

29 January 1965

MEMORANDUM FOR: Deputy Director, Central Intelligence

SUBJECT: History of the CORONA System

1. The following memorandum is submitted for your information, and contains the history of the CORONA Program from initiation in March 1958 up to the present. The memorandum is divided into three sections. The first two: "Technical Development of the CORONA Program" and "Contractual Developments of the CORONA Program" are given as background of the third section: "Government Management". The information is presented in this manner as the technical developments and contractual arrangements provide a base and a prelude to the understanding of the government management developments.

2. Technical Development of the CORONA Program:

a. The first CORONA flights were made from a THOR-AGENA - A launch vehicle. The camera flown was a single f:5.6 scanning lens panoramic camera. The system resolution was in the neighborhood of 20 feet at the operating altitudes. The operating altitudes were rather high--120-150 N. Mi. With the limited performance of these early THOR-AGENA's and the primitive guidance system (which introduced large uncertainties in the injection parameters), the system was severely weight limited. The recovery vehicle was the Mark IIA. The recovery system was developed under cover of a biomedical program; the Mark II capsule could be used for flight of monkeys (such flights were not made). Following a development period of approximately 2 1/2 years, marked by 11 unsuccessful flights, success was finally achieved with a CORONA camera system in August of 1960. One "diagnostic" vehicle had been recovered one week earlier. Shortly thereafter, design improvements were proposed for the basic camera; and development was initiated on

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SUBJECT: History of the CORONA Program

the C^{III} unit. This camera was basically a f:3.5, 24-inch focal length system, with resolution to the order of 10 feet. This camera differed from C primarily in that the lens rotated continuously during operation, rather than scan-and-return. Continual improvements were being made concurrently in the AGENA and THOR vehicles to allow more positive injection of desired parameters with greater weight capabilities. The first C^{III} was flown in August of 1961 (approximately one year after the first successful flight of the original CORONA system).

b. The increased THOR-AGENA capabilities made possible the introduction of a two-camera stereo model. (The necessary recovery system modifications had been accomplished under the ARGON Program.) This new model, called CORONA/MURAL, was formally initiated in March of 1961 and first flown in February of 1962. The system consisted of two C^{III} cameras in a 30° convergent stereo configuration. Because of continual difficulties with the time recording mechanism used on the CORONA cameras, a digital clock from the ARGON Program was modified and substituted for the original clock. Auxiliary cameras for extended ground coverage at low resolution (index camera) and a stellar camera for accurate attitude determination were added in later versions.

c. Concurrently, developments were made in the flight programming and command capabilities. The initial CORONA camera had only one ground command (a selection of the operating speed of the camera). More elaborate controls on v/h control were instituted, and an on-off capability for the program was added. All flights to date have used minor modifications of the original Fairchild Camera and Instrument Corporation flight programmer for flight command of the camera. Currently, three parameters of v/h time dependence, 10 separate programs, stereo-mono operation, and sequences of off-on can be commanded from the ground.

d. Under the LANYARD Program, the increased performance capability of the Thrust Augmented THOR (TAT) was developed. This allowed almost doubling of the payload

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SUBJECT: History of the CORONA Program

weight; a program was started under CORONA to double the film capacity and extend the useful mission life. This system, known as CORONA-J, used the basic mural camera with two recovery vehicles. The CORONA-J System was first flown in mid-1963. After a short period of program difficulties, the "J" System is operating satisfactorily and is providing the search surveillance for the community.

e. Two other programs were run concurrently with CORONA with a large overlap in technical personnel and management. The first of these was the LANYARD Program. LANYARD was a modification of the SAMOS E-5 System, designed to provide five-foot ground resolution photography with a swath width of about 40 miles. A single 66-inch focal-length F:6 panoramic camera was used. This camera could be operated in an interrupted stereoscopic mode or in continuous monoscopic. LANYARD was formed as a back-up to the [redacted] Program and was cancelled on the success of [redacted]. The second program was ARGON, a program sponsored primarily by the Army Map Service and designed to establish a world-wide geodetic control network. A three-inch focal-length, low-distortion lens provided terrain coverage over a 70° field of view, at about 200-300 feet resolution. Fairchild Camera and Instrument Corporation (FCIC) was subcontractor to LMSC for camera development. [redacted] was a working associate of LMSC, responsible for ground data reduction equipment. The ARGON Program was continued until recently, including a second procurement with FCIC as associate to LMSC. Two systems are still in storage; flight is being considered at the present. The ARGON System has provided a reasonable amount of geodetic control for the mapping community.

3. Contractual Development of the CORONA Program:

a. Under the management philosophy used for the 117-L Program, the covert side of the DISCOVERER or CORONA Program operated with Lockheed Missiles and Space Corporation as Weapons' Systems Manager/Prime Contractor. However, Mr. Bissell, through the monthly suppliers' meetings,

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CORONA

SUBJECT: History of the CORONA Program

exerted rather direct program control. This monthly suppliers' meeting management control technique had been used in the IDEALIST and in the OXCART programs. Under this prime contract for C, C' (follow-on procurement, similar camera to C), and C'', Itek was the first tier subcontractor for the camera; and General Electric was subcontractor for the recovery system development. FCIC was subcontractor to Itek on C and C'. With the changed Government philosophies on contractual arrangements, and in order to reduce program costs, the MURAL Program was initiated with Lockheed, Itek, and General Electric as associate contractors. Technical support of the Government management continued to be supplied by Lockheed under a Systems Engineering contract, initially planned to be contracted for the Air Force, but subsequently reverted to a CIA Contract. Control of the associate contractors was vested in a Configuration Control Board with representatives of various Government offices. The covert contracts on the program were handled by the CIA Contracting Office. The funding on the original CORONA Program (covert contracts) was CIA, the Air Force funding the vehicle developments and the "biomedical" recovery capsule developments. Subsequent funding, until the NRO was established, was through the Air Force, although justification for funds was ultimately made by the Agency (Mr. Bissell). I. e., the "Air Force funding" was primarily a bookkeeping matter.

b. From the inception through May 1961, the following statement was an official part of the direction to the contractors: "Technical direction of the program is the joint responsibility of several agencies of the Government. In the interest of effective management, however, such direction will be provided primarily by and through the Air Force Ballistic Missile Division acting as the agent for all interested components of the Government. A Project Officer will be established in BMD as the single day-by-day point of contact for the Contractor. This Officer will have authority to make on-the-spot decisions within the scope of the work statement on all matters pertaining to the program other than those of major importance. From time to time, the Government agencies concerned will jointly review the progress of the program. The Government will make arrangements

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SUBJECT: History of the CORONA Program

to permit the prompt rendering of major decisions concerning the program which cannot be made by the Project Officer." In May 1961 this statement was changed to read as follows: "Overall technical direction of the program is the joint responsibility of several agencies of the Government. In the interest of effective management, however, such direction will be provided primarily by and through the Air Force, Space Systems Division, acting as the agent for all interested components of the Government. A project officer established in SSD will be the single day-by-day point of contact for the Contractor. LMSD shall establish and maintain technical and management control of sub-contractors as are required for proper execution of the work statement. Major subcontractors are Itek Laboratories and General Electric Missile and Space Vehicle Department. Subject to the overall management of SSD/Headquarters, LMSD shall fulfill responsible systems management of the C''' program as Weapon System Contractor. Government approval of the technical decisions of the Contractor shall not be required prior to implementation, except as specifically set forth elsewhere in this contract. This provision should not, however, be construed in any way limiting the right of the Government to direct or redirect the technical aspects of the Contractor's efforts at any time." Essentially the same language was carried through on MURAL and "J", although now Itek and General Electric were associate contractors, and Lockheed with both an associate contractor and assistant engineering contractor.

c. While the project at SSD was the single day-by-day point of contact for the contractor or contractors, the Agency maintained a rather direct and frequent contact (in addition to the controlling role in monthly suppliers' meetings) with the working level people through the operations officer (Col. Murphy) who was located at the Palo Alto facility. Col. Murphy acted in a triple role. His primary responsibility was, of course, operations; as a secondary responsibility, he had mainly technical oversight. Third, he had limited authority as a contracting officer. In 1964, with establishment of the CORONA Project Office (Prog. [redacted] under [redacted] was detailed from Los Angeles to the Palo Alto facility to provide the technical

5 CORONA

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SUBJECT: History of the CORONA Program

contact with the contract and, as such, really assumed the second of Col. Murphy's three roles.

d. As a sidelight on contractor relationships, in the early phases of CORONA, all contractors and subcontractors felt relatively free to discuss proposed changes and problems with all parts concerned. Final acceptance of the systems was performed by a Washington representative. Extensive communications between all parts concerned were generally prevalent, both cable and telephone plus frequent interchanges. Beginning in late 1961, and increasingly so as time progressed, the contractors were restrained from direct interchange with Project Headquarters. By 1962, no cables could be released from the contractors at the Palo Alto facility to Project Headquarters without word-by-word approval from SSD. During late 1963 and 1964, communications channels dried up almost completely.

4. Government Management:

a. The CORONA Reconnaissance Program started in March of 1958 under the joint direction of the Advanced Research Projects Agency and the CIA, with the support of the Air Force. Proposal work in early feasibility investigations have been performed earlier as part of Weapons System 117-L. The CIA was charged with the development of the reconnaissance equipment, security, cover, and covert procurement. The Air Force contracted and directed the detailed procurements on the overt side. These included the booster, the AGENA 2nd stage, control networks, launch facilities, and the basic recovery vehicle development under the Biomedical Program auspices. It appears somewhat mixed right now as to exactly who was doing detailed supervision of the cameras and associated equipment. (A small group of Ballistic Missiles Division in Los Angeles, basically charged with the photo systems under 117-L, consider that they had much of this responsibility. Some of these officers were: Col. Sheppard, Col. Oder, [redacted] and [redacted]. Agency people concerned do not consider that this group had a strong or active role). Col. Battle of SSD was the official

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SUBJECT: History of the CORONA Program

program director of the DISCOVERER Program, including both the Biomedical Program (cover program) and the operational flights. The CIA, under the direction of Mr. Bissell, then DDP, was in formal charge of the technical direction of the payload, and represented Project Headquarters. Messrs. Kiefer, Kucera, [REDACTED] and Parangosky assisted Mr. Bissell in these early days. [REDACTED] participated somewhat later. In February of 1959 an inert THOR-AGENA was launched, followed by two non-camera bearing test vehicles. The first camera was flown in June of 1959 but did not orbit. In November of 1959, the ARPA responsibility was transferred to the Air Force under direction of the Secretary of Defense. At this time, there had been no successful camera operations in orbit nor recoveries. By April of 1960, camera operation had been accomplished (primarily because of a change to a polyester based film, rather than the acetate base used earlier). A recovery system diagnostic program was instituted, culminating, in August of 1960, with the first successful recovery from orbit. Later that month, a camera system was flown and film was recovered. It should be noted that during this period, and for several years thereafter, CORONA was looked on as a short-term back-up for the developing SAMOS Reconnaissance Systems.

b. Management during this period was basically joint and, as is obvious from conversations with various persons involved, without a single unified head; however, apparently good working relationships were maintained. Col. Murphy was the Chief Operations Officer for the CORONA Program on the West Coast. He was, at the time, assigned to the CIA and operated as the local Agency representative. Contact between the Government and both the prime and subcontractors was free and frequent. The original CORONA Program was extended without major system modifications (the C') and, in 1961, further extended with a major modification in the camera design (C'''). The C''' was first flown in August of 1961. In 1961 Dr. Charyk, then Under Secretary of the Air Force, authorized the development of a dual camera-stereo configuration, known as "C MURAL". (The SAMOS E-6 system was concurrently under development.) By agreement, Dr. Charyk and Mr. Bissell changed the contractual arrangement of the MURAL Program. LMSC, Itek, and General Electric became

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SUBJECT: History of the CORONA Program

associate contractors; and LMSC, in addition, was given the Systems Engineering Contract. Concurrently, a Configuration Control Board was established. The Board consisted of a representative from Col. Battle's office [REDACTED] the CIA Operations Officer of Palo Alto (Col. [REDACTED]) and a CIA Project Headquarters representative [REDACTED] [REDACTED] from NRO Staff, joined the Board shortly thereafter. The first CORONA/MURAL System was flown in February 1962.

c. Rather early in the program, when severe technical difficulties were encountered, a high-level team of government officers were assigned responsibility of solving the problem. The committee was known as the "Autumn Leaves Committee", headed by Mr. Kiefer. However, as Mr. Kiefer notes in a memorandum of 12 March 1964, "During two periods of great technical problems, subsequent to the establishment of the CCB, the engineering direction was largely pre-empted by Dr. Scoville on an ad hoc basis." The first of these problems was the electro-static discharge fogging problem, which is still plaguing us to some extent.

[REDACTED]

d. Direction of the program proceeded under this Configuration Control Board until early in 1964. In late 1963 and early 1964, the Director, NRO played an increasingly strong role; and, in January 1964, specifically directed that all changes to the payload system be approved by himself, following review by the CCB. The CCB was not formerly dissolved, but has not met since approximately March 1964.

e. From the inception of the program until 1963, the day-by-day technical direction of all contractors was under the general supervision of Col. Lee Battle, first in Ballistic Missiles Division and later in Space Systems Division. (SSD) Col. Battle responded directly to Washington authorities: Mr. Bissell, Dr. Charyk, etc. The program was generally assigned (under the NRO) to Director, Program "B" in CIA. Col. Battle considered his line of command as separate from the SAMOS Program. His successor, Col. Worthington, responded

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SUBJECT: History of the CORONA Program

somewhat to [REDACTED] Director, Program "A", nominally assigned to SSD, but actually heading an office [REDACTED] reporting directly to the Under-Secretary of the Air Force (Director, NRO). Early in 1964, as part of the Air Force move to assume full control of the CORONA Program, the program was transferred to a new office, directly under and reporting to [REDACTED] and headed by [REDACTED]. [REDACTED] had earlier been in charge of several photographic systems under SAMOS, most recently E-6. Since that time, [REDACTED] has been taking an increasingly strong role in the program, not using the CCB or associated mechanisms and reporting to Washington offices only through [REDACTED].

f. During the major portion of the CORONA Program, funding was from Air Force funds transferred to CIA. Budgeting information, etc., was also generated by CIA for submission. However, during 1964, budget submissions were made by the Director of Program "A" as part of the overall satellite reconnaissance program.

g. Throughout the course of the CORONA Program from inception to date, CIA has had the responsibility for security and actual contracting. They have maintained this role primarily because of certain prerogatives of the Agency and methods of doing business.

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