NATIONAL MUSEUM OF THE UNITED STATES AIR FORCE™

A BIRD'S EYE VIEW / REMOTE SENSING—Part 1

Students will learn what remote sensing is and how it was developed, from the early years of 'pigeon photography' to the latest in satellite imagery. They will also develop an awareness of how things are interpreted within the realm of aerial photography!

*Please note: Some of the ideas contained within this lesson plan were derived from information obtained from an animated NASA lesson plan entitled "The Adventures of Amelia the Pigeon" (*https://science.nasa.gov/adventures-amelia-pigeon).

LESSON PLAN – PART 1

Learning Objectives

The students will

- Learn about the development of remote sensing with respect to the five senses, focusing on sight
- Learn how to change their thought processes about how objects look from far above
- Learn how to sketch familiar objects—not how they look from the typical 'side/personal view,' but from a perspective which is high above the object in question
- Understand how and why we changed our mindset from the normal vision of the world (eye level) to that of an aircraft flying in the sky
- Develop an understanding of how to interpret photographs taken from birds, kites, rockets, hot air balloons, aircraft, satellites and spacecraft—and how to interpret textures, colors, geometric shapes, shading and shadows

Introduction/Background

Remote sensing was initially introduced in the late 1950s, and prior to that aerial photography was used and more apropos. Simply stated, remote sensing is the science and acquisition of information about a particular object (identifying, measuring or observing) without making direct, physical contact with that object. Although several of our five senses may be amplified and/or reconfigured to be used in a remote sensing role, for the purposes of this lesson plan, the focus will be on the sense of sight. The history of remote sensing (from the "bird's eye view" perspective) began with the invention of photography. The very first aerial photo was taken in 1858 from a hot air balloon that was floating about 1,200 feet above Paris. During the Civil War, observations were done from balloons for military purposes, and it is also possible that photographs were taken as well. In 1903, the Bavarian Pigeon Corps used pigeons to take aerial photos over Europe. The cameras which were strapped to them were activated by timing mechanisms. Cameras were affixed to kites to photograph the San Francisco earthquake of 1906. During World War I, aerial photography was accomplished from airplanes, as it was during World War II (although, more sophisticated techniques existed).

Grade Level: 2—4

Ohio Learning Standards/Science (2018)

Expectations for Learning

Nature of Science

Earth and Space Science

4.ESS.1: Earth's surface has specific characteristics and landforms that can be identified.

Ohio Learning Standards/Fine Arts (2012)

Fine Arts: Grade 3:

3PR: Find and solve problems of personal relevance and interest when developing art making ideas

4PR: Create artworks that demonstrate awareness of two- and three-dimensional space.

Ohio Learning Standards/Social Studies (2019)

Grades 2 through 4:

History: Historical Thinking and Skills

Geography: Spatial Thinking and Skills

Ohio Learning Standards/Mathematics (2017)

Geometry:

2.G: Reason with shapes and their attributes

3.G: Reason with shapes and their attributes

Materials Required:

- Board and markers
- Laptop, monitor, digital projector
- Paper and pencils for each student
- Helium-filled balloon tied to long string
- Two-liter bottle with lid

And the first photographs of Earth from space were made by a camera riding aboard an American-launched V-2 rocket in 1946. After World War II ended, a climate of distrust and political unrest existed between the Soviet Union and the United States—the Cold War. The very first overflight of the Soviet Union by a U-2 spy plane was in 1956, and this aircraft did an adequate job taking secret, aerial reconnaissance photos for the Central Intelligence Agency (CIA) for several years. However, on May 1, 1960, Francis Gary Powers was shot down by surface-to-air (SAM) missiles while flying over the Soviet Union, and our secret reconnaissance missions were exposed. President Eisenhower was forced to admit to our aerial spying.

CORONA Program satellites, first launched in 1960, contained the first American high-resolution space reconnaissance system (the American public didn't know of the program's existence until 1995 when it was finally declassified – it was known to the public at the time as the Discoverer XIV research program). The first satellites in this program took photographs of wide swaths of land to identify items such as airfields and missile sites of foreign military and nuclear powers. But we still needed an aircraft to replace the U-2 that would help us see if the Soviet Union, as well as other countries, was developing the types of weapons that could be used against us. It would have to be a long-range, supersonic, photo-reconnaissance aircraft. It would have to be able to fly faster than Mach 3 (more than three times the speed of sound) for hours at a time. It would have to reach an altitude in excess of 85,000 feet (over 16 statute miles). It would have to be able to photograph up to 100,000 square miles of the Earth's surface per hour. Such an aircraft could fly high enough and fast enough to avoid SAM missiles, and it could also fly higher and faster than any enemy fighters or interceptors.

The CIA turned to the makers of the U-2, Lockheed Martin's "Skunk Works" in Burbank, California, to design and build this aircraft. The first of these very special aircraft were designated A-12s, and they were three decades ahead of any other jet airplanes. These "Blackbirds" first flew at the secretive Area 51 in Nevada, in April of 1962. In July of 1964, President Johnson announced the SR-71 Blackbird Program to the world—and every aforementioned requirement was met or exceeded by the SR-71. In the 1960s and early 1970s, Gemini and Apollo astronauts took hundreds of photographs of the Earth, the moon and space from their spacecraft and from the moon! And between 1971 and 1986, HEXAGON KH-9 reconnaissance satellites were the largest (and last) U.S. intelligence satellites to return photographic film to earth. During the Cold War, 19 HEXAGON missions imaged 877 million square miles of the Earth's surface. In 1972, the first Earth Resources Technology Satellite (ERTS-1) was launched by the National Aeronautics and Space Administration (NASA). It was later renamed Landsat-1, and its primary objective was to obtain information on agricultural and forestry resources, land cover, land use, geology and mineral resources, hydrology and water resources, environmental pollution and marine resources! In the late 1990s, the USAF started flying the unmanned Predator vehicle which used satellite data links to gather information which could be shared instantaneously with commanders around the world. About the same time, the US first flew another unmanned aerial vehicle, the Global Hawk, with its powerful digital camera and infrared sensor that can gather imagery in any weather condition, day or night. Through satellite links and ground relay stations, that information is transmitted immediately anywhere in the world. Its "Synthetic-Aperture Radar/Moving Target Indicator" lets ground crews track even small, moving objects on the ground. In 2001, Google Earth was released – a computer program that provides a 3-D representation of our planet based primarily on satellite imagery and aerial photography!

Procedures:

NOTE: Teachers may use as much of the information contained within the "Intro/Background" section as they deem appropriate for their students; similarly, teachers may wish to pick and choose items within this section.

- Write (on board) the things that will be covered in class, including: our five senses, the historical aspects and details surrounding the development of present-day remote sensing, why remote sensing is important to the defense of our country, student drawings, demonstrations, 'clues' to help students interpret what a particular aerial image is depicting (such as geometric shapes, textures, shading, colors and shadows) and a PowerPoint presentation (as part of the interactive lesson plans). Before beginning the 'Hook' segment below, ensure that students have several sheets of drawing white paper and a pencil.

- Hook: Release a helium-filled balloon and allow it to go to the classroom ceiling (tethered with a long string). Tell the class this is a model/representation of a hot air balloon, and they should imagine that they are inside a basket beneath it. Show the students a 2-liter bottle with the cap affixed to the top but only show them the side view of the bottle. Ask them to imagine that they are floating up in the balloon, and they are looking down at the bottle (making certain that students can only see the side of the bottle). Ask the class to draw what they think the bottle might look like as they look straight down at it.

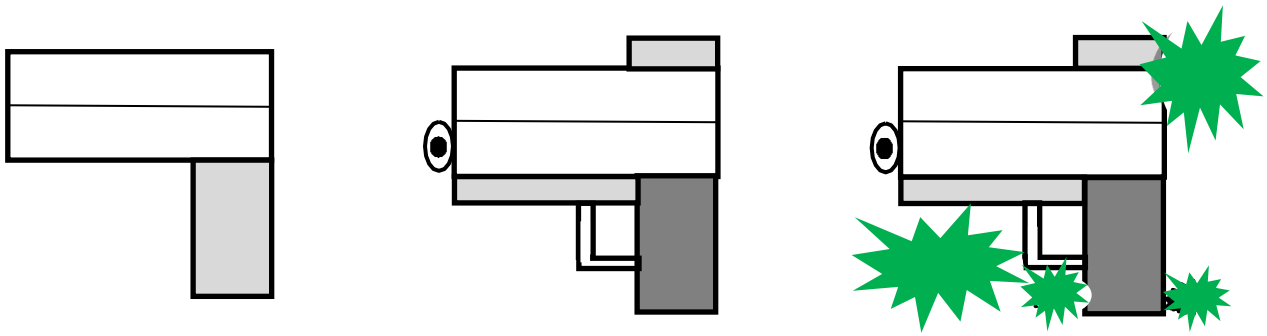
- Show the class what the overhead view of a 2-liter bottle looks like on the board: a large circle, with a much smaller circle in the center (representing the cap). You may also wish to show the students how it looks by pointing the cap end of the bottle at them.

Side view

Top view

Procedures (continued)

- Tell the students to imagine that their hot air balloon has floated outside and it is now far above their own house—or they may wish to pretend that they are inside a helicopter hovering above their home.
- Get the class started by drawing a few simple objects on the board. A large rectangle with a horizontal line bisecting it could represent the roof of the house, and another rectangle sticking out from it might show where the driveway is:
- Features may be added: Texture for landscaping:



- While students are trying to visualize and draw a bird's eye view of their home, do not show them the house with the features added (deck, front porch, sidewalk and chimney) or the drawing with trees and shrubbery. Walk around the classroom; only give assistance to those students who are having difficulty getting started. Give them ample time and tell them that they don't have to create a 'masterpiece'—a basic drawing will do quite nicely! When most of the students have finished their works of art, show them your detailed drawings with features and landscaping. Ask students how their drawings differ from yours (they may have added a mailbox on the street, a garden in the back yard, a sidewalk close to the road, etc.). Ensure that students can recognize 'clues' to help them understand overhead drawings (shapes, textures, shading, shadows and color)!
- Pass out a piece of 8.5 x 11-inch cardstock (any color) to every student and have them fold about an inch of the sheet over (along the 11-inch dimension). You may wish to demonstrate this from the front of the classroom and they may wish to use the edge of their desk or table to facilitate the folding—but it should result in an "L" shape with a 90-degree angle. Tell the class that this could be the side (person's) view of a building, such as a warehouse or an office complex. Ask the class what the 'bird's eye view' of this folded sheet of cardstock looks like, and have them draw both the 'side view' and 'bird's eye view' perspectives. Students should have drawn a long, thin rectangle for a 'side view' and a wider rectangle for the 'bird's eye view,' as depicted here:

('Side View')

('Bird's Eye View')

This concludes Part One of this lesson.

Resources:

NASA's Amelia the Pigeon website: https://science.nasa.gov/adventures-amelia-pigeon

Another lesson plan using Amelia the Pigeon:
https://www.univie.ac.at/geographie/fachdidaktik/FD/site/external_htmls/imagers.gsfc.nasa.gov/amelia/index.html
And the teacher guide:
https://www.univie.ac.at/geographie/fachdidaktik/FD/site/external_htmls/imagers.gsfc.nasa.gov/amelia/teachersguide/lessonsK_2/K-2Lesson1.html

ERTS: https://landsat.gsfc.nasa.gov/landsat-1/

Google Earth: https://www.google.com/earth/

Background resources from the National Museum of the USAF (https://www.nationalmuseum.af.mil/):

- Homing Pigeon: https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/197423/USAFmuseum/
- U-2: https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/195974/lockheed-u-2a/
- SR-71: https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/198054/lockheed-sr-71a/
- Reconnaissance Satellites:
    - https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/198108/discoverer-xiv/
    - https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/195920/gambit-1-kh-7-reconnaissance-satellite/
    - https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/195922/gambit-3-kh-8-reconnaissance-satellite/
    - https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/195921/hexagon-kh-9-reconnaissance-satellite/
    - https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/589823/teal-ruby/

A ‘BIRD’S EYE VIEW’ (REMOTE SENSING)

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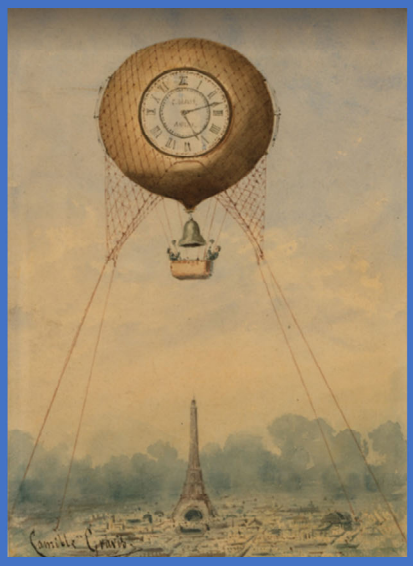
Remote sensing initially introduced in the late 1950’s, and prior to that, aerial photography was used and more apropos. Simply stated, remote sensing is the science and acquisition of information about a particular object (identifying, measuring or observing) without making direct, physical contact with that object. Although several of our five senses may be amplified and/or reconfigured to be used in a remote sensing role, for the purposes of this lesson plan, the focus will be on the sense of sight. The history of remote sensing (from the “bird’s eye view” perspective) began with the invention of photography.

Balloons Were Used for Aerial Reconnaissance



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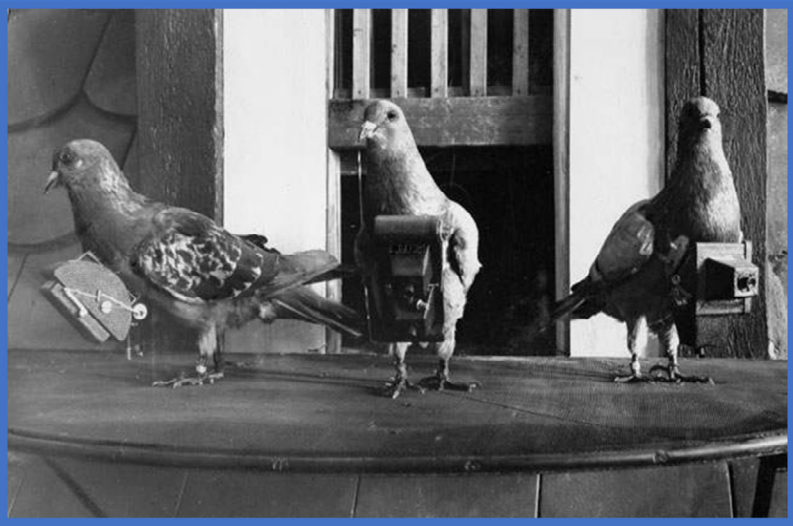
The very first aerial photo was taken in 1858 from a hot air balloon that was floating about 1,200 feet above Paris. During the Civil War, observations were done from balloons for military purposes, and it is also possible that photographs were taken as well.

Pigeons Outfitted With Cameras



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In 1903, the Bavarian Pigeon Corps used pigeons to take aerial photos over Europe. The cameras which were strapped to them were activated by timing mechanisms.

Camera Suspended Under A Kite

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Cameras were affixed to kites to photograph the San Francisco earthquake of 1906.

Photo Taken From A Kite (1906)

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WW I Aerial Photography

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A British aerial photographer, WW I

During World War I, aerial photography was accomplished from airplanes, as it was during World War II (although, more sophisticated techniques existed).

WW II Aerial Photography

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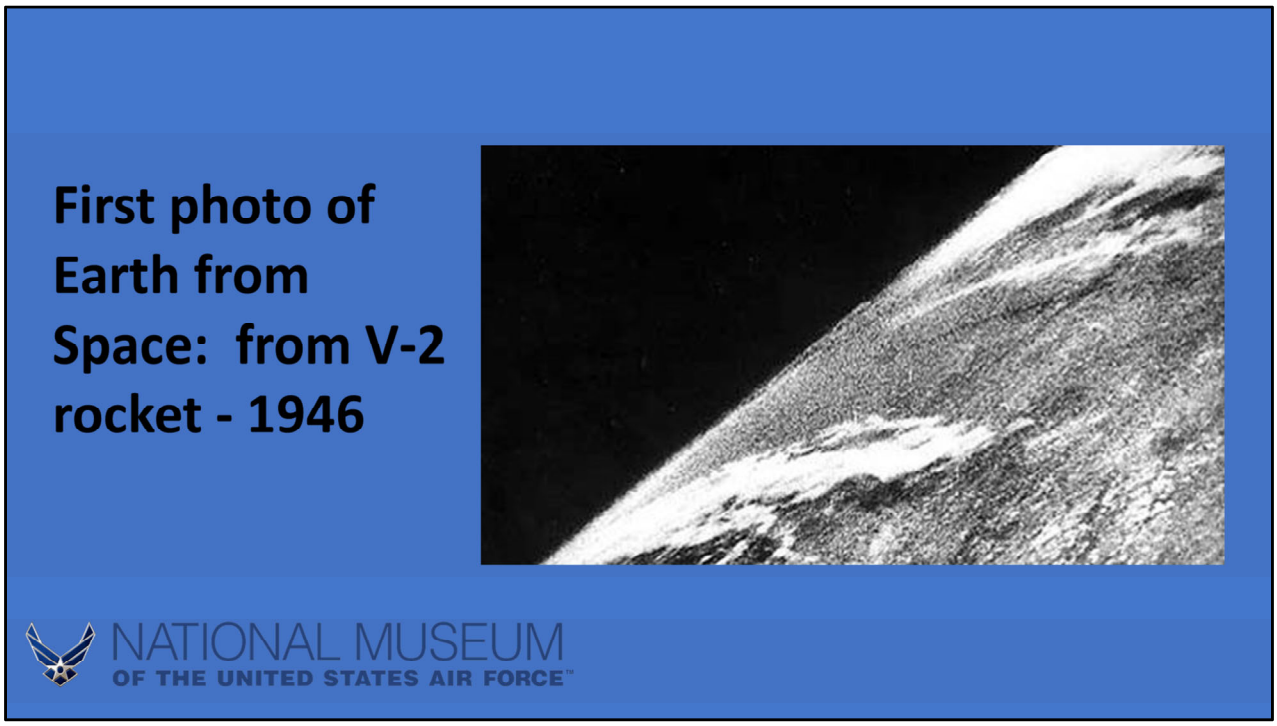
Reconnaissance photos show Peenemunde, site of German World War II rocketry research. Arrow indicates V-2 rocket lying on its side. Photos such as these helped Allies to understand the nature of reported new German "secret weapons" research.



Alfred Nobel, the Swedish millionaire who originated the world's most prestigious science prizes, was also a compulsive tinkerer and filer of patents. Among the fields that caught his interest was rocketry, perhaps not surprising for the man who invented dynamite.

Nobel wasn't the first to think of launching a camera on a rocket, but in 1896 he filed a patent for "an improved mode of obtaining photographic maps" from aerial platforms, including rockets. Each rocket firing would produce one picture, which the camera would snap while parachuting back to the ground. To control when the shutter released, he used a time fuse instead of a clock.

Nobel died in Dec. of that year, but engineers at his research lab in Karlskoga, Sweden took the idea forward, and within a few months had built a prototype. On April 26, 1897, their rocket camera took two photographs looking down on the town of Karlskoga.

Since then, most people have assumed the pictures were taken from a rocket, since it was, after all, a rocket camera. The trouble is, there was no account of the device being launched, even though Nobel's staff kept detailed records.

Now Swedish-born aerospace engineer Ingemar Skoog thinks he's figured out why. Based on the location of buildings in the photos, some of which still exist, he thinks the pictures were most likely taken from a high hill overlooking Karlskoga. Skoog, who reports his findings in a recent issue of *Acta*

Astronautica, figures that the two rocket camera images, which are nearly identical, would have been very different in angle and perspective had they been taken from cameras swinging from parachutes after separate launches. His conclusion: The camera was probably fixed to a static mount during a ground test. And there's no evidence it was ever launched on a rocket. Still, Nobel gets credit for a good idea. And no doubt he would have been pleased by V-2 rocket photos of the Earth taken half a century later (image on this slide is from V-2 rocket in October 1946).

After World War II ended, a climate of distrust and political unrest existed between the Soviet Union and the United States—the Cold War. The very first overflight of the Soviet Union by a U-2 spy plane was in 1956, and this aircraft did an adequate job taking secret, aerial reconnaissance photos for the Central Intelligence Agency (CIA) for several years. However, on May 1, 1960, Francis Gary Powers was shot down by surface-to-air (SAM) missiles while flying over the Soviet Union, and our secret reconnaissance missions were exposed. President Eisenhower was forced to admit to our aerial spying.

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The Museum's C-119J Flying Boxcar made the world's first mid-air recovery of an object returning from space. In August 1960, it caught the Discoverer XIV satellite using recovery gear lowered from the open rear door. This mechanism snagged the satellite's parachute, and a winch slowly reeled the film capsule into the aircraft. "Satellite catching" became an important and regular U.S. Air Force operation to recover secret reconnaissance satellite film.

But we still needed an aircraft to replace the U-2 that would help us see if the Soviet Union, as well as other countries, were developing the types of weapons that could be used against us. It would have to be a long-range, supersonic, photo-reconnaissance aircraft. It would have to be able to fly faster than Mach 3 (more than three times the speed of sound) for hours at a time. It would have to reach an altitude in excess of 85,000 feet (over 16 statute miles). It would have to be able to photograph up to 100,000 square miles of the Earth's surface per hour. Such an aircraft could fly high enough and fast enough to avoid SAM missiles, and it could also fly higher and faster than any enemy fighters or interceptors.

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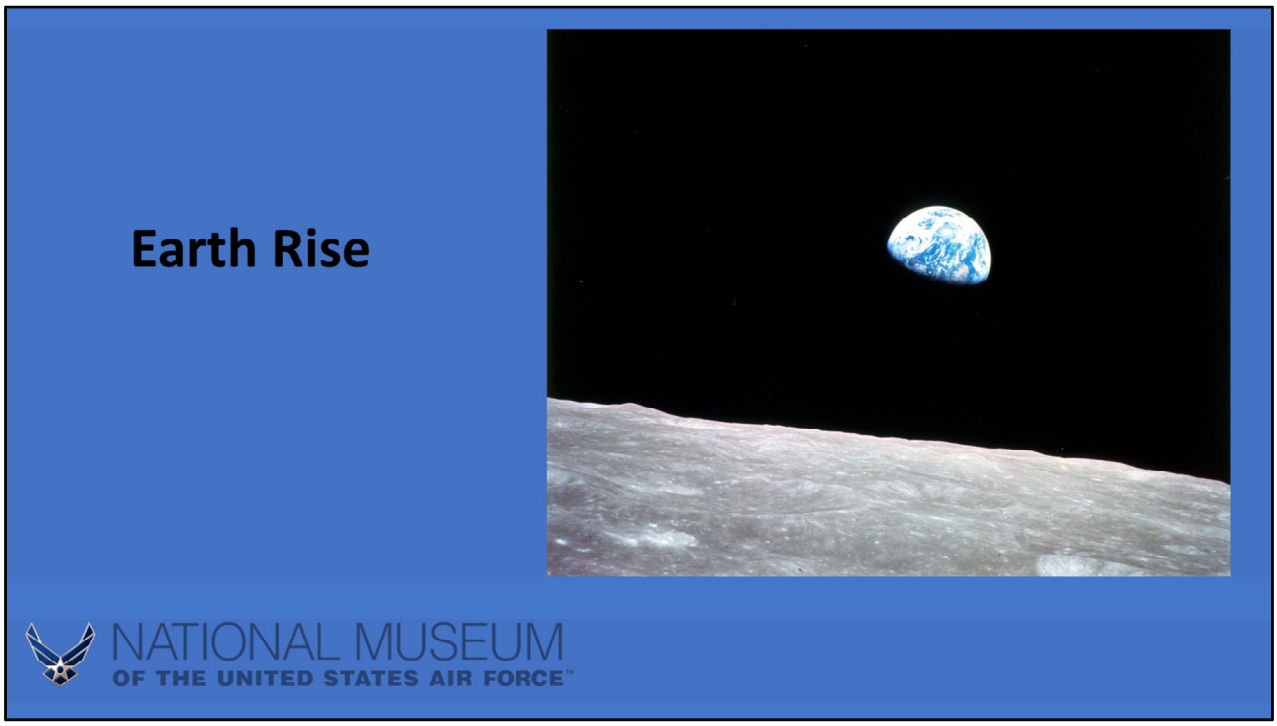


In the 1960's and early 1970's, Gemini and Apollo astronauts took hundreds of photographs of the Earth, the moon and space from their spacecraft and from the moon!

Apollo 8, the first manned mission to the moon, entered lunar orbit on Christmas Eve, Dec. 24, 1968. That evening, the astronauts-Commander Frank Borman, Command Module Pilot Jim Lovell, and Lunar Module Pilot William Anders-held a live broadcast from lunar orbit, in which they showed pictures of the Earth and moon as seen from their spacecraft. Said Lovell, "The vast loneliness is awe-inspiring and it makes you realize just what you have back there on Earth." They ended the broadcast with the crew taking turns reading from the book of Genesis.

Image Credit: NASA

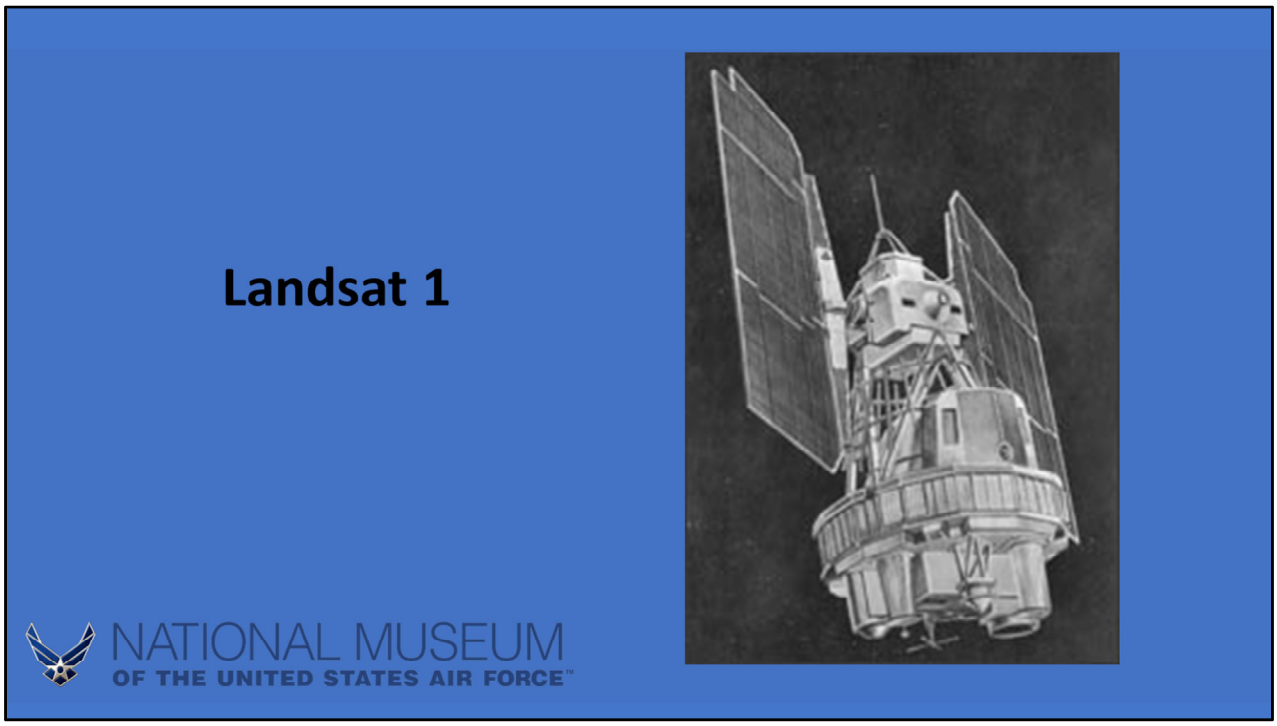
HEXAGON KH-9 reconnaissance satellites were the largest and last U.S. intelligence satellites to return photographic film to earth. During the Cold War, 19 HEXAGON missions imaged 877 million square miles of the Earth's surface between 1971-1986.

HEXAGON's main purpose was wide-area search. Analysts pored over HEXAGON's photos of large areas, then focused in on potential threats with close-up surveillance from GAMBIT satellites.

The Lockheed Corp. built the HEXAGON vehicle. Its development included creating a very complex camera and film system. The satellite featured two separate cameras, designated KH-9 and made by the Perkin-Elmer Corp., working together to produce stereo images. These so-called "optical bar cameras" on the bottom of the satellite spun on their axes, taking overlapping images to form a very large panoramic picture. Objects smaller than two feet across could be imaged from around 80-100 miles altitude.

Some missions included a separate mapping camera mounted at the front of the satellite. This camera imaged wider areas to make very accurate maps for war planning and featured its own bucket-like film return vehicle.

The U.S. Air Force launched HEXAGON satellites aboard Titan IIID rockets from Vandenberg AFB, California, and provided tracking and control at an Air Force facility at Sunnyvale, Calif. USAF aircraft recovered film return vehicles in midair near Hawaii.



Landsat 1 was launched on July 23, 1972; at that time the satellite was known as the Earth Resources Technology Satellite (ERTS). It was the first Earth-observing satellite to be launched with the express intent to study and monitor our planet's landmasses.

To perform the monitoring, Landsat 1 carried two instruments: a camera system built by the Radio Corporation of America (RCA) called the Return Beam Vidicon (RBV), and the Multispectral Scanner (MSS) built by the Hughes Aircraft Company (El Segundo, CA; NASA contract NAS 5-11255).

The RBV was supposed to be the prime instrument, but the MSS data were found to be superior. In addition, the RBV instrument was the source of an electrical transient that caused the satellite to briefly lose altitude control, according to the Landsat 1 Program Manager, Stan Weiland.

Sketch of the Landsat 1 satellite.

The MSS instrument was flown as the secondary and highly experimental instrument. "But once we looked at the data, the roles switched," relates Stan Freden, Landsat 1 Project Scientist.

The MSS recorded data in four spectral bands—a green, red, and two infrared bands.

To help understand the data and to explore the potential applications of this new technology, NASA oversaw 300 private research investigators. Nearly one third of these were international scientists. These researchers came from a wide array of Earth science disciplines. They evaluated the usefulness of Landsat data to their respective fields.

In the foreword of the U.S. Geological Survey's "ERTS-1 A New Window on Our Planet," published in 1976, then-director of the USGS, Dr. V. E. McKelvey, wrote: "The ERTS spacecraft represent the first step

in merging space and remote-sensing technologies into a system for inventorying and managing the Earth's resources."

Landsat 1 operated until January 1978, outliving its design life by five years. The quality and impact of the resulting information exceeded all expectations.

Note of Interest

Landsat 1 was built on a weather satellite platform—which is why the satellite so closely resembles the Nimbus weather satellites.

Technically, the RQ-1 Predator is not just an aircraft but an entire system. Developed as an Advanced Concept Technology Demonstration (ACTD), this system consisted of four unmanned aerial vehicles (UAVs), a ground control station, a satellite communications terminal and 55 personnel. The Predator UAV in the museum -- the most recognizable part of the system -- provided military commanders with an Intelligence, Surveillance and Reconnaissance (ISR) platform capable of flying over dangerous areas for extended periods without risk to a human pilot.

In January 1994 the Department of Defense awarded a contract for ten Predator aircraft to General Atomics Aeronautical Systems of San Diego, Calif., and the first Predator flew just six months later in July 1994. Within a year, Predators deployed to Europe, where they proved their value in operations over Bosnia from July 1995 to March 1996. In April 1996, the Secretary of Defense selected the U.S. Air Force as the operating service for the RQ-1 Predator system, and the system entered production in August 1997. In subsequent deployments, the Predator continued to demonstrate its value to military leaders.

The pre-production version Predator aircraft was designated RQ-1K, but the entire system with all the components was designated the RQ-1A. Powered by a four-cylinder, 81-hp Rotax 912 engine, the RQ-1K aircraft could cruise at 87 miles per hour for 16 hours. The production version Predator aircraft was designated the RQ 1L, and it was equipped with a turbo-charged Rotax 914 engine producing 105 horsepower.

In flight, the UAV and its on-board sensors are controlled by the ground crew with a direct data link. However, when the aircraft is flown beyond the range of a direct link, the ground crew maintains control though a satellite data link. The equipment carried in the bottom turret can provide live video, still photographs, or radar imagery in all weather conditions, day or night. Using satellite data links, the information gathered by a Predator can be shared instantaneously with commanders around the world.

Modern military commanders demand accurate and timely reconnaissance information. The RQ-4 Global Hawk high-altitude, long-endurance (HALE) unmanned aerial system (UAS) provides air, ground and sea force commanders the near-real-time reconnaissance imagery they need to defeat an enemy halfway around the world.

First flown in 1998, Global Hawk's powerful digital camera and infrared sensor gather imagery in any weather condition, day or night. Through satellite links and ground relay stations, that information is transmitted immediately anywhere in the world. Its "Synthetic-Aperture Radar/Moving Target Indicator" lets ground crews track even small, moving objects on the ground.

A typical, pre-programmed Global Hawk mission can include a 1,200-mile flight to an area of interest, 24 hours flying over the area, and the flight back to base. In just 24 hours, the RQ-4 can survey an area the size of Illinois (about 40,000 square miles) while cruising above the range of enemy air defenses.

Two small ground teams manage Global Hawk's flights: a launch and recovery element (LRE) loads flight plans and makes necessary adjustments to the vehicle while a mission control element (MCE) manages the aircraft and its sensors during flight.

Among the RQ-4's accomplishments are winning the 2000 Collier Trophy for aeronautical achievement and achieving the first autonomous UAS flight across the Pacific Ocean. This autonomous flight from

California to Australia was made in just over 23 hours. Global Hawk set a world record for jet-powered UAS endurance in 2000 by flying for more than 31.5 hours at a mean altitude of 65,100 feet.

Google Earth is a computer program that renders a 3D representation of Earth based primarily on satellite imagery. The program maps the Earth by superimposing satellite images, aerial photography, and GIS data onto a 3D globe, allowing users to see cities and landscapes from various angles. Users can explore the globe by entering addresses and coordinates, or by using a keyboard or mouse. The program can also be downloaded on a smartphone or tablet, using a touch screen or stylus to navigate. Users may use the program to add their own data using Keyhole Markup Language and upload them through various sources, such as forums or blogs. Google Earth is able to show various kinds of images overlaid on the surface of the earth and is also a Web Map Service client. Recently Google has revealed that Google Earth now covers more than 98 percent of the world, and has captured 10 million miles of Street View imagery, a distance that could circle the globe more than 400 times.

In addition to Earth navigation, Google Earth provides a series of other tools through the desktop application. Additional globes for the Moon and Mars are available, as well as a tool for viewing the night sky. A flight simulator game is also included. Other features allow users to view photos from various places uploaded to Panoramio, information provided by Wikipedia on some locations, and Street View imagery. The web-based version of Google Earth also includes Voyager, a feature that periodically adds in-program tours, often presented by scientists and documentarians.

‘Side View’ Of A Famous Building

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[Pentagon]

Aerial view of the Pentagon

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Aerial view of a famous monument

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[Washington Monument]

Side view of the Washington Monument

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Aerial view of a famous statue (on the lower center of the island)

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[Statue of Liberty]

Side view of the Statue of Liberty

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Aerial view of a sporting event

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[Football stadium]

Aerial view of the pyramids

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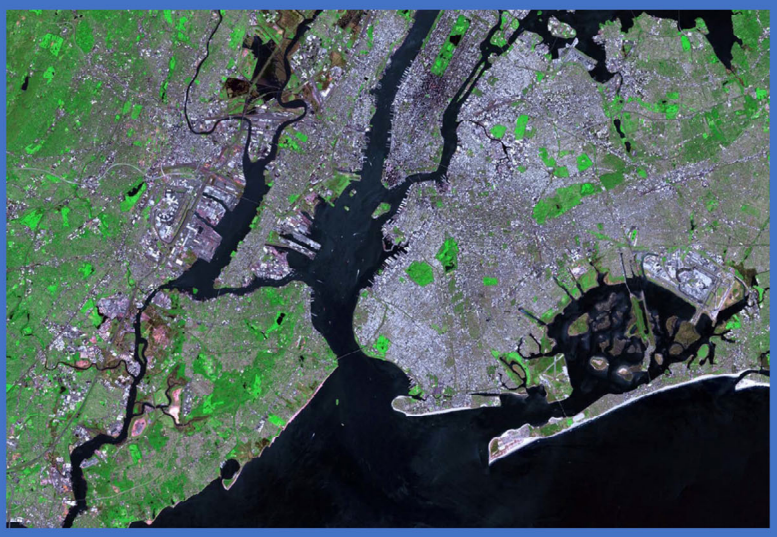
Satellite view of a famous city



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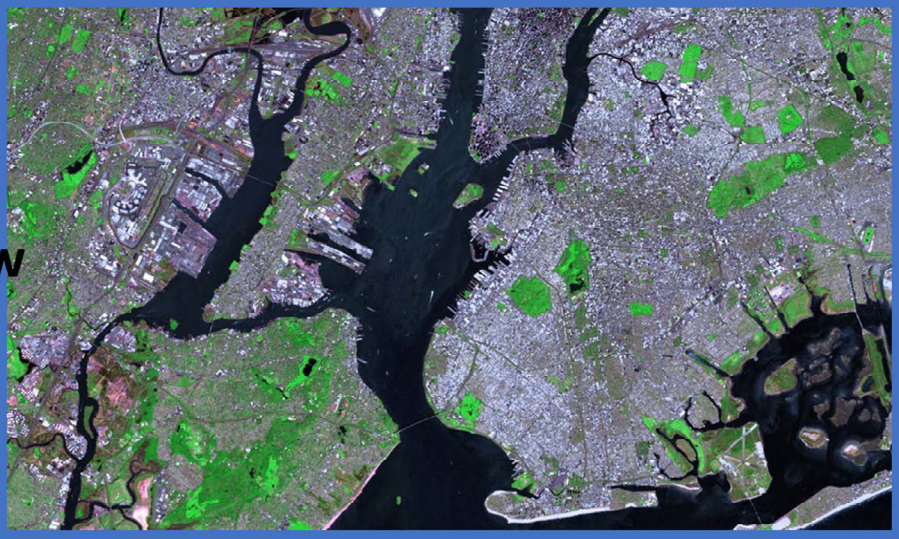
[New York City]

Closer satellite view of a famous city



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[New York City]

Satellite view of another famous city

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[Washington, DC]

Closer satellite view of a famous city

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[Washington, DC]

SR-71 side view

SR-71 front view

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A ‘BIRD’S EYE VIEW’ (REMOTE SENSING)

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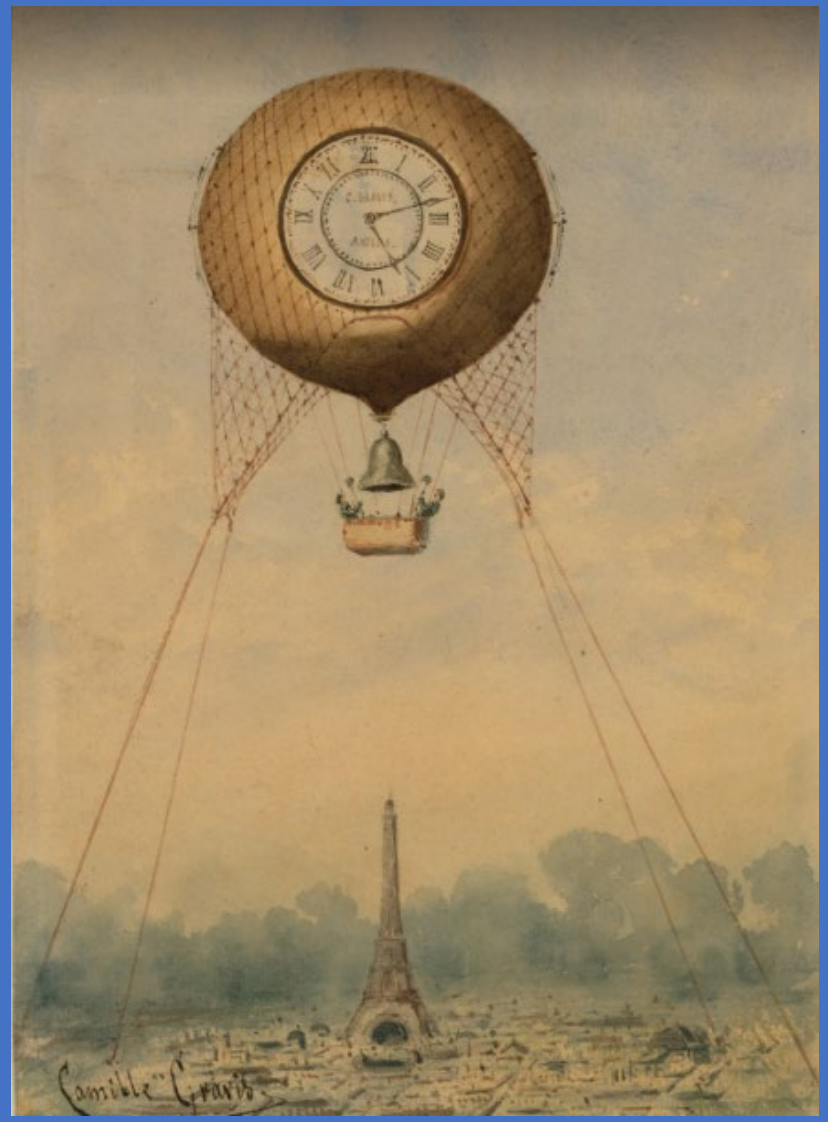
Balloons Were Used for Aerial Reconnaissance



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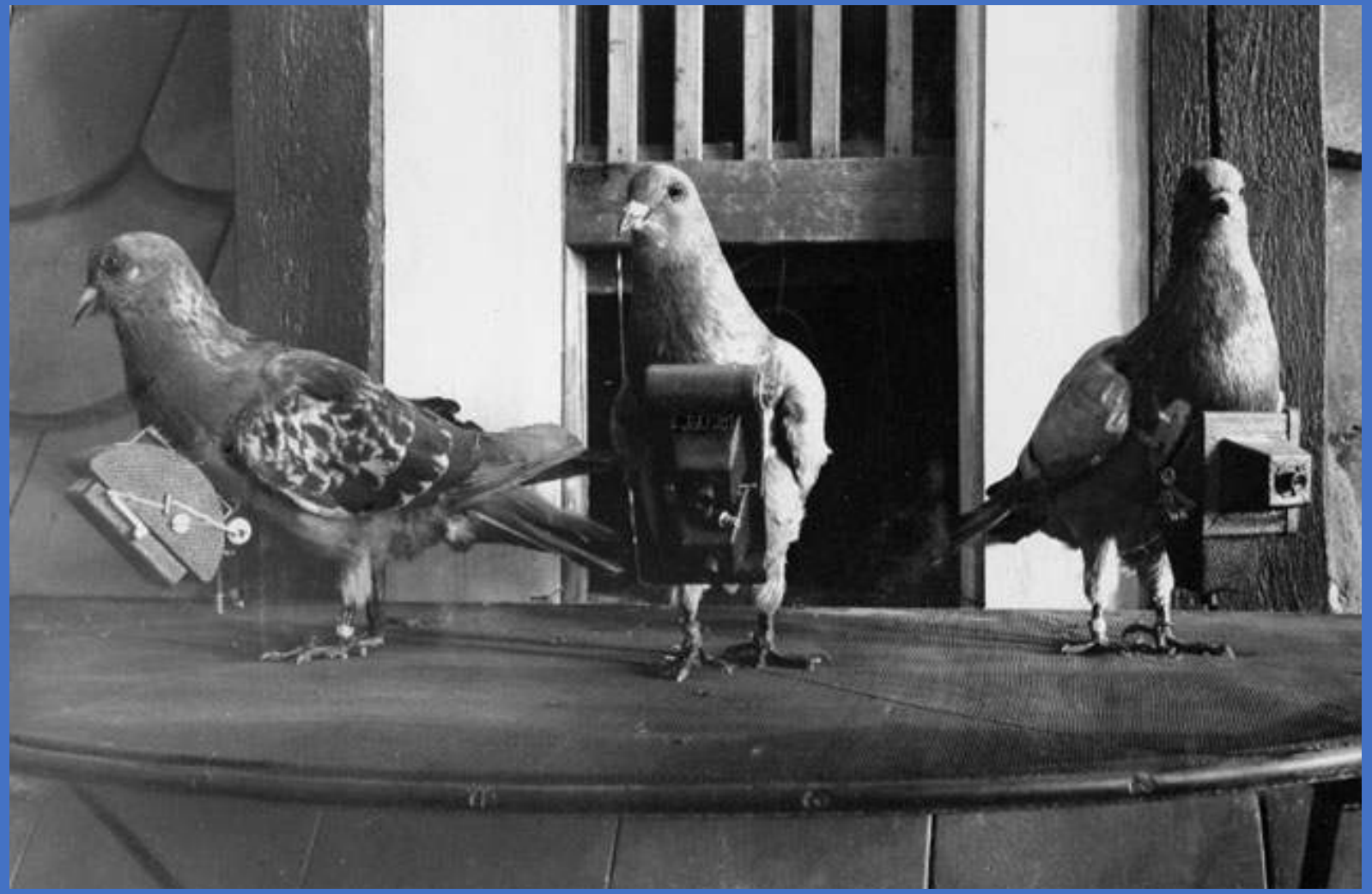
Pigeons Outfitted With Cameras



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Camera Suspended Under A Kite

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Photo Taken From A Kite (1906)

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WW I Aerial Photography

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WW II Aerial Photography

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First photo of Earth from Space: from V-2 rocket - 1946

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U-2

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Air Force C-130 Aircraft Snags a Reentry Vehicle

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SR-71

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Earth Rise

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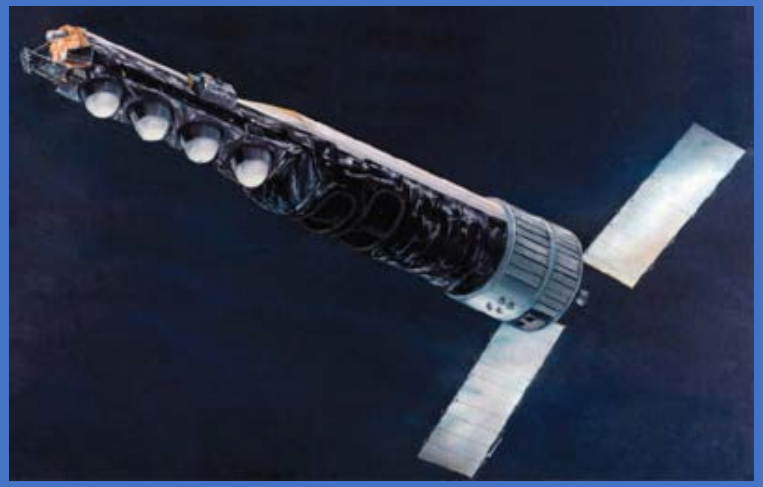
KH-9 Hexagon Reconnaissance Satellite



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Landsat 1

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Predator with camera under its nose

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Global Hawk

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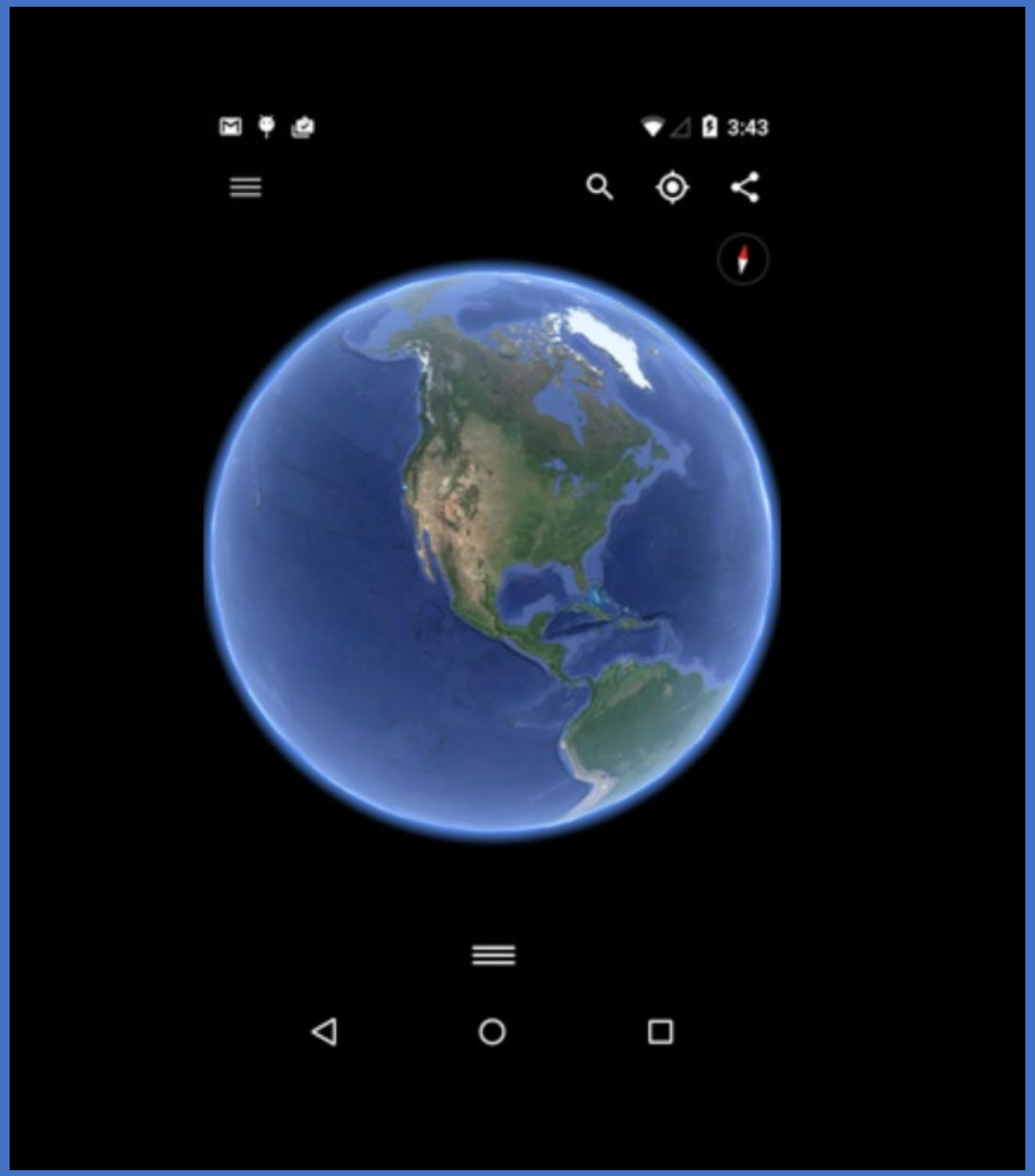
Google Earth



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‘Side View’ Of A Famous Building

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Aerial view of the Pentagon

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Aerial view of a famous monument

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Side view of the Washington Monument

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Aerial view of a famous statue (on the lower center of the island)

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Side view of the Statue of Liberty

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Aerial view of a sporting event

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Aerial view of the pyramids

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Satellite view of a famous city

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Closer satellite view of a famous city

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Satellite view of another famous city

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Closer satellite view of a famous city

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SR-71 side view

SR-71 front view

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