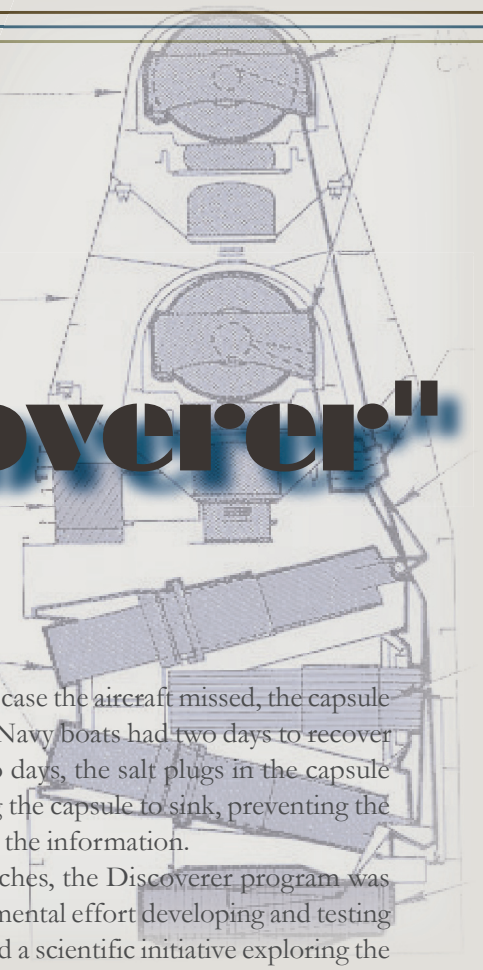
Corona Codename "Discoverer"

America's First Space Surveillance Satellite



In February 1995, President William Clinton signed an Executive Order declassifying early satellite imagery. The release of over 860,000 photos, taken between 1960 and 1972, has helped scientists explore ancient habitation sites and track environmental changes. But it also provided an insight into the early Cold War.

In the 1950s, the United States was making great advances in weapons technology, but the Soviet Union also saw significant gains. In 1953, the Soviets became a nuclear power. Two years later they unveiled a long range bomber and the intercontinental ballistic missile followed soon thereafter. As the press explored the bomber and later the missile gaps, there was a need to define the threat to the nation. As Admiral William O. Studeman, Acting Director of Central Intelligence, observed in 1995, "CORONA was conceived in … an era when facts were scarce and fears were rampant."

The concept of using an Earth orbiting satellite for reconnaissance was initiated as early as 1946 in a memorandum by the RAND Think Tank. When overtures to the Soviet Union, such as the Open Skies Policy, were rejected, President Dwight Eisenhower approved the project in February 1958. The Corona Project was incorporated into an existing Air Force Weapon System 117L — the Discoverer program.[1]

Project Corona was a highly classified satellite reconnaissance program developed and tested under the codename Discoverer. Equipped with a panoramic camera, the Corona would fly over and photograph Soviet Bloc countries. The exposed film would be transferred to recovery vehicles and de-orbited for mid air or ocean recovery. With a parachute slowing the descent, the capsule or "bucket" was captured by an Air Force C-119. In case the aircraft missed, the capsule was designed to float. Navy boats had two days to recover the buckets. After two days, the salt plugs in the capsule would dissolve causing the capsule to sink, preventing the enemy from capturing the information.

With 38 public launches, the Discoverer program was described as an experimental effort developing and testing satellite subsystems and a scientific initiative exploring the environmental conditions in Space.[2] It achieved a number of breakthroughs. Discoverer I, launched Feb. 28, 1959, was the first polar orbiting satellite. Discoverer II, launched April 13, 1959, was the first satellite to be stabilized in orbit in all three axes to be maneuvered on command from earth, to separate a reentry vehicle on command, and to send its reentry vehicle back to earth.[3]

The next major accomplishments for Discoverer/Corona came in August 1960. Launched from Vandenberg Air Force Base, Calif., atop a Thor-Agena rocket, the Discoverer XIII completed 17 orbits of the Earth. On Aug. 10, 1960, the capsule became the first manmade object recovered from an orbiting satellite. An American flag flown in Space aboard the capsule was later presented to President Eisenhower in a ceremony at the Oval Office. Eight days later, the Air Force achieved a mid-air recovery of the Discoverer XIV capsule and its 20-pounds of film.[4] Flight XIV covered over 1,650,000 square miles of Soviet Territory more than all of the earlier U-2 missions combined. The age of satellite reconnaissance had begun.

Although the Discoverer program ended on Feb. 27, 1962, Corona continued for another 10 years under the newly created National Reconnaissance Office. The primary collection targets were Intercontinental Ballistic Missiles, Intermediate Range Ballistic Missiles, sub-launched missiles, heavy bombers and nuclear energy. The first target was Mys Schmidta, a Soviet air base, on the Chukchi Sea in

far northeastern Russia. As technology evolved, resolutions improved to six to 10 feet, for example, showing a parking lot at the Kremlin or locating missile silos.

The Corona payload began as a single panoramic camera with a resolution of 35-40 feet. Later flights carried two panoramic cameras and by the mid 1960s, they could take stereo photographs by tilting the cameras fore and aft as they passed over a particular site. This innovation allowed cartographers, creating maps from the data, to determine terrain relief.[5]

The use of film in Space produced some initial technical problems. Some flights experienced "mysterious fogging and bright streaks on the film." Studies concluded that electrostatic discharges, now called corona discharges, from the camera's rubber components had exposed the film. Grounding of the equipment and outgassing testing of the parts resolved this issue. Other problems (tearing and jamming) with acetate based film used in early missions, were addressed by Eastman Kodak. Kodak developed a new polyester based film (mylar) coated with high resolution emulsion which could withstand Space operations. Later versions of the 70mm film were thinner allowing the system to carry more film thereby increasing the length of the missions up to 19 days.

It was of utmost importance to protect this project as the satellite's cameras would only be able to discern objects 50 to 100 feet on a side. This being the case, it would be easy for the Soviets, if they discovered the project and its capabilities, to build dummies able to fool the cameras.

Officials terminated the Corona project on May 31, 1972. According to one source, this decision was made after a Soviet submarine was detected in a Corona mid-air retrieval zone. After 13 years and 145 missions, the Corona project had:

- Imaged all Soviet medium-range, intermediate-range and Intercontinental Ballistic Missile complexes
- Imaged each Soviet submarine class from deployment to operational cases
- Provided inventories of Soviet bombers and fighters
- Revealed the presence of Soviet missiles in Egypt protecting the Suez Canal
- Identified Soviet nuclear assistance to the People's Republic of China
- Monitored the SALT I Treaty
- Uncovered the Soviet Anti-ballistic Missile program and sites (GALOSH, HEN HOUSE, etc.)
- Identified Soviet atomic weapon storage installations
- Identified People's Republic of China missile launching sites
- Determined precise locations of Soviet air defense missile batteries.
- Observed construction and deployment of the Soviet ocean surface fleet
- Identified Soviet command and control installations and networks
- Provided mapping for Strategic Air Command targeting and bomber routes
- Identified the Plesetsk Missile Test Range, north of Moscow.

As Admiral Studeman observed, "Such pictures held enormous significance for the course of the Cold War. They provided information that allowed our leaders to weigh the Soviet threat and measure our response. CORONA debunked the "missile gap" argument. [And,] it allowed us to base our national security strategy — and spending — on facts rather than fear, on information rather than imagination.

The Corona program achieved a number of firsts in its 13-year history. It was the first photo reconnaissance satellite in the world, the first to achieve a mid-air recovery of a vehicle returning from Space, and the first to eject and recover multiple vehicles from Space. The Corona images, the first stereo optical data from Space, also represent the first mapping of Earth from Space. Finally, the Corona was the first reconnaissance program to fly 100 missions. The Corona holds a significant place in our national history. A role that is recognized at the Smithsonian, which has a corona camera and the recovery buckets from the last mission on display.

[1]WS 117L/Discoverer also included the Satellite and Missile Observation System (SAMOS), a more rugged photo reconnaissance satellite which would transmit the images electronically, and the Missile Defense Alarm System (MIDAS), which would use an infrared sensor to detect foreign launches. Both programs achieved some success but were subsequently canceled.

[2]In keeping with this, some of the Discoverer missions carried experimental payloads in addition to or instead of the reconnaissance equipment.

[3] Ice Station Zebra, by Alistair MacLean, is apparently based upon news accounts of the search for Discoverer II. A timing error caused the capsule to be ejected early near Spitsbergen in northern Norway rather than the Pacific Ocean. It is believed that Soviet agents recovered the prototype capsule which was not fitted with a camera.

[4]Note the first satellite photos of Earth were actually taken on 14 August 1959 by Explorer 6.

[5]Corona data had many other uses, e.g. to assess military strength and to estimate grain production.