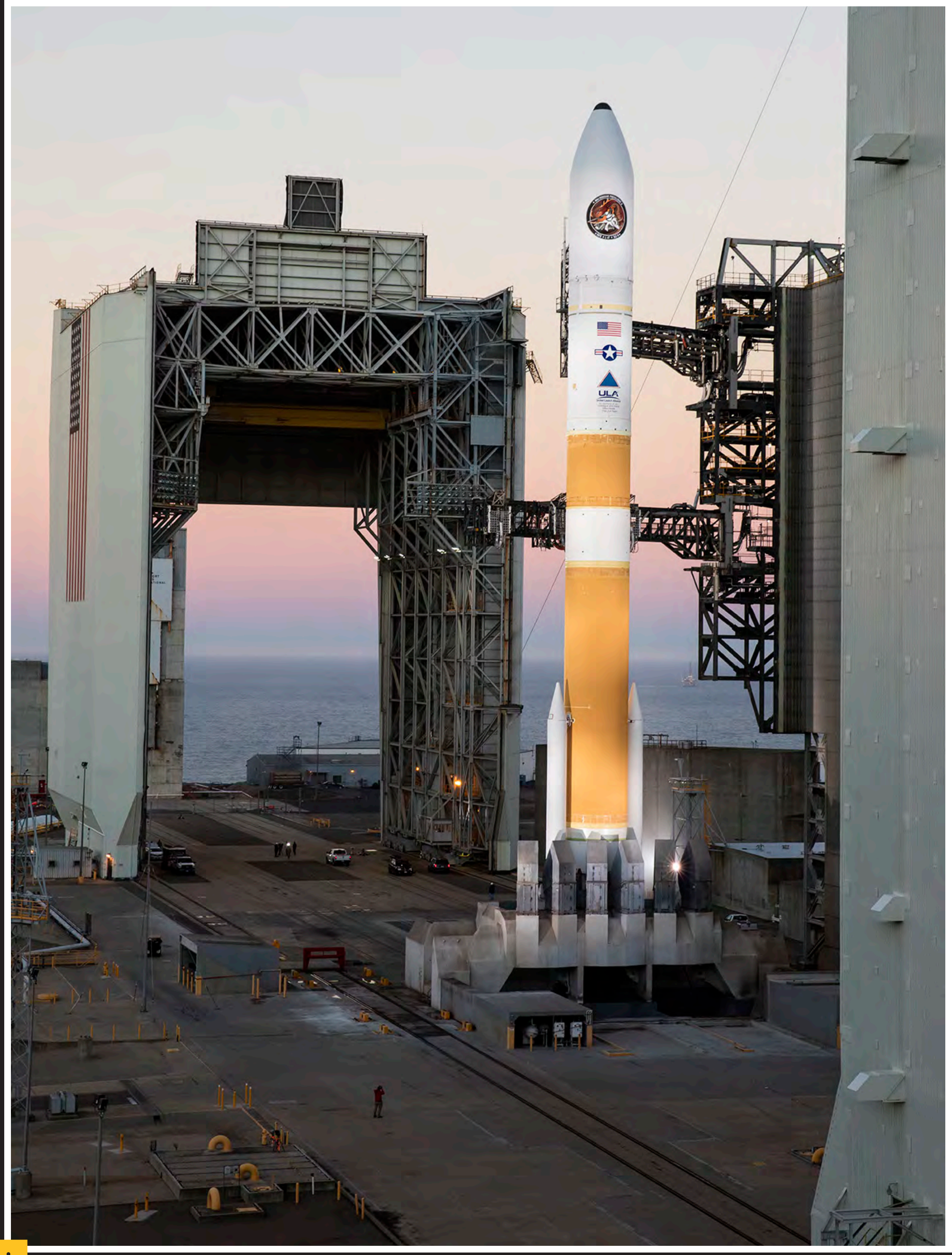


NROL-47 - Delta IV - launch from Vandenberg - 12 January 2018.

FOREWORD

The Center for the Study of National Reconnaissance (CSNR) often receives requests for photographs associated with National Reconnaissance Office programs. Prompted by those requests, Christine Grannas and Chuck Glover have created a NRO pictorial history to help readers understand the history of the NRO in a visual fashion. The photo collection is intended to help readers see the technical complexity of satellites and the majesty of space intelligence collection.

We have also included short written narratives to help readers who are not familiar with the history of the NRO and its programs to become more so. The narratives are intentionally brief so as to encourage readers to seek more understanding through reading other CSNR publications on national reconnaissance topics.

Our hope is that the pictorial history will prompt sharing and discussion among those who read the publication. Finally, this collection will help readers understand how the National Reconnaissance Office has gone "above and beyond" for more than sixty years in defending the national security interests of the United States.

James D. Outzen, Ph.D
Director, Center for the Study of National Reconnaissance

Hexagon (KH-9) image of Glen Canyon Dam, Arizona - 10X.

PREFACE

In early September 1961, a highly secret intelligence organization was established to design, develop, build, and operate national reconnaissance satellites for the United States in our effort to protect the country and our western allies against a surprise nuclear attack from the Soviet Union, and to obtain valuable intelligence on other countries and areas of importance to national security. That agency was the National Reconnaissance Office – a partnership between the Department of Defense and the Central Intelligence Agency – the fact of which was so highly classified, that for the first three decades of its existence, the vast majority of Congress members did not know about it, nor even did some of the employees who worked here. To say the name of the agency outside of appropriate secure facilities and the very small number of cleared personnel was considered a criminal offense.

Certainly, time changes things. The existence of the NRO and many of its earliest satellite collection systems now have been declassified. The photos contained in this book are some of the declassified photos that explain portions of the first 60 years of NRO's history. There are many more programs and fascinating work that the NRO has done, but because the systems are still flying and remain highly classified, they cannot yet be talked about or included in this book. Future historians will write about them decades from now. Today, it is our goal to showcase with you, the reader, the pictures that the NRO can show, while still telling its story.

The photos in this publication are organized in a manner that explains the pathway taken by the various departments and agencies of the U.S. Military and the Intelligence Community as they progressed through the early days of overhead reconnaissance. This publication discusses the first efforts in overhead reconnaissance that were necessarily performed by aircraft, then takes a look at early satellite systems that predated the establishment of the NRO, then moves on to the early NRO developed satellite system, and follows with a look at some of the experimental programs that provided valuable information and scientific discovery despite not being put into actual service.

Also, the photos are grouped together by the various eras within signals and photo-reconnaissance intelligence satellites. In reality, these time periods overlap and systems frequently intertwine and cross paths with one another. There is no clean break between time periods or systems. Also, it was often customary in the early days of these highly secret programs to destroy photographs and physical components of the work in order to maintain secrecy and effective security measures. For that reason, some programs, such as Quill, have few if any photographs that were preserved to document the history of the program.

It has long been said that a picture is worth a thousand words. With that in mind and wanting to keep the attention and focus on the photographs, we have purposely kept the amount of text to the bare minimum necessary to provide the background of the photos.

We did not complete this project alone and would be remiss to not thank other members of the CSNR staff who contributed to the publication. We would like to thank James Outzen, the Director of CSNR, for supporting this project and for his wise counsel and support throughout the process. Thank you to Michael Suk, NRO Historian, for his keen editorial eye and relentless attention to detail. Also, we would like to give shout outs to the NRO photographers, both past and present, without whom there would be no photos to publish, and to the unseen, but important folks in the NRO Prepublications Review Office for their review of this product prior to its publication.

Christine Grannas
Deputy Chief,
Historical Documentation and Research, CSNR

and

Chuck Glover
Visualization Analyst, CSNR

U.S. Air Force Satellite Test Center (Blue Cube) Sunnyvale, CA mid 1970s.

INTRODUCTION

In the late evening hours of 31 January 1958, the U.S. Army launched a Juno rocket carrying the Explorer-1 satellite from Launch Complex 26A at Cape Canaveral in Florida. This momentous event was the first successful launch of a U.S. satellite, two months after the U.S. Navy failed with its first launch attempt of the Vanguard program and four months after the Soviet Union launched the world's first-ever satellite, Sputnik-1, on 4 October 1957. Naturally, as most people at the time imagined, if rockets were powerful enough to launch small satellites into outer space, then it was only a matter of time until they could launch nuclear weapons around the world. By 1959, both the United States and the Soviet Union had operational nuclear-armed intercontinental ballistic missile (ICBM) units.

The U.S. President at the time, Dwight D. Eisenhower, as well known for being the Supreme Allied Commander in Europe for the last half of World War II as he was for being President, was extremely concerned about the dangers presented by ballistic missiles. With the shock and horror of the Japanese attack on Pearl Harbor still fresh in his mind, he feared what a surprise attack with ICBMs could do to the nation and to the world. He often admitted that his main goal as President was to prevent "another Pearl Harbor" from befalling the country. But how can one prevent a surprise attack when an ICBM can travel across the world in a matter of minutes? It became clear to Eisenhower that to do so, he would need better strategic intelligence about the Soviets' capabilities and intentions.

With many typical intelligence-gathering methods unavailable to the West due to the Iron Curtain and the Soviets' closed society, the U.S. had to look for new methods of gathering intelligence. Eisenhower was a strong supporter of aerial reconnaissance photography because of his extensive use of it during WWII, so he quickly became a proponent of strategic intelligence gained from overhead surveillance. By the late 1950s, Eisenhower authorized the development of the U-2 and A-12 spy planes and the GRAB and Corona intelligence satellites. He also laid the groundwork for the creation of the NRO, which was formed by President Kennedy, just nine months after Eisenhower left office.

The U.S. began overhead surveillance of the Soviet Union shortly after WWII, flying reconnaissance aircraft around the periphery of the country, collecting signals and imagery intelligence. However, this practice provided no information about what was located in the vast open spaces of the middle of the Soviet Union. The answer to this problem was the U-2 reconnaissance aircraft. Approved by Eisenhower in 1954 and flown for the first time in August 1955, less than one year later the U-2 was ready for deployment. On 20 June 1956, CIA pilot Carl Overstreet conducted the first U-2 flight over denied territory, flying over East Germany and Poland, and on 4 July 1956, Hervey Stockman flew a U-2 over the Soviet Union for the first time. In just the first two months of U-2 operations, photo interpreters were able to debunk the "Bomber Gap," the belief that the Soviets possessed a much larger number of long-range, nuclear-capable bombers than the U.S. Air Force. Over the next four years, the U-2 would fly a total of 23 successful U-2 missions over the Soviet Union before Francis Gary Powers was shot down on 1 May 1960, ending U.S. aircraft overflights of the Soviet Union.

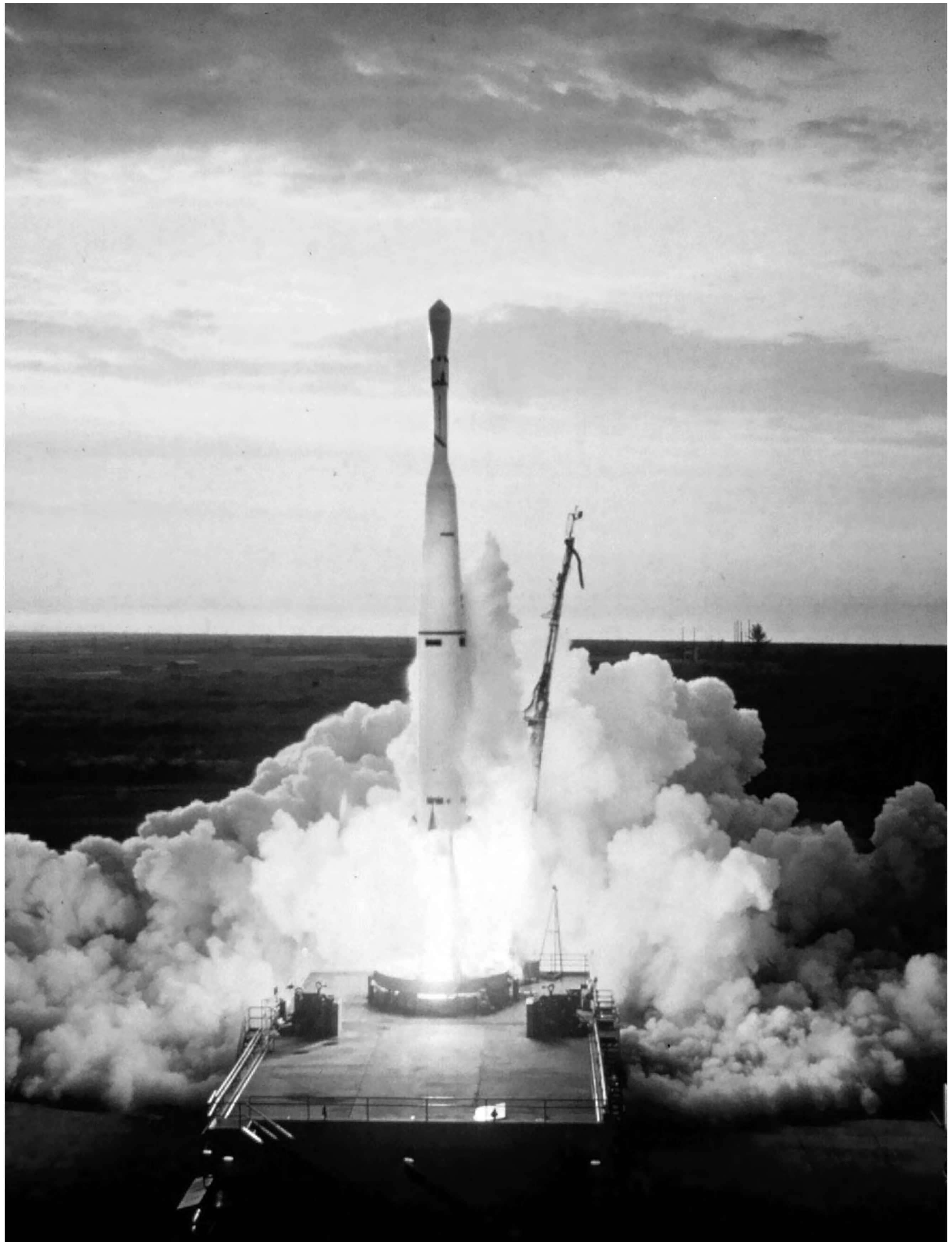
When Eisenhower promised not to fly aircraft over the Soviet Union any longer after the Powers shootdown, the country needed to find a new way to collect strategic intelligence. The obvious answer was to move into space. Luckily, that event had been foreseen, and work on intelligence satellites was well underway. On 22 June 1960, just a month and a half after Powers was shot down, the U.S. Navy launched the world's first intelligence satellite, the Galactic Radiation and Background (GRAB) signals satellite. Two months later, on 18 August, the Air Force launched the first photointelligence satellite, Corona, and retrieved the first reconnaissance imagery returned to Earth. By the end of the summer of 1960, strategic intelligence had entered the Space Age, and the world was forever changed.

MOL test launch vehicle.

One year later, on 6 September 1961, the NRO was formed and remained one of the most secret government organizations until 1992 when it was finally declassified. In those first formative years, the NRO developed a large number of imagery, signals, and weather satellites and experimented with numerous other intelligence-gathering methods. With the advent of digital imagery and near real-time satellites in 1976, film-based imagery satellites became slow and redundant, and they were phased out in the mid-1980s. President Clinton declassified the Corona program in 1995, and since then, numerous other NRO projects have also been declassified. The reader of this book with get to enjoy the results of all those declassifications.

While numerous other books and studies have been dedicated to individual NRO programs over the years, this book is a one-stop shop of space-based intelligence gathering all in one handy reference. The purpose of this book is to show the entire gamut of the country's space reconnaissance in a visual context. This book contains numerous pictures that could not be included in previous histories, and many of these photos from NRO's archives have never been published before. You, the reader, get to see them for the first time.

Michael Suk
NRO Historian, CSNR



TIROS 1 Thor Able launch - 1 April 1960.

NROL-111 launch - 15 June 2021.

U-2 Image of Moscow Airport.

AIRCRAFT OVERFLIGHTS

During the mid to late 1940s, in the aftermath of World War II, the United States and its western allies needed to collect intelligence information on the military and industrial capabilities of the Soviet Union and other adversaries. The Soviet Union was an emerging superpower and the threat of war with the West loomed large. Relations with the United States were increasingly tense as the Soviets expanded their control and influence beyond their land borders and into Eastern Europe. The country and its communist leaders long harbored grievances against the United States for refusing to recognize the legitimacy of the Soviet Union within the international community and for the delay in America's entry into World War II. They also resented the containment strategy being used by western policy makers to defend against the post-war Soviet threat. It was at this same time that the Soviets achieved a series of technological advancements, including the ability to produce nuclear weapons and the delivery systems necessary to attack the United States. They were openly hostile and provocative in their actions, sparking global fears of armed conflict as the relationship between the two countries progressively deteriorated. The Soviet Union had become the United States' most formidable and dangerous enemy.

As tensions continued to mount, U.S. leaders struggled with obtaining the intelligence necessary to answer difficult national security questions about Soviet intentions. The Soviet Union was a closed society, virtually locked behind the Iron Curtain, and nearly all activity and information was tightly controlled by the communist government. Additionally, Soviet propaganda and misinformation campaigns led to concerns that their military attack assets were far greater in number and capability than those of the United States. However, the information needed to assess the Soviet Union's true abilities and strategic plans was lacking. The country presented an exceptionally difficult and challenging intelligence target – one that was virtually impenetrable by traditional human intelligence gathering methods and tradecraft of the day. With few options available, the United States turned to aerial reconnaissance to fly near, and sometimes over Soviet territory in missions known as overflights.

After the United States exited World War II, multiple military aircraft systems were available to be modified for use as aerial reconnaissance platforms to collect intelligence about the Soviet Union and other eastern bloc adversaries. The first to be used, the P-2 Neptune and the F-80 Shooting Star, were flown near the periphery of the Soviet Union and other denied countries to collect intelligence from cameras and sensors mounted on the aircraft. Beginning in December 1950, modified RB-47 Stratojet bombers were used to conduct photographic and signals detection overflight missions of the Soviet Union. While the information obtained from the overflight reconnaissance missions was valuable, it was also limited to what was available very near the borders of the Soviet Union, leaving questions unanswered on what was going on much deeper inside the land mass as these areas remained outside the reach of the aircraft. There were also issues of diplomatic fallout from the United States' incursions into Soviet airspace, and the overflights were exceptionally dangerous as Soviet air defenses regularly attempted to intercept the flights, frequently damaging the aircraft and on several occasions succeeding in shooting down the aircraft and killing the crews.

When the memory of the Pearl Harbor attack became coupled with the fear that the Soviets could conduct a surprise nuclear attack, and with decision makers facing an information vacuum, it became clear that new methods to obtain intelligence were needed. To increase information gathering capabilities, the U.S. turned to the development of new aircraft that could fly at higher altitudes and faster speeds than Soviet air defenses could counter. The first of those new aircraft was the U-2, which was quickly followed by two supersonic aircraft, the A-12 OXCART and the SR-71 Blackbird.

U-2 commemorative postcard - 2018.

THE U-2

At the dawn of the Cold War with the Soviet Union, intelligence information on Soviet military and industrial capabilities existed in a vacuum, and memories of the attack on Pearl Harbor, attributed in part to a lack of information on the plans of the Japanese, weighed heavily on U.S. leaders. It was of paramount importance that another strategic surprise did not occur, so the U.S. turned to aerial reconnaissance missions over the Soviet Union and Eastern Bloc countries to gather the information. The overflights were dangerous, provocative, and subject to diplomatic fallout. As early as 1946 experts recommended the design of new high-altitude reconnaissance platforms, but while multiple efforts to address this need started within the Air Force and CIA, the aircraft and the advanced capabilities would not exist for nearly a decade.

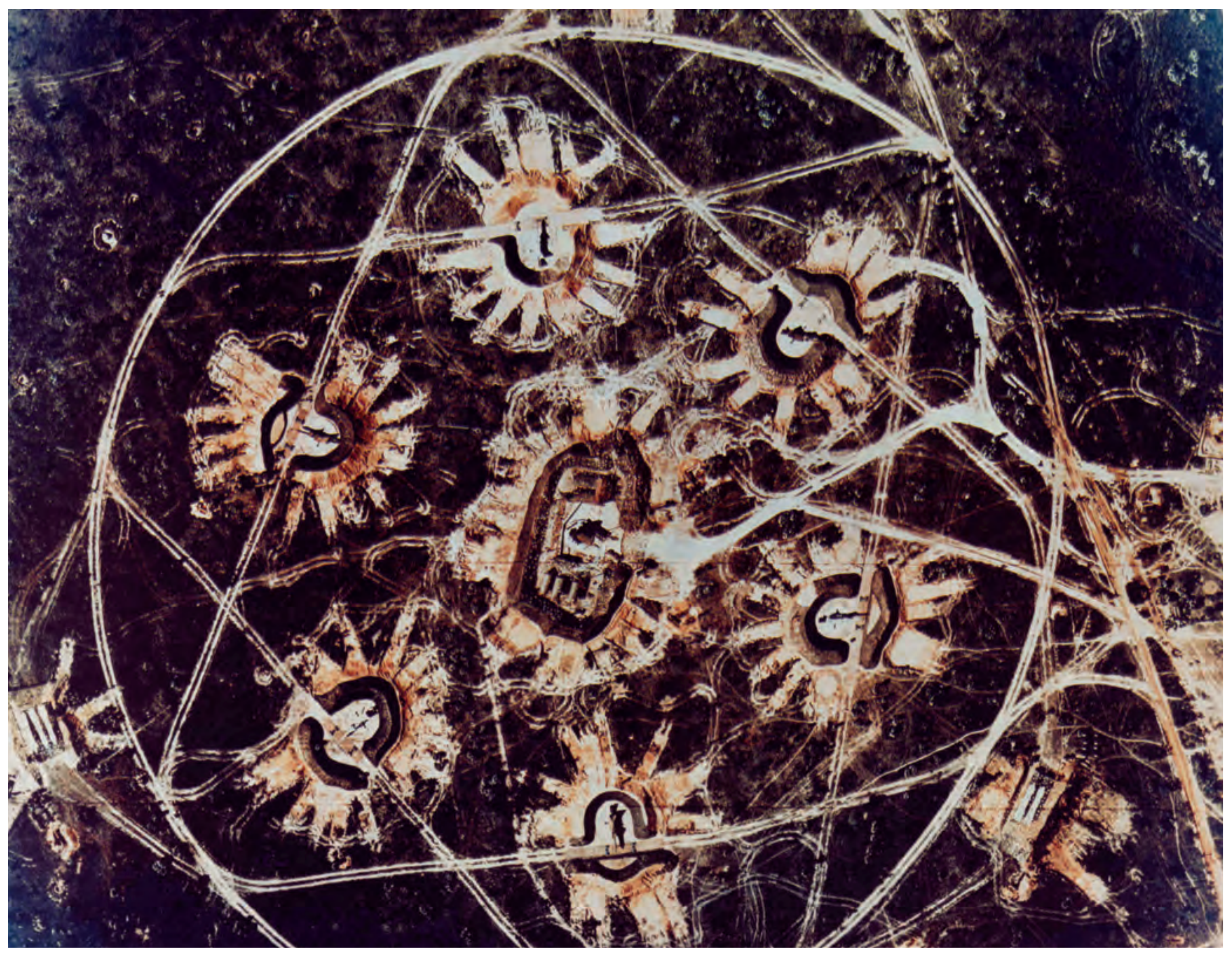
During the late 1940s and early 1950s, the technological achievements of the Soviet Union continued to ratchet up tensions with the West. In August 1949, the Soviets detonated their first atomic bomb, three years ahead of U.S. intelligence estimates. Then, four years later, they test detonated a hydrogen bomb that was manufactured using a production method deemed superior to that used by the United States. The Soviets also aggravated world tensions by, among other things, enabling the North Korean invasion of South Korea in June 1950, brutally crushing a 1953 uprising in East Berlin, and routinely attempting to cause dissension between Western Europe and the United States. To newly elected President Eisenhower, the Soviet Union was a dangerous opponent with an aggressive foreign policy stance and appeared to be moving toward a position of military and technological parity with the U.S.

In 1953 concerns grew around the Soviet ability to deliver a nuclear strike against the continental United States when an American military attaché sighted a Mysasishchev-4, a new type of Soviet intercontinental bomber aircraft, at Ramenskoye airfield. Later designated the Bison, the bomber was powered by jet engines rather than the typical turboprops of previous Soviet long-range bombers, and pictures of the Bison taken at a Moscow air show had a chilling impact on the U.S. Intelligence Community. In the summer of 1954, pictures of the Bison were published in the news media, that when combined with an overestimated number of the aircraft, ignited the bomber gap controversy. The bomber gap was the fear that the Soviet Union was surpassing both the number and capabilities of U.S. bombers.

In November 1954, President Eisenhower approved the development of the U-2, the world's first high altitude reconnaissance aircraft, to provide a new capability to perform overflights of the Soviet Union. Using the CIA's special contracting and covert funding capabilities, work began on the U-2 development project, code named AQUATONE. Shortly thereafter, on 4 July 1956, the first U-2 mission over the Soviet Union was flown by pilot Hervey Stockman.

The U-2 was one of the most important sources of strategic intelligence on the Soviet Union and is credited with dispelling the Cold War bomber gap controversy as reconnaissance photos taken from the U-2 flights enabled an accurate count of the Soviet long range bomber aircraft and reassured U.S. leaders that the Soviet Union had not surpassed the United States in terms of aerial assets. While U-2 flights over the Soviet Union were halted in May 1960 after Francis Gary Powers was shot down, the U-2 continued to fly other high-altitude reconnaissance missions around the world, including missions over Cuba before and during the Cuban Missile Crisis in 1962. The U-2 and its successor reconnaissance planes, the A-12 and the SR-71, were incorporated into NRO's program D, and jointly managed by the CIA and the USAF until 1974 when the NRO transferred the U-2 along with other Program D aircraft assets to the Air Force. As of 2022, 66 years after the first U-2 flight, modern U-2s still fly intelligence, surveillance, and reconnaissance missions for the Air Force.

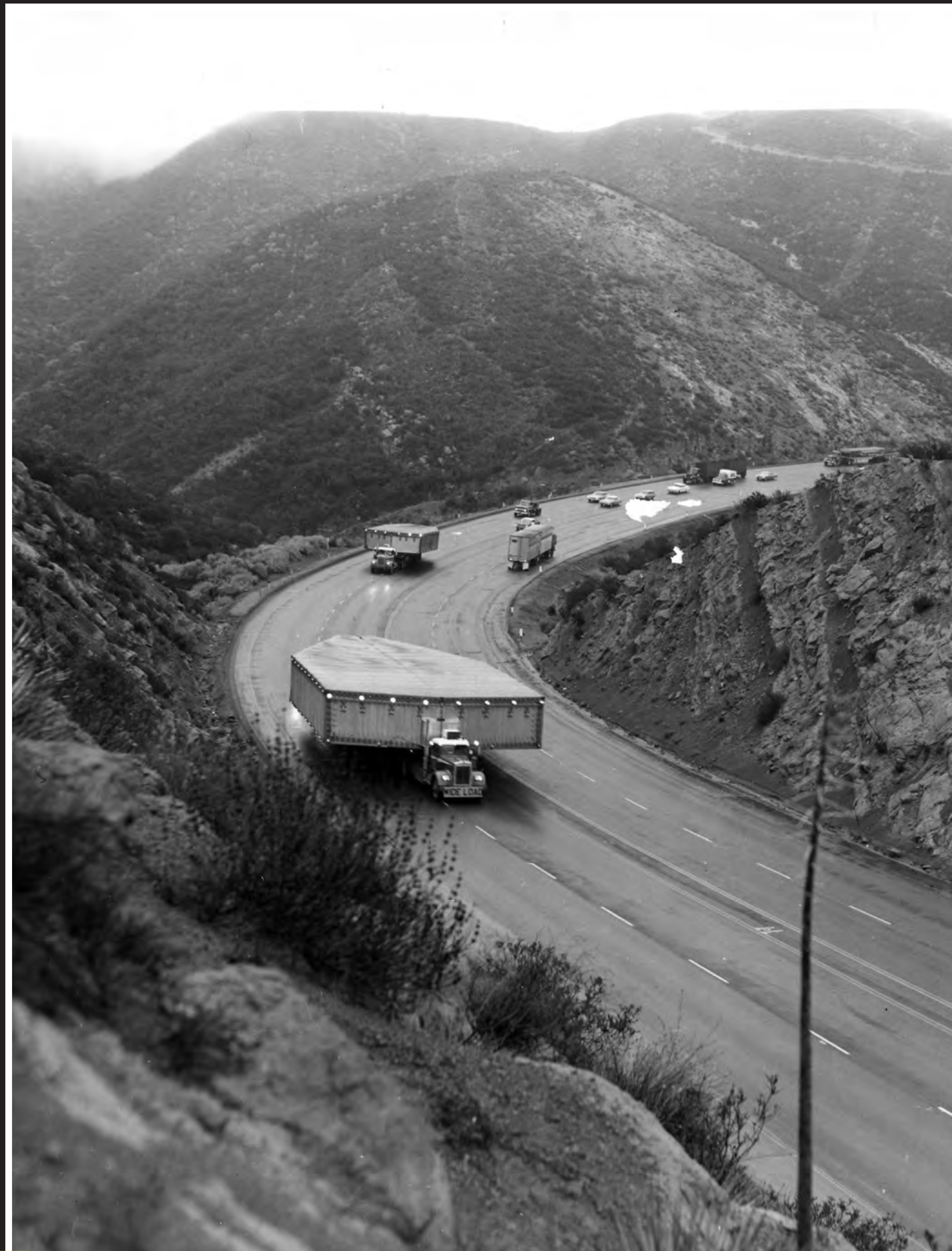
U-2 aircraft in flight.



U-2 Photo of Soviet SAM site in Cuba.

U-2 aircraft.

U-2 image of Tyuratam missile testing range.



A-12 aircraft crates in transport - 29 October 1964.

THE A-12 OXCART

During its development and until the U-2 high-altitude aircraft first flew over the Soviet Union, the CIA was confident that Soviet defense radars would not be able to track it, and officials involved in its design predicted that its useful life as a reconnaissance platform would last about 24 months before Soviet defense systems would be able to intercept it and shoot it down, thus ending its collection capabilities. Both predictions ended up being incorrect. The very first U-2 flight over the Soviet Union on 4 July 1956 was not only detected by Soviet defense radars, but its flight path was tracked quite accurately. However, despite being tracked on radar the U-2 aircraft successfully operated for nearly four years, double the original estimate, before the U-2 piloted by Francis Gary Powers was shot down on 1 May 1960.

From the time of its initial flights, efforts began to make the U-2 less vulnerable to air defenses by reducing its radar cross section and introducing the use of radar-absorbing material. While some efforts achieved considerable success, none completely solved the issues. The design of an aircraft less vulnerable to radar detection and shoot down needed to be accelerated, a decision later supported by a 1957 advisory committee analysis that showed the probability of shooting down a plane varied with speed, altitude, and radar cross-section. The analysis concluded that supersonic speed, the speed at which an object moves faster than the speed of sound, greatly reduced the chance of detection by radar. The ability to achieve supersonic speed first occurred in October 1947 when Captain Charles "Chuck" Yeager piloted a Bell X-1 rocket powered plane to a top speed of Mach 1.07, and in August 1955, Colonel Horace Hanes became the first to pilot a turbojet powered aircraft to a top speed of Mach 1.08 at 40,000 ft altitude, setting a world record. Supersonic flight was not new, but the combination of supersonic speed at extreme altitudes, in a jet powered aircraft, did not yet exist.

From late 1957 to late 1958, early designs were underway for what would eventually be known as the A-12 OXCART, or Archangel, reconnaissance plane. The A-12 was intended to be the supersonic successor aircraft to replace the U-2. Work continued over the next few years as the CIA and Lockheed developed the highly secret aircraft. The A-12 was intended to meet the nation's need for a very fast, very high-flying reconnaissance aircraft that could avoid Soviet air defenses, and became operational on 12 November 1965. By that time the A-12's originally intended mission, photoreconnaissance overflights of the Soviet Union, no longer existed as the flights had been terminated after the Gary Powers incident. As a result, the A-12 flew for only one reconnaissance operation, codenamed BLACK SHIELD, a series of 26 flights over East Asia from May 1967 to May 1968 to collect high-quality imagery in support of the Vietnam War.

The A-12 had a documented maximum speed and altitude of 2,208 MPH at 90,000 feet, set during a test flight in 1965. It was, and still is, the fastest and highest aircraft to ever fly, but does not hold the official world record because at the time it flew, the A-12's capabilities were part of a highly classified CIA program that was not declassified until the 1990s. Therefore, the official world record is held by the SR-71 Blackbird, the Air Force's slightly slower and lower flying version of the A-12.

By the time of CIA's first A-12 deployment in 1967, Corona photoreconnaissance satellites were launched regularly and collecting thousands of images worldwide each year. Although its imagery was less timely and of poorer resolution than the A-12, Corona was invulnerable to anti-aircraft missiles and much less provocative than overflights. At the same time, the U.S. Air Force was developing the SR-71, a modified version of the A-12. Seeing little value in maintaining both overt SR-71 and covert A-12 fleets with similar capabilities, President Johnson ordered the A-12's retirement in 1968.

A-12 flight suit testing.

A-12 aircraft mock-up undergoing radar testing.

A-12 OXCART aircraft assembly - 1963.

A-12 OXCART aircraft assembly - 11 March 1963.

A-12 aircraft assembly and testing in desert.

A-12 aircraft.

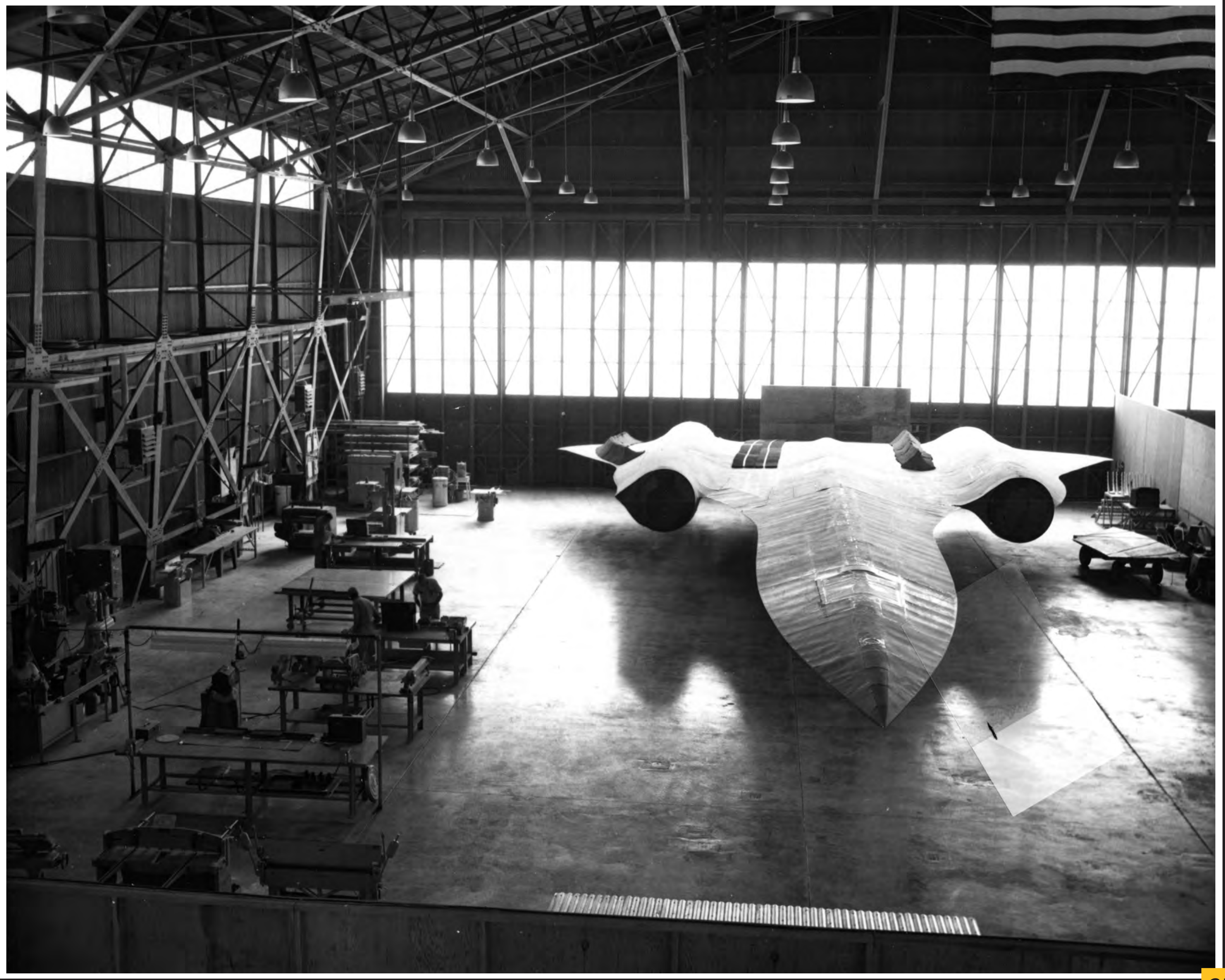
SR-71 commemorative postcard - 2018.

THE SR-71 BLACKBIRD

While the CIA was testing the A-12 OXCART, the Air Force was developing its own variants of high-speed aircraft, the YF-12A interceptor and the SR-71 reconnaissance version. Both Air Force variants were two-seat aircraft to allow for a co-pilot to handle additional weapons or sensors. Because of this, the single-seat A-12s were both smaller and lighter than the Air Force models, allowing the A-12 to fly higher and faster. While the A-12 was concerned primarily with photo acquisition, the Air Force version carried two Technical Objective Cameras (TEOC), as well as several additional optical and signals intercept sensors. These additional sensors provided greater flexibility and a greater mission profile, which was part of the reason the SR-71 survived after the A-12 was cancelled. The YF-12A never advanced past the prototype phase.

The SR-71 Blackbird was a follow-on version of the A-12 and was used as a long-range, advanced, strategic reconnaissance aircraft. The first flight of an SR-71 took place in December 1964, more than two years after the A-12, and the first SR-71 to enter service was delivered to the 4200th (later 9th) Strategic Reconnaissance Wing at Beale Air Force Base, California, in January 1966.

The term Blackbird refers only to the SR-71, and not the A-12. Sometimes confused with A-11, the A-11 was simply a counter-intelligence attempt used during the Presidential announcement of the existence of the SR-71 aircraft. The prototype "A-11" was merely a YF-12A that was used in the official world speed/altitude record trials. Interestingly, the Air Force's version was initially named the RS-71, or Reconnaissance/Strike-71. However, during its public unveiling, President Johnson transposed the letters and called it the SR-71. Rather than correct the President, Air Force officials created a new Strategic Reconnaissance (SR) category and renamed the aircraft. Upon its retirement in January 1990, the SR-71 was the second longest running reconnaissance platform for the United States.

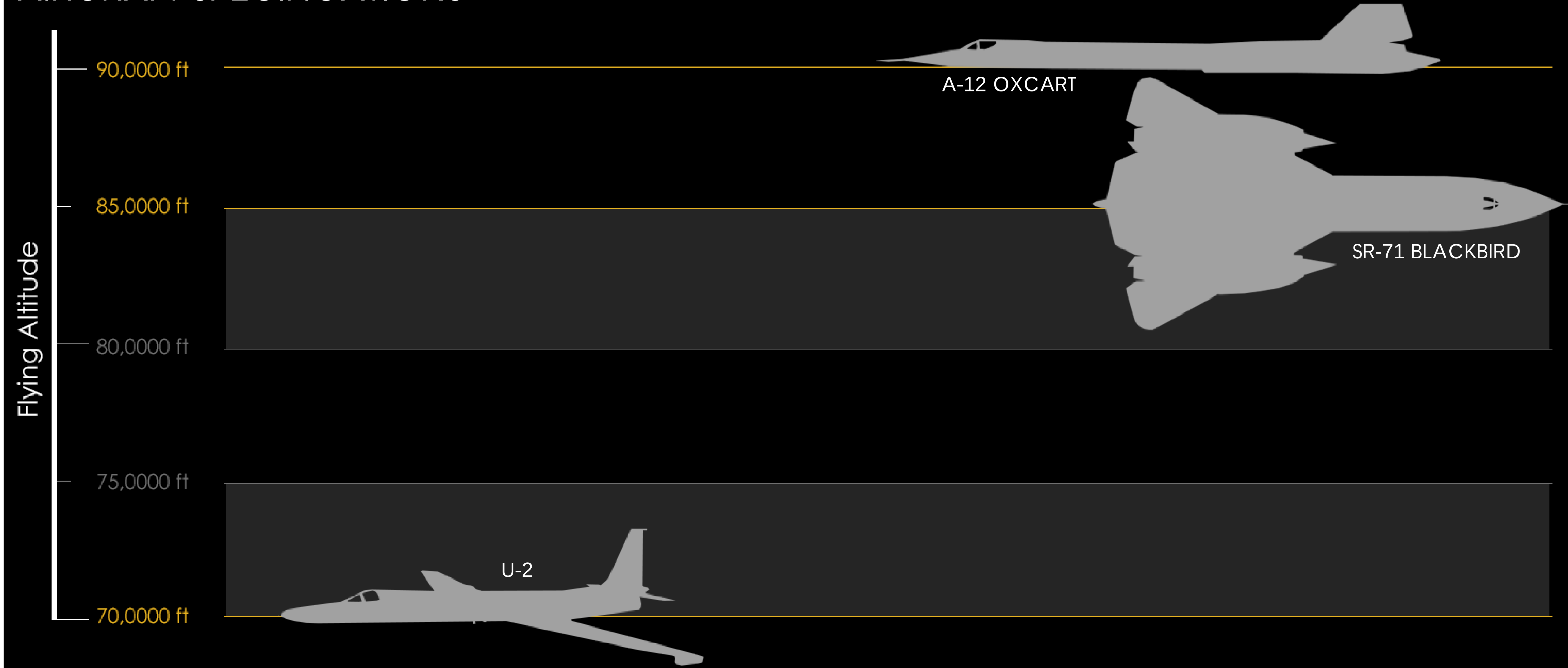


SR-71 model - 11 August 1961.

SR-71 aircraft in flight.

SR-71 aircraft and flight suits.

AIRCRAFT SPECIFICATIONS



U-2 SPECIFICATIONS

- June 1956 – October 1974
- Manufacturer: Lockheed
- Flying Altitude: 70,000 feet
- Flying Range: 2950 miles
- Flying Speed: 460 MPH
- Engine: Pratt & Whitney J57-P31, J75-P13
- World's first high-altitude photoreconnaissance aircraft

A-12 OXCART SPECIFICATIONS

- April 1962 – October 1974
- Manufacturer: Lockheed
- Flying Altitude: 90,000 feet
- Flying Range: 3,000 miles
- Flying Speed: 2,208 MPH
- Engine: Pratt & Whitney J58
- World's fastest plane

SR-71 BLACKBIRD SPECIFICATIONS

- December 1964 – October 1974
- Manufacturer: Lockheed
- Flying Altitude: 85,000 feet
- Flying Range: 3,250 miles
- Flying Speed: 2,193
- Engine: Pratt & Whitney J58
- Second longest running reconnaissance aerial platform

Time Magazine cover - 6 June 1960.

EARLY SATELLITES

In the February 1945 edition of Wireless World, science fiction writer Arthur C. Clarke wrote, "A rocket which can reach a speed of 8 km/sec parallel to the earth's surface would continue to circle it forever in a closed orbit; it would become an 'artificial satellite'….It would thus be possible to have a hundred-weight of instruments circling the earth perpetually outside the limits of the atmosphere and broadcasting information as long as the batteries lasted." Clarke had anticipated the idea of using geosynchronous satellites for receiving and re-transmitting radio signals from space – the basic concept for both a communications satellite and a satellite for collecting Signals Intelligence.

Shortly thereafter, in 1946, the RAND Corporation published a report, Preliminary Design of an Experimental World-Circling Spaceship, which provided an engineering analysis for a generic launch vehicle and satellite. The report speculated that such a system could function as a communications or scientific research platform. However, it also mentioned in a single paragraph that such a "satellite offers an observation aircraft that cannot be brought down by an enemy who has not mastered similar techniques."

Thus, it was in the years immediately following the end of World War II that the idea of using space for military purposes had begun to percolate around the various armed services. All of the American military services saw the potential and began programs to develop rockets and spacecraft, but in the lean post-war years, these were shoestring efforts.

- U.S. Army efforts led to the Explorer program, which in January 1958 launched Explorer-1, the first successfully orbited American satellite.
- U.S. Navy efforts led to the Vanguard program, and the launch of the first Vanguard satellite in March 1958, which still orbits the Earth today.
- U.S. Air Force efforts led to the Weapons System 117L (WS-117L) program providing the basis for two later satellite systems, Samos and Corona.

These early studies and experiments continued throughout the late 1940s and early 1950s. When the availability of a launch vehicle became imminent, the Air Force issued an operational requirement for a means to provide continuous surveillance of an enemy's war-making capability. This requirement led to the WS-117L program, which upon its 1954 inception, became the ancestor of all American reconnaissance satellites, and from 1954 to 1957, the WS-117L program developed studies for reconnaissance satellites carrying various imagery and signals intelligence payloads. However, the program languished without much attention until the Soviet Union launched the world's first intercontinental ballistic missile in August 1957, and barely two months later, launched and successfully orbited Sputnik-1, the first artificial satellite. Officials now feared that the U.S. lagged the Soviet Union in the development of strategic nuclear forces and with the Soviets the first to reach space, a new sense of urgency was placed on the WS-117L program.

With increased attention and emphasis on the WS-117L program, by 1958 there were two satellite efforts within the Defense Department. One effort was the Vanguard satellite research program at the Naval Research Laboratory, which eventually would provide the basis for GRAB, the first signals intelligence satellite. The other effort was the Air Force's WS-117L military system, which would later lead to two programs: Corona, developed by the CIA as the first imagery intelligence satellite; and Samos, an Air Force satellite program that would combine both imagery and signals intelligence collection. The Samos, GRAB, and Corona programs, together with the U-2, A-12, and SR-71 reconnaissance aircraft, were the building blocks of what would become the National Reconnaissance Office in 1961.

Explorer 1 launch - 31 January 1958.

EXPLORER

On 8 November 1957, soon after the Soviet Union launched Sputnik-1 on 4 October 1957, which was quickly followed by the launch of Sputnik-2 on 3 November 1957, the Secretary of Defense directed the Department of the Army to launch a satellite using its Jupiter C rocket and to do so within 90 days. To complete the task, the U.S. Army Ballistic Missile Agency (ABMA), located at Redstone Arsenal in Alabama, began working with the Jet Propulsion Laboratory, to design, build, and operate the satellite that would be the rocket's payload. They completed the task in just 84 days and on 31 January 1958, the U.S. Army successfully launched Explorer-1 from Cape Canaveral, Florida. The Jupiter C was developed under the direction of Dr. Wernher von Braun, a German scientist who had worked on the German V-2 missile program during World War II. After the war, he brought his expertise to the U.S. and worked to advance the launch capabilities and get America in to space.

Explorer-1 was the first successful U.S. satellite and carried a scientific experiment payload designed to measure radiation around the earth. Dr. James Van Allen, a physicist at the State University of Iowa, designed and built the scientific instruments, primarily a cosmic ray detector designed to measure the radiation environment while in Earth orbit. The Explorer-1 satellite led to the discovery of the Van Allen Belts, areas of charged radiation particles that originate from solar wind activity and cosmic rays that are trapped in space around the earth by the Earth's magnetic field. Explorer-1 operated until May 1958 and then continued to orbit the Earth until March 1970 when it burned up during re-entry into the Earth's atmosphere.

After the successful launch of the first Explorer satellite in January 1958, several more satellites were launched in rather short order. Some were successful, others were not. One of the successful launches was Explorer-6 in August 1959, which took the first ever photograph of the Earth from orbit. The Explorer program was later transferred from the Army to NASA and as of December 2021 the Explorer program continues with nearly 100 scientific satellites launched over the first six decades of the program. While the Explorer program satellites pre-dated the establishment of the NRO and were never part of the activities that would become part of the organization, the history and contributions of the Explorer program are important to the NRO and to the U.S. space reconnaissance programs because the successful launch and operation of the Explorer-1 satellite in 1958 marked the successful entry of America into the realm of space operations.

EARLY EXPLORER LAUNCHES

Explorer-1

Successful launch on 31 January 1958

Operated until 23 May 1958, burned up upon re-entry on 31 March 1970 after more than 58,000 orbits

Explorer-2

Launch failure on 5 March 1958

Cause: 4th stage of Jupiter-C rocket failed to ignite

Explorer-3

Successful launch on 26 March 1958

Operated until 16 June 1958

Explorer-4

Successful launch on 26 July 1958

Operated until 6 October 1958

Explorer-5

Failure on 24 August 1958

Cause: Rocket booster collided with 2nd stage after separation, causing incorrect upper stage firing angle

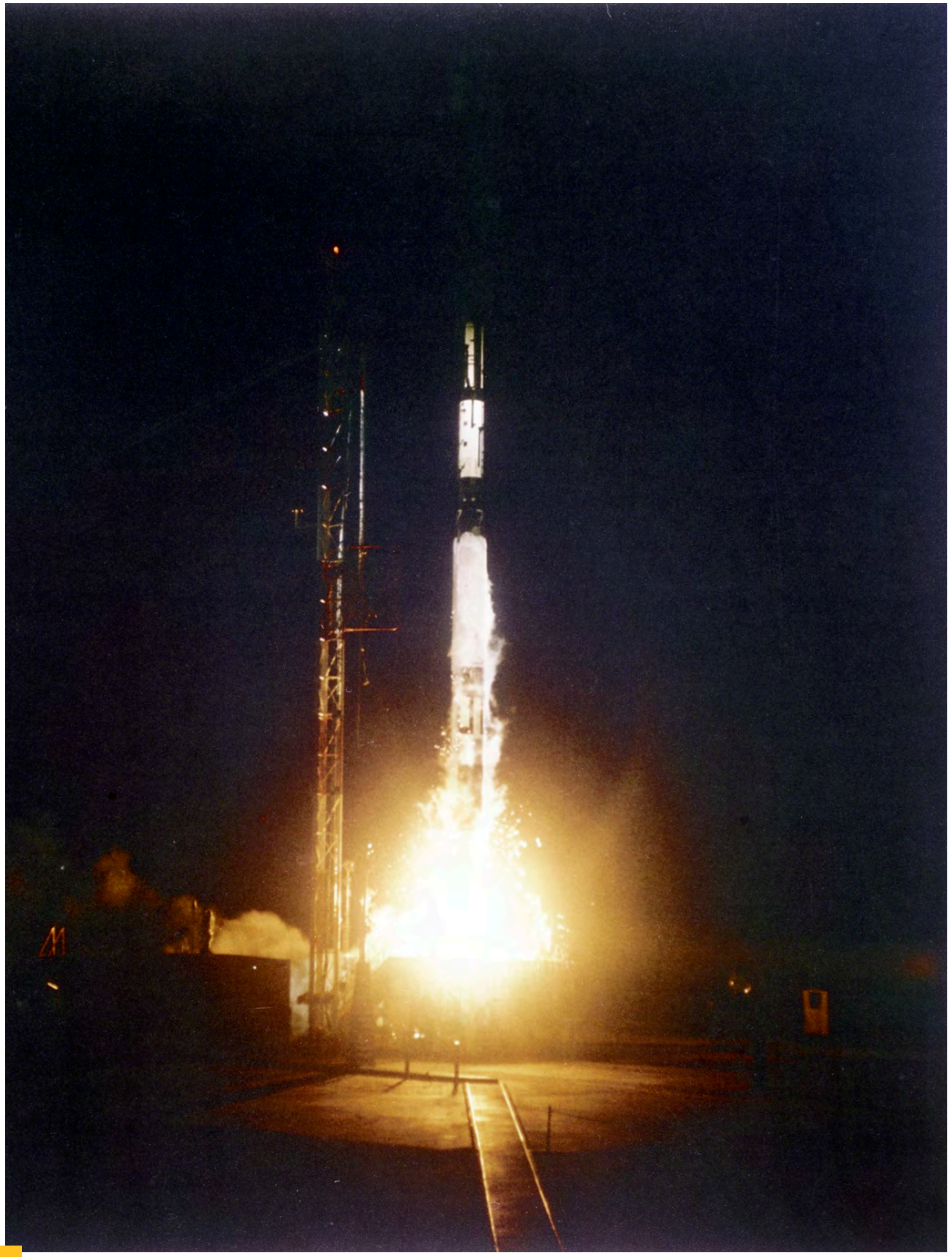
Explorer-6

Successful launch on 7 August 1959

Took the first photograph of Earth from space on 14 August 1959

Explorer 1 launch - 31 January 1958.

Explorer satellite test - James G. Winkler.



Vanguard III launch - 18 September 1959.

VANGUARD

The Vanguard Project was an undertaking by the U.S. Naval Research Laboratory to participate in the International Geophysical Year, a worldwide program involving a series of coordinated observations, encompassing multiple fields of geophysics, established to study various geophysical phenomena of the Earth within its planetary environment. The International Geophysical Year was held during the solar maximum cycle of July 1957 to December 1958.

The basic objectives of the Vanguard Project were, by the end of the International Geophysical Year, to build a satellite launch vehicle, orbit one satellite, track and verify the satellite's orbital path, and perform one scientific experiment while in orbit. Beginning in December 1956 and ending in April 1958, a series of test launches were conducted by the Navy to evaluate the various aspects of the launch vehicles and facility complex, range safety, satellite instrumentation, and other aspects of the Vanguard program. On 6 December 1957, the first three stage test vehicle of the Vanguard program was set to launch and place the first U.S. satellite into orbit, however the attempt ended in failure when the vehicle exploded on the launch pad less than one second after liftoff. Ultimately, it would be the Army's launch of Explorer-1 in January 1958 that would place the first U.S. satellite into orbit, but despite the disappointing setback, work continued on the Vanguard program.

The first successful launch of a Vanguard vehicle came three months later, when the first Vanguard satellite was launched into orbit on 17 March 1958. Known as Vanguard 1, the satellite was a small 3.25 pound, 6.5 inch diameter, aluminum sphere that was placed into orbit with an apogee of 2,500 miles. The satellite's batteries lasted only 20 days, but the solar cells continued to provide power to the satellite for an additional seven years. Vanguard 1 returned data and information on air density, temperatures, and micrometeorite impacts. Its orbital data provided a significant understanding of upper atmospheric physics, geodesy, geodynamics, solar terrestrial relationships, dynamical astronomy, and exospheric structure. Vanguard 1 data also led to the revelation that the earth is ever so slightly pear shaped rather than round. The satellite sent its final data transmission in 1964, but subsequent ground tracking continued to provide scientists with data concerning the effects of the sun, moon, and atmosphere on satellite orbits. The Vanguard project and personnel were transferred from the Navy to NASA after the agency was founded by the National Aeronautics and Space Act of 1958 and became the hub of what would become the Goddard Space Flight Center. As of 2022, Vanguard 1 continues to orbit with an apogee and perigee nearly unchanged since its 1958 launch and is the oldest artificial object to orbit Earth.

The Vanguard research program and its satellites pre-existed the 1961 establishment of the NRO and were never a part of the NRO operations, but the Vanguard satellites provided the basis for a later Naval Research Laboratory satellite project known as Galactic Radiation and Background, or GRAB. An electronic signals intelligence satellite, GRAB would become the world's first successful reconnaissance satellite and was ultimately assimilated into the National Reconnaissance Program and the NRO.

VANGUARD LAUNCHES RESULTING IN ORBIT

Vanguard 1

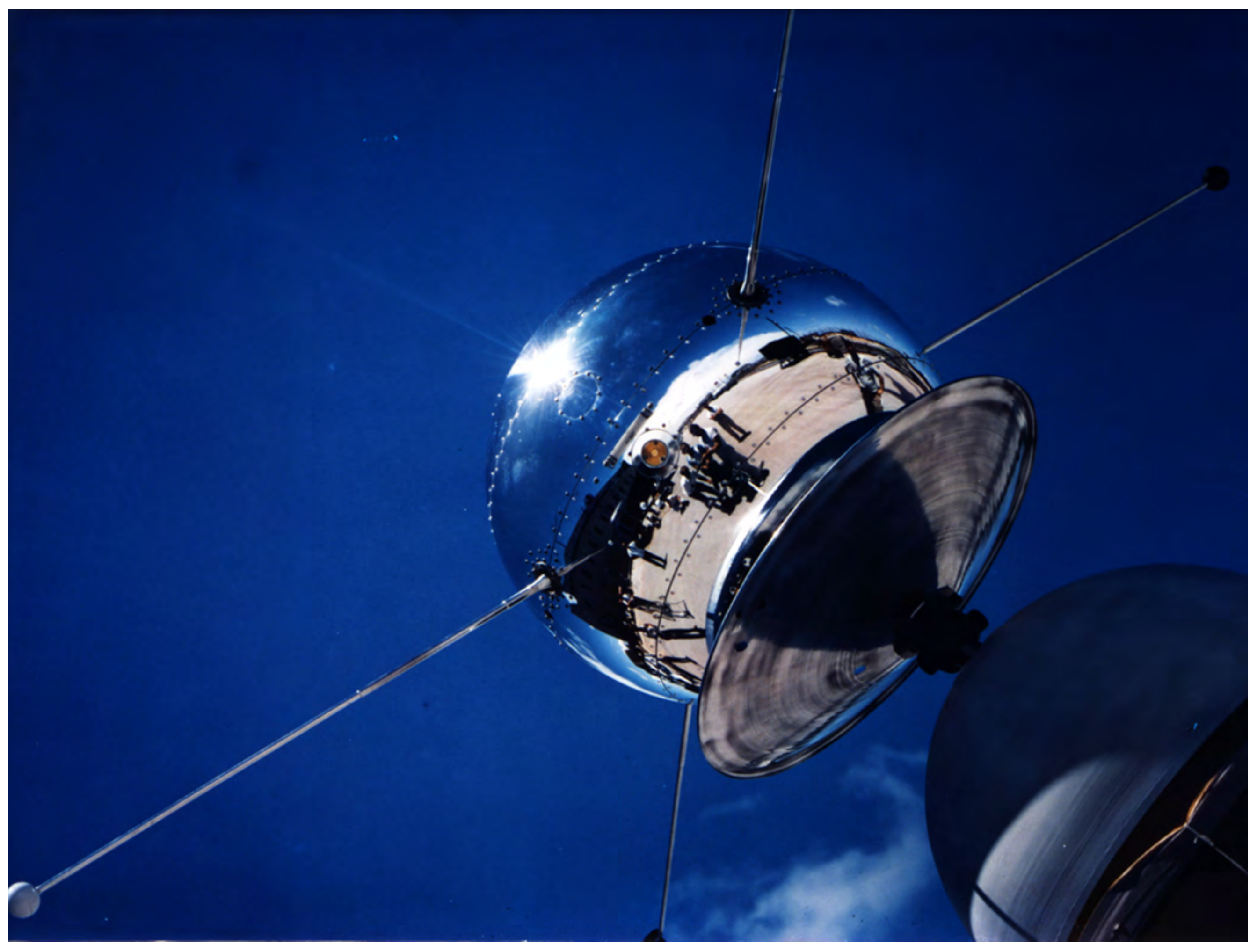
Successful launch on 17 March 1958

Vanguard 2

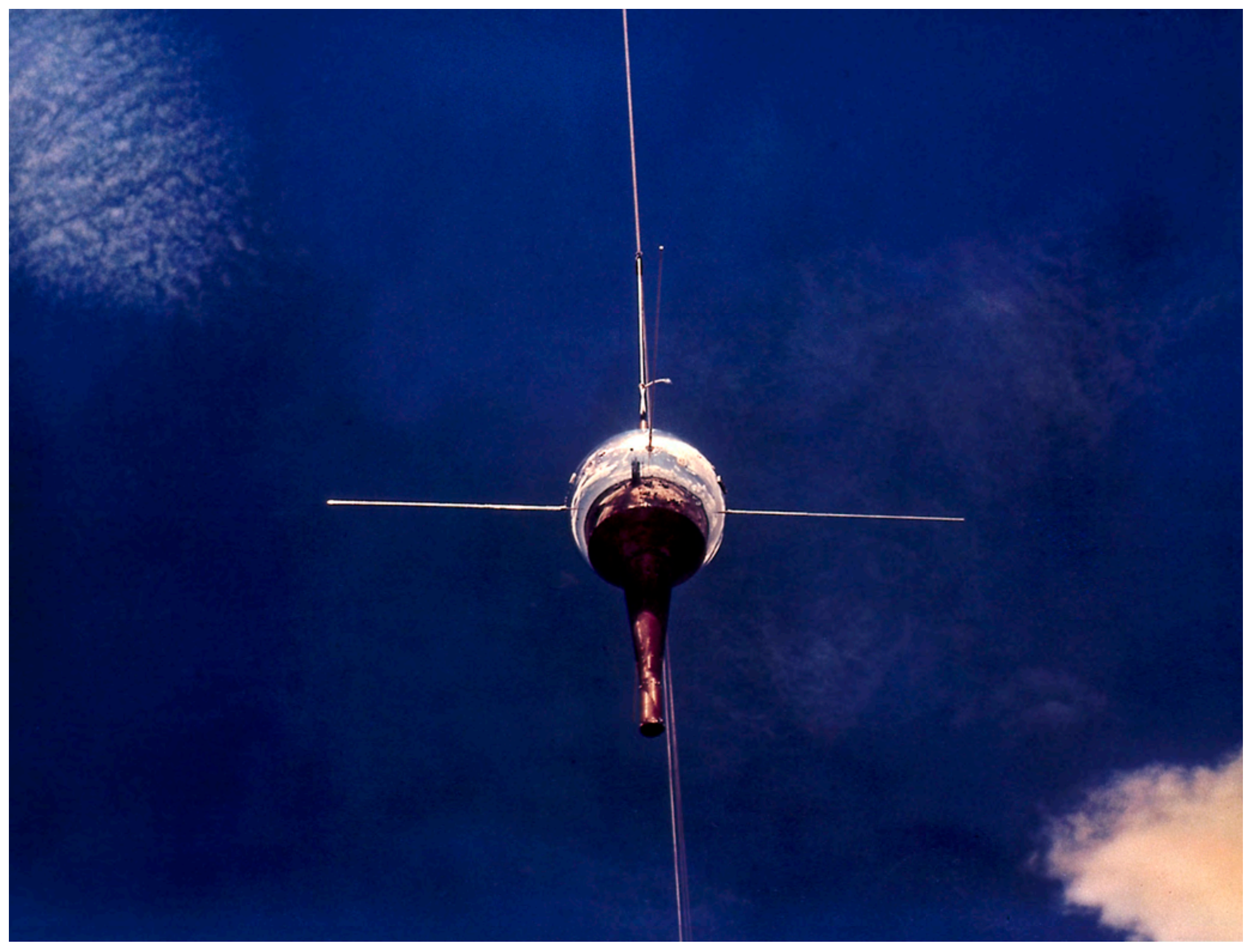
Successful launch on 17 February 1959

Vanguard 3

Successful launch on 18 September 1959

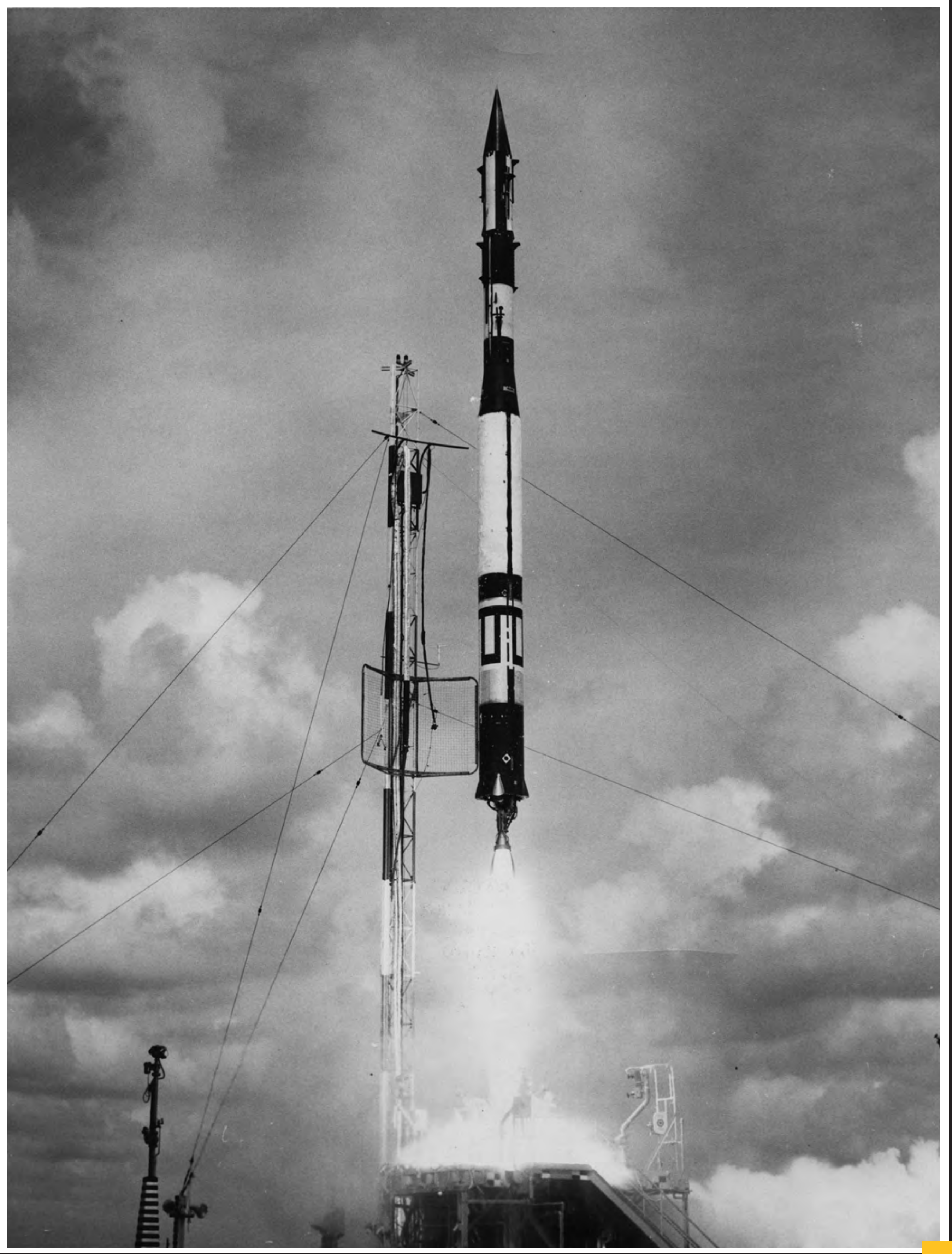


Vanguard II.



Vanguard III.

Vanguard.



Vanguard launch.

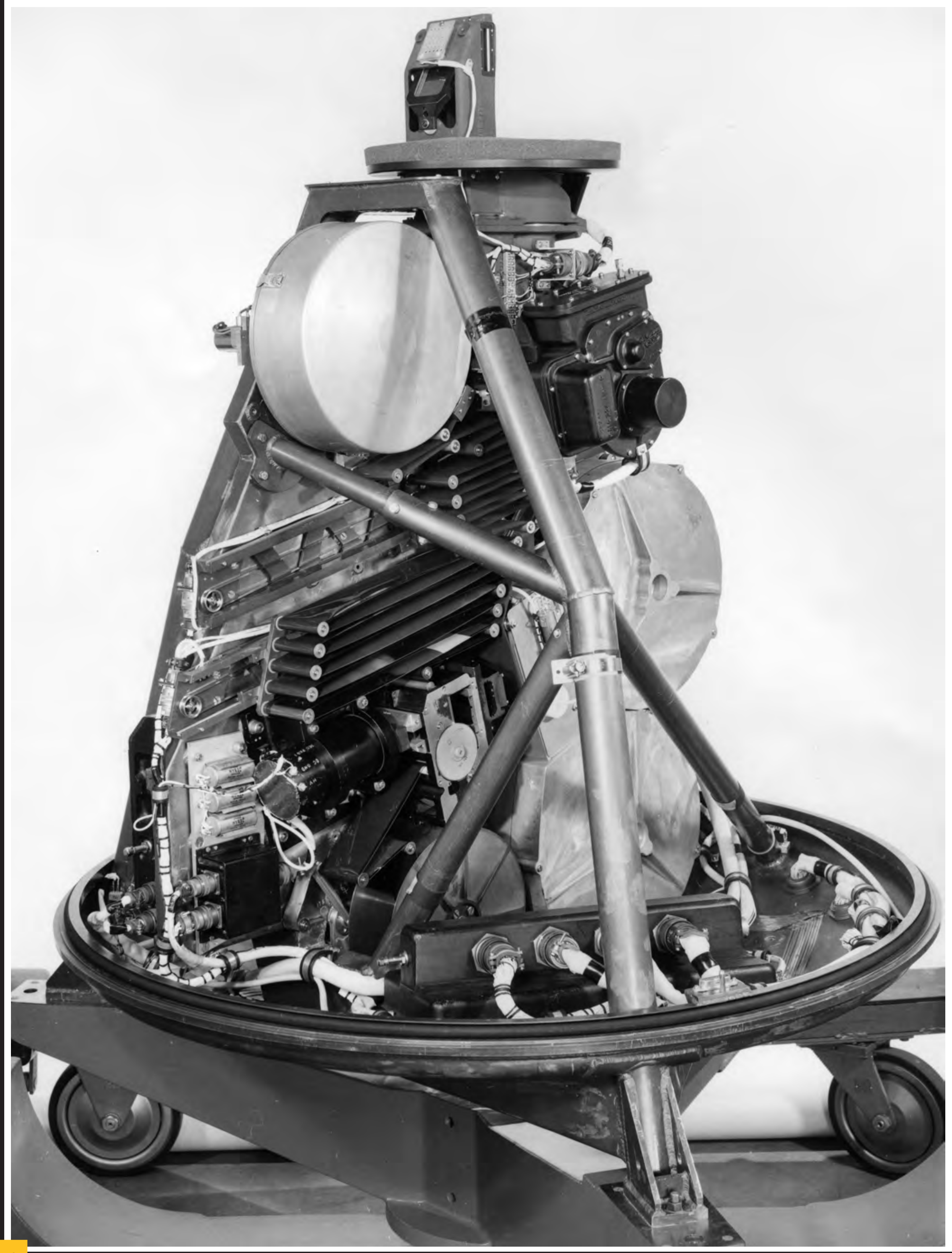
Samos 1 - pre-launch - 11 October 1960.

SAMOS

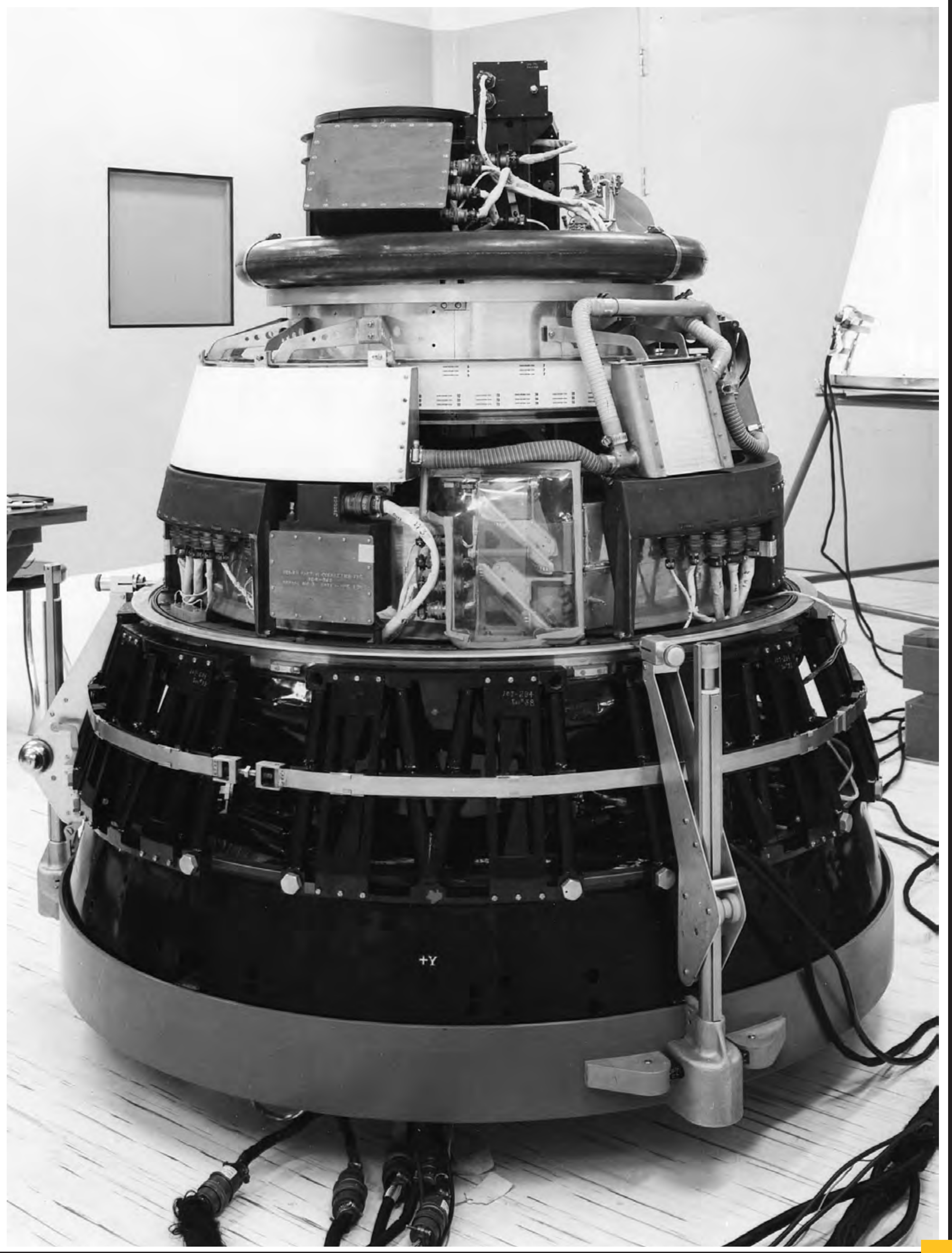
During the years following the end of World War II, multiple efforts were begun to develop satellites from which intelligence could be collected from space, but most of these early efforts gained little traction. The earliest effort of real significance began with a 1946 report, from what would later become RAND Corporation, which detailed the possibilities of an "earth-circling spaceship" and called for the development of satellites for national security purposes. Many saw this as an opportunity for developing intelligence collection and reconnaissance from space. For nearly a decade RAND pursued these efforts under Project Feedback, and by the mid-1950s the U.S. Air Force had committed funding to study satellites for space-based reconnaissance under WS-117L, a program that proposed the development of both imagery and signals collection satellites. The nation's first reconnaissance satellite program, the Satellite and Missile Observation System (Samos), was one of the satellite programs born from the Air Force's WS-117L program.

Samos was an ambitious program that proposed both imagery and signals intelligence components designed to collect against Soviet ICBM sites and operations. Overall, the signals collection components of Samos were successful and ultimately incorporated into NRO's Program A. However, the imagery components of Samos were not as successful and faced several daunting technology challenges with the mechanics of returning reconnaissance photos from space. At the time the Samos program began, nothing had yet been launched into space, so it was unknown if or how anything could be returned. The program included options to develop two types of satellites for returning the imagery collected. The first proposal was a "readout" system where the film would be processed while the satellite remained in orbit, the images translated into an electrical signal by means of a flying-spot scanner, and then the signal transmitted to earth for re-composition as a picture. The second proposal was a "film return" system, where the film would be returned to earth via a separate reentry capsule for development of the film and intelligence exploitation back on earth. Originally, when Samos emerged from the WS-117L program it had two planned photographic capabilities, designated as E-1 and E-2. Both originating options involved the on-orbit exposure and processing of the film. However, over the life of the Samos program, six variations of the imaging system would be developed, including film-return options, but only three would ever fly: E-1, E-2, and E-6.

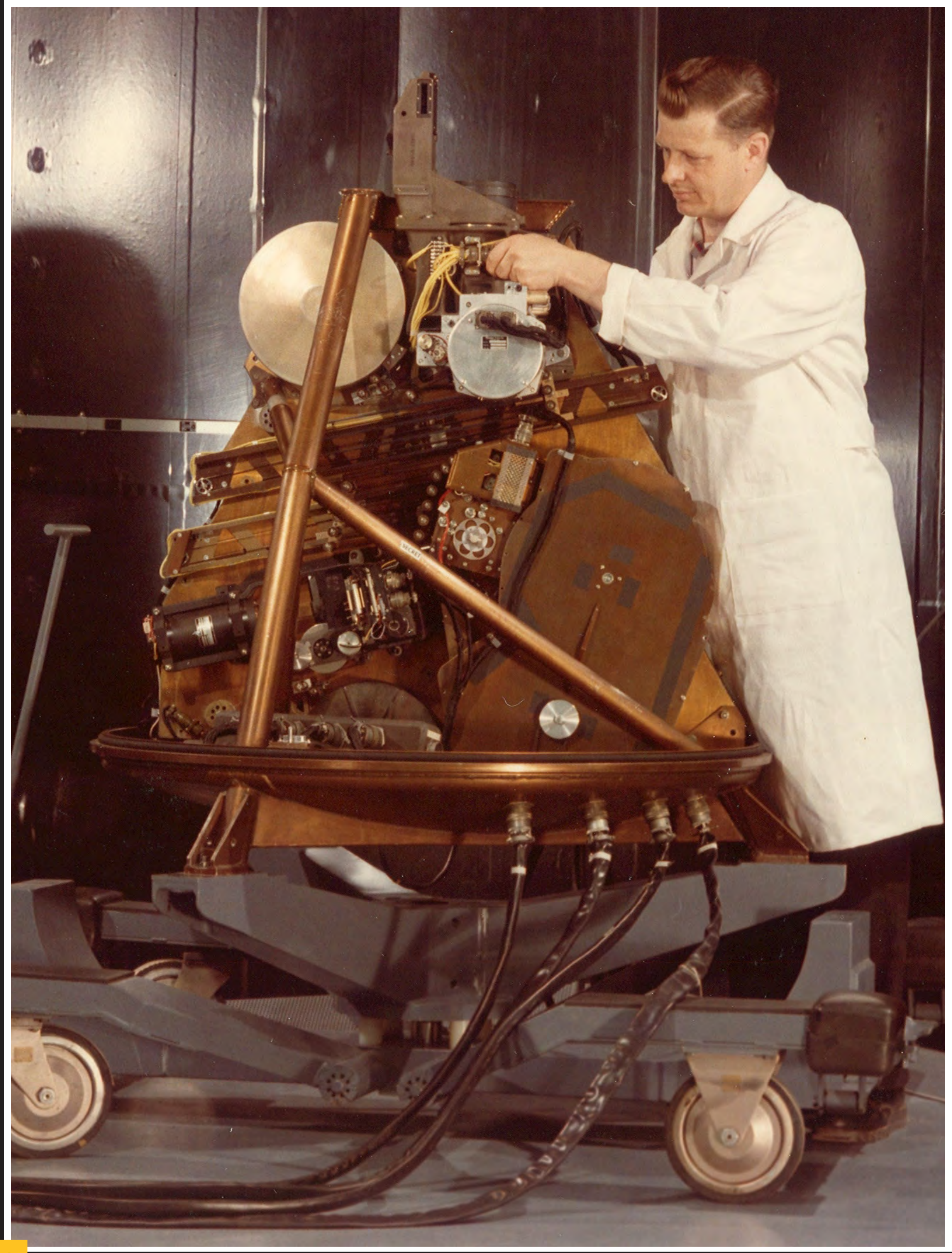
From a technology standpoint, the Air Force experienced limited success in their film-readout satellite efforts, and by 1960 the Samos program was not meeting its program goals. After multiple difficulties and setbacks, the film-readout efforts eventually withered, and the Samos program was cancelled in 1963. The only use of the film-readout technology came in 1966 when the National Aeronautics and Space Administration (NASA) used an improved Samos film-readout system for imaging of the lunar surface to support the Apollo program. In the later 1960s and early 1970s the film readout concepts originally developed under Samos would be improved upon and lead to the digital photography and near real-time reconnaissance imaging systems that would eventually come to fruition and be launched on NRO systems in the mid-1970s. In contrast, the film return elements of Samos lived on and in the early 1960s matured within the Corona and Gambit programs. The Corona, Gambit, and Hexagon film-return satellites can trace portions of their origins to the Samos program.



Samos E-1.

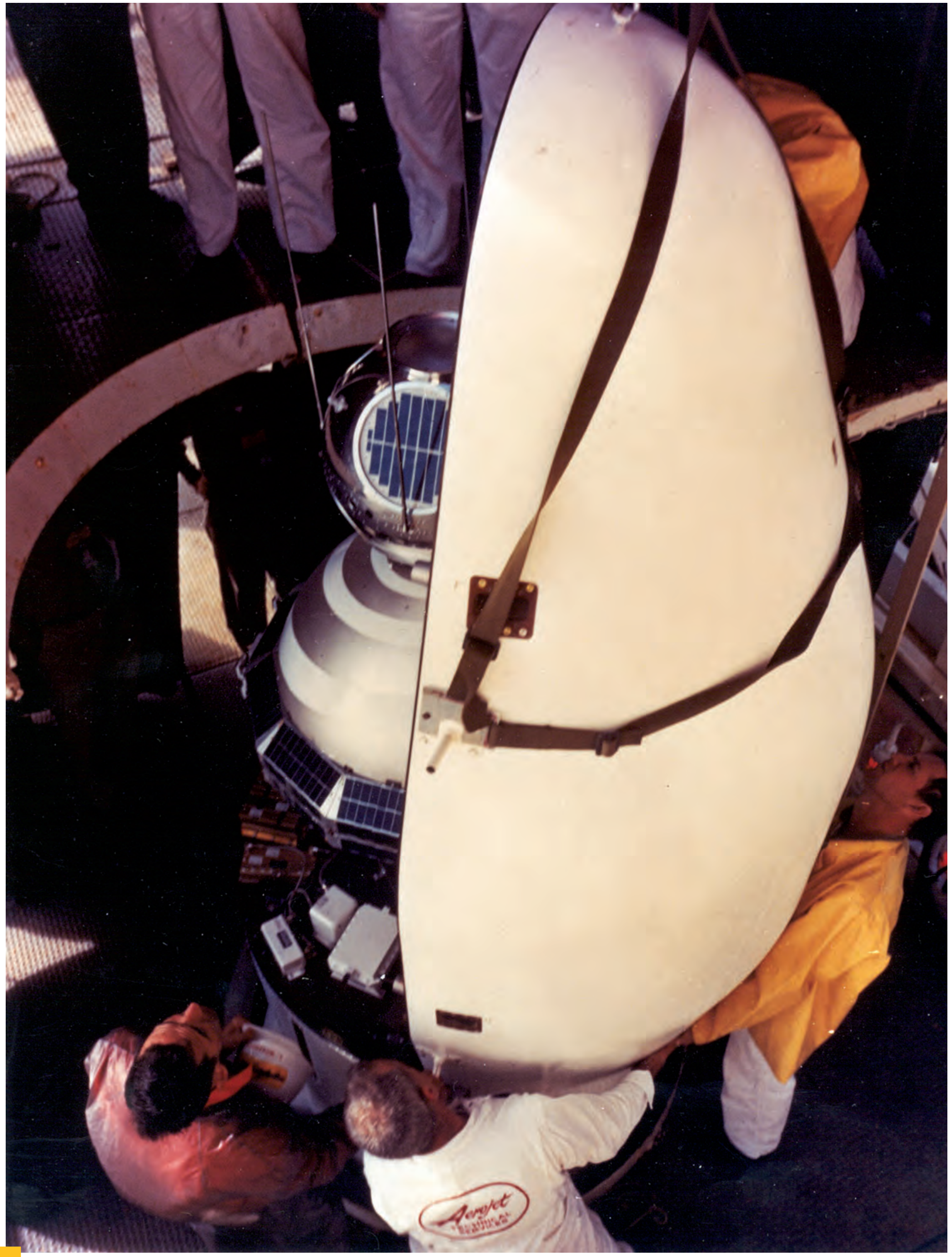


Samos E-2.



Samos assembly.

Samos prepared for launch.



GRAB satellite assembly.

GRAB

The Galactic Radiation and Background (GRAB) electronic signals intelligence satellite was the world's first successful reconnaissance satellite. The Naval Research Laboratory (NRL) began the development of the GRAB satellite in 1958 under a classified project that was code named Tattletale. GRAB was the project's unclassified cover name and publicly described the purpose of the satellite as scientific research to measure solar radiation in space, however the classified intelligence mission (Tattletale) was to detect pulsed-radar signal emissions from Soviet air defense systems. The NRL launched the first GRAB mission in June 1960 and for the first time, the U.S. was able to intercept and analyze signals from Soviet air defenses deep inside Soviet territory. The second successful GRAB satellite was launched in June 1961.

The GRAB concept originated in March 1958 with Reid D. Mayo, an NRL research engineer, who was investigating the problem of intercepting and analyzing Soviet air defenses systems. While stranded during a blizzard at a Howard Johnson's Restaurant along the Pennsylvania Turnpike, Mayo began sketching illustrations and penciling range calculations on a paper placemat. His idea was to modify the periscope mounted radar system from a submarine to a solid state version, so it could be placed inside a 20-inch solar powered Vanguard satellite. After returning to Washington, his idea took hold, and the NRL began initial development of the project. President Eisenhower approved the GRAB program in August 1959. In May 1960, just four days after the Soviets shot down the U-2 plane piloted by Francis Gary Powers, President Eisenhower approved the first GRAB satellite launch, and just over one month later, on 22 June 1960, a Thor Able-Star rocket launched from Cape Canaveral carried GRAB 1 into orbit. While GRAB was the world's first intelligence satellite, it was also part of the nation's first "ride-share" program, being launched on top of Navy Transit navigation satellites.

All preceding U.S. signals collection platforms, which were either airborne or ground-based, only could reach about 200 miles inside Soviet territory and were not only provocative, but inherently dangerous to the crews. Artificial earth orbiting satellites were generally less provocative and a safe means to gain access to denied areas. Data collected by GRAB 1 supported the Strategic Air Command's mapping of Soviet air defenses and aided the U.S. Intelligence Community in assessing the threat of military radar development. The GRAB 1 intelligence collection provided evidence that the Soviet Union could detect and defend itself against a U.S. nuclear attack, contradicting earlier National Intelligence Estimates (NIEs) that had concluded that the Soviets did not have these capabilities. The payload carried by the GRAB 2 satellite observed different portions of the spectrum and enabled the National Security Agency to characterize a powerful, new Soviet system that was probably located at the Sary Shagan missile complex.

The GRAB project became assimilated in the National Reconnaissance Program and ultimately the NRO upon its establishment in September 1961. The GRAB program ended in 1962 with two successful missions and three failures. The NRL went on to develop a successor, Poppy, a larger and more capable satellite. GRAB remained a secret to the public until its existence was declassified in 1998.

SPECIFICATIONS

Operational: 1960 - 1962

Successful Missions: 2

Size: 20 inches in diameter

GRAB LAUNCH LIST

GRAB 1

22 June 1960 - Thor Able Star - Success

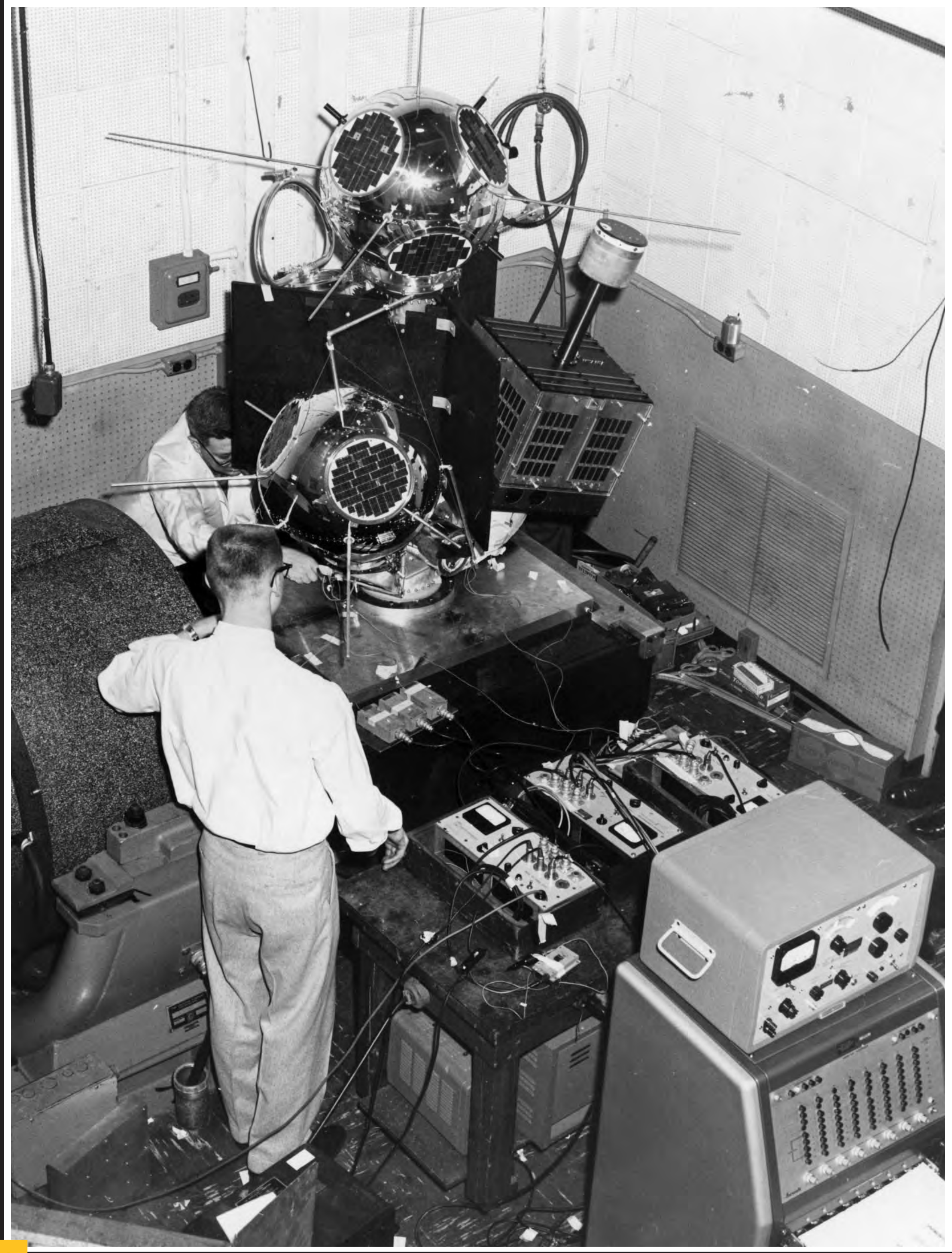
30 November 1960 - Thor Able Star - Failure

GRAB 2

29 June 1961 - Thor Able Star - Success

24 January 1962 - Thor Able Star - Failure

26 April 1962 - Scout - Failure



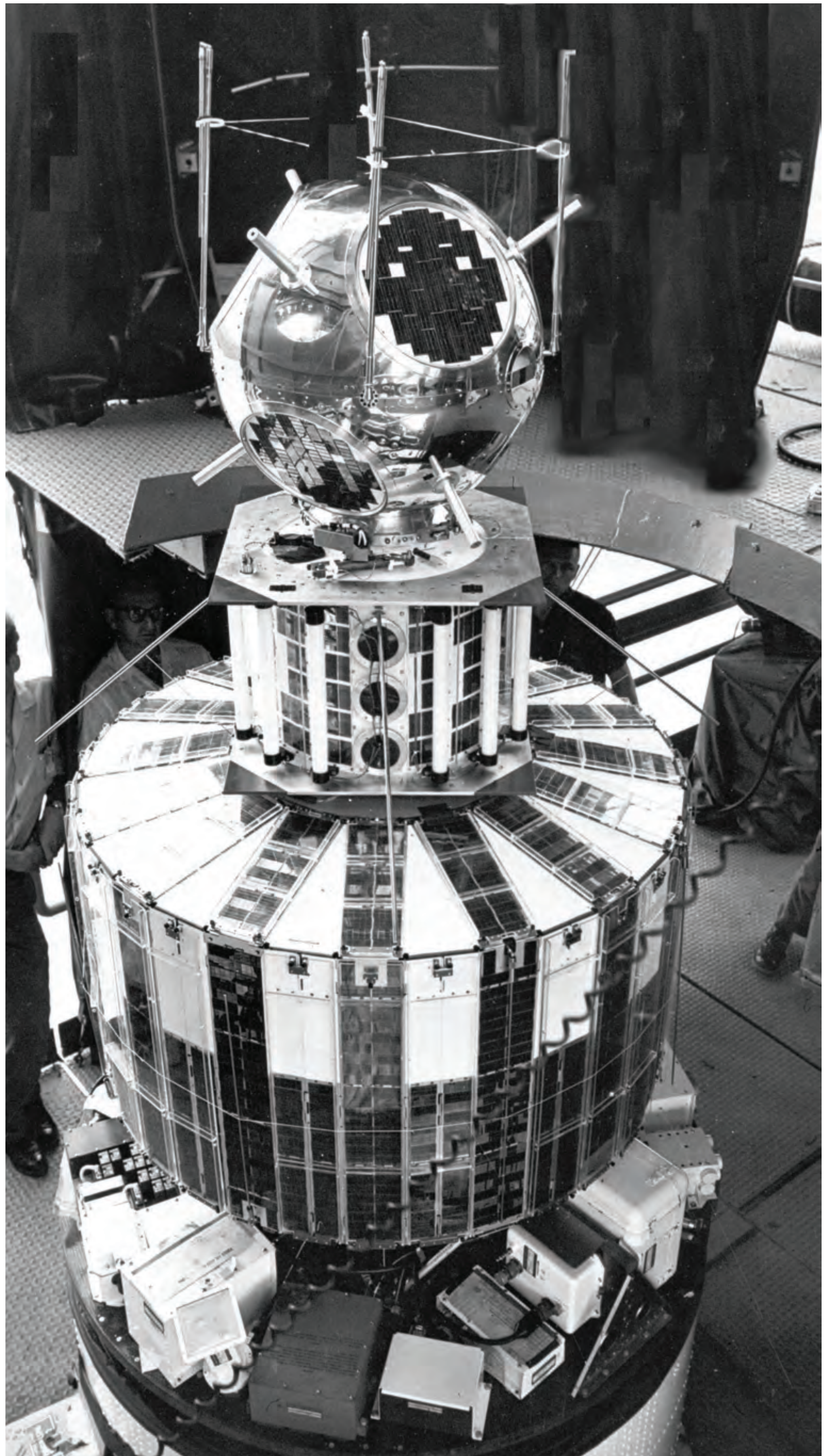
GRAB satellite assembly - 1960s.

GRAB - Thor Able Star - pre-launch.

GRAB signals satellite assembly.

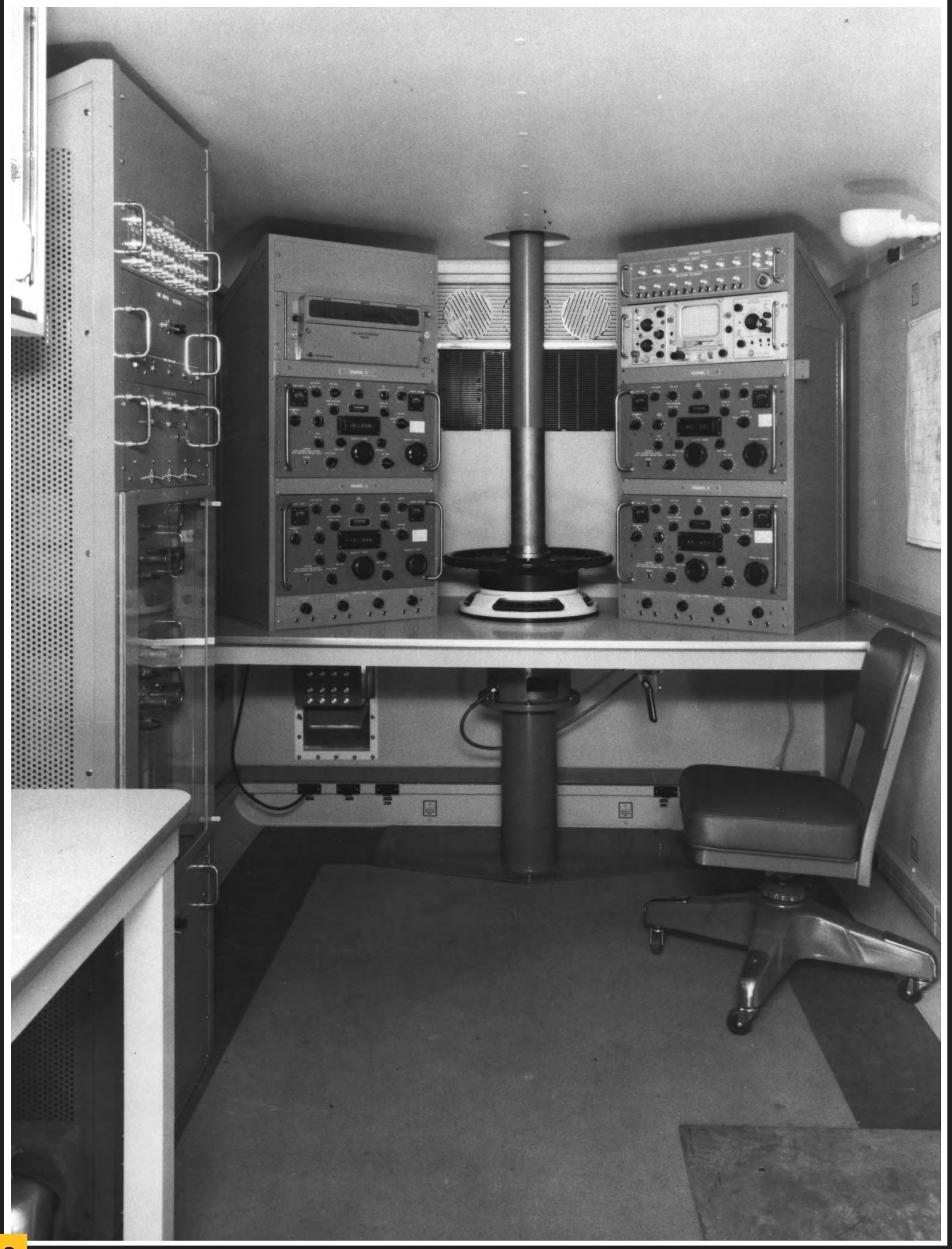
GRAB - primary receiving hut.

Transit signals satellite assembly.

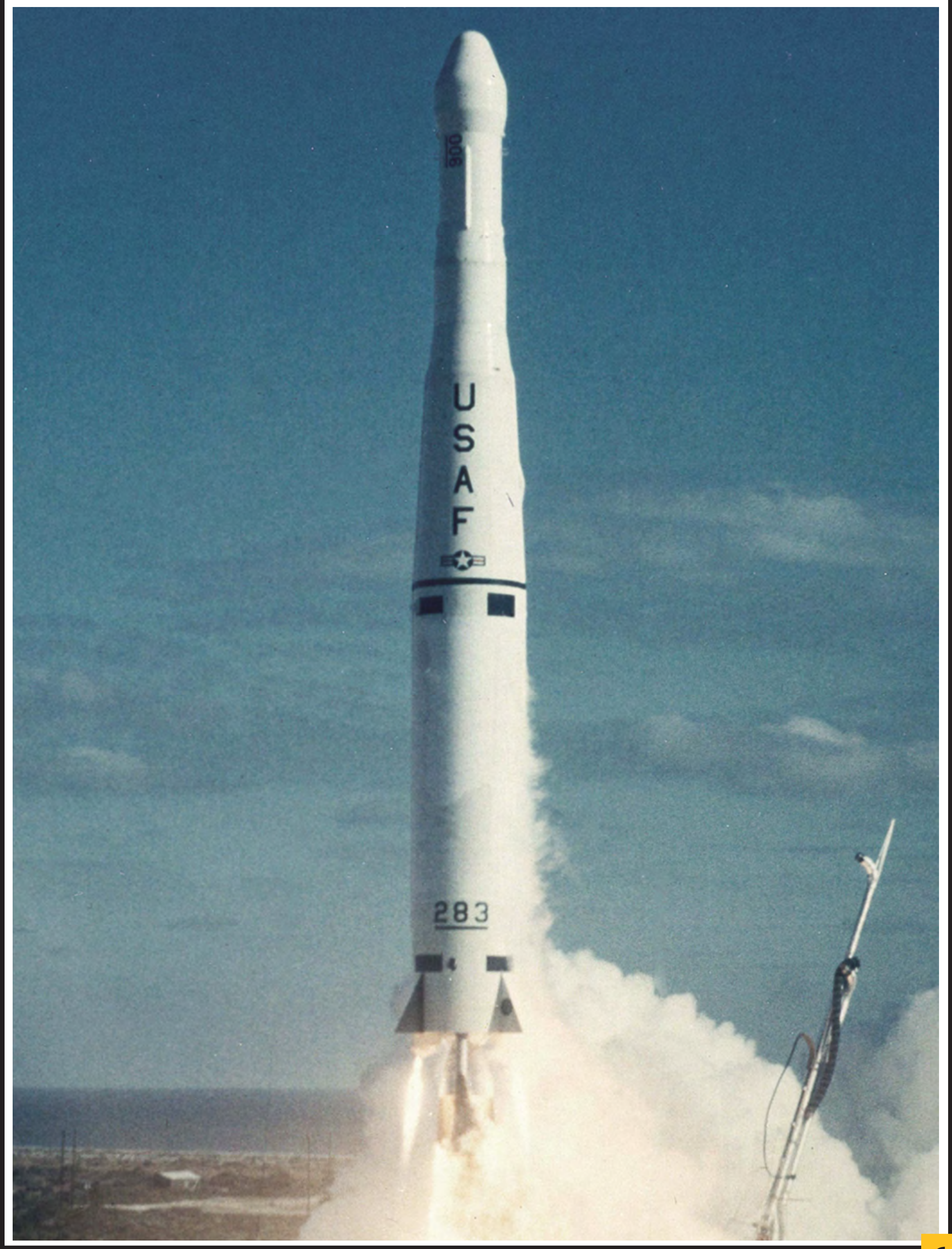


GRAB satellite assembly.

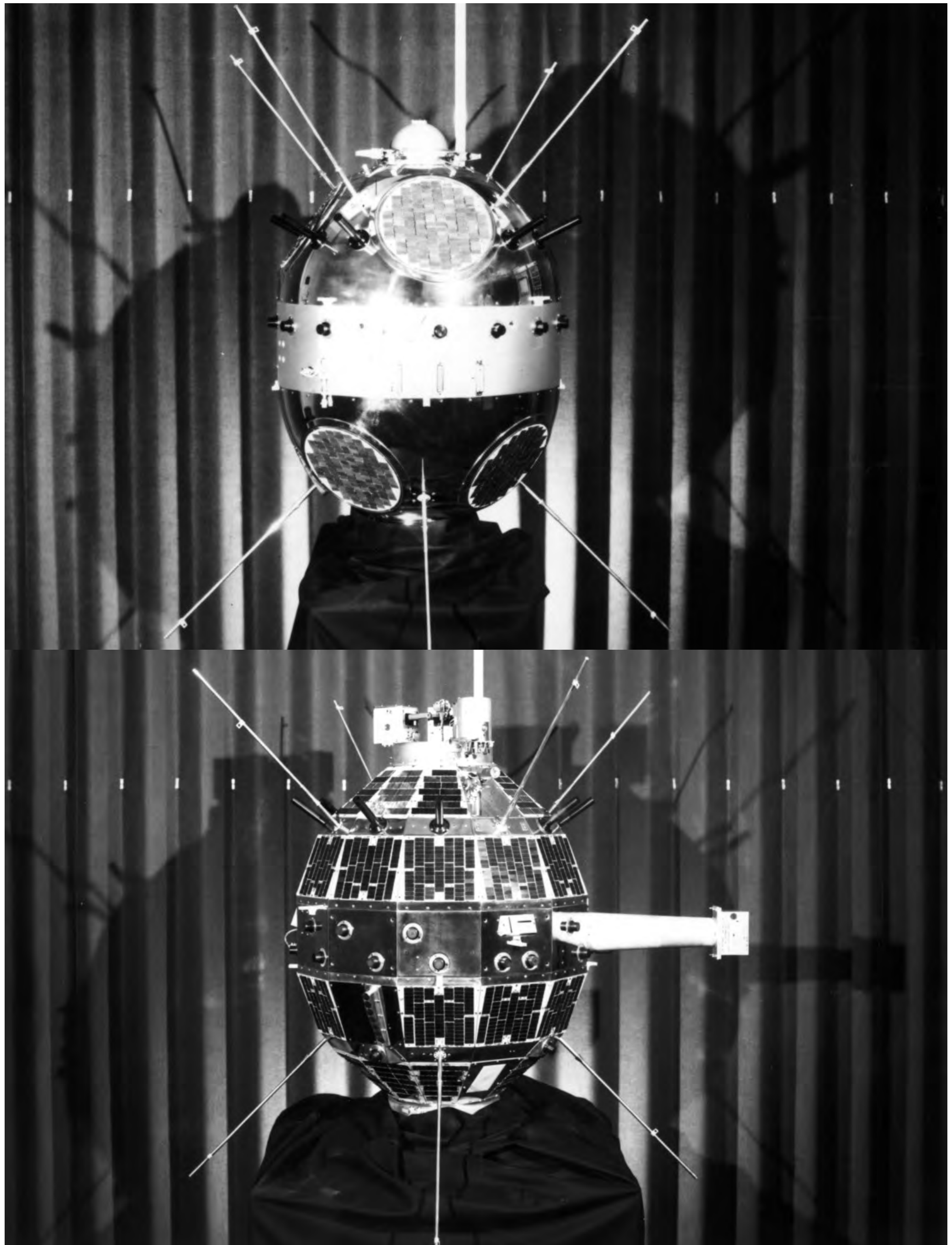
GRAB satellite assembly.



GRAB signals satellite - hut interior.



GRAB launch - 30 November 1960.



Poppy signals satellite - Top: Stretched spherical and Bottom: Multi-face.

POPPY

The two successful GRAB satellite missions had demonstrated the value of using Earth orbiting satellites to collect intelligence against the denied areas of the Soviet Union and other difficult targets. The satellites provided significantly more data than was attainable by aircraft and ground collectors, could reach deep into the country borders inaccessible by aircraft, did not endanger the lives of pilots and aircraft crews, and from a diplomatic perspective, were far less provocative than aircraft overflights. The volume and density of the information collected by the very first GRAB satellite was enough to overwhelm the existing U.S. analytical capabilities and stimulated the development of computer-aided approaches at the Naval Research Laboratory, National Security Agency, and Air Force Strategic Air Command (SAC).

Recognizing the need for more capability, in 1962 the NRL, which had been moved into NRO's Program C, developed a larger and more advanced electronic signals intelligence (Elint) satellite as a successor to GRAB. Known as Poppy, the satellite featured two prominent designs – stretched spherical and multiface. The first Poppy missions featured the use of a stretched spherical design, measuring 20 x 24 inches and weighing 55 pounds, which as the program evolved, grew to 24 x 32 inches and a weight of 129 pounds. Later Poppy missions utilized a slightly larger 12-sided multiface design which initially measured 27 x 32 inches and weighed 162 pounds, and grew to 27 x 34 inches with a weight of 282 pounds. The NRL launched the first Poppy satellite on 13 December 1962, and in total the Poppy program launched and completed seven successful missions. The last Poppy mission was launched on 14 December 1971.

From an orbit of approximately 600 miles above the Earth, Poppy satellites intercepted Elint signals from radar sites throughout the Soviet Union and other areas. The intelligence derived from that data supported a wide range of applications and conclusions. It identified cues to the location and capabilities of radar sites within the Soviet Union; provided SAC with characteristics and locations of air defense equipment to support building the U.S. Single Integrated Operations Plan (SIOP) 13; delivered ocean surveillance information to Navy operational commanders; and, with data from the Corona imaging reconnaissance satellite, furnished a more complete picture of the Soviet military threat. We can credit these systems with helping the U.S. win the Cold War. At the same time, the satellites extended their impact into the future as they laid the foundation for future national reconnaissance capabilities. The NRO's 21st-century signals intelligence reconnaissance capabilities grew out of the GRAB and Poppy innovations of the 1960s and 1970s. The Poppy program operated from 1962 to 1977 with seven successful launches and missions. The fact of Poppy's existence and limited details about it were declassified in 2004; however, not all information about Poppy has been declassified.

SPECIFICATIONS

Operational: 1962 - 1977

Successful Missions: 7

Size: 20 X 24 inches (stretched spherical)

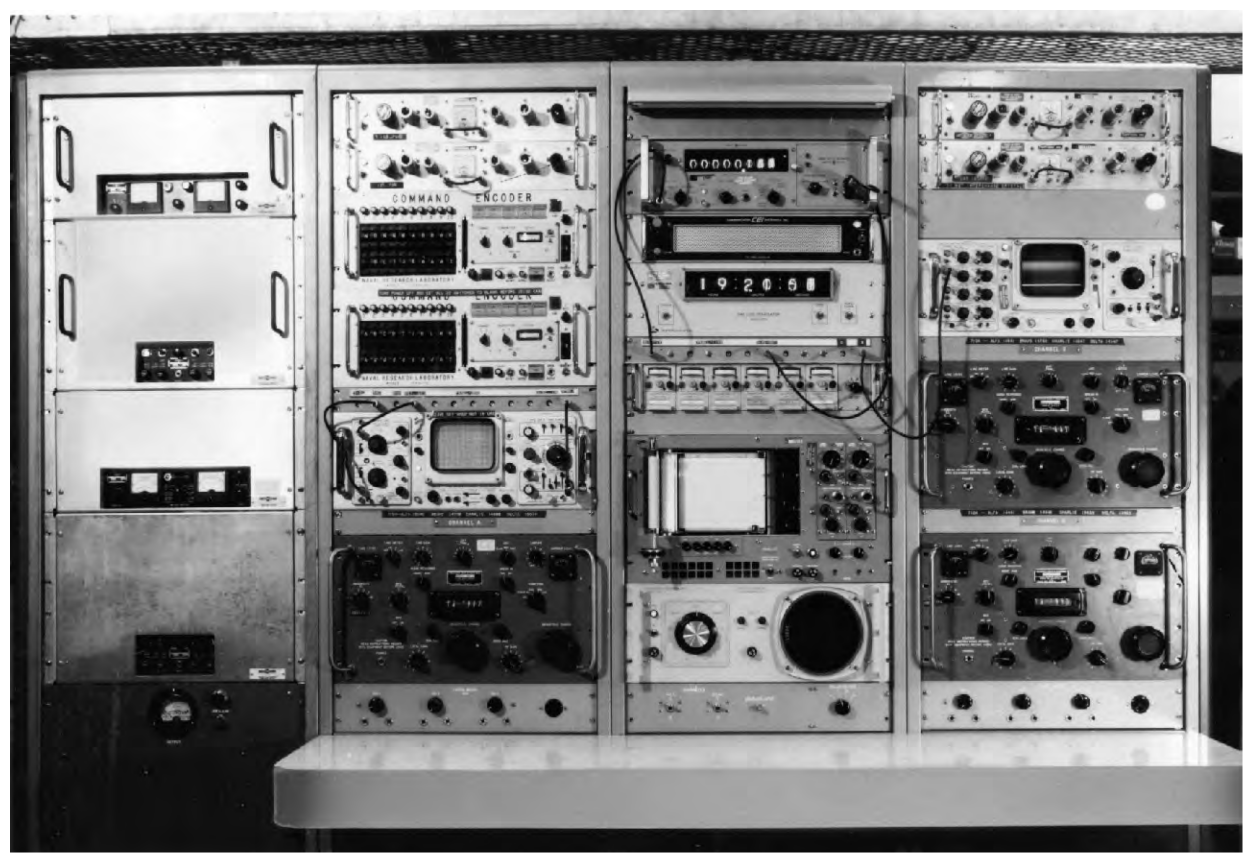
24 X 32 inches (multifaced)

POPPY MISSIONS

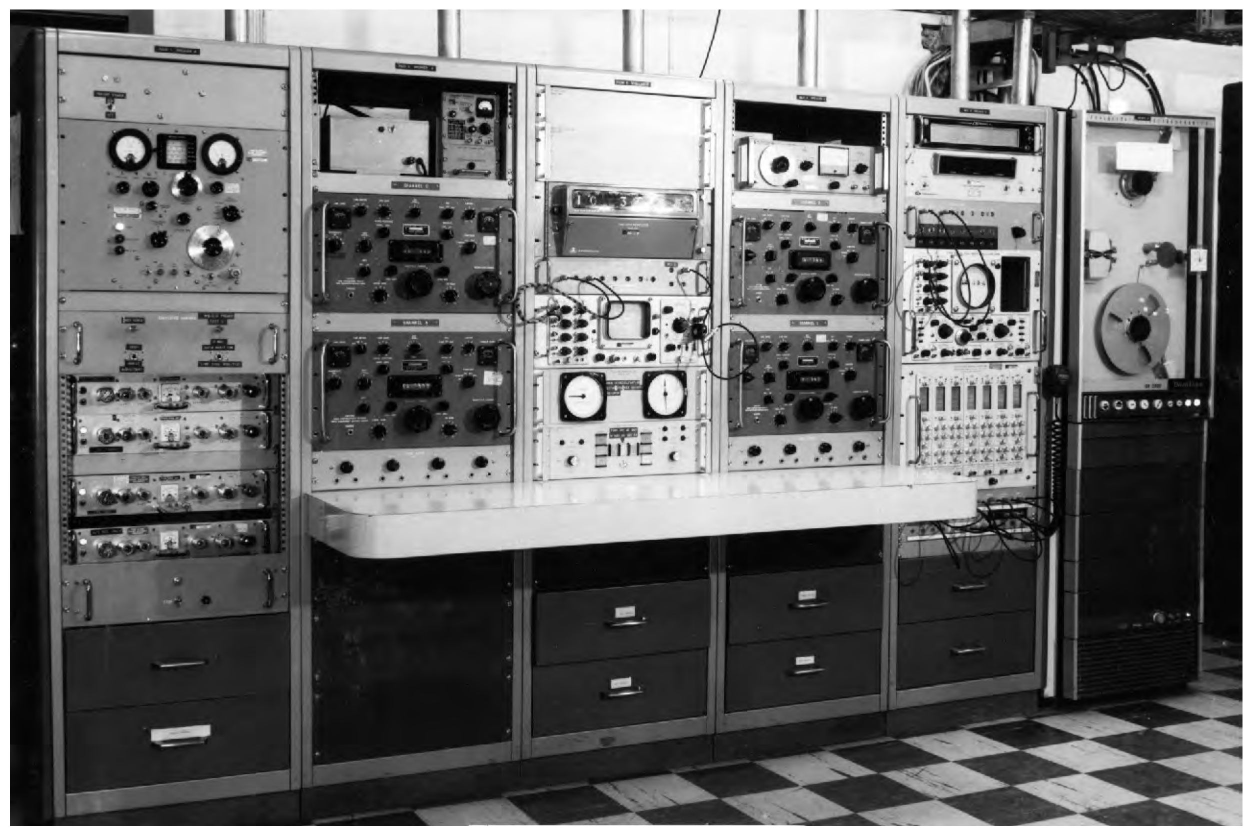
Poppy 1	13 Dec 1962	THOR/AGENA D
Poppy 2	15 June 1963	THOR/AGENA D
Poppy 3	11 Jan 1964	THRUST-AUGMENTED-THOR/AGENA D
Poppy 4	9 March 1965	THOR/AGENA D
Poppy 5	31 May 1967	THOR/AGENA D
Poppy 6	30 Sept 1969	THORAD/AGENA D
Poppy 7	14 Dec 1971	THORAD/AGENA D

Poppy 2 pre-launch - June 1963.

Poppy 4 launch - 9 March 1965.

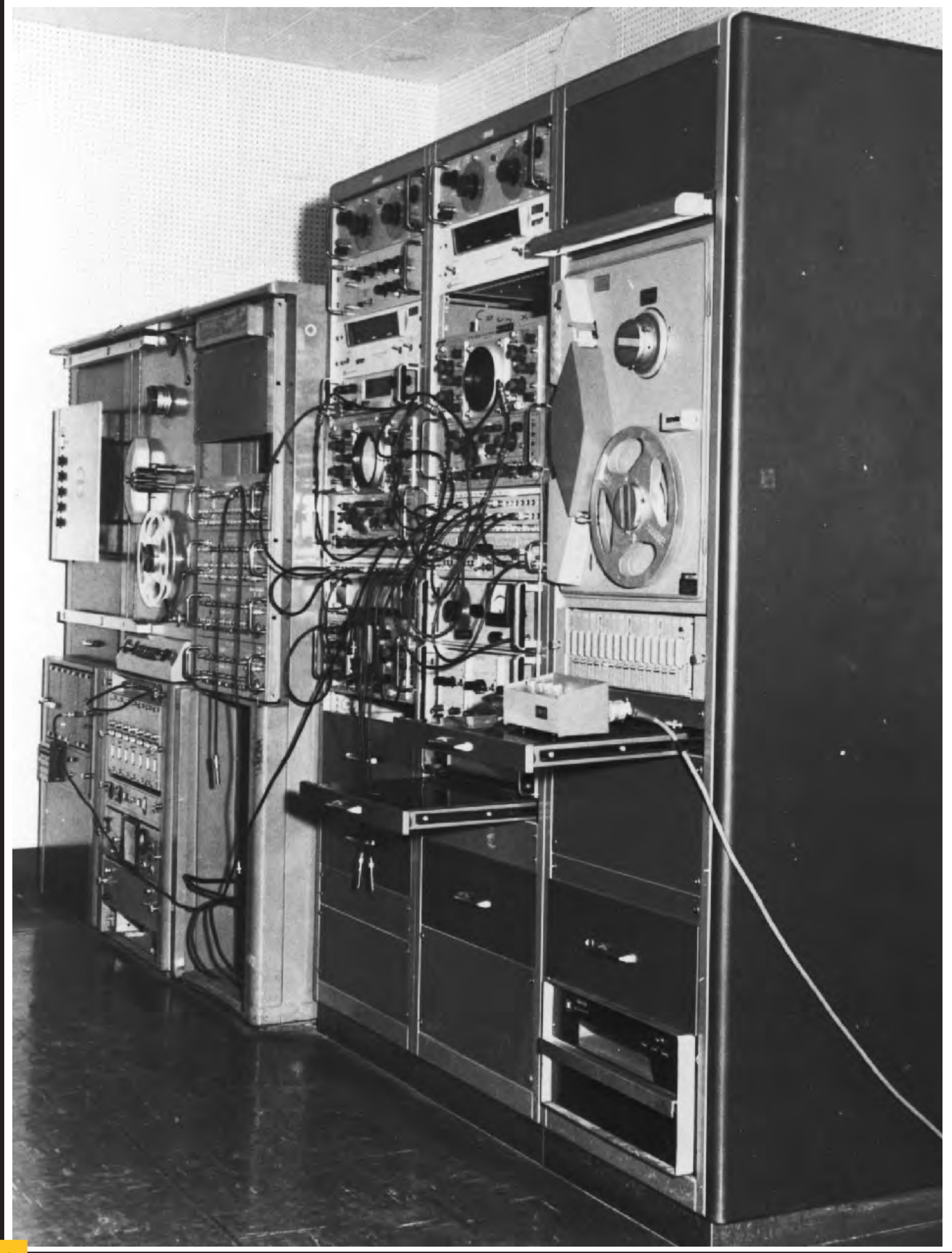


Poppy - transmitter console - November 1965.



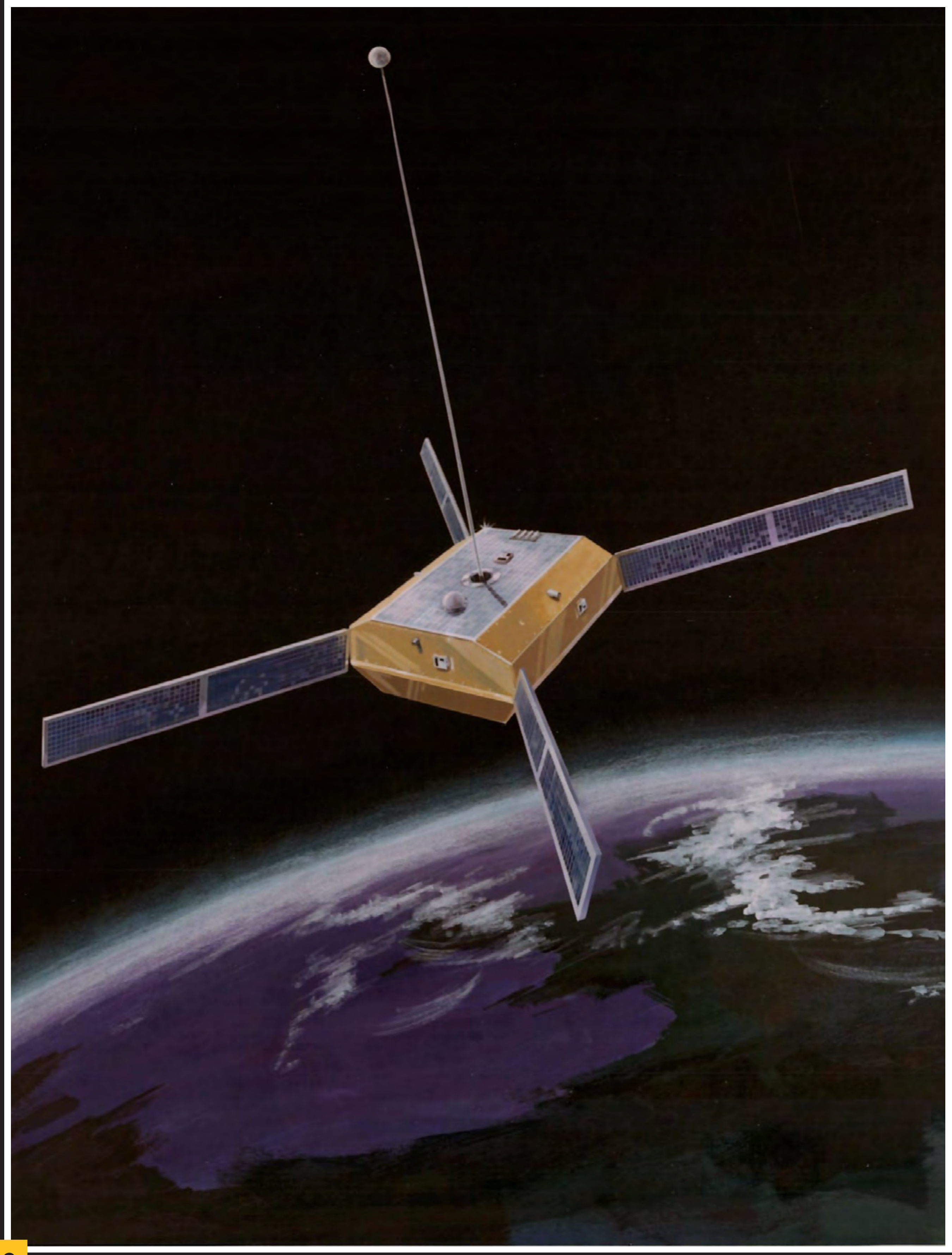
Poppy - receiving console A-GR-2800 - November 1965.

Poppy 3 satellite launch - 11 January 1964.



Poppy - quality control position - November 1965.

Poppy 6 satellite pre-launch - 9 September 1969.



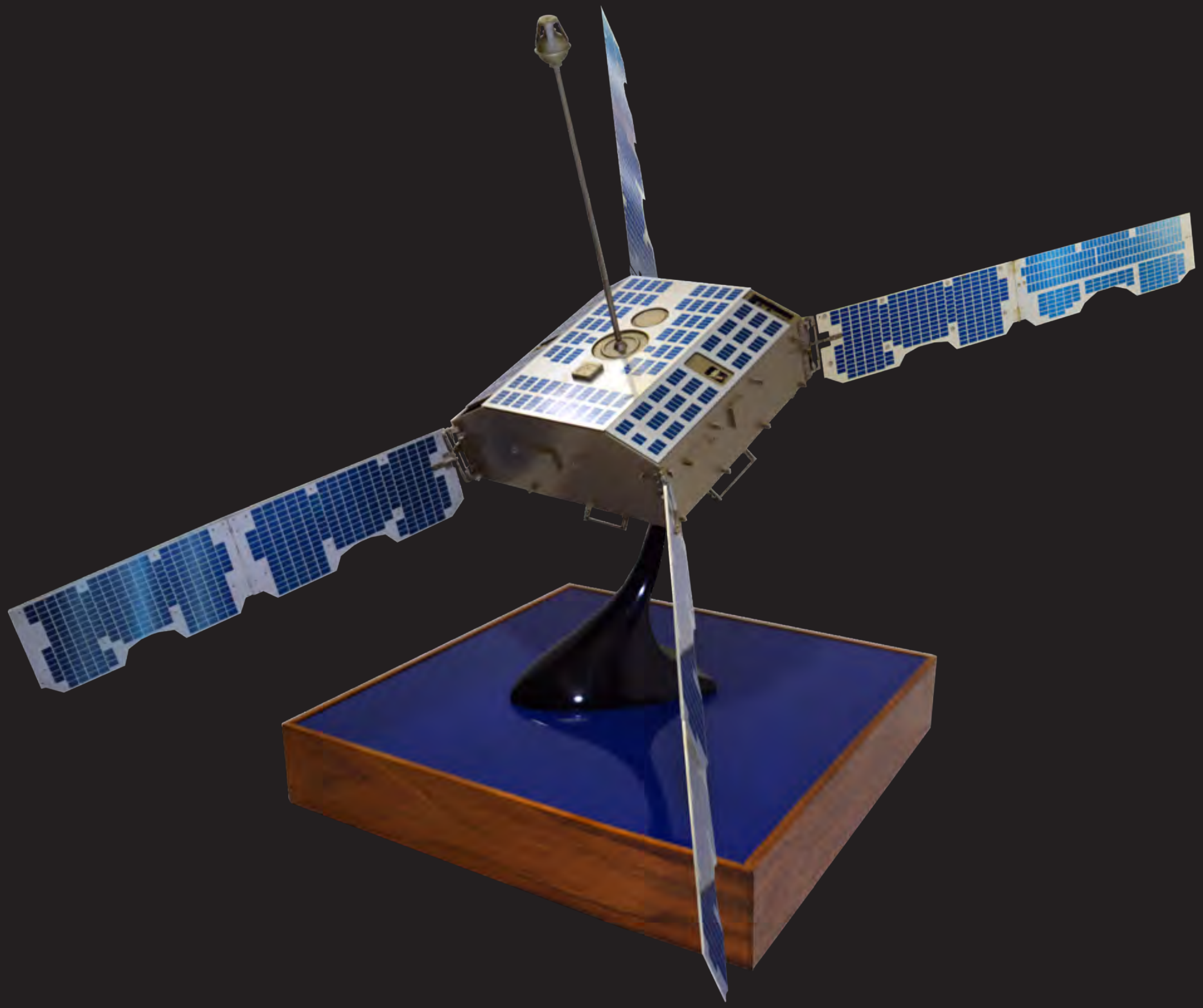
Artist rendering of Parcae satellite.

PARCAE AND IMPROVED PARCAE

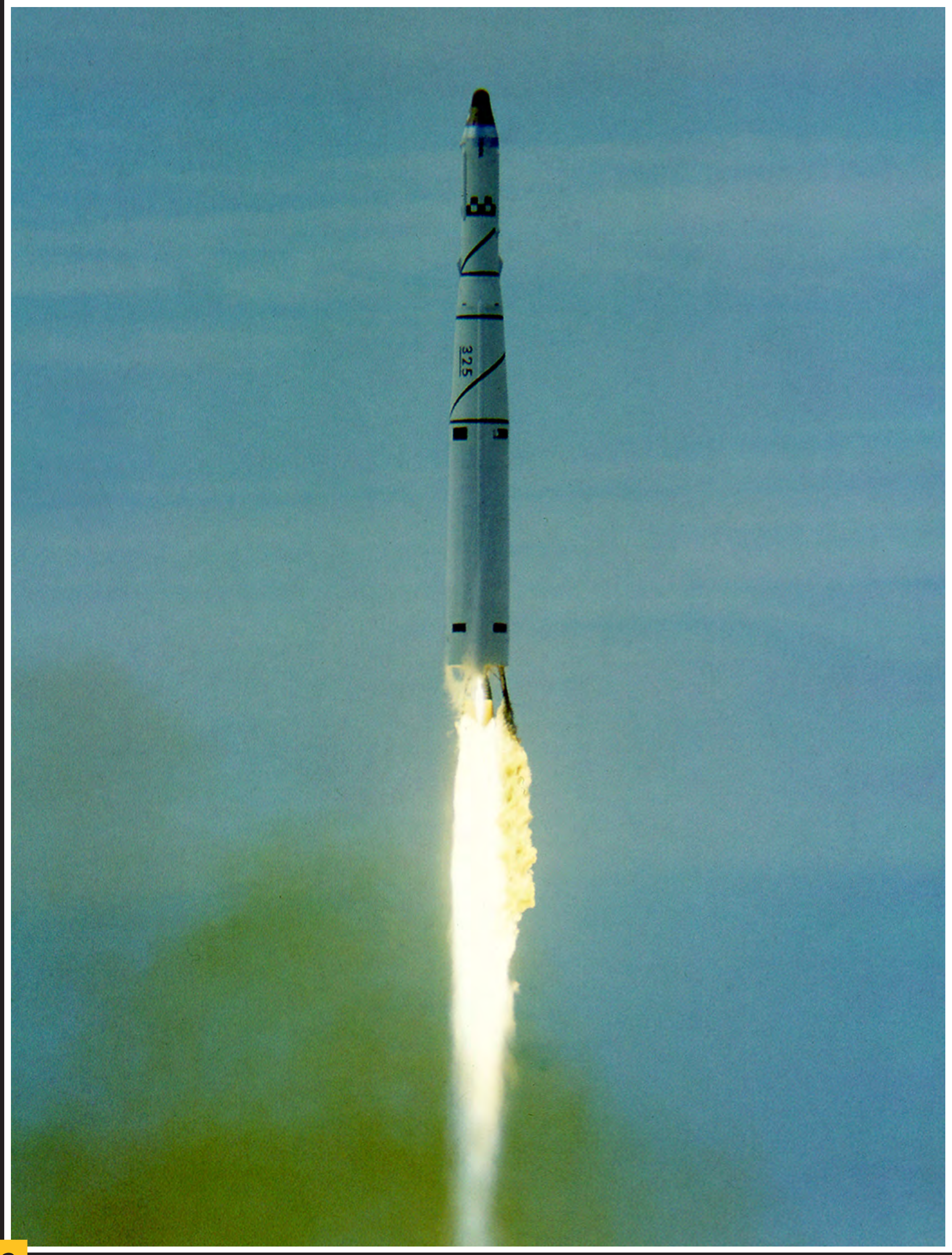
After the success of the GRAB and Poppy signals collection programs, and with increasing concerns about the Soviet Navy, the Naval Research Laboratory as part of the NRO's Program C, developed the next system that would collect the needed information on the Soviet Union's naval fleet. That system, Parcae, was the programmatic follow-on to GRAB and Poppy. Later on, the NRO developed the next generation of Parcae, referred to as Improved Parcae, which added the capability to collect against and recognize selected foreign communications systems.

Parcae and Improved Parcae were Low Earth Orbit electronic intelligence collection systems that downlinked the collected data to ground processing facilities located at selected locations around the world. Once received, the data was provided to the National Security Agency for processing and reporting to U.S. policy makers.

Launched from 1976 to 1996, under mission numbers 7108 to 7120, Parcae and Improved Parcae were successfully operated by the NRO until 2008. In July 2023, the Director, NRO declassified the fact of the existence of the Parcae and Improved Parcae satellites in addition to limited details about their purpose.



Parcae model.



Corona launch - 12 December 1961.

FILM RETURN SATELLITES

In the early to mid-1950s, when the requirements for photoreconnaissance satellites were first explored, nothing had yet been launched into space, so it was unknown how photographs could be returned to Earth for processing and intelligence exploitation. Over the following few years, work within the WS-117L and the early Samos program led to two primary options for returning the reconnaissance images, film return capsules and film readout in space processes. Eventually, the film readout option succumbed to the technology limitations of the time, and film return methods were matured and utilized on America's first photoreconnaissance satellites.

The film return method was a process where intelligence photos taken in space were captured on film and stored in the satellite, then some days or weeks later, physically returned to Earth by way of a capsule jettisoned from the satellite, and subsequently captured by specially equipped aircraft and trained crews as it descended through the atmosphere. The method was effective at providing needed intelligence without the inherent risks and provocations associated with aircraft overflights of hostile nations and denied areas. However, the film return satellites did have drawbacks – the imagery was impacted by poor weather conditions on Earth, with clouds often obscuring images, and the satellites were not overly responsive to crisis events that necessitated real-time images.

Although the first imagery satellites utilized film return methods – a process that today seems rather primitive – the idea of near-real time photoreconnaissance and electronic transmission of photographs from space had been born and work begun on such systems in the 1950s, well before the first film return satellite ever flew. Near-real time satellites would become a reality in the mid-1970s with the introduction of the Kennen system, but film return satellites were operational and effectively used from 1960 until 1986. Film return satellites began flying several years prior to the first flight of the A-12 and SR-71 supersonic aircraft, both originally intended for photoreconnaissance and signals intelligence overflights of the Soviet Union and other denied areas, and the satellites continued to provide photoreconnaissance images for a decade after the launch and successful operation of the first near-real time satellites of the Kennen system. The United States developed and used three film return photoreconnaissance systems: Corona, Gambit and Gambit-3, and Hexagon.

First intelligence photo from space - Corona photo of Mys Shmidta Runway - 18 August 1960.

CORONA

The Corona satellite, first successfully operated in August 1960, was the world's first photoreconnaissance satellite. Corona was originally intended to be a stop-gap effort, having been separated from the struggling Air Force WS-117L Samos program and given to the CIA to bring the capability to fruition, while the Air Force continued efforts to develop the film readout and other capabilities of Samos. Corona, was intended to operate for two years, until the much larger and complex Air Force WS-117L Samos satellite could take over photoreconnaissance missions. However, Samos experienced grave technical problems, and by 1963 the photo-reconnaissance aspects of the Samos program had been cancelled. Corona continued to operate well beyond its projected two-year life, and when the program was terminated in 1972, Corona had flown for a total of 12 years.

Known to the public as the Discoverer satellite program, with the objective of conducting experiments in space to aid in the mission to put man into space, the Corona satellite's true, but classified, mission was to put cameras into space to obtain intelligence photos of the Soviet Union and other denied countries. Corona was a complex system that used new technology and proved quite challenging to develop. Given the difficulties within the WS-117L program and the need for photoreconnaissance intelligence of the Soviet Union, President Eisenhower put significant pressure on the CIA to make the Corona system an operational reality. However, throughout 1959 and early 1960 success was difficult to achieve; the first thirteen attempted launches failed for one reason or another. With each failure more was learned about the launch vehicles, the satellite, or the recovery system, and the information applied to future launches until finally, the 14th launch attempt (Discoverer Mission XIII) was successful; the return capsule was recovered, but as a test vehicle it carried no camera or film. The first fully successful mission to return photoreconnaissance images, Discoverer XIV, was launched on 18 August 1960 and recovered the next day over the Pacific Ocean near Hawaii. This first mission returned 3,000 feet of film (more than the entire U-2 program had collected to that point) and had imaged about 1.65 million square miles of Soviet territory. With the intelligence images from this mission, intelligence analysts began to dismantle the myth that the U.S. lagged behind the USSR in missile production – the so called "missile gap" – and with additional imagery obtained on the second and third Corona missions, analysts had the information necessary to dispell the missile gap concerns. The imagery showed the Soviets had far fewer strategic missiles and launch sites than was previously thought.

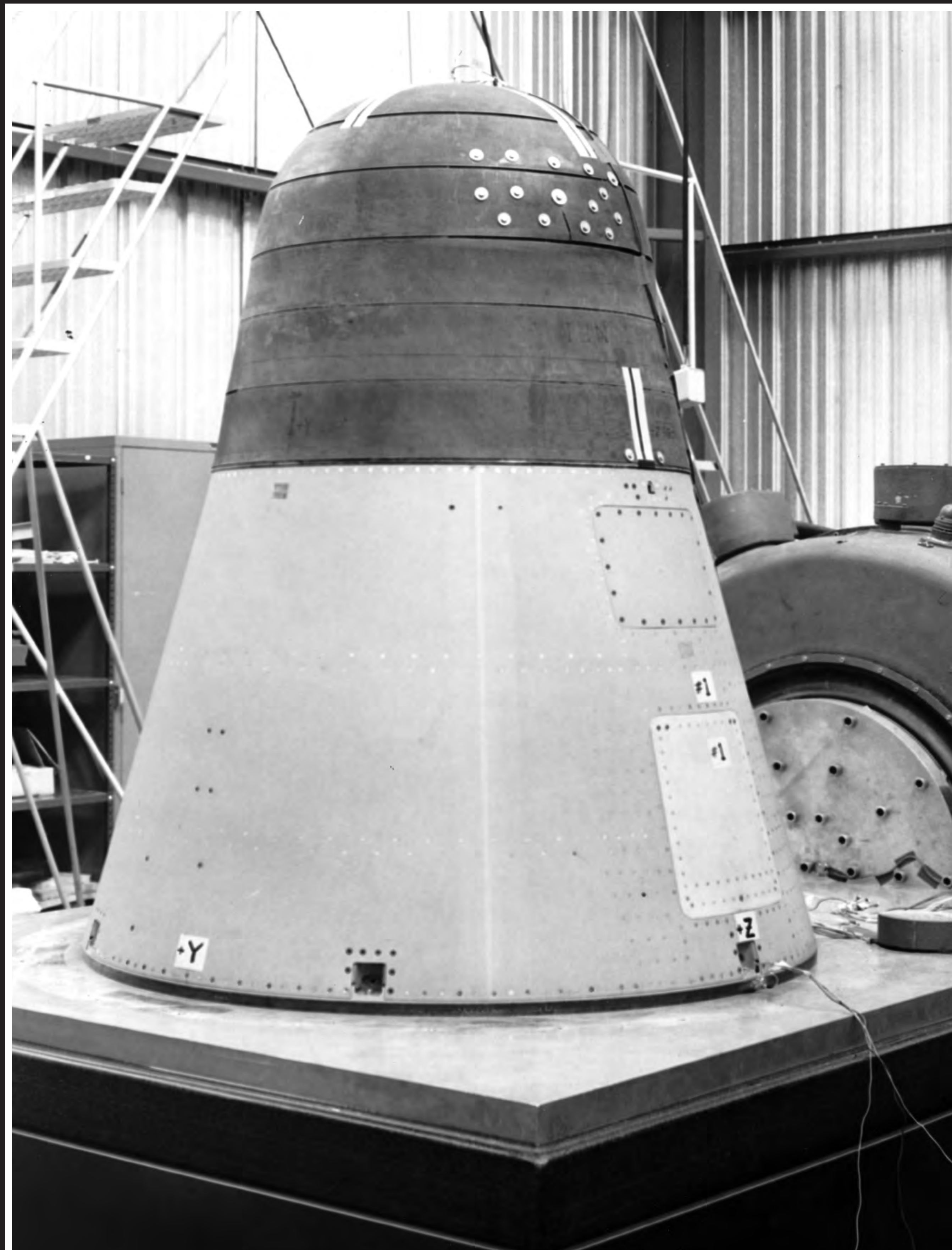
Corona's first imagery obtained a ground resolution of about 35 feet, but by the time the program ended the ground resolution had been reduced to around 7 feet. Over the 145 missions of its operational life the Corona system imaged all Soviet medium-range, intermediate-range, and intercontinental ballistic missile launching complexes. Using Corona imagery, analysts were able to discover the main Soviet construction site for ballistic-missile-carrying submarines at Severodvinsk. In total, the Corona missions produced over 800,000 images from space, a collection containing more than 2.1 million feet of film in 39,000 film canisters. As America's first eyes in space, Corona helped win the Cold War by revealing and monitoring potential threats to U.S. national security. The Corona program and all Corona imagery was declassified in 1995.

C-119J loadmasters Corona recovery crew - 1960.

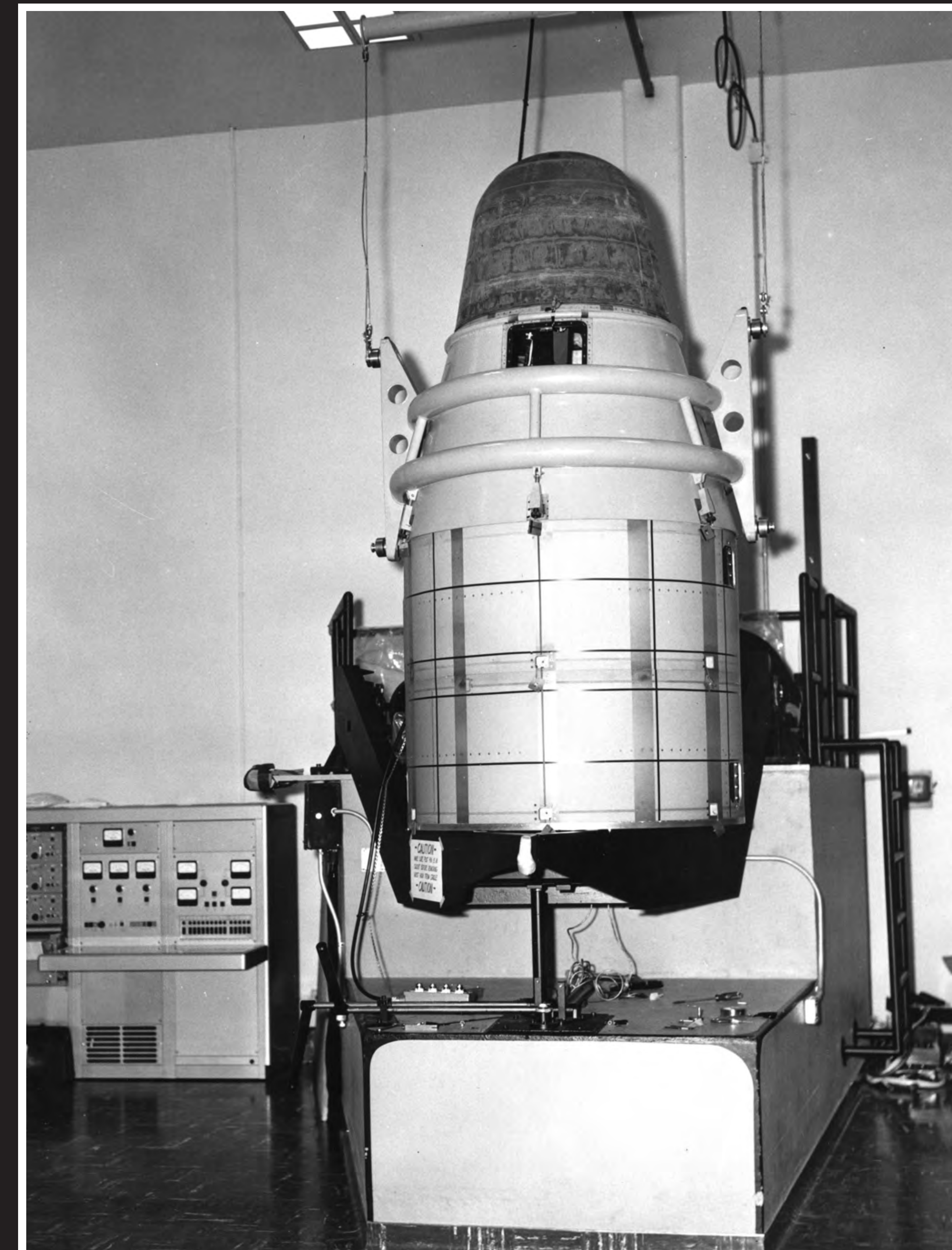
Corona launch - 26 April 1963.

C-130 Recovering a test package and parachute - 1962.

First recovery C-130 parked beside several C-119Js - 1960.



Corona (KH-1) Payload.



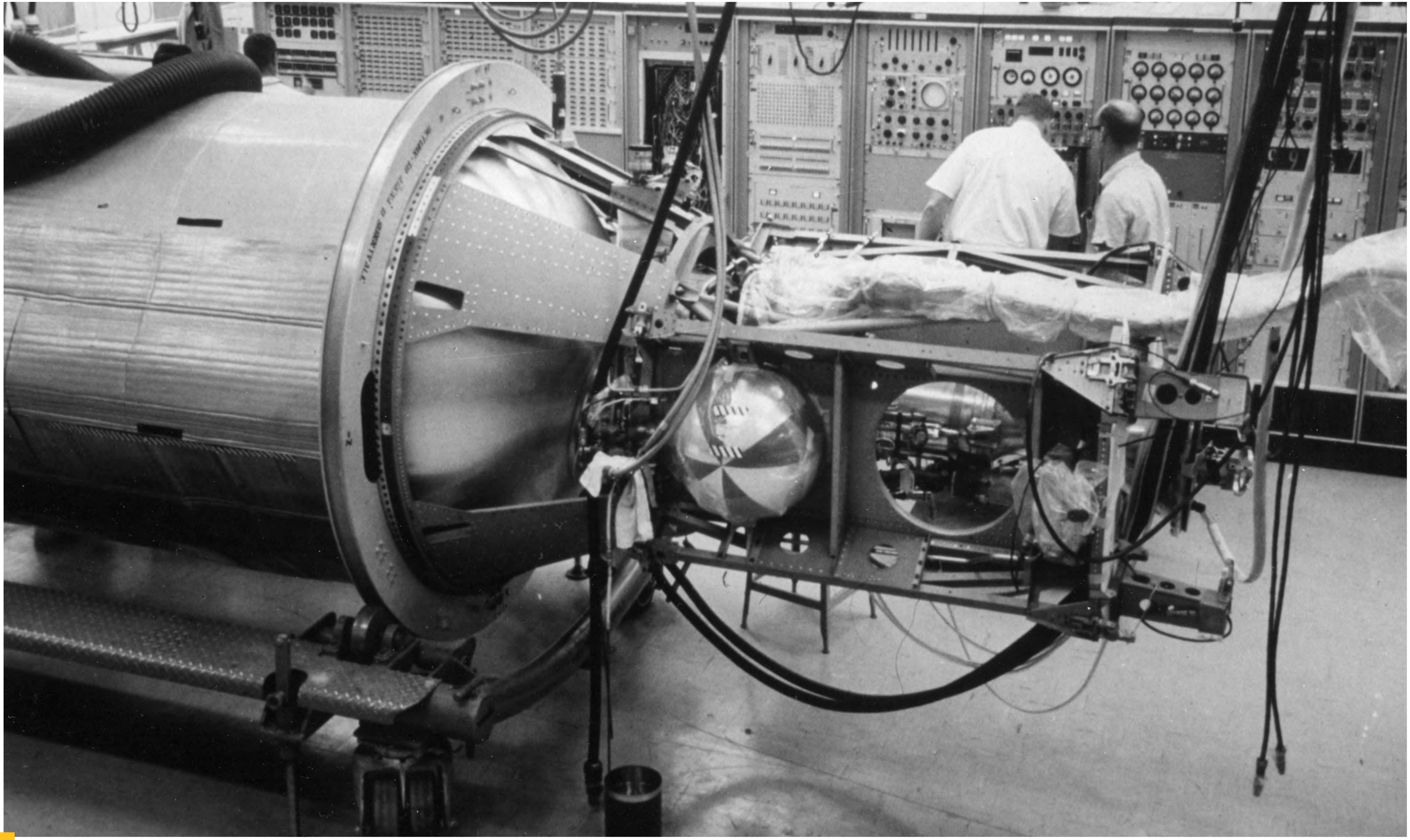
Corona (KH-4) payload undergoing stress test.

JC-130B during a parachute recovery flight test - Edwards AFB - 1960

6593d flight crew in front of C-119J aircraft .

C-119 Discoverer 26 recovery - 1961.

Discoverer 13 capsule - 13 August 1960.



Corona assembly.

JC-130 aircraft recovering parachute with test payload.

C-119 loadmasters retrieving capsule.

Corona recovery diver.

Corona recovery diver.

Corona recovery diver.

Corona recovery diver retrieving Discoverer XIII capsule, 11 August 1960.

Corona recovery diver.

C-119J winch control box - Corona

C-119J parachute recovery winch operator - Corona.

Loadmasters watching a parachute recovery from the rear of a C-119J.

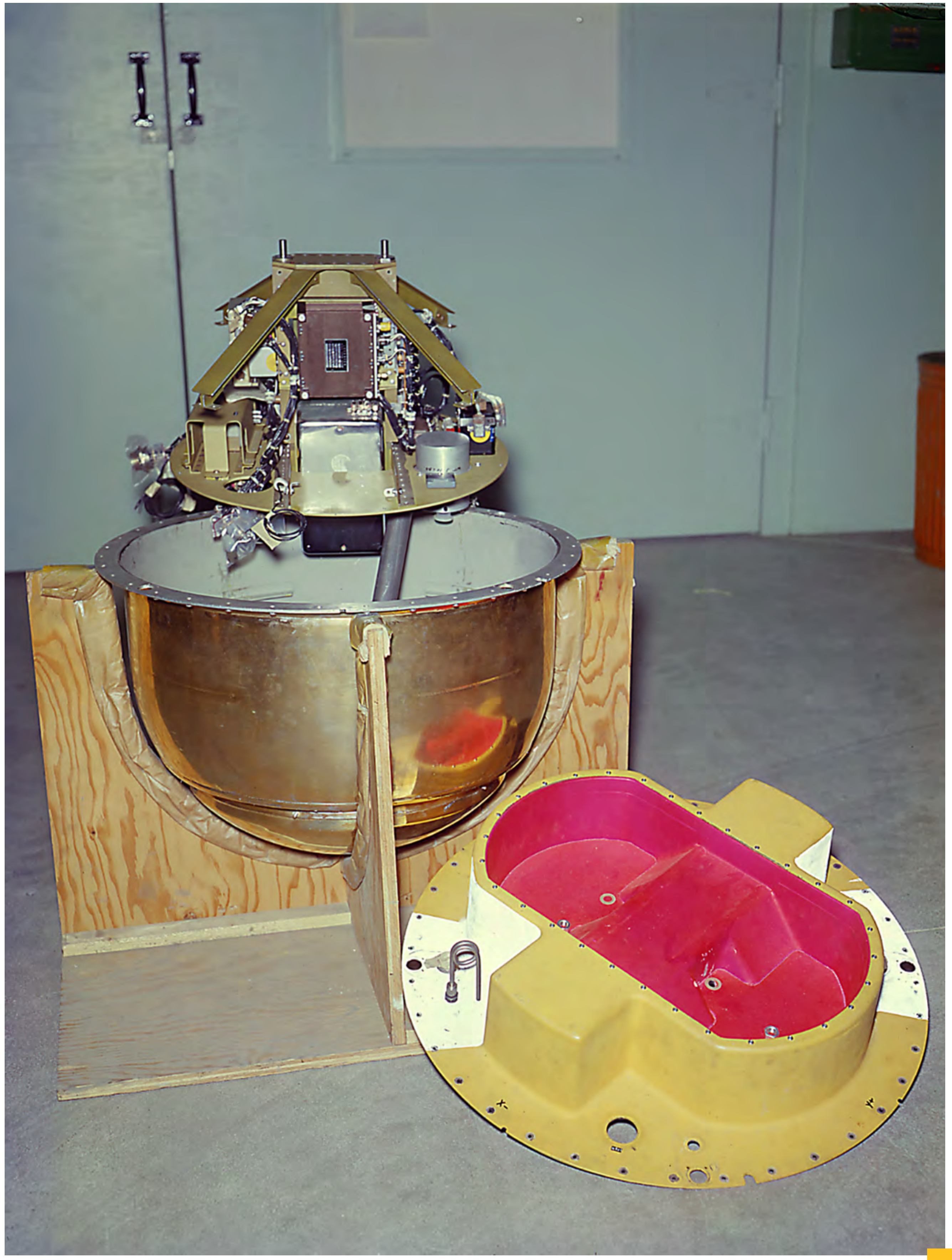
C-119J recovering floating capsule 1960.

Corona loadmasters.

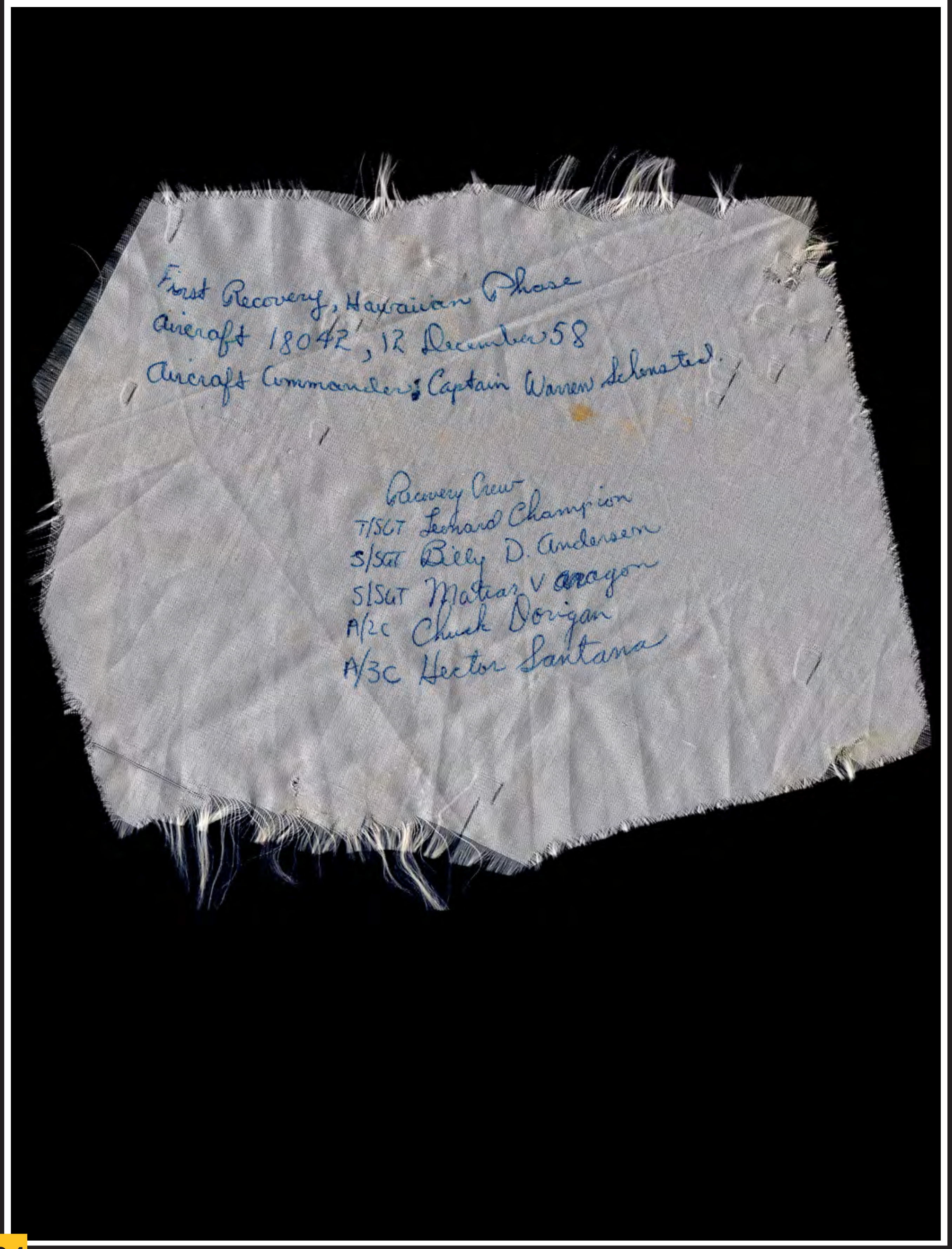
Corona recovery crew transport Corona capsule.

Corona recovery crew transport Corona capsule.

Practice recovery with recovery poles.



The Discoverer 13 space capsule in 1959 before it was launched on 10 August 1960.



Fragment of first test parachute recovered in Hawaii and signed by recovery team - 12 December 1958.

C-119 #18042 crew at Hickam AFB in 1959.
Front Row, L to R: A1C Ken Riding, A1C John Lansberry (LM), Capt Warren Schensted (P) and 1st Lt Jack Ludwick (Nav). Back Row, L to R: TSgt Elbert Jenkins (CE), 1st Lt Robert Clifton (CP), SSgt Billy Anderson (LM), A2C Charles Dorigan (LM), TSgt Leonard Champion (WO), and SSgt Matias Aragon (LM).

6593d aircrew and their C-119J in 1960.

The arrival of Discoverer 14 film capsule (within the metal container) at Hickam AFB on 19 August 1960.

6594th aircrew and their C-119 in 1959.

JC-130B with poles down and loop in trail - Edwards AFB - 17 April 1961.

 A2C Daniel Hill telling a group of school children about the Discoverer 14 capsule.

A2C Daniel Hill during the Discoverer 14 publicity tour.

President Eisenhower with first Corona capsule recovered from space at the White House.

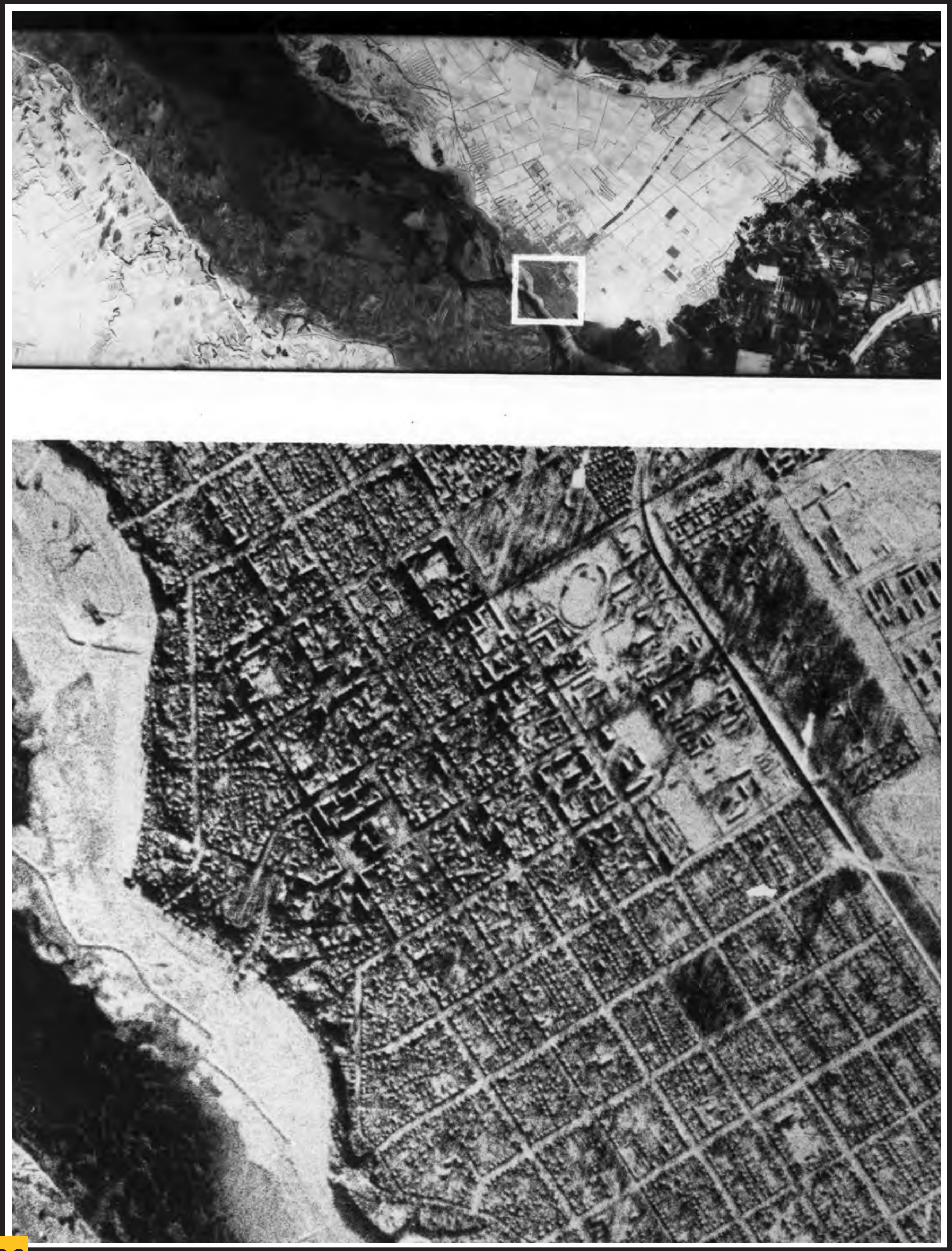
President Kennedy with Corona capsule at Air Force facility.

Press see first Corona capsule recovered from space at the White House.

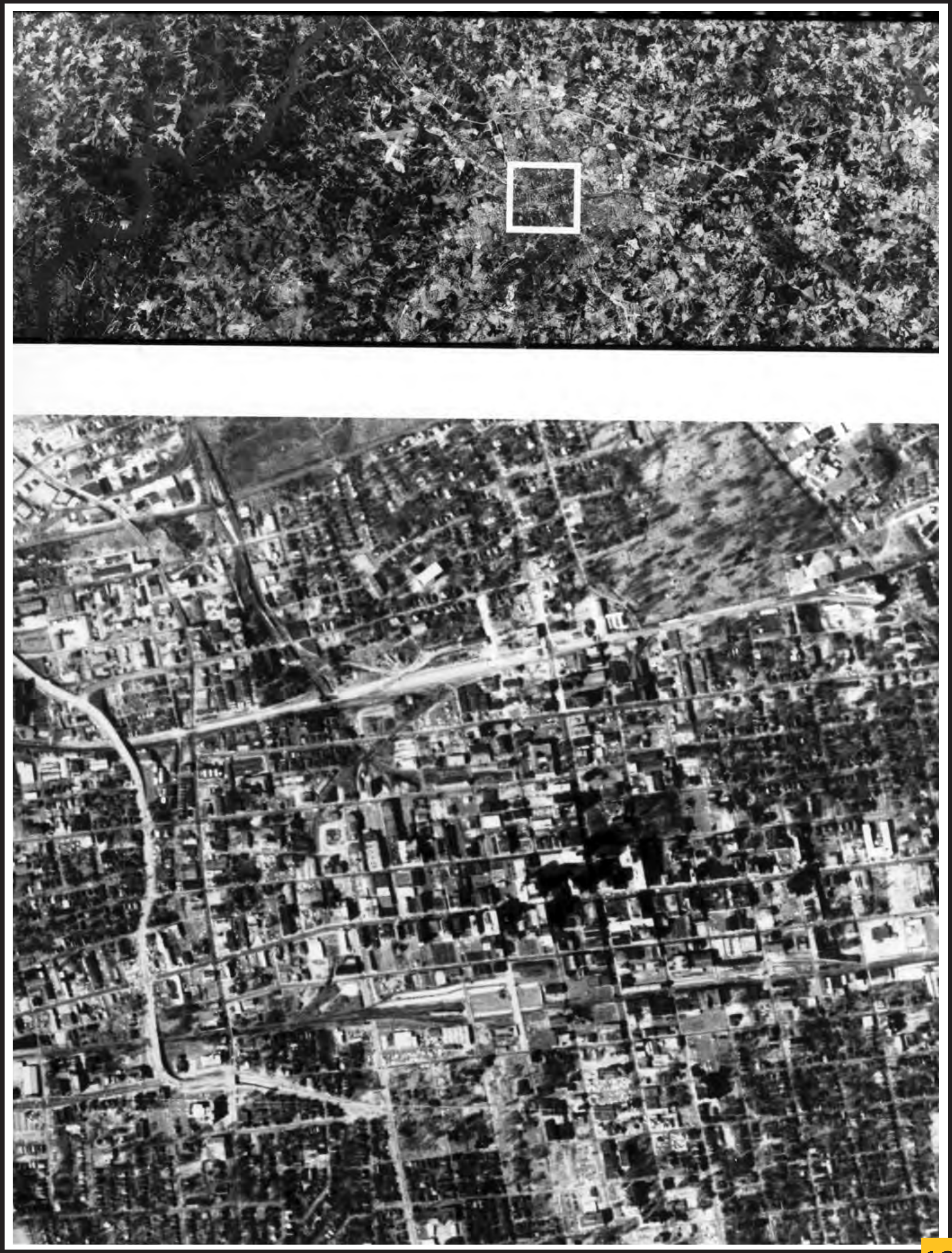
Press see first Corona capsule recovered from space at the White House.

Corona C (KH-1) image - 18 August 1960.

Corona C' (KH-2) image .



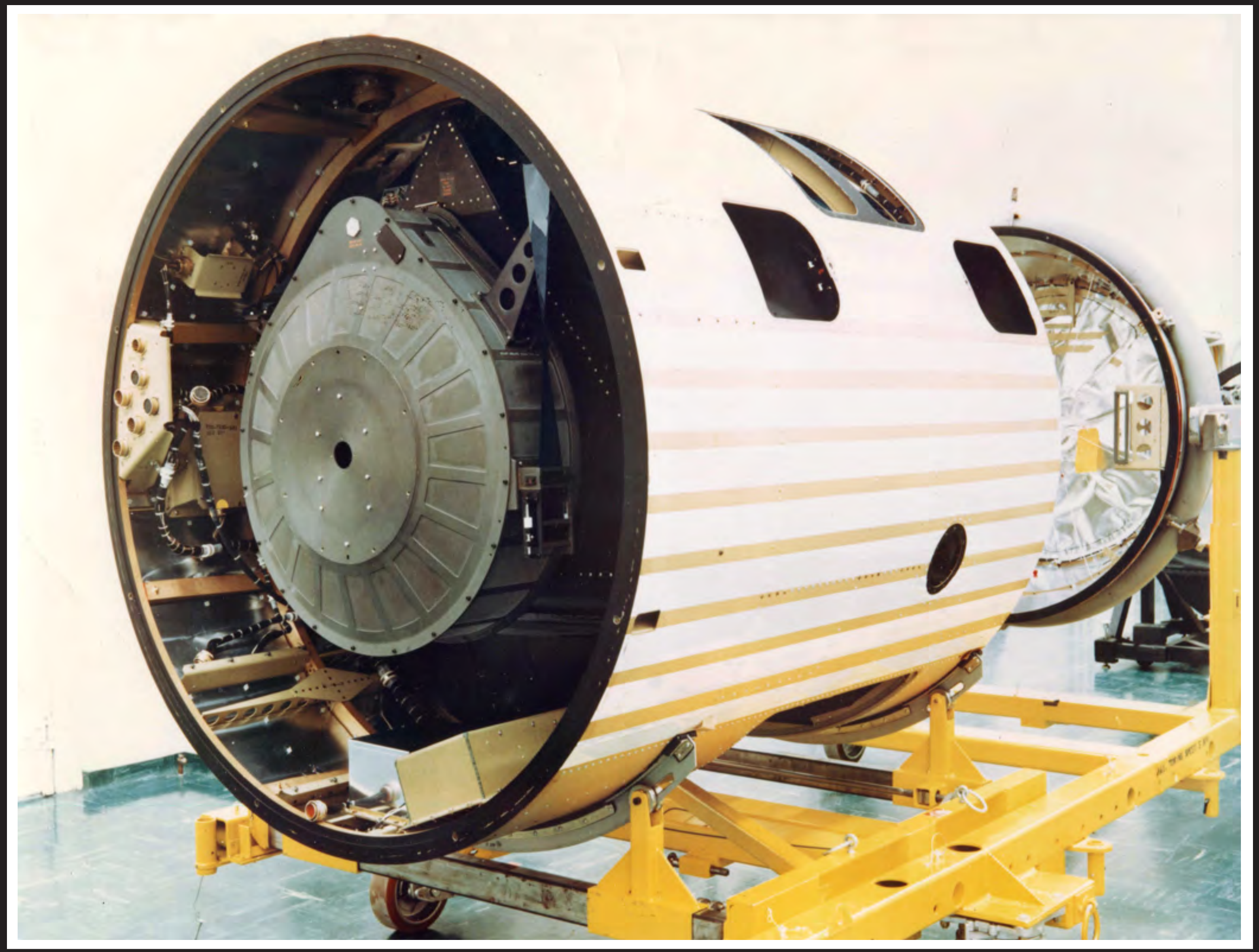
Corona C''' (KH-3) image.

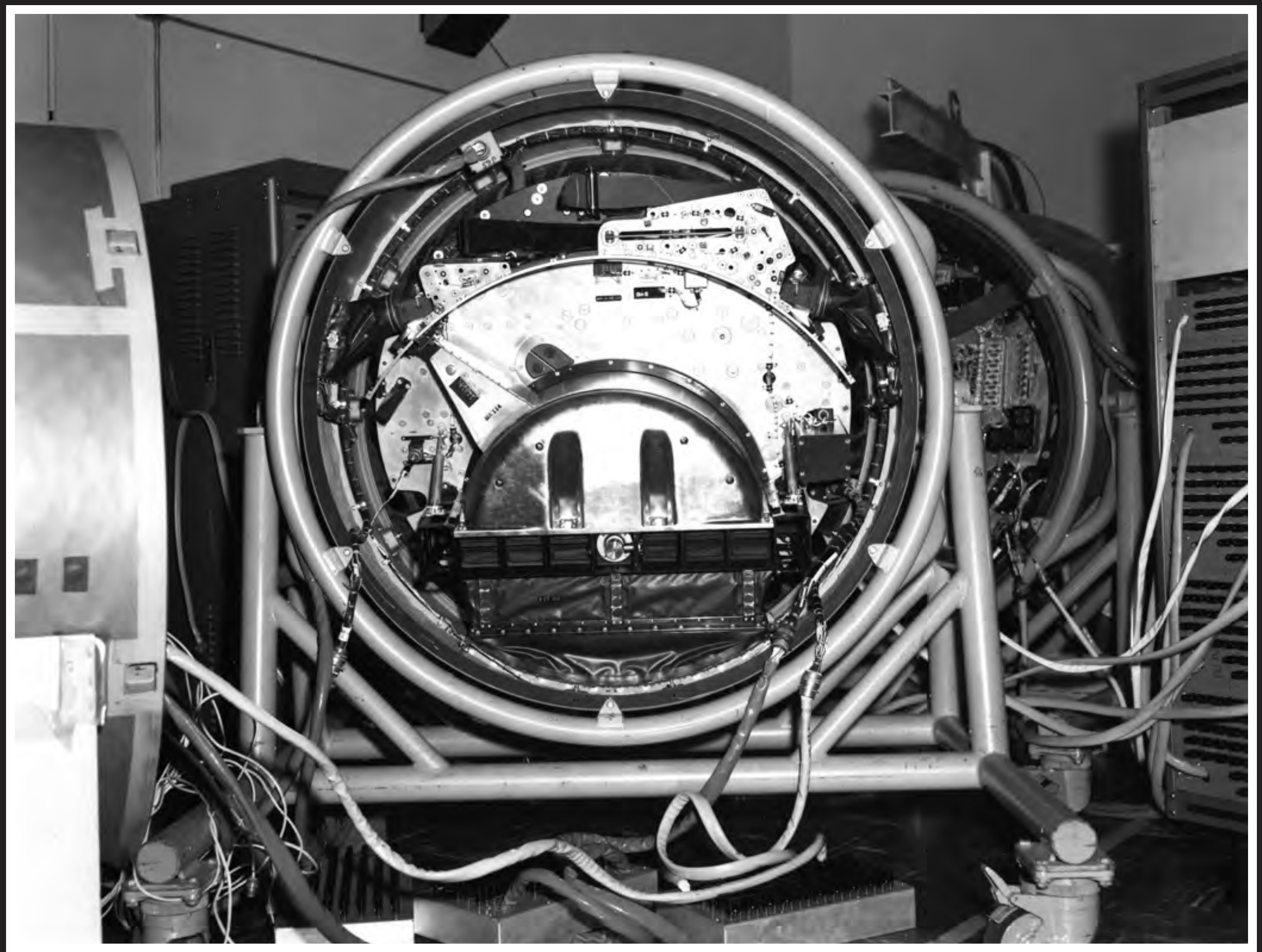


Corona - Mural (KH-4) panoramic camera image.

C-119J loadmasters in recovery training - 1959.

Corona capsule.

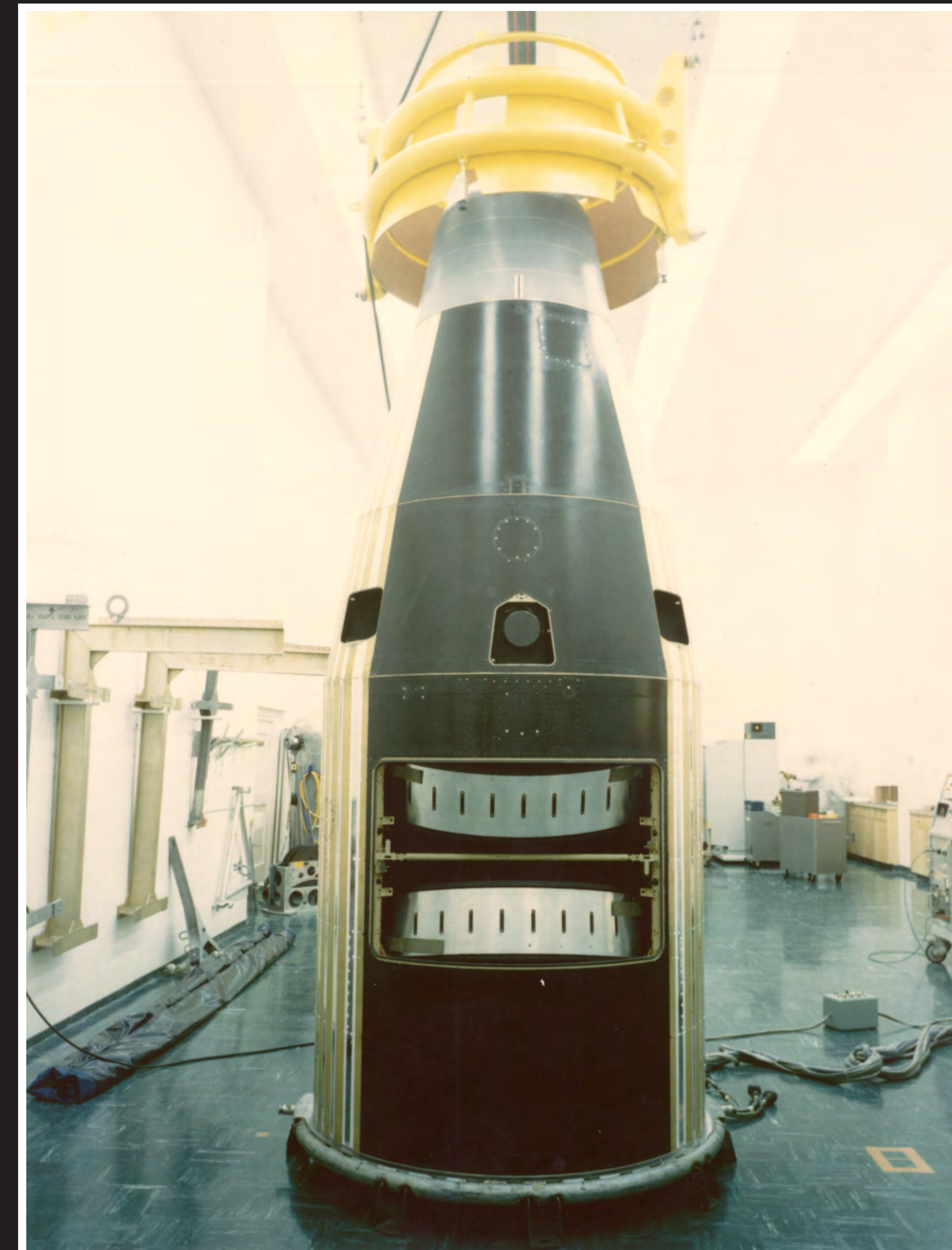




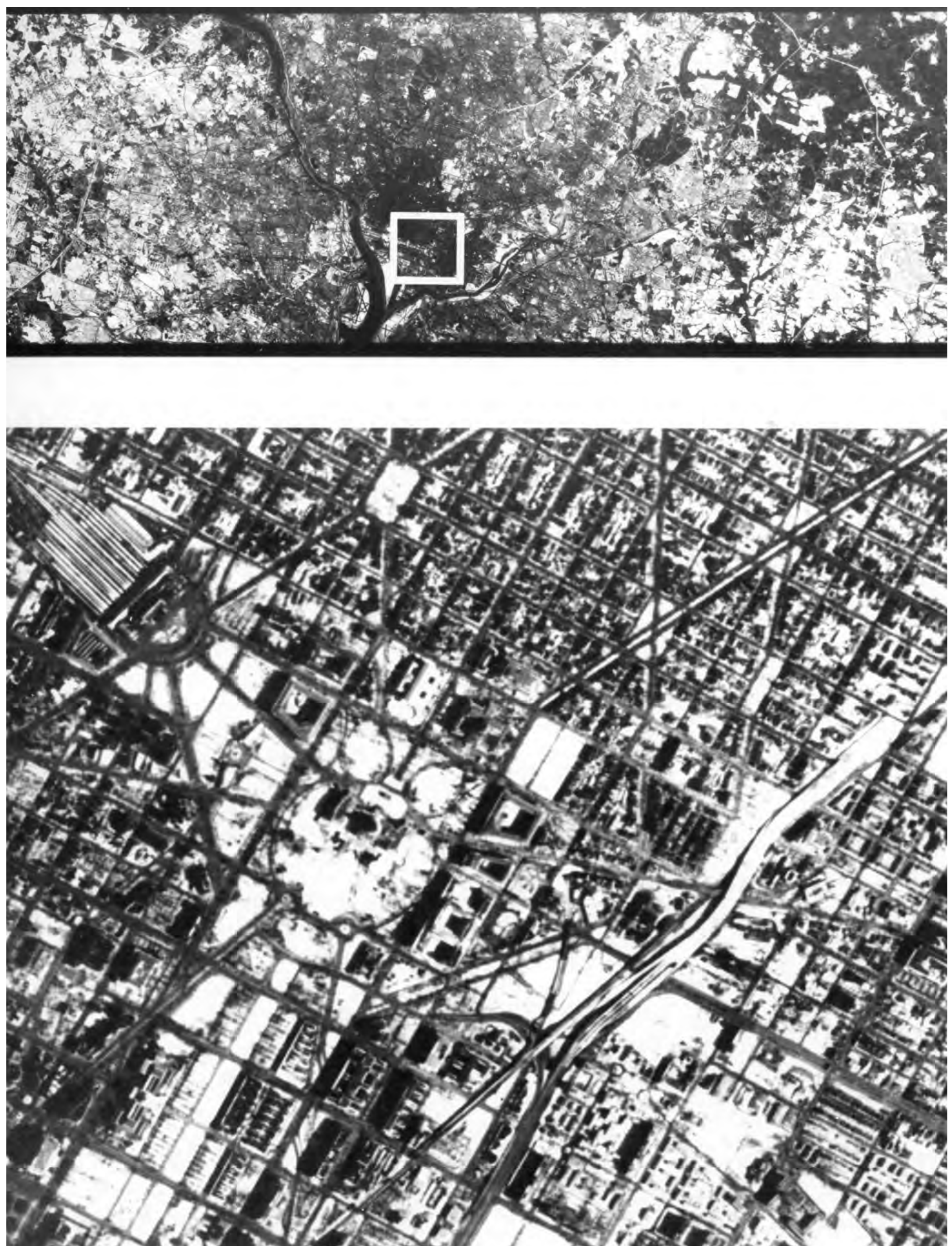
Corona assembly.

Corona Reciprocating Panoramic Camera test prior to build.

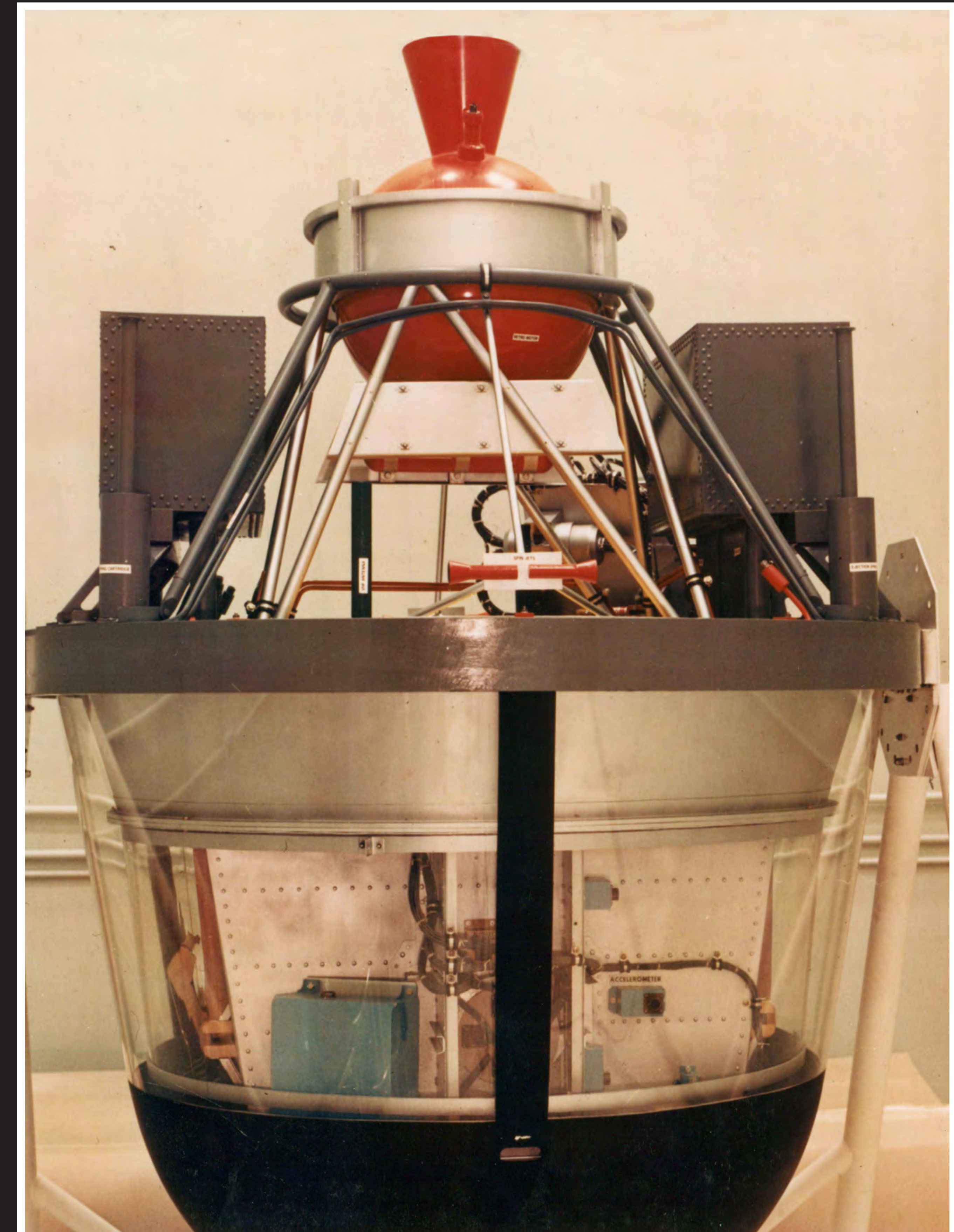
Corona (KH-4A) payload assembly.



Corona (KH-4B) payload.



Corona-Janus - J-1 (KH-4A) image - 19 January 1965.

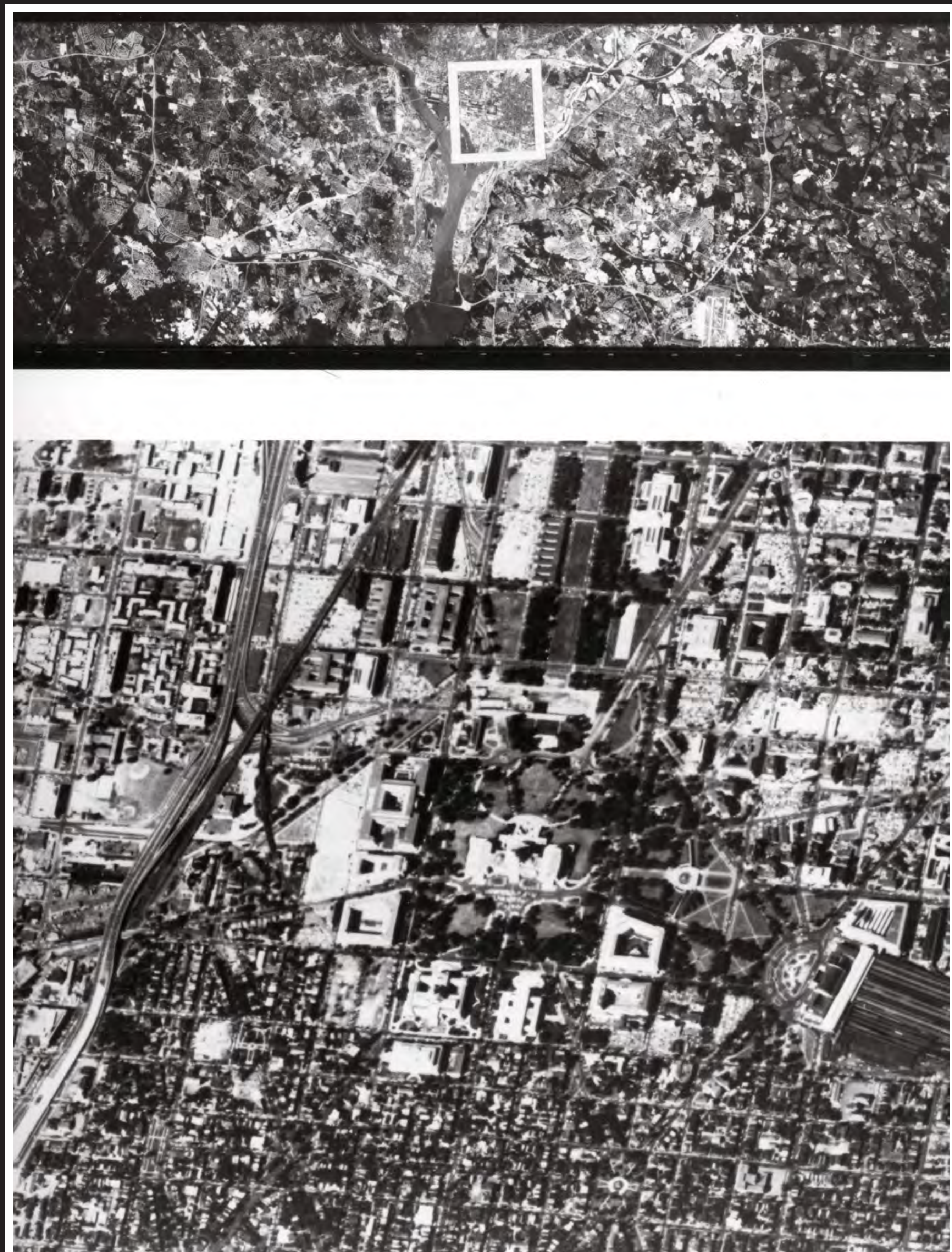


Corona capsule.

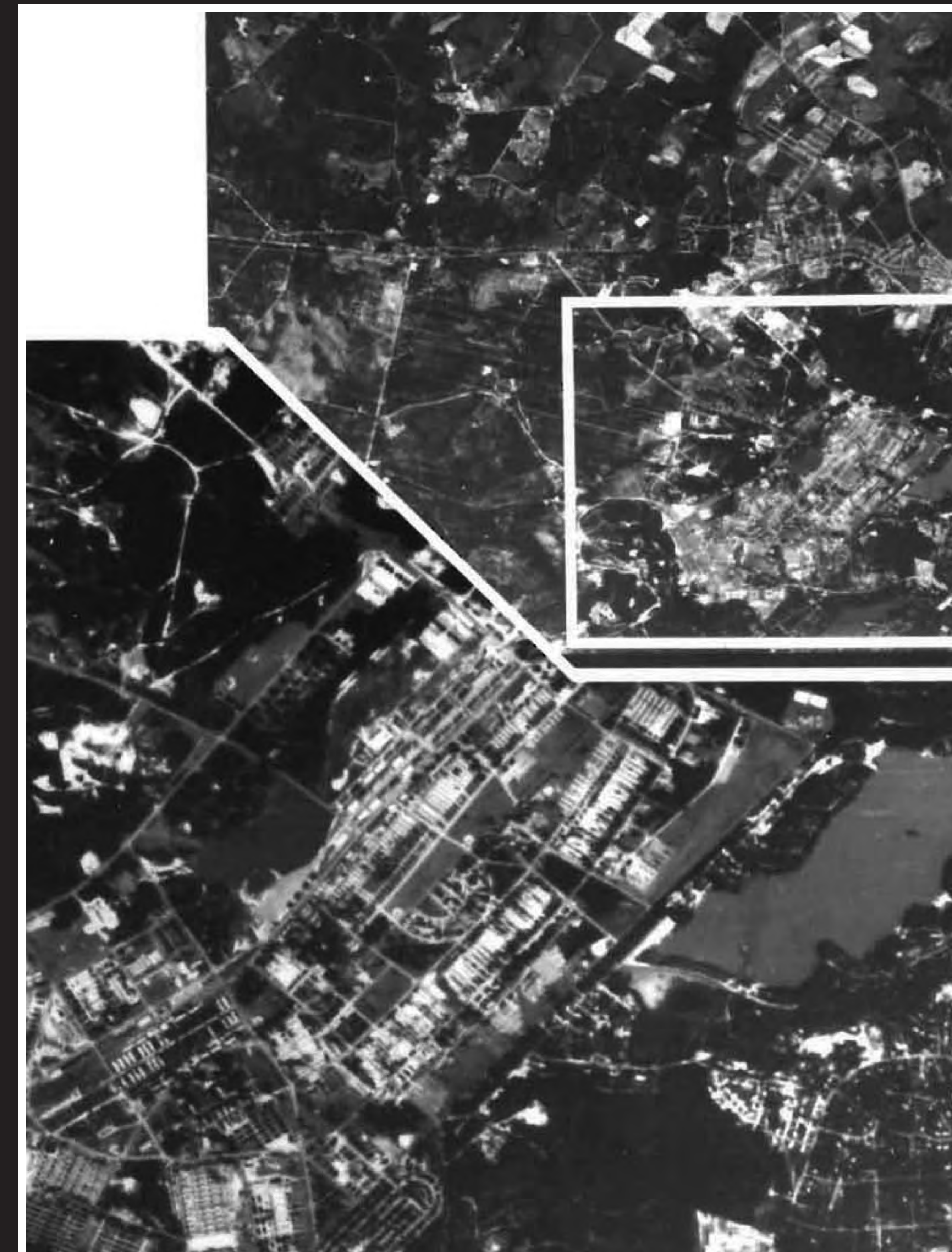
C-119J aircraft with homing antennas.

C-130A flight crew at Edwards AFB - 1960s.

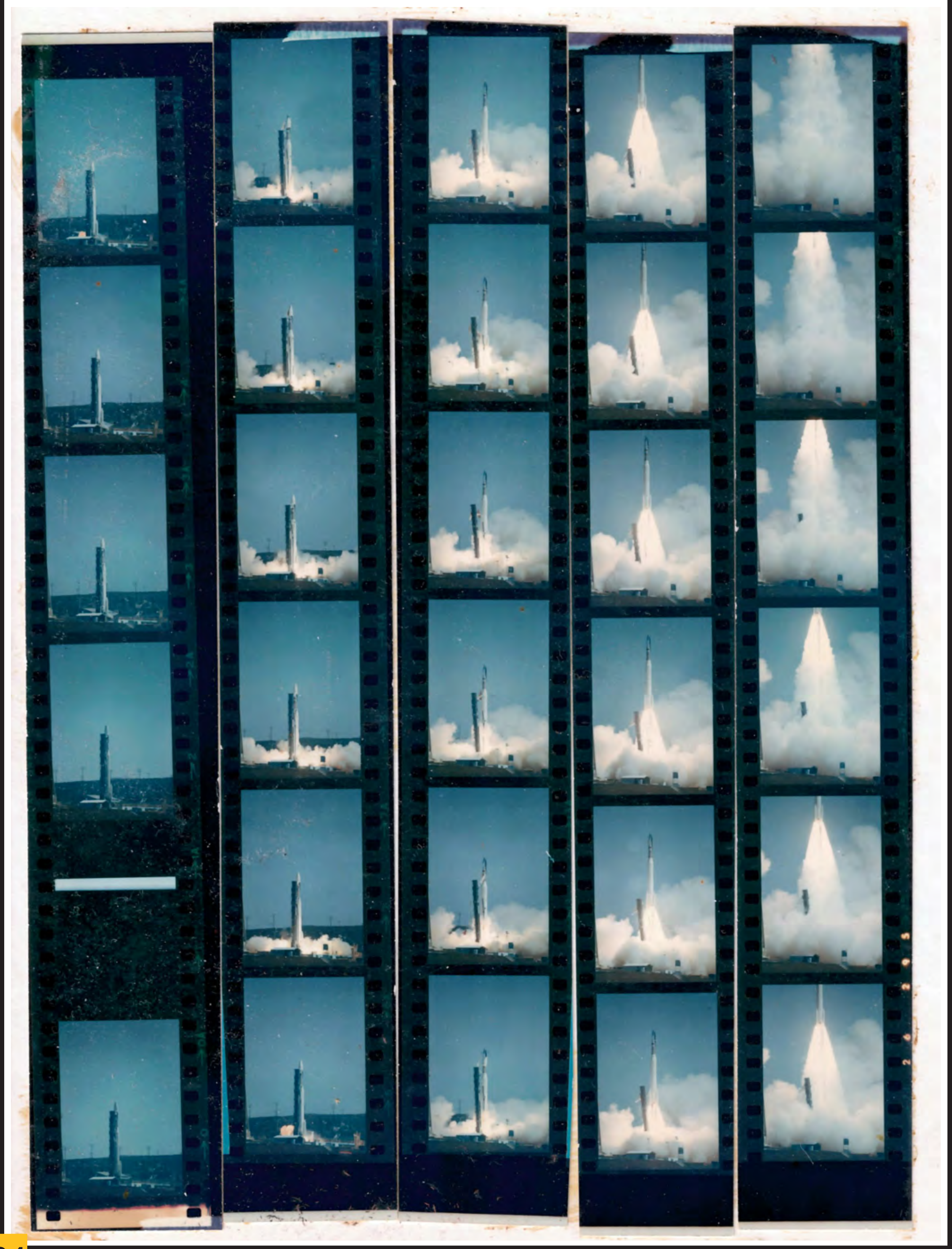
6593d flight crew in front of JC-130 aircraft .



Corona-Janus - J-3 (KH-4B) panoramic camera image.



Corona-Lanyard-KH-6 camera image - 20x enlarged.



Corona (KH-4B) launch photo contact sheet.

Corona pre-launch.

Discoverer 14 - Agena launch vehicle assembly.

Corona - 6593d Test Squadron - Loadmasters.

Original 6593d Test Squadron Patch - 1958 - 1960.

Official 6593d Test Squadron Patch - July 1961.

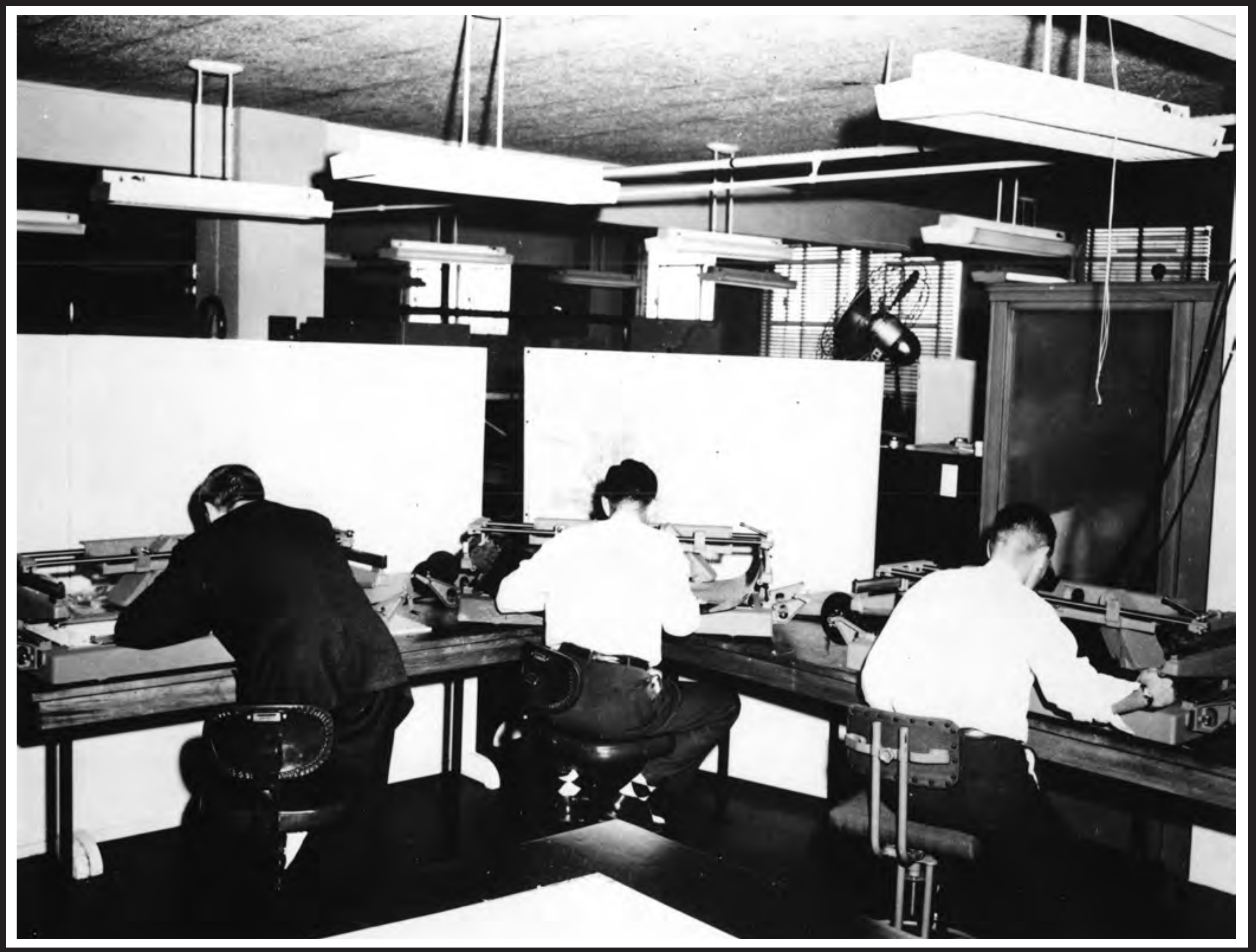
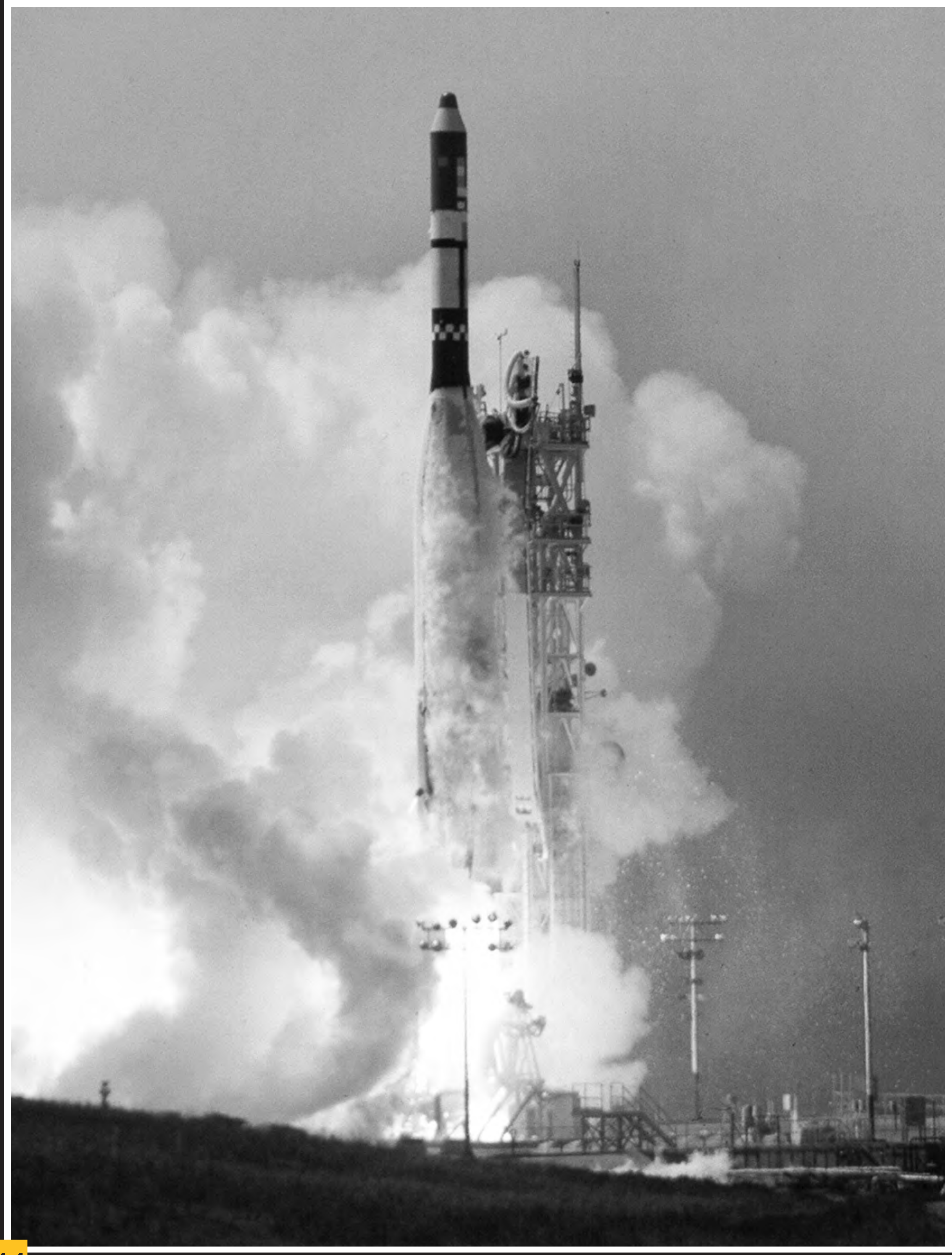


Image Scientist evaluating image quality.

Photo-interpreters using microscope viewing tables.

SAC photo interpreters assess film shot over Cuba - 12 November 1962.

SAC photo interpreters assess film shot over Cuba - 13 November 1962.



Gambit-1 (KH-7) launch - 6 September 1963.

GAMBIT

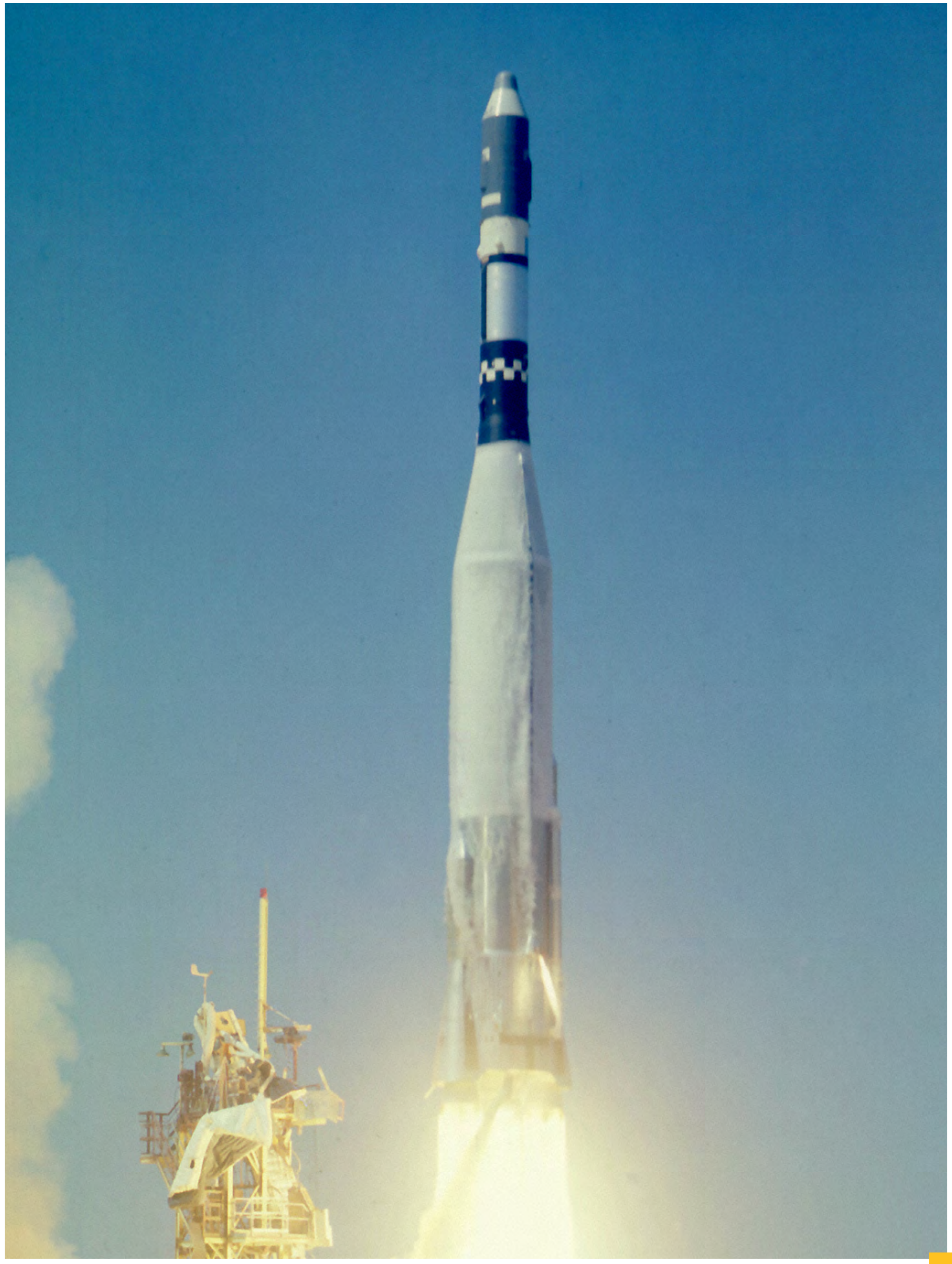
Gambit-1 (KH-7)	Gambit-3 (KH-8)
1963 - 1967	1966 - 1984

Gambit was the first operational high resolution film-return photoreconnaissance satellite. One week after the first successful Corona mission in August 1960, President Eisenhower approved the development of the Gambit satellite system. First launched in 1963, its 77-inch focal length lens produced ground resolution imagery of two to three feet, providing analysts with detailed information about intelligence targets for the first time. The second, later version of this high-resolution system, Gambit-3, was equipped with a 175-inch focal length lens that could acquire imagery with ground resolution better than one foot. The NRO operated the first Gambit-3 in 1966 and then launched a dual-recovery vehicle version in 1969. The NRO continued to introduce additional improvements, such as better roll-joint capability, a new parachute thermal cover, and a dual platen camera for later Gambit-3 missions.

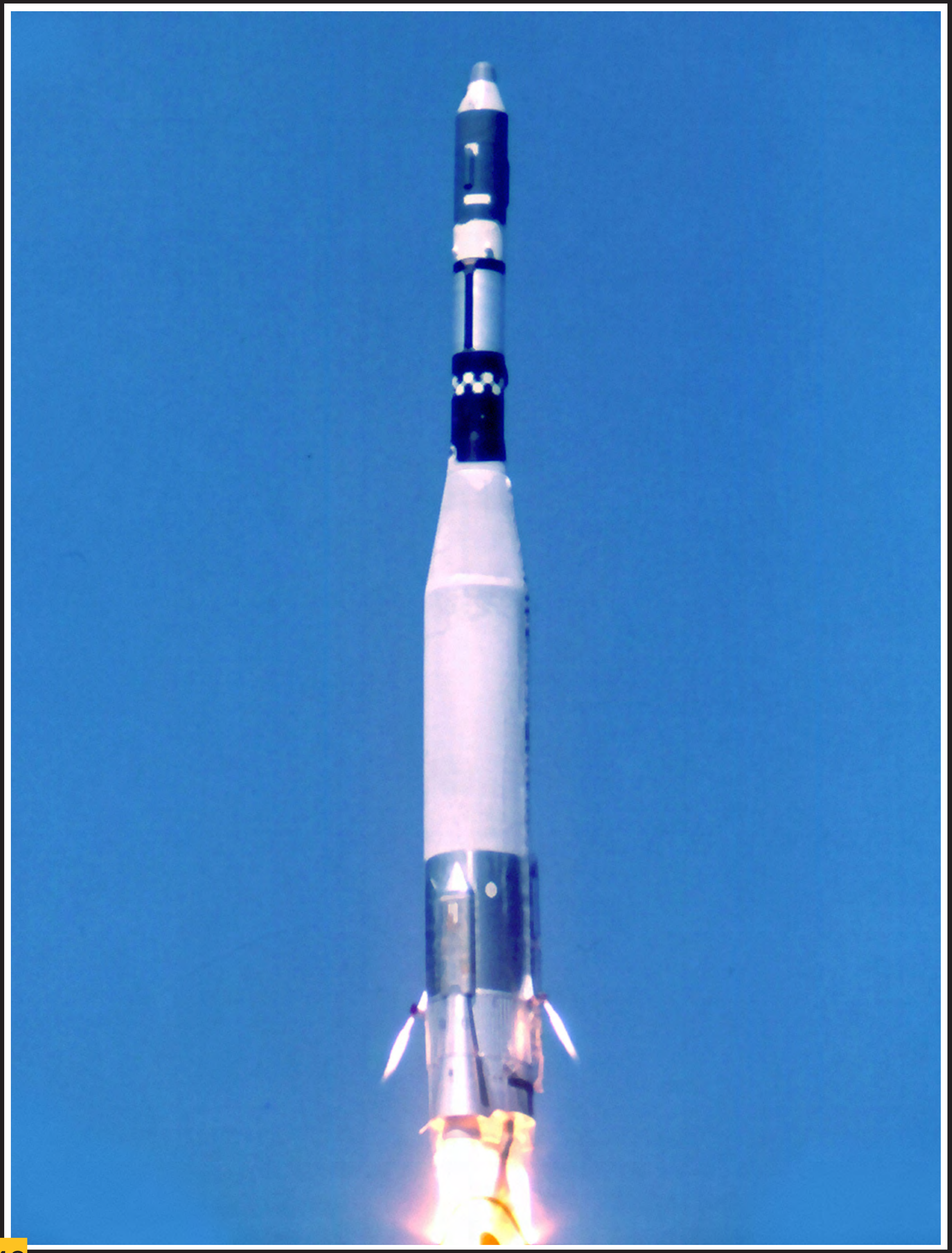
Gambit-1 completed 28 successful missions, with each carrying 3,000 feet of film and having a mission life between one and eight days. Gambit-3 completed 50 successful missions and carried up to 12,241 feet of film on each flight. Gambit-3's average mission life was 31 days and its longest mission was 129 days. In addition to providing invaluable contributions to national security, the Gambit photoreconnaissance systems saved the U.S. billions of dollars in weapons development costs. The imagery provided by the Gambit missions uncovered the weapons capabilities of U.S. adversaries and enabled the U.S. to design cost-effective counter weapons.

The Gambit systems operated from 1963 to 1984 providing the U.S. with exceptional high resolution capabilities from space for more than two decades. The majority of the Gambit system was declassified in 2011, although a few limited details remain classified.

Gambit-1 (KH-7) - Atlas Agena launch - 6 September 1963.



Gambit-1 (KH-7) - Atlas Agena launch - 23 September 1964.



Gambit-1 (KH-7) - Atlas Agena launch - 23 October 1964.

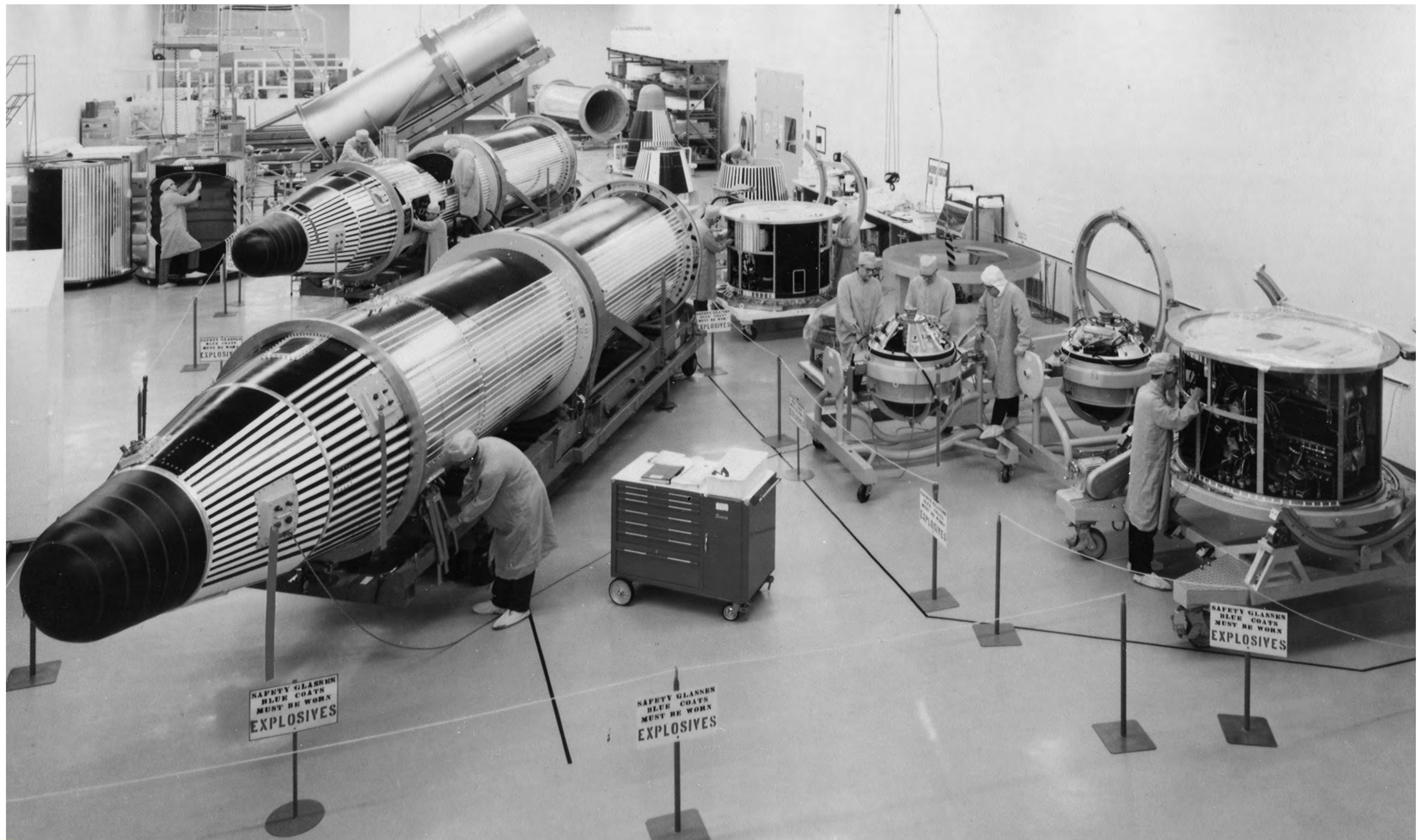
Gambit-1 (KH-7) image of the U.S. Capitol - 19 February 1966.

Gambit-1 (KH-7) image of a Space Tracking Radar Facility - 10X - 28 May 1967.

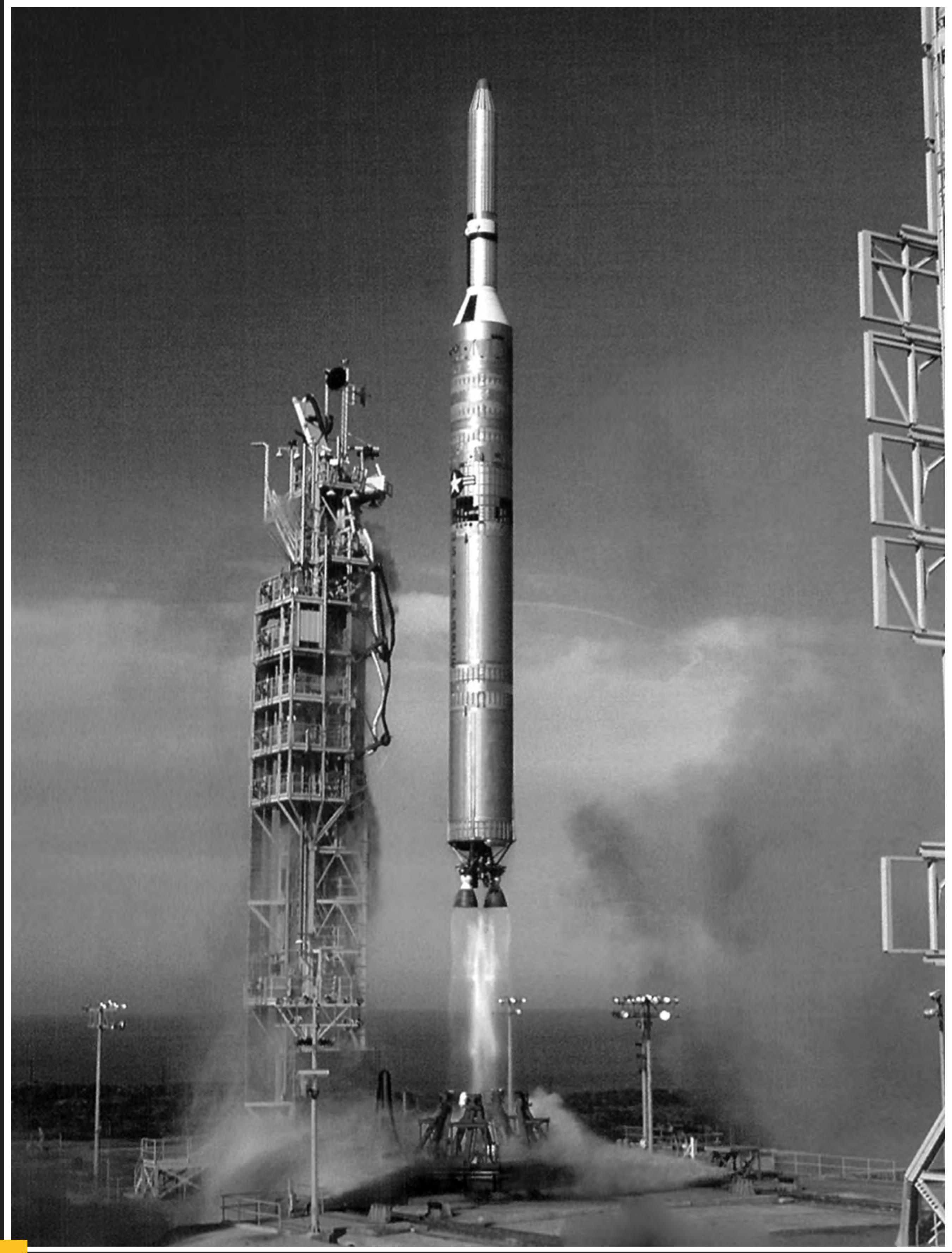
Gambit-1 (KH-7) image of a Space Tracking Radar Facility - 25X - 28 May 1967.

Gambit-1 (KH-7) image of a Plesetsk ICBM Complex - 9 June 1967.

Gambit-3 (KH-8) satellite assembly.



Gambit-3 (KH-8) assembly.

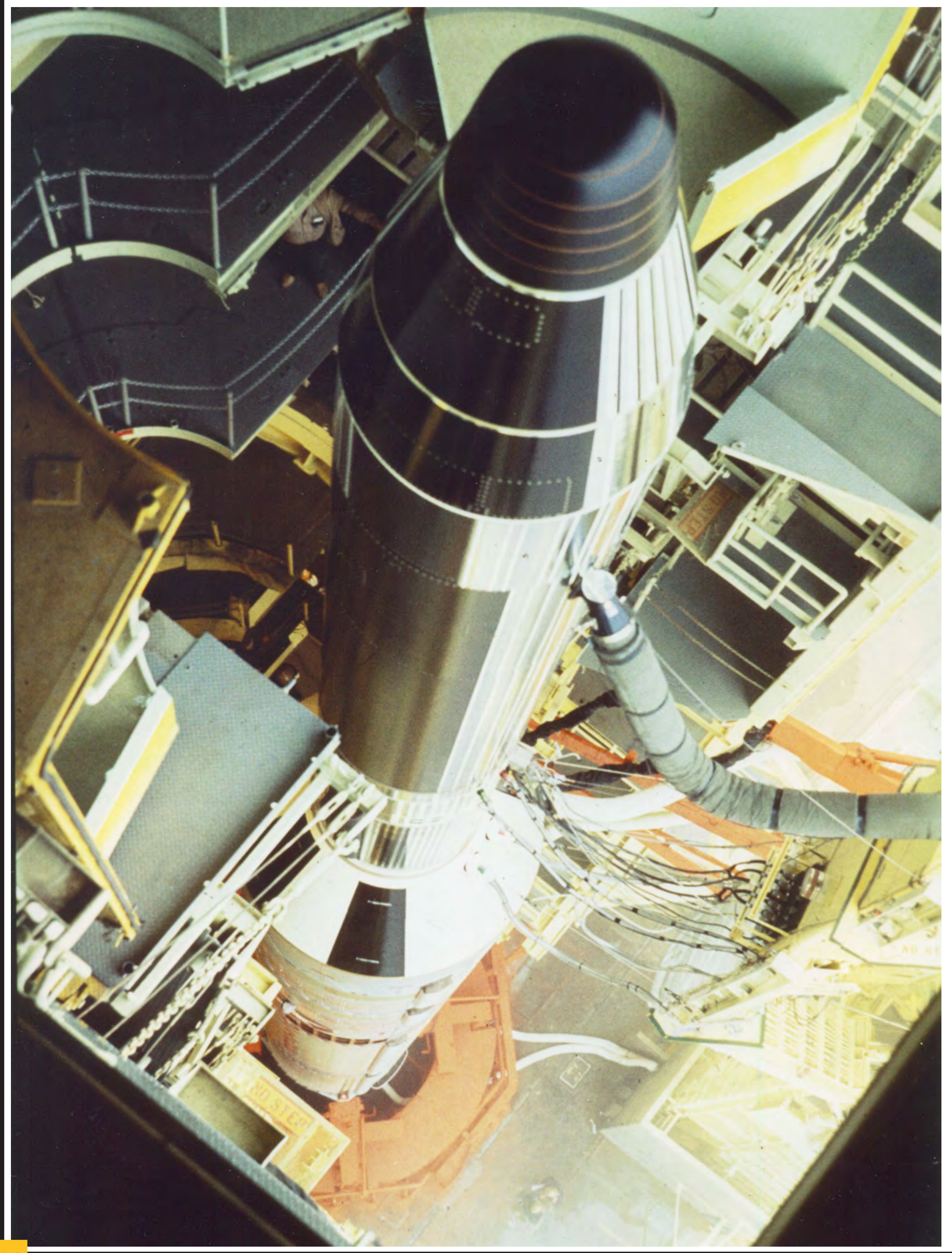


Gambit-3 (KH-8) - Titan Agena launch - 14 December 1965.

Gambit-3 (KH-8) - Titan IIIB Agena launch - 28 May 1979.

Gambit-3 (KH-8) - Titan IIIB Agena launch - 15 April 1983.

Gambit-3 (KH-8) launch.



Gambit-3 (KH-8) integrated with Titan IIIB Agena on launch pad.

Gambit-3 (KH-8) image of Kaspiysk, Soviet Union- 19 March 1968.

Gambit-3 (KH-8) image of Tyuartam Missile Test Center - 19 September 1968.

C-130 aircraft recovering parachute with Gambit satellite payload.

Gambit-3 (KH-8) image of a Typhoon Class submarine - 10 October 1982.

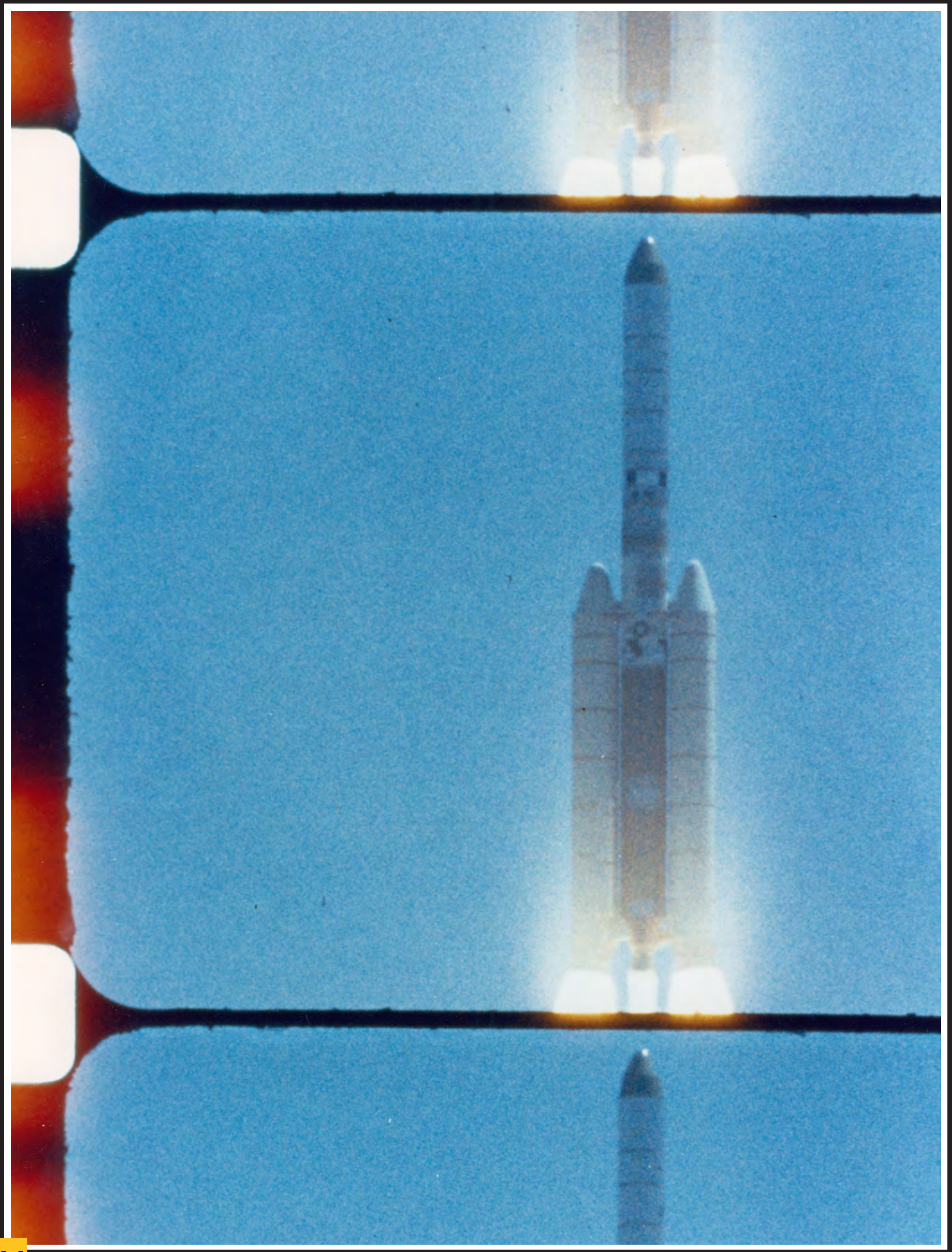
Hexagon (KH-9) pre-launch - 15 June 1971.

HEXAGON

Hexagon was the last operational U.S. film-return imagery satellite system. It was an advanced wide-area search and mapping satellite system that was intended to replace both the wide-area search capabilities of Corona and the high resolution surveillance capabilities of Gambit. The optical components of Hexagon were not able to improve upon the ground resolution already available within the Gambit system and ultimately led to the decision to use Hexagon as the wide-area search satellite to replace Corona. Although Hexagon first flew in 1971, the program officially began in 1964 at the Central Intelligence Agency when its first concepts were proposed and work started. Hexagon's innovative capabilities enabled up to four recovery capsules, extended mission life, and improved ground resolution for collecting mapping data and intelligence information of strategic importance to the U.S.

Much larger than either the Corona or Gambit satellites, the Hexagon vehicle was nearly 60 feet in length (the size of a locomotive engine) and weighed around 30,000 pounds. It carried two mission camera systems—a panoramic camera to search for intelligence targets and a mapping camera to gather mapping data. The panoramic camera's wide-area search capabilities could image a ground distance of 370 nautical miles, roughly the distance between Cincinnati, Ohio and Washington, DC. The mapping camera used terrain and stellar cameras, and a separate recovery bucket; allowing the mapping camera to operate independently and at the same time as the panoramic camera system. Hexagon missions carried between 175,000 and 300,000 feet of film and the later missions could remain in orbit for more than 200 days.

Throughout its operational life, Hexagon played a prominent role in U.S. national security. Hexagon satellites served as one of the key national technical means that the U.S. used to monitor the Soviet Union's compliance with the Strategic Arms Limitation Talks Agreement. Hexagon also acquired intelligence about adversaries' strategic weapons deployment and industrial and agricultural production. Hexagon continued this invaluable intelligence service until 1986 when, after 19 successful launches, the 20th and last Hexagon satellite was lost during a launch explosion bringing to an end the era of film-return satellites. The Hexagon program was declassified in 2011.



Hexagon launch.

Hexagon (KH-9) assembly.

Hexagon (KH-9) mapping camera image of Kubinka Airfield - 40X - 6 April 1979.

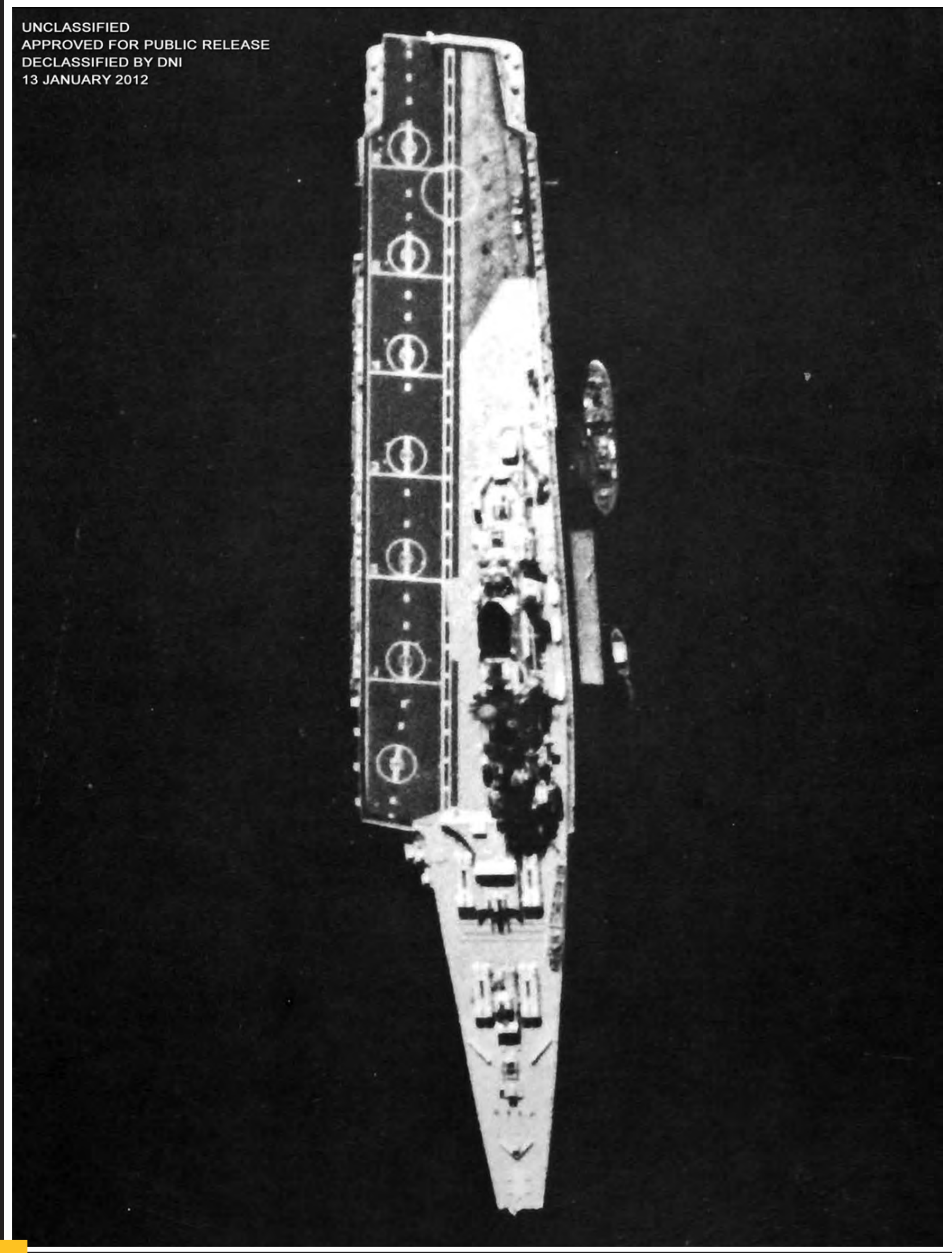
Hexagon (KH-9) launch.

Hexagon Mark VIII recovery parachute and film canister.

Recovery of ripped Hexagon parachute with payload.

Hexagon (KH-9) mapping camera image of Moscow - 10X - 6 April 1979.

Hexagon (KH-9) mapping camera image of Kubinka Airfield - 150X - 6 April 1979.

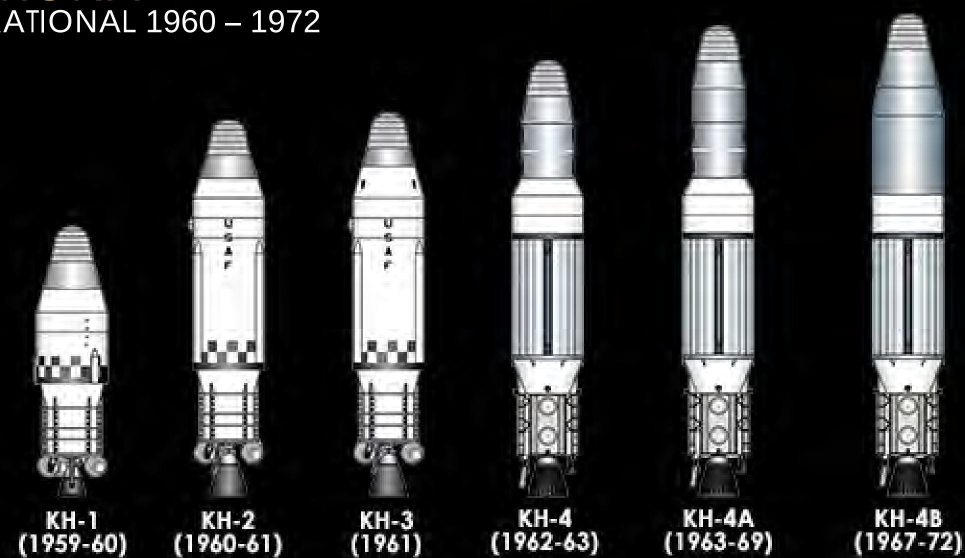


Hexagon (KH-9) panoramic camera image of Soviet Kiev-class carrier - July 1980.

Hexagon (KH-9) panoramic camera image of Deep Space Tracking Antenna, Simferopol - September 1982.

FILM RETURN SATELLITE SPECIFICATIONS

CORONA
OPERATIONAL 1960 – 1972



Corona KH-1, KH-2, KH-3

CAMERA SYSTEM CHARACTERISTICS

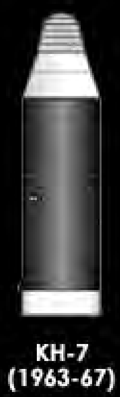
- Lens: 24 Inch Focal Length
- Film Payload: 1,200 to ≈ 5,000 Feet
- Resolution: 20 - 40 Feet
- One Film Recovery Capsule

KH-4, KH-4A, KH-4B

CAMERA SYSTEM CHARACTERISTICS

- Lens: 24 Inch Focal Length
- Film Payload: ≈ 5,000 to 48,000 Feet
- Resolution: 6 - 10 Feet
- One or Two Film Recovery Capsules

GAMBIT-1
OPERATIONAL 1963 – 1967

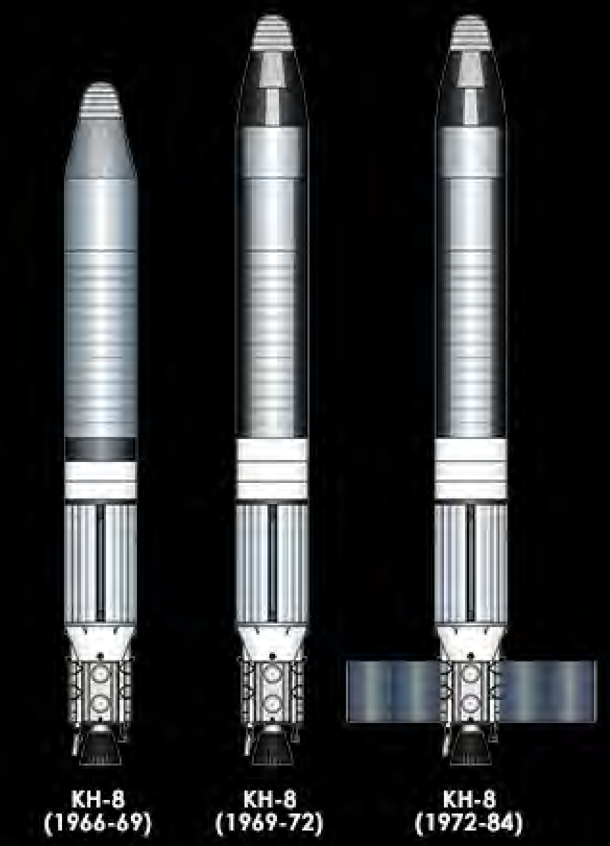


Gambit-1/KH-7

CAMERA SYSTEM CHARACTERISTICS

- Lens: 77 Inch Focal Length
- Film Payload: 3,000 Feet
- Resolution: 2 – 3 Feet
- One Film Recovery Capsule

GAMBIT 3
OPERATIONAL 1966 – 1984

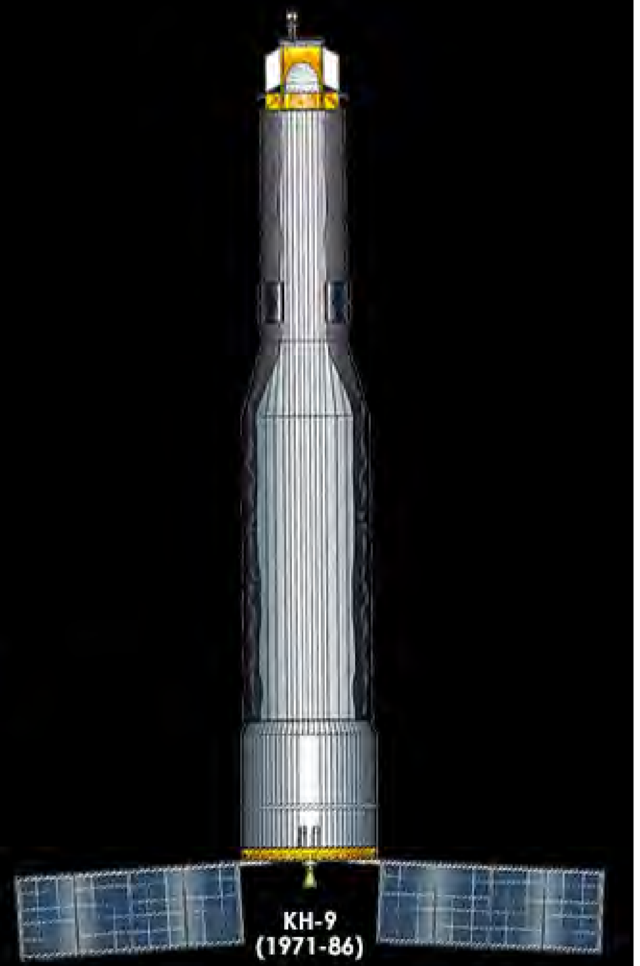


Gambit 3/KH-8 - 1966 - 1984

CAMERA SYSTEM CHARACTERISTICS

- Lens: 175 Inch Focal Length
- Film Payload: Up to 12,200 Feet
- Resolution: Better Than 1 Foot
- One or Two Film Recovery Capsules

HEXAGON
OPERATIONAL 1971 – 1986



KH-9 Panoramic Camera

CAMERA SYSTEM CHARACTERISTICS

- Lens: 60 Inch Focal Length
- Film Payload: 320,000 Feet (60 Miles)
- Resolution: 2 - 7 Feet
- Four Film Recovery Capsules

KH-9 Mapping Camera

CAMERA SYSTEM CHARACTERISTICS

- Lens: 12 Inch Focal Length
- Film Payload: 3,000 to 6,000 Feet
- Resolution: 30 - 35 Feet
- One Film Recovery Capsule

B-52 with D-21B under each wing.

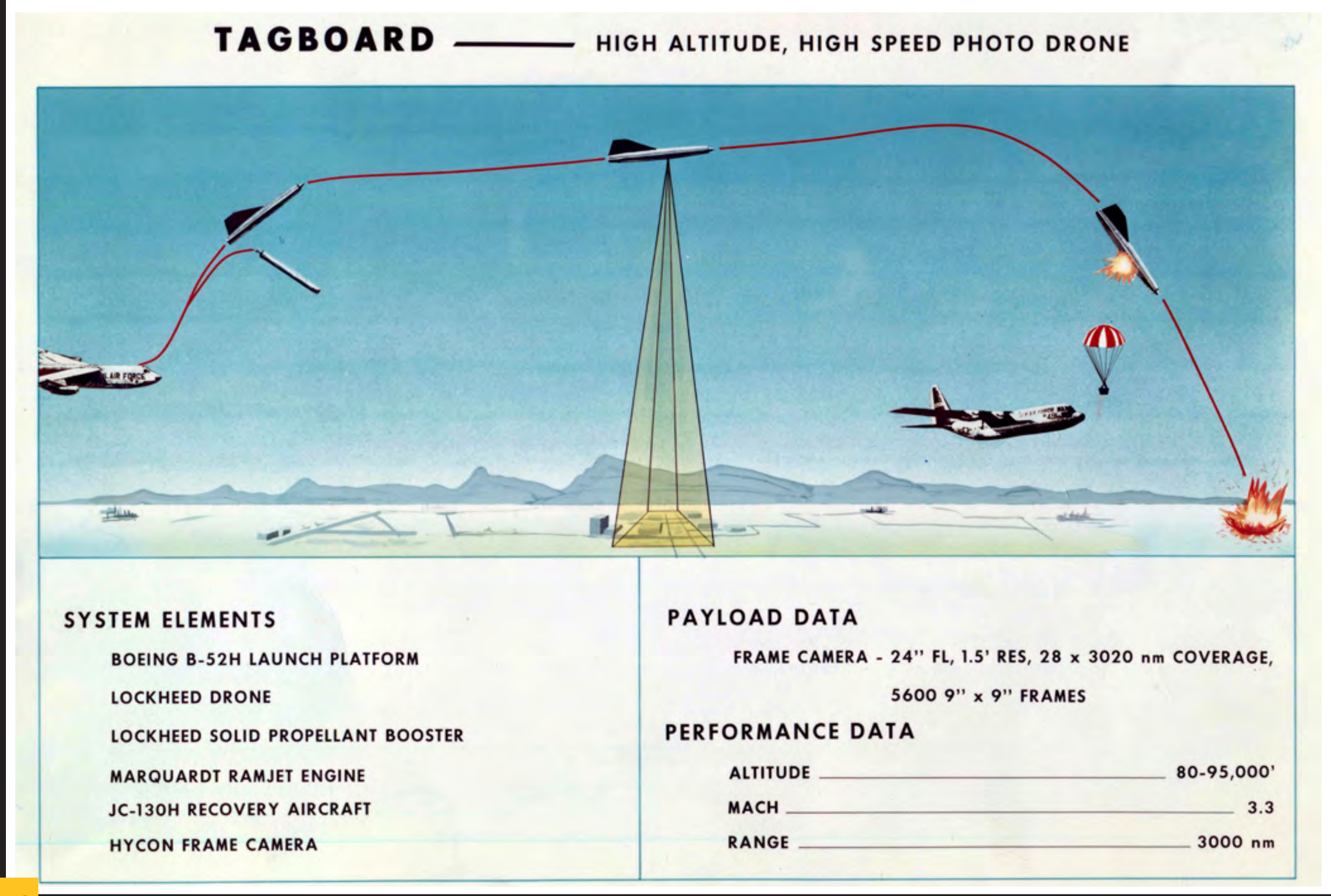


Diagram of D-21 Drone (Codename TAGBOARD).

EXPERIMENTAL PROGRAMS

It can be difficult to imagine that failure is often the foundation on which success is built. When something has never been done before, risks must be taken to achieve goals and repeated failures contribute to learning. For example, the Corona program experienced 13 failures in a row before achieving the first successful mission. Each failure resulted in learning and brought adjustments and corrections that were applied to the next attempt in our maiden quest to use space and satellites for collecting imagery intelligence. On the other hand, it is difficult to accept that a program is successful from the start, but is then quietly shelved and not put into service until decades later while other elements of the program mature; such is the case with Quill, one of the NRO's very early experimental programs. Some experimental programs will be successful, others will not, but what is critical is that failures lead to learning, and that those lessons are applied to future activities.

Over the years, the NRO has had several experimental programs to develop and test new and different approaches to achieving the mission, or to test cutting edge technology that will create new vehicles for collecting intelligence information of our adversaries. Three of NRO's early experimental programs were Quill, the D-21 Drone, and the Manned Orbiting Laboratory (MOL).

MOL test launch vehicle.

Quill pre-launch.

QUILL

In April 1960, the U.S. Army unveiled pictures of American cities that had been taken at night and through cloud cover using a synthetic aperture radar (SAR) system mounted inside a small aircraft. Realizing the potential of radar imagery, the U.S. Air Force was very interested in learning if this new technology could be used in conducting battle damage assessments without waiting for appropriate weather conditions that were favorable to other optical sensor platforms. This emerging technology, which traces back to World War II radar navigation systems, received significant interest from people and organizations involved in reconnaissance activities.

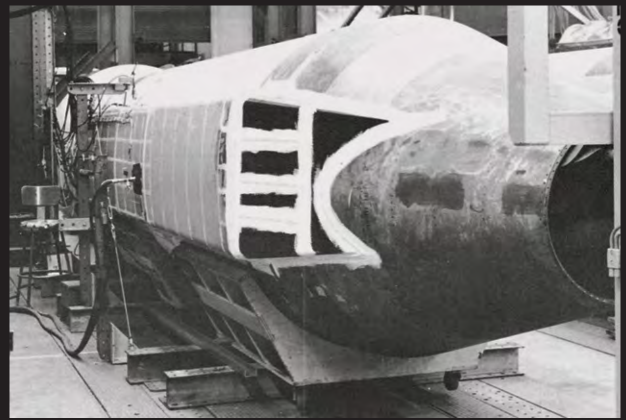
In late 1962, the Director of the NRO, Dr. Joseph Charyk, directed Major David D. Bradburn (USAF) to lead project Quill. The project was an experimental effort within the NRO to determine if the collection of usable synthetic aperture radar imagery from satellites was feasible. The Quill project was purely a test of technology and not intended to be an operational program that would subsequently build a series of satellite collection platforms.

Bradburn successfully paired off-the-shelf equipment and technology with experienced personnel from Goodyear Aerospace and the Lockheed Missiles and Space Company to quickly and efficiently get the satellite off the ground. Quill was designed to collect radar returns on tape spooled within the satellite and then transmit the data back to collection sites on earth. The first and only Quill radar satellite was launched on 21 December 1964. The satellite worked so well that a second planned launch was cancelled because all of the original program objectives had been met during the first launch.

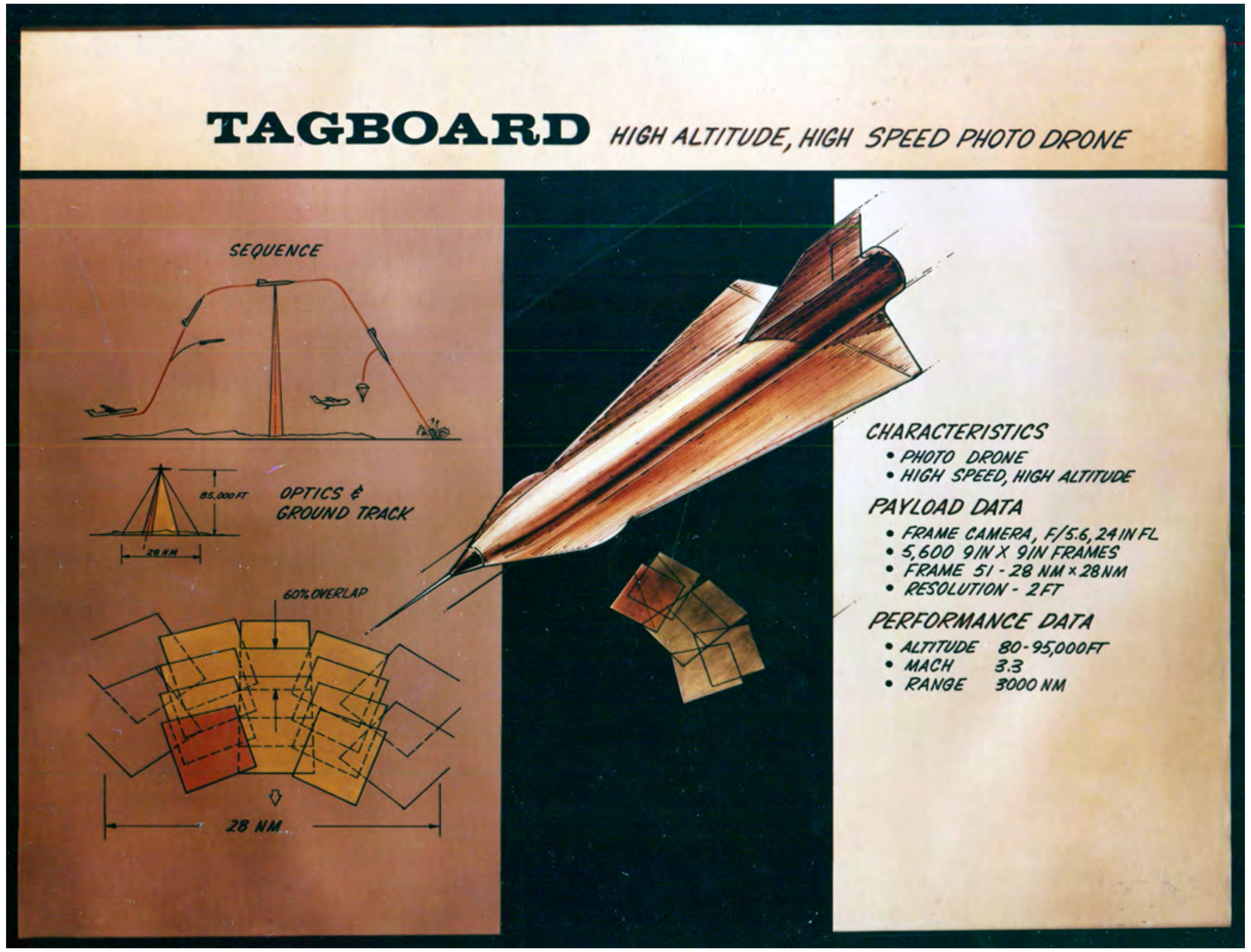
The Quill project was a resounding success. At the conclusion of the Quill flight, it was found that usable synthetic aperture radar imagery could indeed be collected from satellites; although at the time, the resolution of the Quill imagery was relatively poor, and it still would be many years before the Intelligence Community would be able to build a usable radar satellite. Due to the limited scope of the experiment and Bradburn's leadership, Quill was the only early NRO program to be completed on time and under budget.

As with many highly classified programs of the era, at the conclusion of the work, all of the equipment was either destroyed as part of security protocols or repurposed onto other programs, therefore no physical artifacts remain of the Quill program, and only one photo of the satellite vehicle is known to exist. Bradburn achieved the rank of Major General and became the Director of NRO's Program A. On 27 November 2009 the Director of National Intelligence approved the declassification of the fact of Quill as a 1964 NRO experiment in radar imagery. However, the majority of other information about the Quill program remains classified.

Quill Experimental Radar Satellite
Launch: 21 December 1964
Number of Launches: 1
Mission duration: 96 Hours
Manufacturer: Lockheed & Goodyear



Unfortunately the small poor quality photo above is the only surviving photo of the Quill radar satellite.



Top: Artist Illustration of D-21 Drone, Bottom: B-52 with D-21B under each wing.

D-21 DRONE

In October 1962, the CIA authorized Lockheed to develop a highly-advanced, remotely piloted, supersonic reconnaissance aircraft, known as the D-21. The drone aircraft was designed by Lockheed's "Skunk Works" engineering division to conduct high-altitude surveillance missions over exceptionally hostile territories. Launched from an airborne carrier "mothership," the D-21 was powered by a Marquardt ramjet engine that propelled it at speeds over 2,000 mph (Mach 3+). The Lockheed M-21 Blackbird motherships used the previously designed A-12 base aircraft that were then re-designated as M-21s when the D-21 "daughter" drones were carried on top.

During a reconnaissance mission, the D-21 would follow a pre-programmed flight path over areas of interest. The drone would then return to international airspace, where the reconnaissance package, equipped with its own parachute, would eject and be recovered in mid-air by specially equipped aircraft or at sea by ships. Shortly after the film package was jettisoned, the drone would self-destruct.

One of the two M-21 motherships was lost in a D-21 testing launch accident in 1966 that killed the Launch Control Officer. The M/D-21 project was canceled after just four flight tests, but the D-21 drone was further adapted in the late 1960s to be launched from B-52H bombers. This later version, designated D-21B and paired with a large, solid-propellant rocket for launch, flew the only operational missions. D-21Bs were used on four operational flights over Asia, but none of these missions fully succeeded. Skunk Works built 38 drones, but the U.S. Air Force canceled the program in 1971 and put the remaining D-21s in storage until decades later when several were placed in various museums around the country.

Begun in the early 1960s by NRO's Program D, the D-21 was a ramjet-powered pilotless drone designed to be launched from the back of a modified A-12 and fly even higher and faster than the A-12. After a fateful accident involving one of the modified A-12s, the design was altered to be launched from under the wing of a modified B-52, which was less dangerous to the carrier aircraft. The D-21 drone incorporated many design features of the A-12, including the use of non-metallic components and insulated fuel propulsion parts to help reduce infrared detection. However, after several test flight failures and the drone's mission becoming less essential, the program was cancelled in 1971.

D-21 Technical Notes:

Construction: Titanium with small radar cross section

Propulsion: One Marquardt RJ43 ramjet of 12,000 pounds thrust
Solid propellant rocket booster

Maximum speed: 2,000+ mph (Mach 3+)

Range: 3,000 nautical miles

Altitude: 80,000 to 95,000 feet

Weight: 11,000 pounds, gross

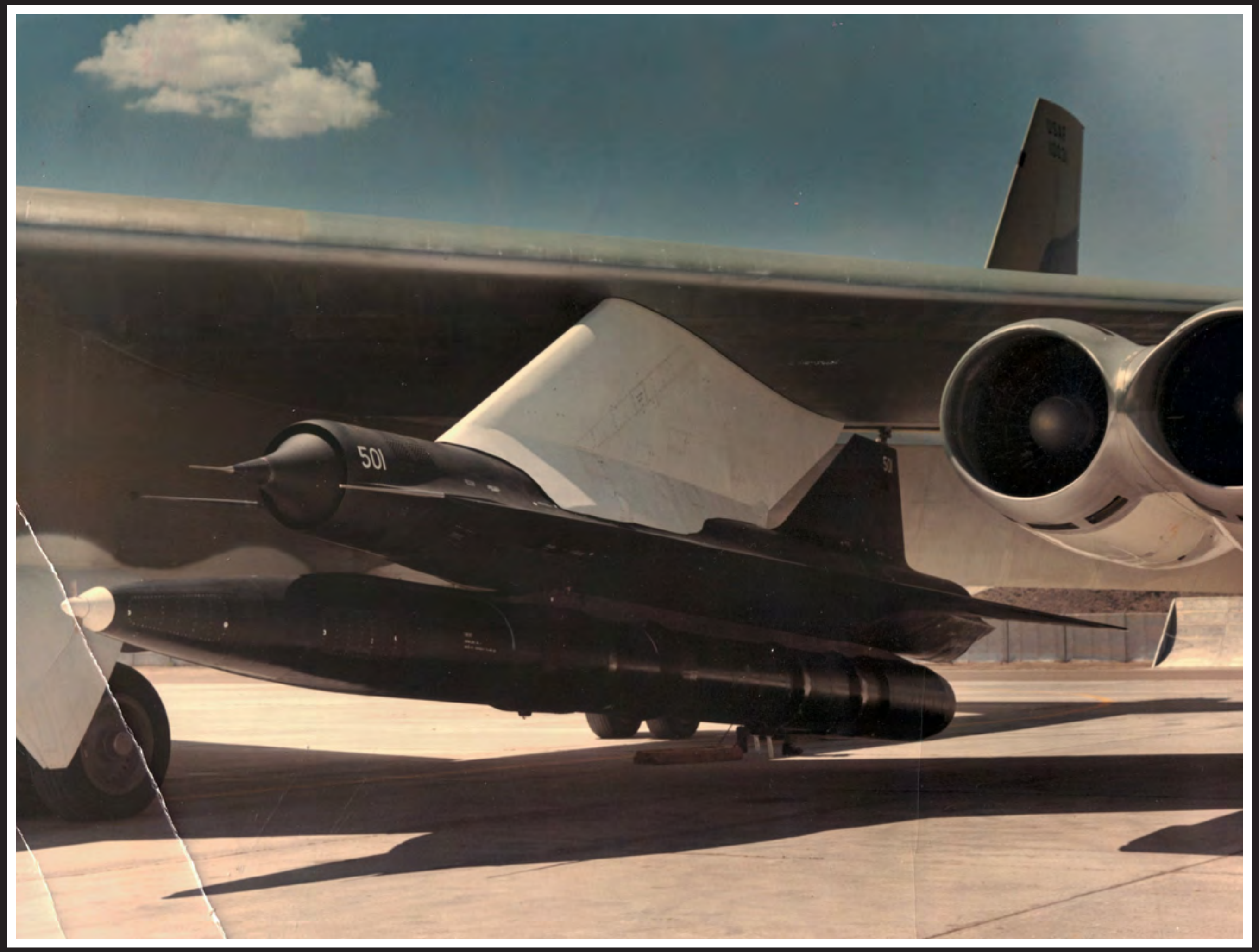
Dimensions: Length – 514.27 inches (42.85 feet)
Wing Span – 288.90 inches (24.075 feet)
Height – 85 inches (7.08 feet)

Payload: Hycon Frame camera (24" fl)

Coverage: 28nm x 3020nm

Resolution: 18 inches

Mission Code Names: TAGBOARD (D-21)
SENIOR BOWL (D-21B)



D-21 drone under a wing of a B-52 aircraft - 1969.

D-21 drone under B-52 wing during inflight refueling.

D-21 drones under the wings of a B-52 in flight.

D-21 drone on tarmac.

MOL test launch vehicle.

MANNED ORBITING LABORATORY

The Manned Orbiting Laboratory (MOL) was a project announced by the U.S. Air Force in December 1963 that was designed to "…increase the Defense Department effort to determine military usefulness of men in space." In other words, use astronauts to conduct a military mission. To the public, this was a major move by the U.S. in an effort to get ahead of the Soviet Union in the ongoing space race, and it called for placing military personnel into orbit to conduct scientific experiments to acquire new knowledge about the capabilities of man in space as related to the national defense, and to develop technology and equipment to advance future manned and unmanned space flights. However, that was only one part of the program – it was the unclassified cover story told to the American public. The other part of the mission, the real mission, was highly classified and managed by an obscure intelligence agency, the unacknowledged National Reconnaissance Office. The classified mission was known to those in the NRO by the compartmented name of Dorian.

Project Dorian, the true and classified objective of the MOL, was to operate a manned reconnaissance station in space that would collect both imagery and signals intelligence. If the program objectives were achieved, the MOL would enable the U.S. to overcome the challenges and limitations of the Corona and Gambit programs – mainly the number of photo-reconnaissance images that were obscured by cloud cover, slow targeting response time, and difficulty in addressing technical issues with an orbiting satellite.

At the time, several military and contractor studies estimated that manned surveillance satellites could acquire photographic coverage of the Soviet Union with resolution better than the best system at the time (the first generation Gambit satellite). Additionally, the Air force billed the MOL as a reconnaissance system that could more efficiently and quickly adjust coverage for crises and targets of opportunity than unmanned systems. The Air Force controlled development of the satellite, which was consistent with MOL's unclassified mission, while the NRO ran development of the covert reconnaissance mission of the program, including the camera system and other subsystems.

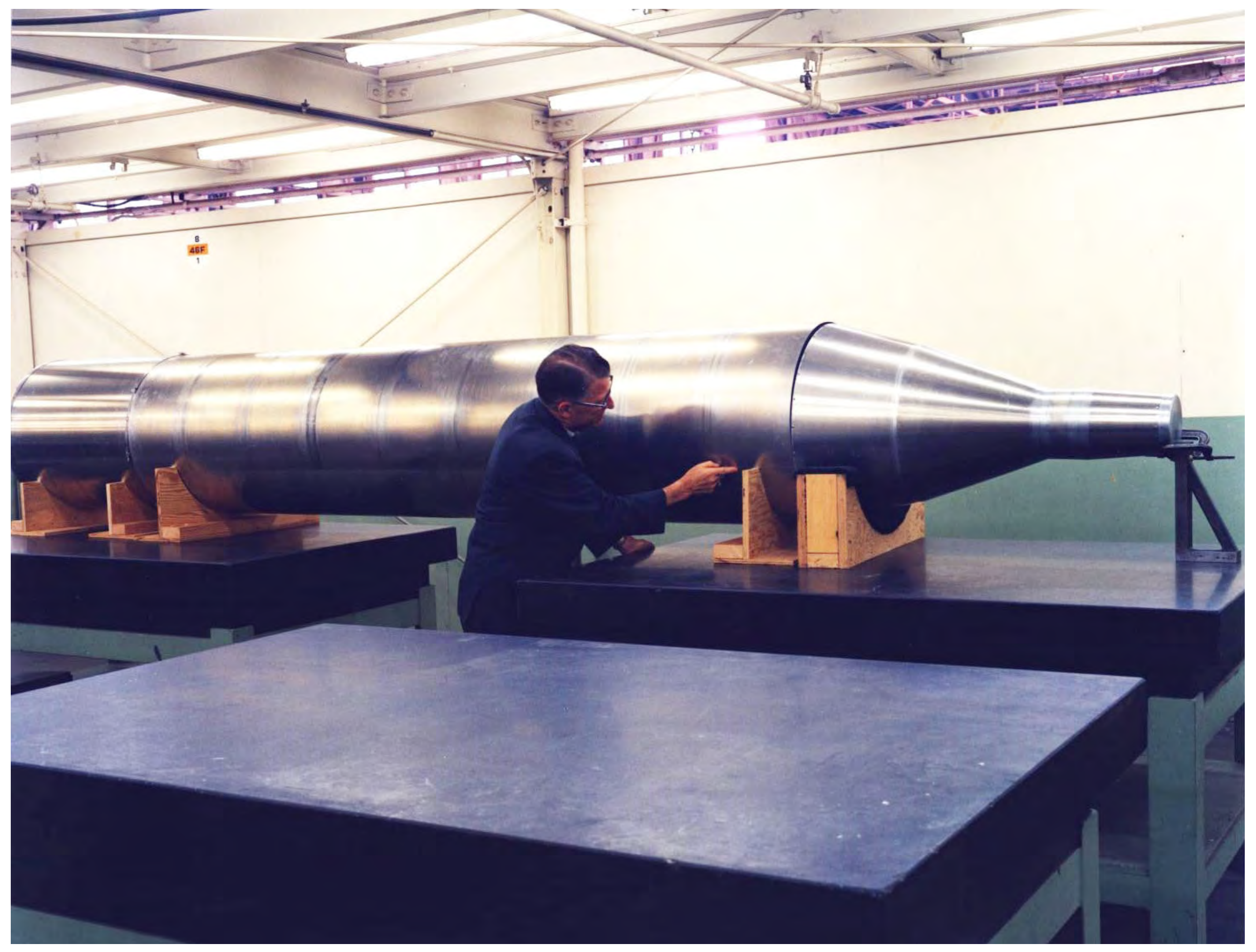
Secretary of Defense McNamara publicly announced the start of the MOL program in December 1963. However, even though the program had support from the military and the President, it was seldom fully funded due to competition from other DoD programs, NASA, and general governmental budgetary pressure. By the time initial studies, planning, and organization were completed and the program was ready to expand into full-scale development and production in the late-60s, budgetary pressure had significantly increased due to NASA's Apollo program and the Vietnam War. At a time when the program required increased expenditures, its budget was being slashed, and as a result, its timelines and costs were expanded and increased. With growing pressure from the expansion of the Vietnam War, the perceived duplication of effort with NASA programs, and improved performance of operating unmanned surveillance systems, in June 1969 the President cancelled the MOL program. The MOL program operated for five and one-half years and spent $1.56 billion, but never launched a manned vehicle into space.

While MOL was not overly successful from a program perspective, it made important contributions to national reconnaissance and space exploration programs. The camera systems were studied for future use on the Hexagon program, the mirror technology was incorporated into a domestic space laboratory, and elements of the technology made advancements that helped achieve longer human based space missions. In addition, many of the astronauts who trained for the MOL program went on to NASA to pilot and fly on space shuttle missions and make important contributions to NASA's space flight programs.

190 MOL group 1 astronauts. From left to right: Crews, Truly, Lawyer, Taylor, Neubeck, Adams, Macleay, Finley.

MOL group 3 astronauts. From left to right: Herres, Lawrence, Peterson, Abrahamson. 191

Fourteen of the seventeen selected MOL astronauts. From left to right, top row: Herres, Hartsfield, Overmyer, Fullerton, Crippen, Peterson, Bobko, Abrahamson. From left to right, bottom row: Finley, Lawyer, Taylor, Crews, Neubeck, Truly.



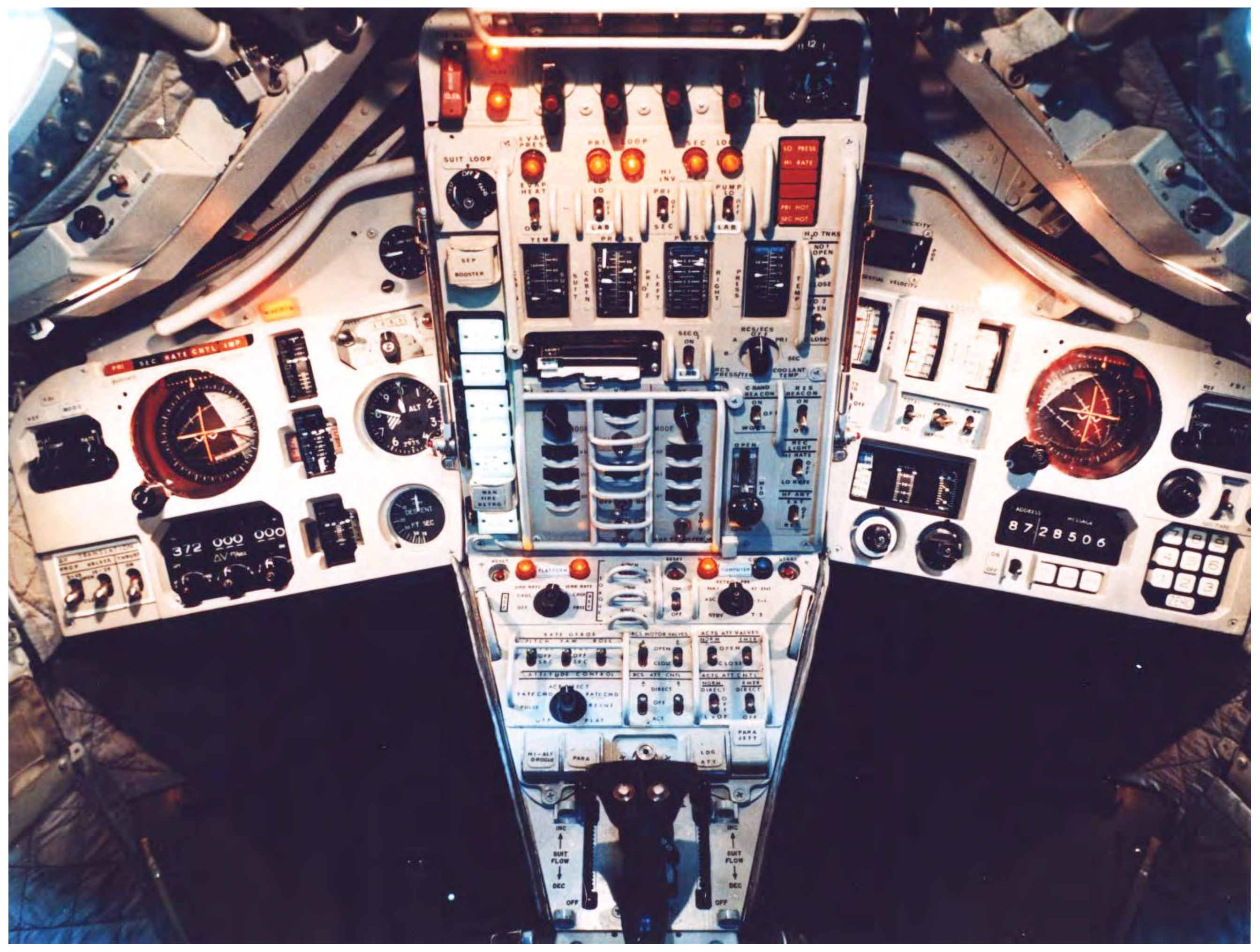
MOL model.

MOL test launch vehicle.

MOL spacesuit test.

MOL interior.

MOL interior.



MOL control panel.

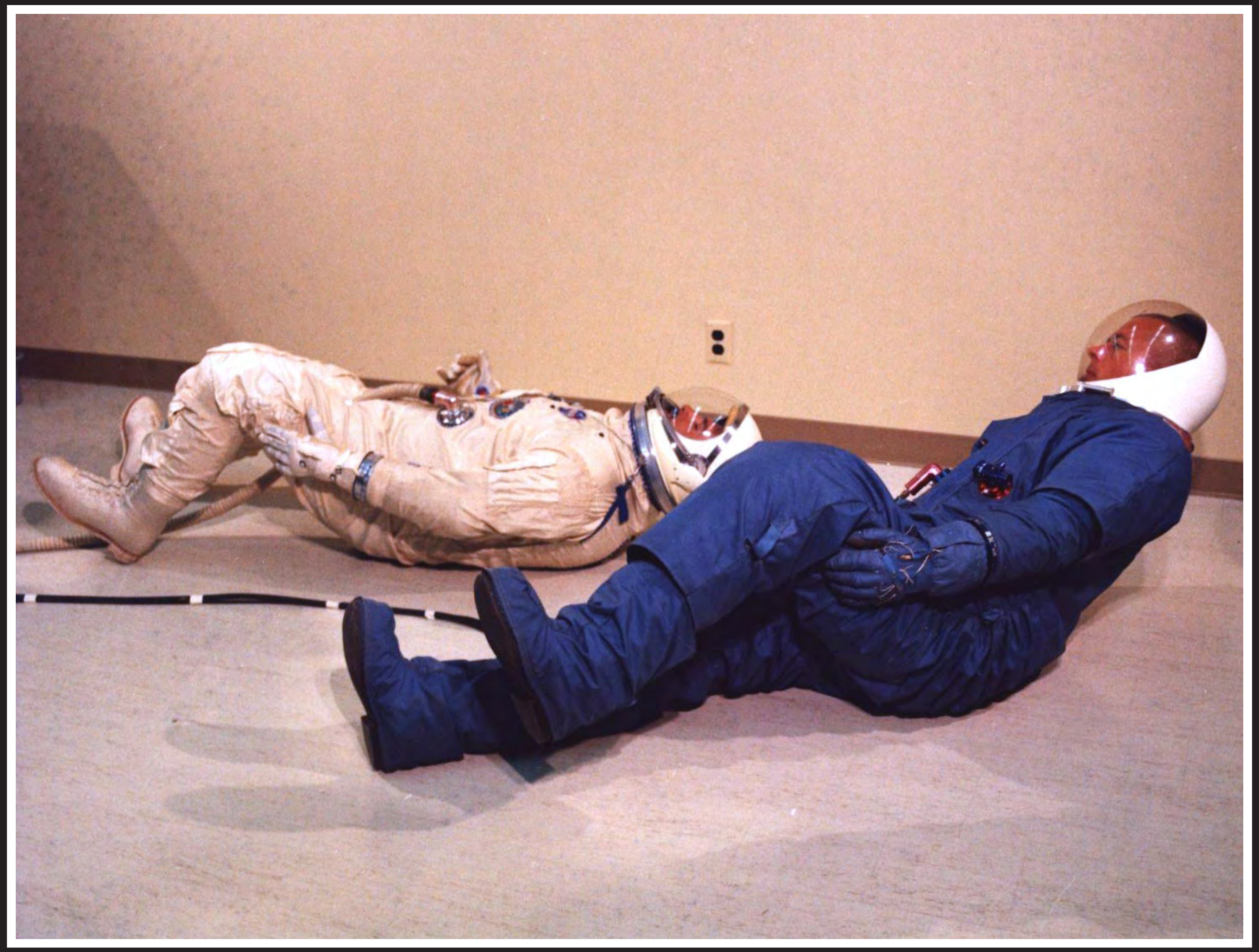
MOL team taking some down time.

MOL interior.

MOL team test spacesuits.

MOL spacesuit testing.

MOL spacesuit test.



MOL spacesuit mobility test.

MOL spacesuit flexibility test.

LAUNCH

The launch of rockets, particularly those large enough to carry satellites into space, cannot be hidden from the public. They make a lot of noise, can be seen for miles, and shake the ground in the vicinity of the launch site. Anyone within hundreds of miles of the launch site is likely to see it and the media can be expected to report on it. However, the situation is made even more complicated when the satellite payloads carried into space are for vital national security missions, and the very existence of the organization carrying out the launch is so highly classified that even saying the words “National Reconnaissance Office” or “NRO” outside of secure and approved facilities is illegal. Such was the case for the NRO satellite launches for more than the first 30 years of NRO’s existence.

The existence of the NRO and very limited details about it was declassified in September 1992; then on 18 December 1996, the NRO made the very first public announcement of a satellite launch. However, information about launches prior to that first announcement remain classified if the program supported by the launch is still classified. Today, the NRO continues to publicly announce its launches although information about the satellite payload and the program it supports are classified and likely will remain so for decades to come.

NROL-101 - Atlas V 531 - launch from Cape Canaveral - 13 November 2020.

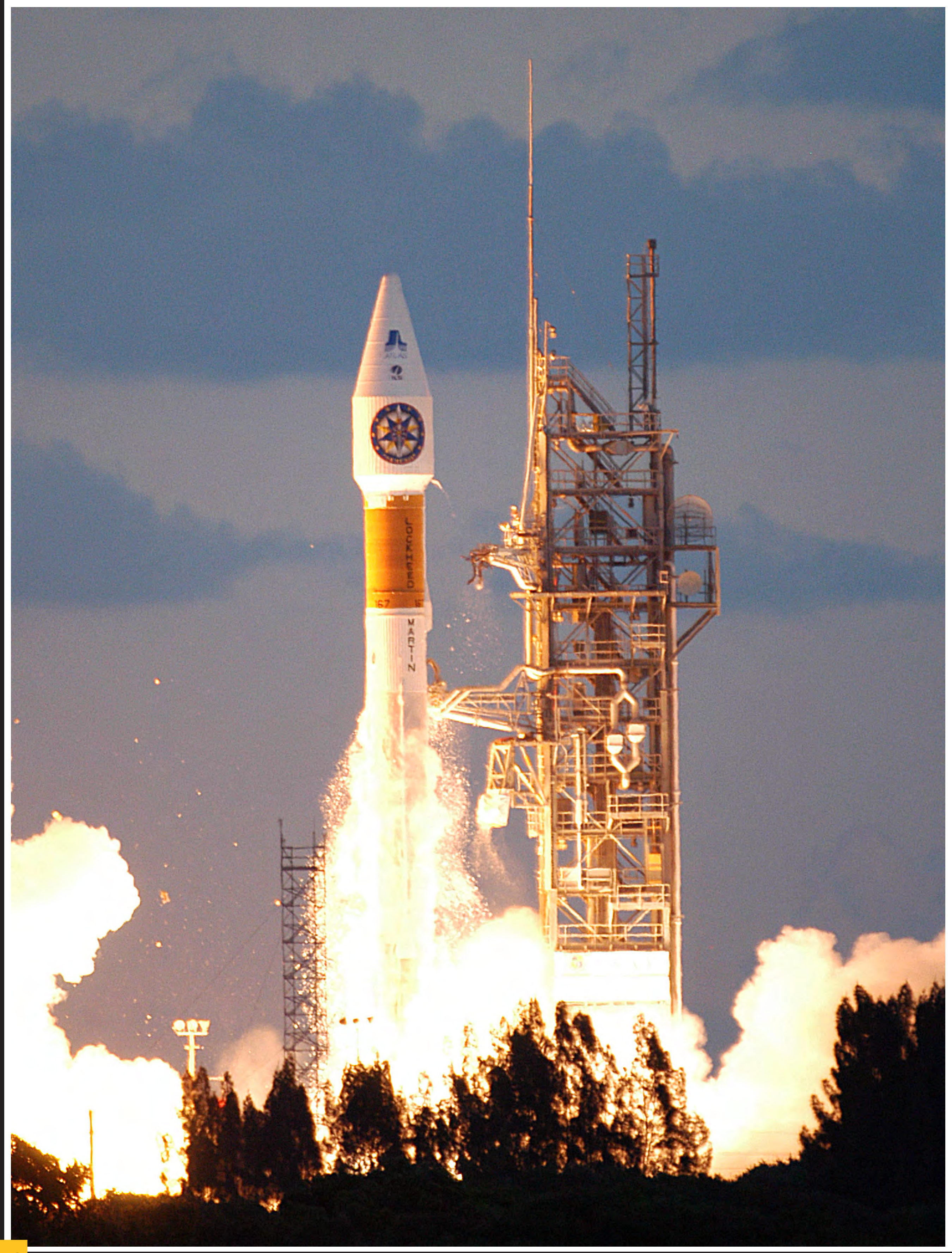
NROL-82 - Delta IV Heavy - launch from Vandenberg - 26 April 2021.

NROL-5 - Atlas IIA - launch from Cape Canaveral - 29 January 1998.

NROL-13 - Atlas IIA - launch from Vandenberg - 8 September 2001.

NROL-12 - Atlas IIAS - launch from Cape Canaveral - 10 October 2001.

NROL-18 - Atlas IIAS - pre-launch at Vandenberg - 2 December 2003.



NROL-1 - Atlas IIAS - launch from Cape Canaveral - 31 August 2004.

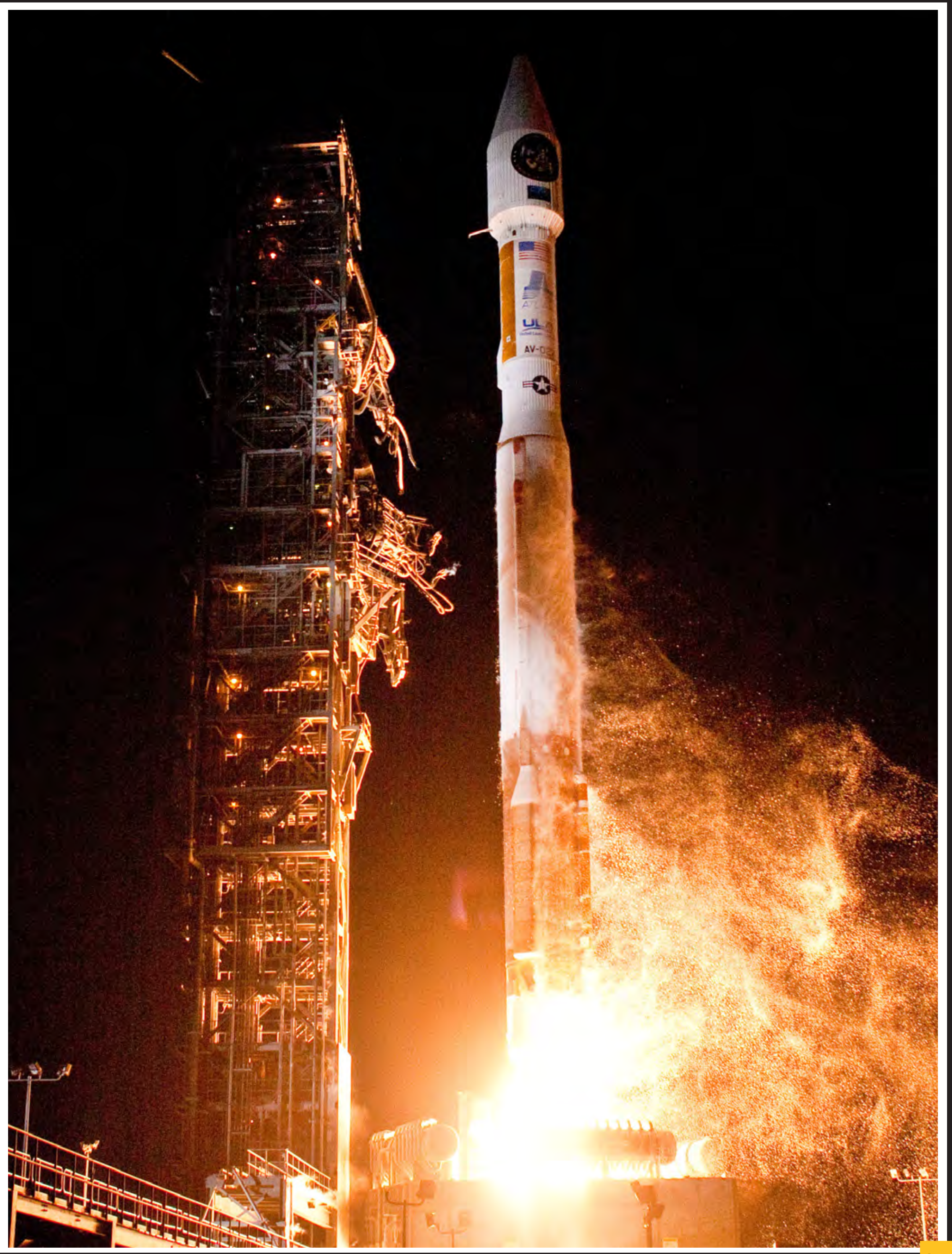
NROL-22 - Delta IV Medium - launch from Vandenberg - 27 June 2006.

NROL-21 - Delta II - launch from Vandenberg - 14 December 2006.

NROL-30 - Atlas V 401 - launch from Cape Canaveral - 15 June 2007.

NROL-24 - Atlas V 401 - launch from Cape Canaveral - 10 December 2007.

NROL-26 - Delta IV Heavy - launch from Cape Canaveral - 17 January 2009.



NROL-32 - Delta IV Heavy - pre-launch at Cape Canaveral - 21 November 2010.

NROL-34 - Atlas V 411 - launch from Vandenberg - 14 April 2011.

NROL-25 - Delta IV M+ - launch from Vandenberg - 3 April 2012.

NROL-38 - Atlas V 401 - launch from Cape Canaveral - 20 June 2012.

NROL-15 - Delta IV Heavy - launch from Cape Canaveral - 29 June 2012.

NROL-65 - Delta IV Heavy - launch from Vandenberg - 28 August 2013.

NROL-67 - Atlas V 541 - pre-launch at Cape Canaveral - 10 April 2014.

NROL-33 - Atlas V 401 - launch from Cape Canaveral - 22 May 2014.

NROL-35 - Atlas V - pre-launch at Vandenberg - 12 December 2014.

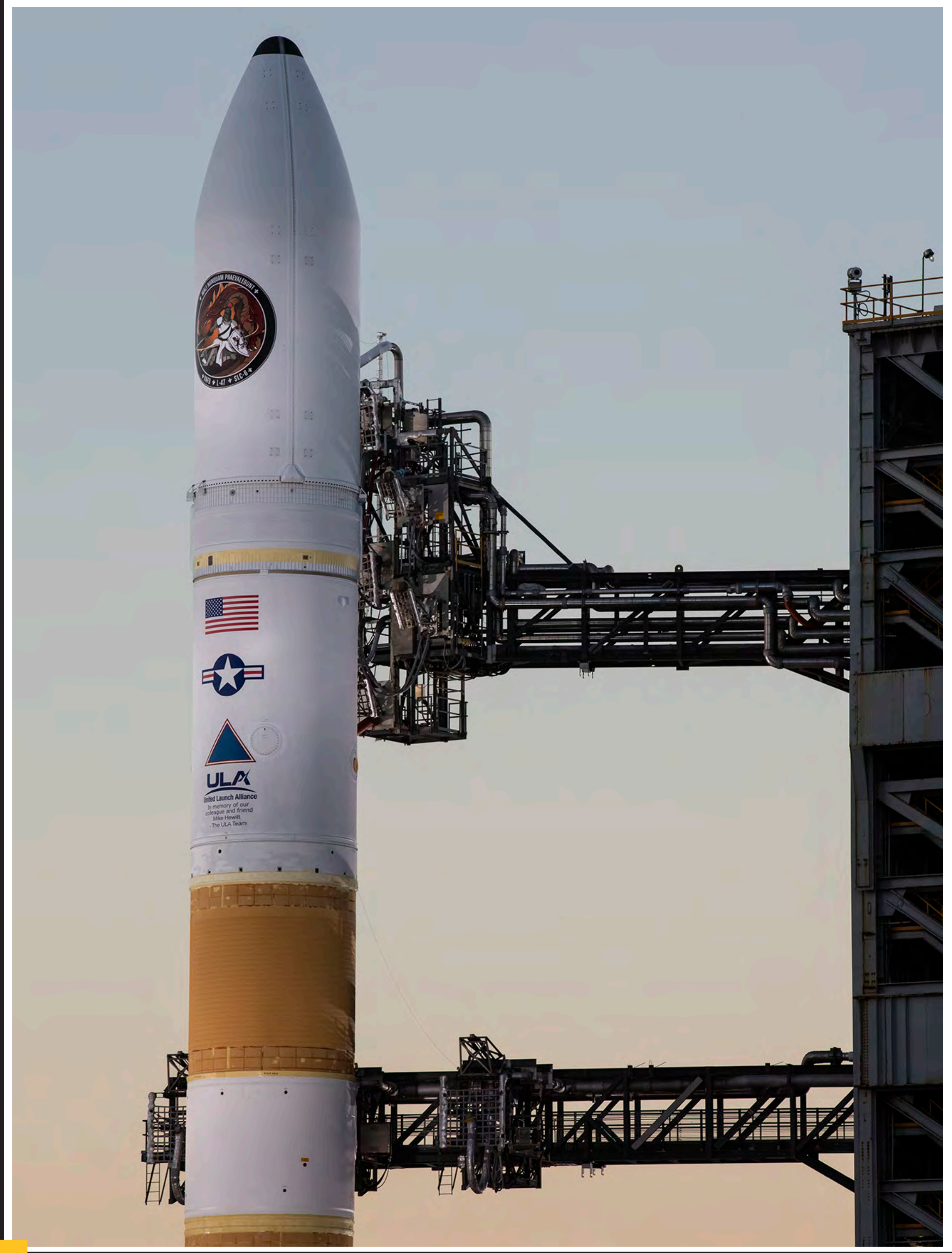
NROL-45 - Delta IV M+ - launch from Vandenberg- 10 February 2016.

NROL-61 - Atlas V 421 - launch from Cape Canaveral - 28 July 2016.

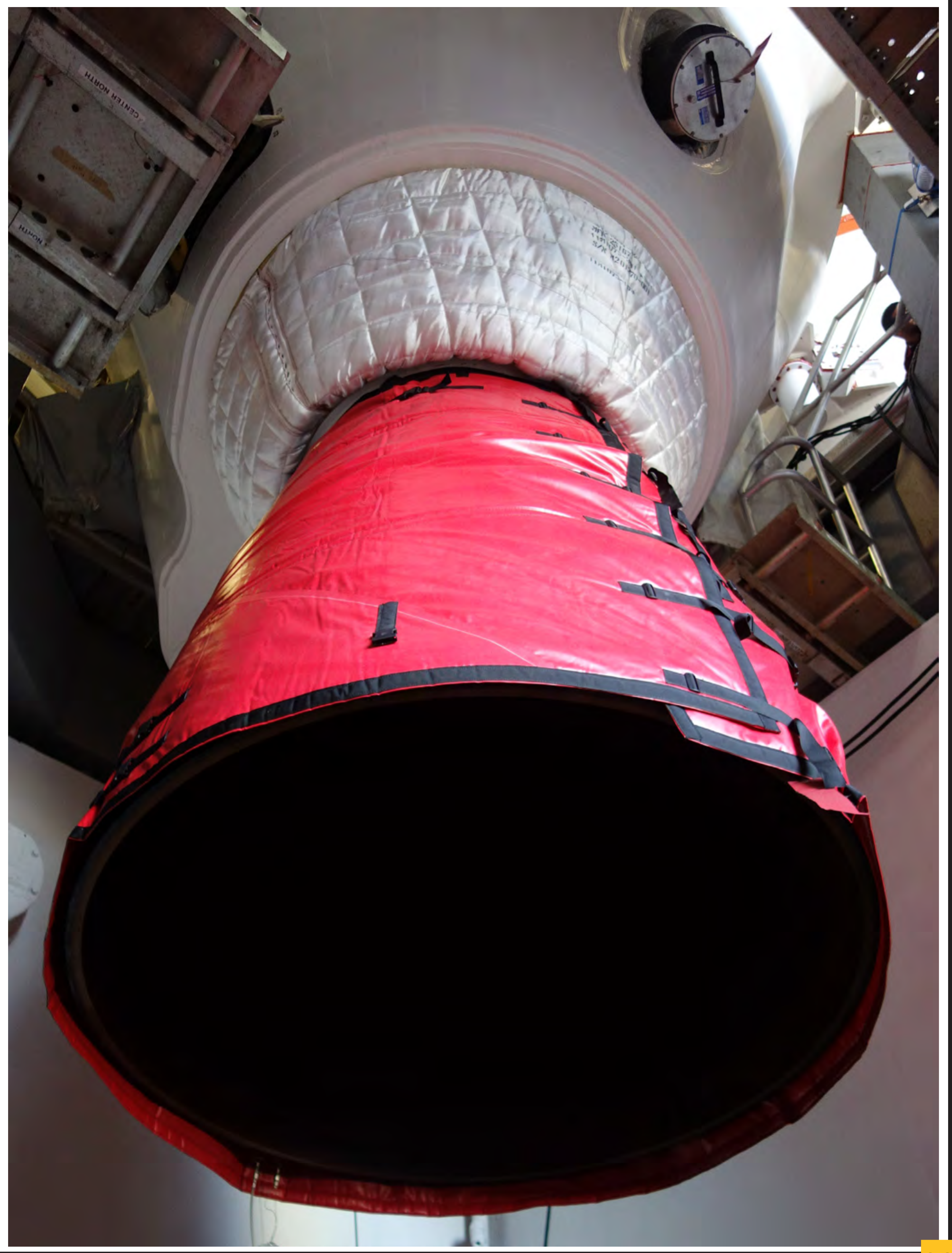
NROL-79 - Atlas V 401 - launch from Vandenberg - 1 March 2017.

NROL-76 - Falcon 9 - launch from Kennedy Space Center- 1 May 2017.

NROL-42 - Atlas V - pre-launch at Vandenberg - 24 September 2017.



NROL-47 - Delta IV - pre-launch at Vandenberg - 12 January 2018.



NROL-71 - Delta IV Heavy - pre-launch at Vandenberg - 19 January 2019.

NROL-71 - Delta IV Heavy - launch from Vandenberg - 19 January 2019.

NROL-151 - Electron - launch from Complex-1 New Zealand - 31 January 2020.

NROL-129 - Minotaur IV - launch from Wallops Flight Facility - 15 June 2020.

NROL-101 - Atlas V 531 - launch from Cape Canaveral - 13 November 2020.

NROL-108 - Falcon 9 - launch from Kennedy Space Center - 19 December 2020.

NROL-44 - Delta IV Heavy - pre-launch at Cape Canaveral - 10 December 2020.

NROL-44 - Delta IV Heavy - pre-launch at Cape Canaveral - 10 December 2020.

NROL-44 - Delta IV Heavy - pre-launch at Cape Canaveral - 10 December 2020.

NROL-82 - Delta IV Heavy - launch from Vandenberg - 26 April 2021.

NROL-82 - Delta IV Heavy - launch from Vandenberg - 26 April 2021.

NROL-82 - Delta IV Heavy - launch from Vandenberg - 26 April 2021.

NROL-85 - Falcon 9 - pre-launch at Vandenberg - 17 April 2022.

NROL-85 - Falcon 9 - pre-launch at Vandenberg - 17 April 2022.

Construction of NRO Westfields facility.

WESTFIIELDS - THE BUILDING OF NRO HEADQUARTERS

When the NRO was established in September 1961, it brought together under one organization all of the overhead reconnaissance efforts from the Navy, Air Force, and Central Intelligence Agency. While the mission of the NRO was consolidated under one organization with a small oversight staff office in the Pentagon, the work and employees were geographically separated from one another across the country. In addition to launch facilities at Cape Canaveral in Florida and Vandenberg Air Force Base in California, there were elements of the NRO at the Pentagon and Central Intelligence Agency in Virginia, the Naval Research Laboratory in Maryland, and additional Air Force efforts in California. That dispersed work force was in place for the first 30 years of NRO's existence, but it became clear that consolidation within one facility was the best option for NRO's continued success as a unified satellite reconnaissance activity.

The decision to collocate the NRO workforce from multiple geographically separated sites began with a series of observations and studies in the mid to late 1980s. During his tenure as NRO Director, Pete Aldridge observed that competition between the NRO's alphabetic programs had become largely counterproductive. In the spring of 1988, NRO's Deputy Director, Jimmie Hill, requested the development of a preliminary plan to collocate all of the NRO into one facility. In February 1989, a team began working on the NRO Restructure Study. Known as the Geiger-Kelly study, the group issued a report in July 1989 that concluded, among other things, that there was "substantial benefit to be gained by the NRO and its users and customers from collocation of the NRO…" For the collocation, the Geiger-Kelly report recommended a three phase approach, with the final step being the purchase of a site for a permanent facility, into which the NRO workforce would relocate. Additionally, in 1992, the Director of Central Intelligence established a task force to continue the review of a restructured NRO. Known as the Fuhrman Panel, the report confirmed the earlier Geiger-Kelly conclusions and recommended completing the collocation effort, which had already begun, by the end of calendar year 1993.

On 15 November 1990, Rockwell International Corporation, acting on behalf of the still classified NRO, purchased the 68 acre tract of land in the Westfields Development of Fairfax County, Virginia, where the current NRO Headquarters now stands. Rockwell was hired as the prime contractor for the project using a pass-through contract. Through this mechanism, the NRO protected its classified status by having Rockwell (and later Boeing Corporation) serve as a cover entity, but without paying fees to Rockwell for hiding the NRO presence. Davis and Dewberry were hired as the architects along with the contract giant Hazel. Later, Hyman was hired to build the first three towers of the complex, which was later expanded to four. Turner Construction was engaged to design the interior of the building. Initial site work and construction of Westfields began in early 1991.

Work proceeded on the NRO's new headquarters compound and the initial construction was proceeding smoothly, but controversy began to swirl due to increased Congressional and public scrutiny over the $350 million top secret project that various members of Congress claimed they were not aware of and had not been approved. After much drama in the press and on Capitol Hill, everyone involved was eventually cleared and vindicated of misleading Congress. The first occupants of Westfields moved into their new office spaces on 11 January 1996.

Aerial of NRO Westfields construction.

Aerial view of construction of NRO Westfields facility.

Construction of the NRO Westfields facility - 1990s.

60th Anniversary Parachutes - Westfield's Main Lobby.

NRO'S 60TH ANNIVERSARY

In 2021, the NRO celebrated the 60th anniversary of its founding with a yearlong series of events that commemorated our achievements and remembered our history. While some of the planned events were curbed by the effects of the global Covid-19 pandemic, itself a significant event in NRO history, the celebration went forward. A wall of signatures of current employees from around the world, presentations, speakers, visual displays, publications, videos, and other events served to remind all who currently serve at the NRO of our rich history. The celebration showcased how far we and our predecessors have pushed the limits of technology, stretched the imagination of what is possible when you bring together the best people, in one place, and with one goal – serving and protecting our nation.

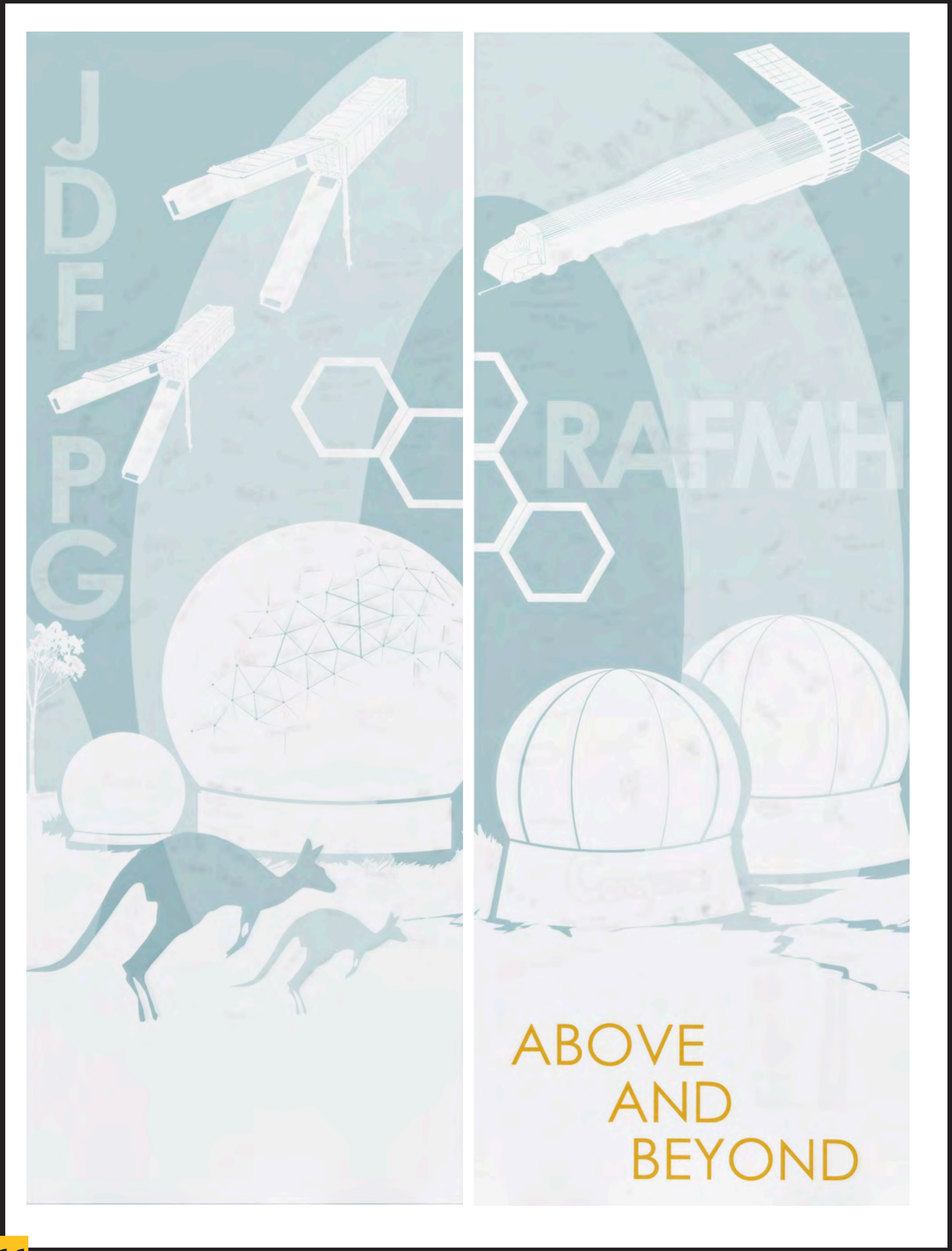
60th Anniversary Signature Panels.

60th Anniversary Signature Panels - Westfield's Panels.

60th Anniversary Signature Panels - ADF-E and Cape Canaveral Panels.

60th Signature Panels - NOPS and ADF-C.

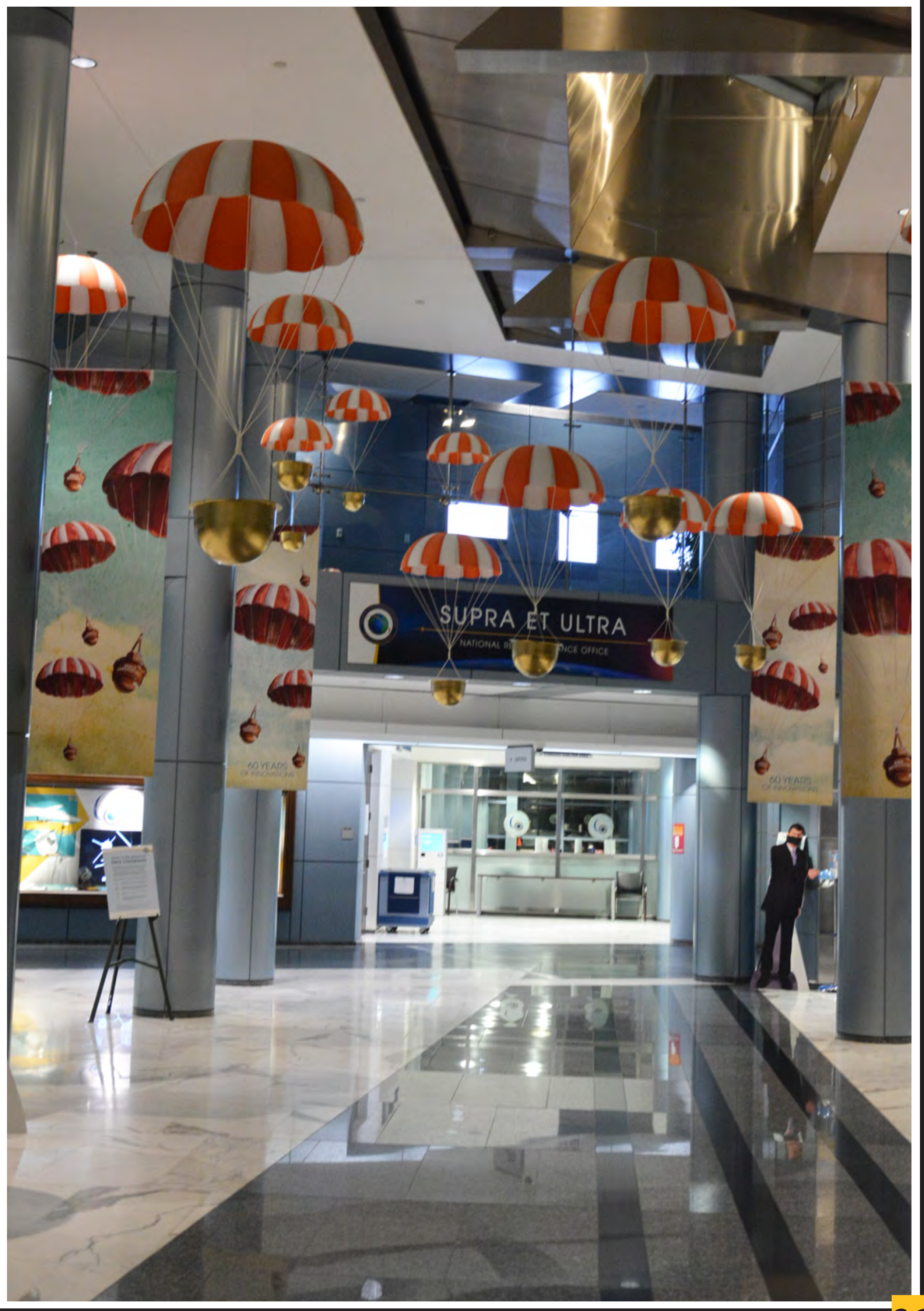
60th Signature Panels - ADF-SW and Vandenberg.



60th Signature Panels - JDFPG and RAFMH Panels.

From Left: Guetlein, Compton, and Scolese sign 60th Signature Panels.

From Left: Guetlein, Compton, Meink, and Scolese sign 60th Signature Panels.



60th Parachutes hang in Westfield's Main Lobby.

NROL-111 - Minotaur I - launch from Wallops Flight Facility - 15 June 2021.

NROL-111 - Minotaur I - launch from Wallops Flight Facility - 15 June 2021.

60th Anniversary Parachutes - Westfield's Main Lobby.

NRO staff dressed as dinosaurs view history exhibit outside Westfield's cafeteria.

60th branding on pedestrian bridge - Westfields.

60th branding on pedestrian bridge - Westfields.

Vendor employees install 60th window decals at Tower 1 pedestrian bridge - Westfields.

"We are bridging innovative legacies of our past with a cutting-edge vision for our future as we celebrate NRO's 60th anniversary. Since its inception in 1961, NRO has taken quantum leaps in the evolution of overhead reconnaissance space and ground systems."

— Dr. Scolese, NRO Director

TIMELINE

1941

7 December

Hundreds of Japanese fighter planes attacked the American Naval Base at Pearl Harbor near Honolulu, Hawaii.

1945

German engineer and rocket specialist Wernher Von Braun and 500 of his top rocket scientists surrendered to the Americans as World War II ended in Europe. Von Braun also turned over rocket plans and test vehicles.

1947

7 March

Small Steps Program: A group of scientists and soldiers in the New Mexico desert saw the first pictures taken of Earth from greater than 100 miles in space. A year earlier John T. Mengel (who later oversaw the NASA's Vanguard Program), experimenting with German V-2 rockets, designed and fabricated the first nose shell to replace the V-2 warhead and placed cameras in the nose shell.

26 July

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

1949

29 August

Soviet Union tested its first atomic bomb.

1950

In 1950

President Truman selected the U.S. Air Force to conduct reconnaissance overflights of Soviet territory. Known as SENSINT, the USAF flew its new modified B-47 bombers for these missions.

Also in 1950

At a University of Illinois, Chicago Space Medicine Symposium Wernher Von Braun presented a paper about the construction and launching of multistage rockets and orbiting space stations. He proposed they could be used as observation posts or as a bomb carrier.

1954

25 July

President Eisenhower appointed a "Technological Capabilities Panel (TCP) to study options for dealing with the threat posed by the lack of ability to gather intelligence on the Soviet Union. The TCP's Project Committee lead by Edwin "Din" Land recommended the government proceed with Lockheed Corporation's plan for a reconnaissance aircraft designed to fly above the Soviet air defenses.

24 November

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

1955

Eisenhower selects Naval Research Lab (NRL) to lead the Vanguard research satellite program for the International Geophysical Year.

4 August

A U-2 prototype flew its first test flight, just eight months after Lockheed signed a contract to build the U-2.

1956

20 June

Carl Overstreet flew a U-2 over denied territory for the first time, photographing areas of East Germany and Poland.

4 July

Hervey Stockman piloted the first U-2 flight over Soviet airspace, flying over Leningrad, Soviet radar detected the flight.

29 October

The USAF awarded a contract to Lockheed for the WS-117L program, an outgrowth of the RAND studies and the only reconnaissance satellite effort at that time in the U.S. The WS-117L program planned for a family of satellites that collected photographic, electronic, and infrared intelligence.

In 1956

U-2 photos taken of Saratov-Engels airfield southeast of Moscow showed only a few dozen new Soviet Myasishchev-4 (Bison heavy bombers), dispelling the myth of the U.S. "bomber gap" with the Soviet Union.

1957

15 May
The U.S.S.R. launched R-7 Intercontinental Ballistic Missile (ICBM), giving Soviet Union the lead in space race.

3 August
Soviet Union tested the SS-6/R7, the first ICBM.

4 October
Soviet Union orbited Sputnik 1, the first artificial satellite.

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

1958

24 January
The Air Force submitted proposals and recommendations for an expedited U.S. satellite and space program at the request of the Office of the Secretary of Defense. An Air Force Manned Strategic Station, assigned missions of weapons delivery and reconnaissance, was one of the programs proposed.

31 January
U.S. Army launched Explorer-1, the first successful U.S. satellite.

7 February
President Eisenhower approved the Corona satellite program. Corona, codenamed Discoverer, was split off from the USAF program WS-117L. Eisenhower appointed the CIA and the USAF to develop and manage the Corona program jointly.

March
The NRL's Reid D. Mayo proposed mounting on satellites technologies used on submarines to capture and analyze Soviet radar sites.

1 August
General Orders activated the 6593rd Test Squadron, U.S. Air Force personnel assigned to recover the Corona film capsules. The aircraft—C-119J and USAF personnel used in the Corona recovery operations had been a part of the earlier GENETRIX program, the reconnaissance balloon operation.

24 August
President Eisenhower approved NRL's proposal to develop the GRAB (Galactic Radiation and Background) satellite, under the codename "Tattletale".

September
Analysts at Aviation Week and Space Technology included radar imagery systems in their predictions for emerging satellite capabilities.

1959

21 January
The attempt to launch the first Corona satellite was aborted.

28 February
Discoverer I launched and established orbit, it constituted a success; however, it did not carry a capsule.

March
USAF Chief of Staff, General Thomas White, instructed his Director of Development Planning to create a long-range plan for an Air Force space program. One project in this plan included a "manned orbital laboratory."

24 August
President Eisenhower approved the GRAB Elint satellite reconnaissance program.

1 September
The Air Force Research and Development Command (ARDC) issued a system directive to the Aeronautical System Division at Wright-Patterson AFB, requesting an investigation of a military test space station (MTSS). The directive's goal was to obtain initial design plans for an orbiting station to conduct tests in an actual space environment. ARDC elements were tasked with finding tests that could be conducted in the space station. ARDC elements contributed more than 125 ideas.

1960

24 March
Eastman Kodak proposed to the U.S. Air Force and the CIA a 77-inch focal length lens camera for satellite reconnaissance. This became the KH-7 camera for the first high resolution imagery satellite, Gambit-1.

20 April
The U.S. Army released images of American cities taken from an AN/UPD-1, side-looking airborne radar (SLAR) system. The technology proved capable of producing images at night and through cloud cover.

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

22 June
GRAB 1, the world's first reconnaissance satellite launched from Cape Canaveral, Florida.

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

11 August
A U.S. Navy team retrieved Discoverer XIII's recovery capsule containing an American flag, the first recovery of a man-made object from orbit.

19 August
A U.S. Air Force crew, flying a C-119J aircraft, caught Discoverer XIV's recovery capsule in mid-air; it contained the first reconnaissance photographs from space.

Fall
Senator John F. Kennedy made the "missile gap" an issue of his presidential campaign. As Vice President, Nixon received the intelligence imagery gathered from the first Corona mission. This imagery revealed that the "missile gap" was a myth; however, Nixon could not publicly acknowledge this highly classified information. When president-elect Kennedy received a briefing about intelligence collected by Corona, demonstrating that the Soviets had fewer missiles, he no longer spoke publicly about the "missile gap."

1 December
The first successful mission carrying the new KH-2 camera system, Discoverer XVIII, launched. The KH-2 featured a simplified camera system and had improved ground resolution of 35 feet compared to the 40 feet of the KH-1.

1961

Fall
Colonel William King, deputy director of the U.S. Air Force's Special Projects Staff in Los Angeles, headed a study group looking at the feasibility of launching a proof-of-concept synthetic aperture radar (SAR) satellite. The group believed an SAR satellite would improve the U.S. Air Force's ability to assess post-nuclear bomb damage. King selected Major David Bradburn to lead the project.

16 August
The Air Force submitted a Program Package to the Office of the Secretary of Defense requesting a $5 million allocation in FY 1963 for space station exploration.

30 August
The first flight with the KH-3 camera system. The improvements implemented resulted in improved ground resolution of 20 to 25 feet. In just one year Corona camera systems improved ground resolution by 20 feet.

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

1962

January
Goodyear, under contract to Program A, began preliminary SAR design work.

12 February
USAF Deputy Chief of Staff Research and Development (DDR&E) Gen. James Ferguson discussed before a congressional committee the Air Force space station proposal. Ferguson discussed a collaboration with NASA, possibly using the Gemini vehicle, NASA's man in space program, as the initial transport for the orbiting station.

27 February
The first Corona KH-4 mission to fly dual KH-3 cameras. The cameras, mounted back-to-back, increased the information gathered using this configuration by a factor of 2.5 times. The KH-4 flew until 1963, completing 21 successful missions and returning 270,000 feet of film. Each mission carried 80 pounds of film and achieved a ground resolution of 10 to 25 feet.

30 April

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

27 July

Secretary of Defense McNamara signed an agreement with NASA allowing the Air Force to participate in the Gemini Program.

29 August

The U-2 imagery revealed SA-2 surface-to-air missile (SAM) sites under construction in Cuba.

October

CIA authorizes Skunkworks to explore the feasibility of outfitting the A-12 with an unmanned reconnaissance drone for use over denied territory.

22 October

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."

28 October

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

7 November

Bradburn officially proposed to NRO Director Charyk the SAR satellite concept. DNRO approved the proposal three days later. The project was known by the classified name "P-40." The satellite received the code name "Quill."

November

NRO awarded contracts to Goodyear and Lockheed. Goodyear manufactured the radar payload and designed, tested, and operated the experimental radar. Lockheed assumed responsibility for overall systems engineering, technical direction, and provided the upper stage/satellite body and associated subsystems.

December

The USAF orders six reconnaissance/strike – RS (aircraft designator letters) high-speed, high-altitude aircraft for flights over hostile territory after a nuclear attack.

13 December

Program C, NRO's Navy program launched GRAB's successor Poppy 1 from Vandenberg Air Force Base.

1963

21 January

Secretary of Defense McNamara and NASA Administrator James Webb signed a second agreement with NASA's Gemini program, which created the Gemini Program Planning Board (GPPB). This panel formed to ensure maximum attainment of objectives of value to both NASA and DoD. The panel also looked for military experiments that could be flown on NASA vehicles.

18 April

The USAF proposed to McNamara the idea of establishing a national space station.

12 July

The NRO launched the first Gambit-1 equipped with the first stereo pointing, high resolution KH-7 camera. The payload was carried in an orbital control vehicle atop an Atlas-Agena D booster combination. The mission returned 198 feet of exposed film with a resolution of 3.5 to 10 feet, the best images obtained from any reconnaissance satellite to date.

5 August

Albert "Bud" Wheelon, appointed as the CIA's 1st Deputy Director of Science and Technology (DDS&T), began to focus on a new search and surveillance reconnaissance system.

24 August

The first KH-4A imagery satellite launched. The improvement to the KH-4A satellites included two film buckets, and auxiliary rockets to control orbit decay allowing the system to fly at lower altitudes to image select targets. KH-4A achieved imagery resolution of nine feet during its mission life.

10 December

McNamara announced at a press conference the cancellation of DynaSoar, a vehicle designed to fly from earth to space and return. McNamara also announced the DoD would build and launch a two-manned orbital laboratory in 1967 or 1968. A replacement for DynaSoar, known as the Manned Orbiting Laboratory would save $100 million in the budget to be sent to Congress.

1964

January

DDS&T Wheelon convened a study with 25 National Photographic Interpretation Center photointerpreters to determine what resolution was needed to identify a variety of Soviet targets. The findings concluded ground resolution of 2-4 feet was needed. The Corona system at the time returned a resolution of 7-10 feet. The panel findings underlined the basis for convening the study—the need for a system with Gambit resolution and Corona wide area coverage.

3 January

SAFSP received formal approval to begin development of Gambit 3. Gambit 3 had a 160 focal length lens, Due to the OCV issues with Gambit I, Gambit 3 would use the Agena for orbital control.

April

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

April

McNamara approved the MOL pre-Phase I technical development studies. The studies included reconnaissance studies, which would be handled under BYEMAN control and carried out exclusively by the NRO as Project Dorian.

8 April

NASA Gemini I (GT-I), an unmanned orbital test of the Titian II launch vehicle, launched. This was the first of 12 Gemini Program launches. Military experiments were performed during the Gemini flights; a number of which proved the feasibility of man to track, acquire, and photograph objects in space and on the ground.

June

When President Johnson announced the existence of the RS aircraft he inadvertently switched the designator letters to SR. The USAF kept the SR designator and changed the category to Strategic Reconnaissance.

October

DNRO McMillan approved the switch to the Titan III as a rocket booster for the new Gambit 3 satellite. This new booster allowed for excess lift capability, this proved to be useful on later Gambit 3 Block II system which, carried two film buckets.

9 December

Eastman Kodak advised it could not deliver the Dorian optical sensor by the original projected delivery date of January 1969.

21 December

Quill launched at 11:08 am Pacific Standard Time from Vandenberg Air Force Base. Vandenberg tracking station personnel declared operational the data-link equipment during its seventh orbit. On the next pass over New Hampshire and Vandenberg radar mapping was attempted. The world's first satelliteborne radar imager, Quill, made orbit and returned the first images as part of an NRO demonstration mission.

22 December

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.

23 December

After a series of studies the MOL Systems Office revised the general performance and design requirement specifications to include a dual approach of a manned and unmanned MOL. The idea of an unmanned system was raised in August 1965.

1965

5 January

Bradburn briefed DNRO Brockway McMillan on preliminary results of the Quill mission. Based on the early analysis the second Quill vehicle would not be launched.

11 January

Quill reentered after its 333rd orbit.

June

In the Program A Quarterly Report, Maj Gen Robert Greer stated that further funding was provided for the associate contractor to complete its studies, but Special Projects considered the Quill program complete.

24 August

McNamara submitted to President Johnson a memo recommending that they proceed with the MOL Project definition beginning in fiscal year 1966. McNamara made his recommendation based on a review of the MOL studies, which he concluded were satisfactorily completed. McNamara recommended that MOL be operated under the NRO security guidelines.

25 August

President Lyndon B. Johnson approved Manned Orbiting Laboratory for USAF development. President Nixon eventually canceled the MOL project in 1969.

1966

President Johnson terminated the A-12 program seeing little value in maintaining two planes with similar capabilities–the overt SR-71 and covert A-12.

January

DoD and NASA established the Manned Space Flight Policy Committee to oversee manned programs and coordinate NRO-NASA activities.

21 March

Charles Schultze, Director of the Budget Bureau, expressed in a memo to McNamara reservations about the cost of MOL. Schultze first raised these concerns in July 1965.

25 May

A study group from the MOL Program Office's Mission Planning Division reaffirmed the need to keep the manned approach to MOL. General Schriever expressed concern in December 1965 that the unmanned approach was favored and the manned version could be eliminated.

26 April

The ExComm approved the development of Fulcrum, now called Helix/Hexagon.

29 July

The NRO launched the first Gambit-3 with an improved KH-8 camera and film resolution.

July 1966 – June 1967

Three active photoreconnaissance satellites – Corona, Gambit-1 and Gambit-3 returned so much imagery the photointerpreters were barely able to keep up with the volume of intelligence photography. This lead to lowering the number of future Gambit-3 launches.

23 August

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

August

General Schriever retired from active duty as head of Air Force Systems Command and MOL Program Director.

Fall

McNamara decided to proceed with MOL as a manned system; as he was more confident the manned system could achieve better resolution than the unmanned system.

October

CIA awarded Perkin-Elmer the contract for development of the Hexagon camera system.

1967

The A-12 began to fly its only operational mission, under the codename BLACK SHIELD. From May 1967 – May 1968 the A-12 flew 29 missions over East Asia, supporting the U.S. military during the Vietnam War.

7 January

Due to budget needs in Southeast Asia the Air Force budget request was $157 million less than the minimum requirement for MOL and $381 million less than contractors' estimates.

4 June

The last Gambit-1 launched from Vandenberg AFB. Its mission life was 8.1 days and the image resolution was better than 2 feet.

20 July

NRO awarded the contract for the Hexagon spacecraft development to Lockheed.

15 September

The first KH-4B imagery satellite launched. The improvements to this final Corona system included better exposure control which allowed the satellite to fly as low as 80 nautical miles (nm). KH-4B achieved a ground resolution of six feet. The KH-4A and KH-4B systems flew 65 successful missions, returned 32,000 feet of film per mission, covering 400,000 nm of cloud-free ground coverage.

20 October and 3 November

A-12s and SR-71s compete in a fly-off, codenamed NICE GIRL to determine which aircraft performed better. The A-12's camera worked better—it had a wider swath and higher resolution—but the SR-71 collected types of intelligence the CIA aircraft could not, although not of very good quality.

1968

January

Itek Corporation became the contractor for the Hexagon Mapping Camera.

In 1968

The MOL project faced opposition from the State Department, CIA, and Congress. Congress agreed to provide $550 million.

23 January

North Korea seized the U.S. Navy ship *Pueblo*, while it was on a SIGINT mission in international waters. On 26 January an A-12, piloted by Jack Weeks, flew three passes over southern North Korea. The mission gathered intelligence on North Korean armed forces and discovered the location of the *Pueblo*. Two subsequent missions determined war with North Vietnam was not in immediate danger of escalation and North Korea was not preparing military action due to the *Pueblo* incident. The *Pueblo* crew was released 11 months after the seizure of the ship.

March

SR-71 began to replace A-12 aircraft in the BLACK SHIELD operation.

21 June

The A-12 made its final flight.

1969

National Photographic Interpretation Center (NPIC) evaluated Quill imagery and stated that SAR was "capable of providing useful intelligence."

In 1969

President Nixon canceled the MOL Program due to cost overruns and lack of utility.

23 January

The Soviet satellite Cosmos 264 made orbital adjustments which brought it close to Gambit-3. U.S. engineers were concerned that Cosmos was a killer satellite. The satellite passed within 15 miles of Gambit-3 without incident.

23 August

The first successful Block II series of Gambit-3 launched. The Gambit Block II satellites carried two film buckets. Block II vehicles flew until 1972.

1970

18 August

The 18 day Gambit-3 mission 28 was given special orbital adjustment to image the Middle East. The mission returned imagery of the Suez cease fire (War of Attrition) zone. The War of Attrition occurred between Israel and Egypt, Jordan, the Palestinian Liberation Organization and its allies.

1971

15 June

The first Hexagon satellite, carrying four film recovery buckets, launched on a Titan III. This first mission (#1201) revealed problems with the parachutes. The U.S. Navy and U.S. Air Force recovered three of the four film buckets. During its 52-day mission, Hexagon conducted 430 photo operations and produced an average ground resolution of 3.5 ft. and a best resolution of 2.3 ft. A total of 123, 601 ft. of film was recovered.

10 July

The third bucket from the first Hexagon mission returned to Earth with a damaged parachute. The bucket, traveling between 400 and 500 feet per second, hit the water with a force of 2600Gs and immediately sank to the bottom of Pacific Ocean.

27 July

Representatives from the U.S. Navy, CIA, NRO, U.S. Air Force and industry representatives met at CIA headquarters to finalize the details to retrieve the lost bucket from Hexagon Mission #1201. The U.S. Navy proposed using its most advanced deep sea submersible Trieste II Deep Sea Vehicle 1 (DSV-1).

1972

26 April

The U.S. Navy's DSV-1 recovered the third bucket from a depth of 16,400 feet.

25 May

The last Corona mission (#1117) launched from Vandenberg, AFB. The Thor/Agena D vehicle carried the KH-4B camera system with dual film recovery capsules. The U.S. Air Force crews from the 6593d Test Squadron (Special) recovered the first capsule (#1117-1) on 27 May. The air crews recovered the very last Corona capsule (#1117-2) on 31 May.

26 May

President Nixon and Soviet General Secretary Brezhnev signed the Strategic Arms Limitation Talks Treaty (SALT 1). Hexagon missions began to play a significant role in monitoring the Soviet Union's development and projection of strategic offensive and defensive weapons.

21 December

First Block III Series Gambit launched. The Block III's most significant change was the new roll joint, which could handle 18,000 maneuvers per mission.

1973

1 July

DNRO McLucas transferred responsibilities for Hexagon from Program B (CIA) to Program A (Air Force).

1974

1 October

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

1976

18 February

President Ford designated the NRO as part of the Intelligence Community.

1977

13 March

The last Gambit Block IV version launched. The Block IV vehicle flew until 1984, when the Gambit program ended.

1981

12 April

Columbia, the first Space Shuttle launched from Cape Canaveral. The flight returned on 14 April.

13 November

President Reagan signed National Security Decision Directive Number 8 designating the Space Shuttle as the primary launch system for U.S. government payloads. DoD payloads must be compatible with the shuttle.

1983

15 April

The longest duration flight of Gambit 3 – 129 days.

1984

17 April

The last Gambit-3 Mission #54 launched and flew for over 116 days.

25 June

The last successful Hexagon mission #1219 launched.

1986

18 April

The Titian booster launched from Vandenberg AFB exploded shortly after liftoff and destroyed the last Hexagon satellite. After nearly 13 years in service this explosion ended the era of film return satellites.

October

Shuttle launch facilities at Vandenberg suspended.

December

President Reagan cancelled the shuttle's status as a national orbiter.

1987

DoD cancelled the Vandenberg shuttle facility.

1992

30 March

President George H. W. Bush signed National Security Directive 67, which approved the Director of Central Intelligence's recommendation to realign the NRO by disbanding Programs A, B, and C.

18 September

The DoD officially acknowledged existence of the NRO.

31 December

NRO is officially restructured along the functional directorate lines of SIGINT, IMINT and COMM.

1995

In 1995

A joint NRO-NASA statement declassified the "fact of" their relationship.

22 February

President Clinton signed Executive Order (E.O.) 12951, declassifying imagery collected by Corona. Vice President Al Gore announces the E.O. at CIA Headquarters on 24 February.

2004

17 December

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

2008

9 June

NRO declassified the "fact of" radar satellite reconnaissance.

2009

27 November

DNI's Principal Deputy Director David C. Gompert approved the declassification of the "fact of" Quill as a radar imager, effective 25 November.

2011

8 – 20 July

The last space shuttle mission—*Atlantis* (STS-135), launched on 8 July. The mission included a supply delivery to the International Space Station.

17 September

DNRO Carlson announced declassification of Gambit and Hexagon IMINT systems.

2012

19 April

Thousands gathered around the Nation's Capital to welcome the Space Shuttle *Discovery* to its new home—The Smithsonian Air and Space Museum's Udvar Hazy facility in Chantilly, VA. The Space Shuttle *Discovery*, piggybacking on a modified 747, flew from Florida on its final journey, flying over many Washington area landmarks.

2015

6 March

The Secretary of Defense, Ashton Carter's memorandum granted NRO the authority to establish a permanent cadre of DoD civilians to staff the NRO.

10 July

The NRO announced the declassification of the U.S. Air Force Manned Orbiting Laboratory Program, code named Dorian. The Dorian Program proposed the use of astronauts to perform space satellite reconnaissance.

2017

1 May

The first NRO payload (NROL-76) carried into orbit on a Space X Falcon 9 rocket successfully launched from Launch Complex 39A, Kennedy Space Center, Florida, at 0715 EDT.

"NRO's most important asset is people….they make all the difference and will lead us to a future where we can — as I like to say with a nod to one of our founders, Edwin Land — see it all, see it well, see it now, and innovate faster."

— Dr. Scolese, NRO Director

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