



4 February 1960

MEMORANDUM FOR : Deputy Director of Central Intelligence
THROUGH : Deputy Director (Plans)
SUBJECT : Background of the Discoverer Series
(Projects CORONA and ARCOH)

Origin

The Discoverer series of satellite launchings involves the covert development and operational use of short-lived photographic reconnaissance (CORONA) and mapping (ARCOH) satellites from which a recoverable capsule will be retrieved at a pre-selected ocean area. Prior to its initiation the development of such a system was started by the Air Force as a part of Weapons System 117L. This phase was cancelled in February 1958; and, Discoverer became the covert reactivation, with a few modifications of a program already undertaken.

Management

Overall management of the project is shared by CIA (DWD) with originally AUSA and now Mr. Yeak's office and with the support and full participation of the U.S. Air Force. Detailed supervision of LMSD, the systems manager, is performed by the Air Force Ballistic Missile Division which is also responsible for the provision of ground facilities. CIA takes the lead in contracting for and in monitoring through LMSD the development of the photo payloads and reentry nose cones and CIA controls the security of the program.

Experiences to Date

The Discoverer series consists of 29 vehicles of which 19 are photo reconnaissance, 4 are mapping and the balance are for cover purposes. (bio-med and physical data) To date there have been 9 launches and 1 abort on pad. Of the launches 7 achieved orbit. As yet there has not been a successful recovery although #2, carrying a bio-med payload, was ejected from orbit over Norway. 5 reconnaissance cameras have been launched. Of these 1 failed of orbit and in the other 4 malfunctions were encountered. The next Discoverer launch, containing a reconnaissance camera, is scheduled for Feb. 4, 1960.

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Description of System

In Accordance with E. O. 12958

The Vehicle

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The vehicle is a two-stage rocket consisting of a THOR as the first stage and the AGNA second stage. To date this system can provide a 27-hour orbit with reentry attempted on the 17th pass and with 7 photo passes over

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denied territory. Assuming E & D problems are solved this spring, data instrumentation can be eliminated and this coupled with a more powerful AGEMA will permit carrying up to a two day payload with 14 photo passes over denied territory.

COMBINA and ANCON Cameras

The COMBINA camera is a modified HIAS-1. Focal length is 24 inches and uses 70 mm film. Present maximum film load is 3,500 feet (20 lbs.); however, this has been reduced to 1800 feet (10 lbs.) to allow for additional instrumentation on shots 10 and 11. With 3700 feet of film (20 lbs.) and at a planned altitude of 120 miles and a vehicle speed of 27,000 feet per second a maximum of seven (7) passes per day and/or per mission will accrue. By June 1960 it is expected that 7000 feet of film can be carried for a two-day operation. Each pass uses an average 500 feet of film.

The resultant scale of the photography is about 1:300,000. Expected ground resolution is 25 feet. A swath of approximately 150 X 1800 N. Miles should be covered in each pass or about 270,000 square N. Miles. This is a programmed 1,350,000 square N. Miles per mission.

The ANCON camera is a mapping type with 3 inch focal length and 5 inch film. The resultant scale of the topography is approximately 1:4,000,000. Camera format size is $4\frac{1}{2}'' \times 4\frac{1}{2}''$ and covers a ground area of approximately 250 X 250 N. Miles. Expected ground resolution is approximately 333 feet. Maximum film load is 4000 feet (42 lbs.). This is sufficient film for four days operation to obtain complete mapping coverage of the earth's land mass with primary emphasis on USSR.

Recovery

The recovery system consists of separation of the reentry nose cone over Alaska followed by retro rocket propelled reentry into the atmosphere and with parachute deployment at 50,000 feet with the nominal impact area approximately 250 South of Honolulu. Recovery is to be effected by air snatch by G 119 B backed up by surface ships in an area from just East of Johnson Island to about 550 miles East of the nominal impact point.

Comparison with 117L Weapons System (Photo Reconnaissance System II of SAMOS)

The following are the main differences as presently planned between the photo reconnaissance systems in Discoverer and in SAMOS:

- (a) SAMOS will carry longer focal length cameras and with its growth potential may obtain better ground resolution.
- (b) SAMOS will provide in flight processing and automatic readout on all flights except N-5 which is a recoverable unit.

- (c) Since SAMOS will be boosted by an Atlas rather than a Thor, its cameras will be on orbit for longer periods e.g. 30 days. The first recoverable SAMOS photo payload is not planned until August of 1961.

Attachment 1 gives further detail on the characteristics of the SAMOS cameras as well as CORONA and ANJON.

Attachment 2 gives the flight schedules for CORONA ANJON and SAMOS.

Problems Encountered

The main problems requiring solution have been those of attaining most effective orbit, successful camera operation and successful recovery. The first appears solved. Continuing camera difficulties have centered around the stresses encountered in ascent and the extreme environmental conditions on orbit. These are difficult to simulate in the laboratory and have brought about film tearing and camera jamming. Intensive R & D have eliminated many of the possible causes of camera and/or film failure and confidence in success of future camera operations is increasing. Recovery problems (retro-rocket failures, battery failures, loss of stabilization) have also had intensive analysis and we are in the verge of successful recovery. The experience gained to date has been valuable to other programs.

Program Cost

The Department of Defense has provided the vehicles, ground and recovery facilities and the cover payloads. CIA has procured the photographic payloads and the nose cone modifications. Program costs supporting CIA's effort are as follows:

CORONA

Costs through 31 December 1959
 Estimate to complete
 Estimated total price

[REDACTED]

ANJON

Costs through 31 December 1959
 Estimate to complete
 Estimated total price

[REDACTED]

ANJON is funded in its entirety by the Department of Defense. Of the total cost of CORONA CIA has contributed [REDACTED]

Future Program

There are 19 launches remaining in the Discoverer Schedule. Four of these, containing the ANCON mapping camera, will be fired during the summer. Thirteen (13) photo reconnaissance cameras will be launched during Spring and Summer and the final 2 vehicles containing cover payloads will be fired at appropriate times during the schedule.

Security

[REDACTED]

a.

[REDACTED]

b.

[REDACTED]

c.

[REDACTED]

SIGNED

[REDACTED]
Acting Chief, [REDACTED]

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TABLE CHARACTERISTICS

ITEM	CLASS	AREA	1-2	1-3	1-4	1-5
Focal Length	24"	3"	6"	120"	72"	72"
Lens Speed	f/4	f/5.5	f/4	f/4.5		
Shutter Speeds	1/500 to 1/2000	1/1000 to 1/500		1/130		
Expected Cr. resolution	25%	33%	20%	5'	5' to 10'	
Film size	2" x 29.3"	4 1/2" x 4 1/2"	2" wide	5' x	5' x 25"	
Film size and weight	Present medium 7 1/2" x 3500" (20%)	3" x 4000" (42%)	70... 10... month for 1 mo.	5' x	5' x	20,000 (400%)
Recoverable	Yes	Yes	No	No	Yes	Yes
Data Transmission	No	No	Yes	Yes	Yes	Yes

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Flight Schedules

Tab
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<u>System</u>	<u>Date</u>	<u>Remarks</u>
ANCOA	each month thru 1960	Increased payload (40%) to start by June 1960 14 total flights 1960
ANCOB	July, August, and September 1960	Total of 4 flights
-1	September and November 1960 and January 1961	Proves -2 only No results
-3		No schedule
-5	August 1961	No additional data