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A HISTORY OF SATELLITE RECONNAISSANCE

VOLUME IIIA - [redacted]

by

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PREFACE TO VOLUME IIIA

[redacted] was conceived while Dwight David Eisenhower was President of the United States. Thirteen years later, when this preface was written, the system still was the principal reliance of the United States government for surveillance of areas to which that country was denied access. It was, of course, a vastly different system from that first proposed shortly after Gary Powers' U-2 ran afoul of a Soviet antiaircraft missile in May 1960. At the time of that incident, the United States had no operational reconnaissance satellites and of the two developmental systems with apparent near-time potential, Samos E-1 was conceptually flawed and the other, Corona, had experienced a frustrating succession of operational failures. Four additional photo-satellites (Samos E-2, E-3, E-4, and E-5) were at some stage between invention and first launch; none was ever to return a single photograph of Soviet territory to American photo interpreters, although that preposterous outcome could not then have been foreseen by any rational participant.

U-2 penetrations had provided some useful insights into the research and development status of Soviet missile and aircraft programs by 1960, but the United States desperately needed information about the characteristics, numbers, and placement of operational ballistic missiles in the Soviet inventory. Notwithstanding the urgency of that need, President Eisenhower chose to disapprove plans for further U-2 operations over Russia rather than chance a nuclear weapons confrontation. In any case, the vulnerability of the U-2 was all too apparent. Lacking credible information about Soviet capabilities, the United States had in 1958 undertaken an enormous expansion and acceleration of its own ballistic missile program, hopeful that American industry could overcome what was generally assumed to be a substantial Soviet advantage in nuclear weapons delivery capability. No Corona satellite had yet functioned correctly; in mid-1960 that program was forced to retreat from launching operationally configured payloads to a resumption of engineering test flights, sans cameras, in the hope that malignant defects in orbital and recovery functions might be identified and eliminated.

In the near panic that followed the discovery that U-2 aircraft could no longer safely overfly the Soviet Union, intelligence specialists devised three major new photo-reconnaissance programs: Oxcart (the Mach 3, 100,000-foot-altitude aircraft that became better known as the A-11 "Blackbird" and later fathered the SR-71 and F-12 programs), Samos E-6 (designed originally to replace the languishing Corona satellite), and [redacted] Political constraints finally kept Oxcart from fulfilling its considerable promise and Samos E-6 was technically deficient, like its five Samos predecessors. Stubborn CIA and Air Force program managers working with Itek, Lockheed, and General Electric engineers rescued Corona and by late 1960 had collected the evidence needed to demonstrate that Soviet missile rattling was mostly hollow bluster. But in the end it was [redacted] that brought back the information needed to proportion the Soviet-American nuclear missile balance--though that event did not become reality until three years after the crisis that fostered the program. And notwithstanding the periodic appearance of programs and proposals for programs to supplement or supplant [redacted] that system grew and prospered so mightily that 10 years after its first flight it still was the principal reliance of United States surveillance effort.

This volume contains the history of the [redacted] program [redacted] Like other volumes in this series, it is designed to stand alone in being fully comprehensible without reference to other sources, but because the several discrete elements of the National Reconnaissance Program are inextricably interrelated, the reader may find it advisable to consult one or another of those volumes for detailed information about events that impacted on [redacted] without being integrals of the program.

This history was prepared under terms of a contract between the Director, Special Projects, National Reconnaissance Office (Director, Program A), and Technology Service Corporation, of Santa Monica, California. The principal author, Robert Perry, began research and wrote draft histories [redacted] while employed first by the United States Air Force and later by The Rand Corporation. He undertook revision and expansion of those sections and the addition of [redacted] flight histories in 1972, in association with [redacted] At various times, parts of the manuscript have been reviewed by members of the staff of the National Reconnaissance Office and of Program A. The reviewers and suppliers of both data and documents are so numerous that it is not practical to list them here. Most are mentioned in source notes following the individual chapters. To acknowledge their invaluable assistance in this way is plainly an inadequate response, but there is no feasible alternative. In any case, for such errors and oversights as may have survived the scrutiny of contributors and reviewers, the author is entirely responsible.

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Illustrations have been separately bound in an Appendix volume.

XII [redacted] ORIGINS AND DEVELOPMENT

Like much of the National Reconnaissance Program, [redacted] was the product of technical and political ferment and international tensions that peaked during the Spring and Summer of 1960.* The need for new sources of high resolution reconnaissance photography had become critical in the aftermath of the U-2 affair and with the enforced suspension of U-2 operations over the Soviet Union. Generally, policy-making officials in the Department of the Air Force and the Department of Defense had become thoroughly disenchanted with what they had seen of the existing Samos program. Continued emphasis on "concurrency" as a program mode and a stubborn Air Force emphasis on readout rather than recovery techniques severely prejudiced the Air Force case, since both approaches were unacceptable to most officials above the level of the Air Staff. The pressures of international politics had made it quite difficult for the Eisenhower administration to openly sponsor a new or accelerated satellite reconnaissance development. Finally, attractive proposals for new orbital reconnaissance systems had appeared during the summer of

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* The resume that follows is largely an encapsulation of Chapter VI of Volume IIA. For that reason, source citations have been used only when new material was employed.

1960. Adding body to the mixture were the facts that until mid-August the Corona had not returned any photographs whatever, while the only other capsule-recovery system then under development, Samos E-5, was regarded with something less than undiluted enthusiasm by much of the technical community.

In March 1960, [redacted] had privately submitted to the CIA and separately to the Reconnaissance Laboratory at Wright Field a proposal to develop a [redacted] camera for satellite reconnaissance. In June the company proposed a [redacted]

A month later, on 20 July, [redacted] submitted a modified proposal which essentially [redacted] Dr. E. H. Land, one of the key industry authorities in the reconnaissance program, personally brought the [redacted] proposal to the attention of Air Force Undersecretary J. V. Charyk, who was rapidly becoming the dominant figure in the Pentagon struggle for control of the Air Force satellite reconnaissance effort. Charyk opened direct contact with [redacted]

[redacted]

[redacted] shortly thereafter. He was particularly interested in the [redacted] approach because it embodied two major elements toward which he was favorably predisposed: a film-only recovery scheme, like Corona, [redacted]

In the meantime, reconnaissance specialists of The Rand Corporation had renewed their efforts to induce the Ballistic Missile Division (BMD), immediate sponsor of the Samos program, to develop a spin-stabilized reconnaissance system along the lines of a 1957 Rand proposal. In response to a request from BMD, Rand in June 1960 began working with Space Technology Laboratories (STL) on a plan to develop a system which by taking maximum advantage of available technology could be made operational in the near term. BMD interest stemmed largely from Charyk's earlier sponsorship of such an approach.

On 7 July 1960, a group of Rand and STL specialists quietly assembled at the invitation of Colonel Paul Worthman of BMD, the sub-rosa Air Force manager of the Corona activity, to discuss details of a newly conceived variant of the original spin-stabilized satellite. Rand had concluded that it would be perfectly feasible to orbit a reconnaissance satellite [redacted]

[redacted] Rand's recommendation to STL covered a 1500-pound satellite carrying a 36-inch (focal length) camera system using spin stabilization to provide panoramic coverage at a ground resolution of about 17 feet. If the satellite were oriented so as to have its lens pointing directly downward while over latitude 55 North it would provide useful coverage of all of the northern hemisphere lying between 40 and 70 degrees.[1]

By early August 1960, STL had shaped the earlier scheme into a semi-formal proposal. It differed from the earlier scheme in being based on a camera with a 24-inch focal length and in certain other minor details. Apart from re-introduction of the spin stabilization mode after a lapse of two years, its chief attraction lay in the premise of operations that could be conducted most circumspectly--even though there was a degree of unreality in the notion that a pretense [redacted]*

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* With allowances for minor differences, there were only [redacted] A three-axis-stable vehicle with a panning lens and fixed-position film was one; its chief practictioner was Corona. [redacted]

By 25 August 1960, when the President approved the establishment of a tightly controlled secretariat-level satellite reconnaissance organization, there were [redacted] leading candidates for sponsorship as "new" systems. [redacted] had proceeded toward source selection while the question of who would control the total program, and at what level, was being resolved.

[redacted]

Nevertheless, the general structure [redacted] was treated as normal, highly classified information at Wright Field, at BMD, and in various Pentagon offices concerned with satellite reconnaissance.

[redacted]

[redacted]

On 20 September 1960, very shortly after the Secretary of the Air Force Samos Project Office (SAFSP) had legally come into being at BMD, Charyk met with Brigadier General Robert E. Greer (the program's new military director), Colonel Paul E. Heran (chairman of the E-6 source selection board), and Lieutenant Colonel James Seay (Greer's procurement advisor). After considering all the options, they agreed that the best course was to continue [redacted] Undersecretary Charyk, with the specific approval of the President, decided the [redacted] should be developed [redacted] How that should be done remained to be determined.* For the moment, the only major action was to provide [redacted] to finance [redacted] through the balance of the year.

[redacted] was briefly continued, but in early November Charyk had ruled against any immediate development of a spin-stabilized reconnaissance satellite. By that time the notion [redacted] Since [redacted] was the originator of the [redacted] amera concept and for a variety of very practical reasons had to be picked

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* See Chapter V for a considerably more detailed account of the considerations affecting the [redacted] program decision.

to carry on that effort, [redacted] (That would probably have been the outcome of [redacted] One of the early problems encountered by program managers arose from the need for specifying a satellite vehicle which would house [redacted]

Concealment of [redacted] proved less difficult than had initially been feared. General Greer arranged to have [redacted] study contract terminated [redacted]

[redacted] from Corona, was of as great concern as the concealment [redacted] from most of the Air Force.

[redacted] which was to perform a limited systems engineering-technical direction function in both [redacted] activity under rigid need-to know rules. Such controls were also imposed on the two main centers of Air Force activity, the program office complex in Los Angeles and Charyk's special staff in the Pentagon. There was some early difficulty in choking off the rather casual circulation of [redacted] knowledge within the headquarters of the Air Research and Development Command and in the Air Materiel Command structure, leading to a couple of episodes of knuckle rapping, but by early 1961 an effective "black" environment had been built around the program.

Perhaps more important to the surprising success of the cover effort, a great deal of effort was then being expended in developing the recovery systems [redacted] in secure but "white" settings. To the outside world it seemed obvious that the new Samos organization [redacted] so any puzzling activity at one of the contractor plants was attributed to these interests rather than to anything new. Inside General Greer's organization, where relatively few people initially knew of [redacted] normal human preoccupation with the tasks of the moment proved a highly successful insulator against random curiosity. Most of the Air Force shared the uncritical assumption that "the establishment" could not accommodate effective internal secrecy and that because procurement and contracting had always been open matters--and "security" a special sort of club to which most cleared Air Force personnel were admitted without qualification--no large-scale development effort could possibly be concealed.

[redacted]

[redacted]

Even while the program was first taking shape, then, General Greer had recognized that eventually he would have to [redacted] The problem continued to trouble him for several months. Among all the space programs being conducted by NASA and the Air Force, only those contained within the reconnaissance effort were significantly concealed. Routine security screened several of the "military satellites," but experience had demonstrated that for a reconnaissance program "routine security" was not enough. The apparent susceptibility of any acknowledged satellite reconnaissance program to cancellation on political grounds was particularly acute in 1960-1961. [redacted]

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* It may be argued that the CIA had done all those things in Corona without arousing suspicion, but in fact Corona was tightly concealed under "Discoverer" for its first four years, and in any case CIA expenditures were not matters of public record, as was the case for all Air Force Samos costs in 1960.

In the event, only until the early months of 1961 was it feasible to pretend that [redacted]

In such circumstances the academic concern General Greer had voiced six months earlier became a real problem. Not only was there [redacted] but the possibility of a politically motivated cancellation of [redacted] seemed greater.

The desirable solution, suggested in Greer's notes of December 1960, [redacted]

[redacted] (the suggestion horrified the CIA, ultra-sensitive to anything that might invite close scrutiny of Discoverer and thus threaten compromise of Corona), and none of the other in-progress space programs of either the Air Force or NASA afforded [redacted] there was no easy or obvious option.

While mulling over the contradictions between needs and possibilities, General Greer conceived an approach based in part on his earlier analysis of the problem of covert procurement. In November 1960 he had begun "black" contracting under the philosophy that since "everybody" knew it was impossible for the Air Force to buy anything expensive without going through established review and approval channels, one might do quite a lot of unsuspected buying and contracting by merely obtaining a direct authorization. It occurred to him that the solution to the [redacted] might be found in the same thesis. He thereby invented the concept of the "null program," a development with no known origin and no specified goal. If such a program were conducted under the aegis of a highly classified payload, it should be entirely possible to purchase boosters, upper stages, and launch services through normal channels. Because "everybody" knew that the entire reconnaissance satellite program was in Greer's keeping, the assignment of "null program" responsibility to the regular Space Systems Division (SSD) organization would serve to convince most observers that it had to have some objective other than reconnaissance. [redacted]*

Putting such a cover into effect required devious scheming and a high degree of ingenuity, but by June 1961 the plan had been reduced to specifics and generally approved by Undersecretary Charyk.[3]

In July the first moves toward establishing an activity called [redacted] were taken. Through the Air Staff, SSD received authorization to buy four "NASA type" Agena B's for launches starting in January 1963--the Agenas to be assigned to no particular space program "for the present." In August, Charyk sent a memorandum to the Air Force Chief of Staff which emphasized the need to protect the USAF's "capability to do future space projects" and which affirmed

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* The author ran across the formal documentation on the [redacted] early in 1962, several months before being exposed to the real workings of SAFSP. [redacted] Any other explanation of the obvious facts was, as General Greer had cannily anticipated, too illogical to deserve serious thought. (R.P.--July 1964)

the desirability of ordering six Atlas boosters (configured to accept Agena B's) to be used starting in February 1963. Again there occurred the phrase about "not assigned to a particular space project."[4]

Apparently the matter seemed so mundane to the Air Staff that the authorizing teletype managed to get lost somewhere in the Pentagon-AFSC headquarters maze. Nearly two weeks were needed to straighten out the resulting confusion and even then it proved necessary to apply considerable pressure before organizational inertia could be overcome.[5]

Having gotten a small batch of Atlas and Agena vehicles on order, SAFSP moved to the next business [redacted] On 25 September 1961, the Air Force vice chief of staff directed General B. A. Schriever, AFSC commander, to establish [redacted] The authorizing message noted that the Secretary of the Air Force had separately ordered the necessary Agenas and Atlases "on an unassigned basis." "They are hereby assigned [redacted]" the teletype read.[6]

In a further exchange of teletypes, all written well in advance in General Greer's complex, the special projects office established

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* The original code word was [redacted] changed because it had been used previously.

the fact that [redacted] had a goal that was classified top secret. Plans to include specific references to the procurement authorizations for the Atlas and Agena purchases had to be put off because nobody in the Pentagon could locate the relevant documents; they had been lost in the course of an Air Staff reorganization during the summer of 1961. The "white" correspondence also stated requirements for the usual sort of elaborate documentation--development plans, cost projections, and the like--that had become customary for new programs. The absence of such paraphenalia would presumably have alarmed the "normal" procurement establishment, though such "documentation" was completely redundant to the SAFSP procedures.[7]

By mid-November the basic plan had been very largely put into effect, only a few of the loose ends remaining. [redacted]--which for reasons of administrative convenience had the additional and unclassified nickname [redacted]

* [redacted]

Colonel Q. A. Riepe, who had been associated with the satellite reconnaissance program at intervals since 1953, was named the [redacted] program director. His assumption of technical responsibility for [redacted] from Colonel Paul Heran [redacted] program director and original custodian of the [redacted] development) [redacted]

A complex network of nominal and actual reporting channels linked [redacted] to General Greer. (Greer then had an additional duty assignment as Vice Commander of the Space Systems Division, although his primary responsibility was for the reconnaissance mission.) All contacts between [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] The land recovery approach, which had been an integral of the original presentation to President Eisenhower in August 1960, was intended to overcome what were considered increasingly hazardous aspects of sea recovery. There was a great deal of concern in 1961 for the possibility that a Soviet ship or submarine might reach a floating Corona capsule before rescue forces arrived or that a capsule might descend, intact, into non-friendly territory. Recovery of such a capsule might well precipitate a grave international crisis--while failure to regain possession might be the excuse for a new U-2 incident, but an echelon or two higher on the scale of risk.**

[redacted]

**A Corona capsule did survive an unplanned reentry, in Venezuela, several years later--and nobody noticed.

[redacted]

A set of four rocket engines, each capable of producing 50 pounds of thrust, would provide for orbit maintenance. Six more such rockets were located in the aft section of the reentry vehicle. After reorientation of the satellite by 180 degrees and a 60-degree pitchdown had been completed, the reentry vehicle would be separated from the vehicle midsection and the engines fired. A velocity meter signaled shutdown.[14]

[redacted]

[redacted] program office had been formally established on [redacted] with an initial complement of 18 officers and 8 clerks. By that time, six Atlas boosters and four Agenas were on order and arrangements to obtain four more of each were pending. The various elements of normal development program documentation either had been completed or were well along toward completion. Arrangements for special facilities were being made: pad, launch complex, and assembly buildings modifications at Vandenberg had been scheduled and the State Department had opened negotiations for an additional up-range station, [redacted] needed both for controlling the orbital vehicle and for safeguarding the proposed land recovery process.[16]

[redacted]

In January 1962, the Samos E-5 program was finally cancelled after a succession of launch, on-orbit, and recovery system failures. Corona was in one of its periodic spasms of operational difficulty, and the proposal for a Lanyard development was receiving generally friendly attention. (Lanyard was a re-engineered, single-camera E-5 system in Corona vehicles.) The need fo[redacted]

[redacted]

Undersecretary Charyk, who was under constant pressure to get quick and effective results in the satellite reconnaissance program, wanted both to accelerate the pace of [redacted] development and to improve its product. He spent 9 February 1962 in Los Angeles discussing those needs with Greer and Riepe. They concluded that program acceleration was impractical unless a considerable degradation in photography was also acceptable. Moreover, it was then becoming clear that problems of mission planning and on-orbit control would be more difficult than originally anticipated--and substantially more complex than anything previously attempted in satellite reconnaissance. [redacted] would differ from all predecessors in being committed to a computer-designed operational procedure, since the precision requirements were deemed too great to be satisfied by the sort of target designation and on-orbit procedures employed in Corona and planned for E-6.[18]

[redacted] seemed incapable of providing the required accuracy within the time limits of the development program. Rather than being able to accelerate [redacted] had to caution that delayed vehicle delivery was probable. A program slip of about four months seemed inevitable, moving the prospective first launch date from February 1963 to May of that year.

[redacted] proposal for correcting the defect was to go to a [redacted] system, essentially abandoning--at least for early flights--the concept of a [redacted]

General Greer had suggested that option on 28 February, shortly after the initial disclosure of [redacted] development problems. He also, but somewhat reluctantly, endorsed and forwarded Colonel Riepe's proposal for an expanded test program, one involving more qualification tests, the construction of more spares for the engineering development program, the inclusion of complete hot-firing tests in the schedule, the provision of a back-up development for major elements of the command system, funding [redacted] industrial facilities, and the addition of three reentry vehicles to the basic test program. All those changes seemed certain to further delay the availability of the first [redacted]

Similar but far less sweeping recommendations affecting [redacted] program went forward simultaneously. [redacted] though having trouble, was in less difficulty than [redacted] The chief camera program change which Greer sponsored involved the development of additional manufacturing processes for lightweight optics.

To the greater question of whether an attempt should be made to maintain schedules at the expense of system degradation, Greer provided a blunt answer: by going to an Agena-derived stabilization system it would be possible to provide for a vehicle with limited accuracy and system flexibility that would meet the February 1963 launch date. But Greer opposed such an option unless the schedule was a sole and overriding consideration, since the development had no future and any resulting photographs would be degraded. Rather than make such a compromise, the general favored accepting a four-month slip in first launch.[20]

With reluctance equal to Greer's, Charyk accepted the prospect of further schedule slippage. On 19 March 1962, he directed that a

[redacted]

The options thus adopted encouraged some optimism about meeting schedules and performance requirements should the primary development systems encounter further difficulty. There was general agreement that the earliest possible date for initial launch would be May rather than February 1963.[22]

Decisions on these matters had to be made and put into effect by mid-March; Charyk was under orders to report to the President on the status and prospects [redacted] at that time. The undersecretary began his 19 March 1962 report by recalling that the objective of [redacted]

He noted that the performance requirements of the system pushed the state of the satellite arts in three specific areas:

[redacted]

The performance of the [redacted] camera depended [redacted] Because the ground swath width of [redacted] cameras was only 10 miles, more photographs would be taken [redacted]

Charyk's report was relatively optimistic, although he refrained from any predictions of complete success in meeting either schedules or resolution requirements. He forecast a first flight date in May 1963 and operational readiness by August of that year. And he concluded by summarizing the measures taken to insure the readiness o[redacted] at the earliest possible date,* appending the note that something on the order of [redacted] in additional funds would be needed to see the "insurance program" through.[23]

Certain other measures were taken during March 1962 to improve prospects of program success. At Greer's insistence, [redacted] management to provide more meaningful attention from high corporate executives and to improve laboratory, assembly, manufacturing, and test procedures. Concurrently, the general pu[redacted] under contract to solve the orbital operations problem[redacted] would receive about [redacted] for computer work on orbit selection, mission profiles, and operational analysis. Charyk also approved these actions in March.[24]

Separately, the West Coast group arranged with [redacted] to begin a backup program supporting [redacted]

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* These were essentially the actions approved in his separate 19 March directive to General Greer and were based on Greer's 28 February recommendations.

[redacted] Equipment tests were to be conducted in the Discoverer program.)

One key reason for making the [redacted] was the need for close correlation of [redacted] developments. The feasibility of such contacts was enhanced by the fact that [redacted] was moving all its [redacted] work to a special facility at [redacted]

The facility problem, in conjunction with an alarming increase in [redacted] cost estimates, caused a minor crisis in [redacted] program affairs in April and May 1962. In part, the reluctance of the Department of Defense to finance an expansion of [redacted] facilities, including those needed for [redacted] production, arose from an expectation that space and equipment released from the cancelled Advent communication satellite program could be diverted to other uses, including [redacted] General Greer felt that nothing of value to [redacted] would emerge from the Advent termination in time to be useful. Charyk had another opinion, and a fair amount of argument was necessary to change his mind. Eventually, on 31 May 1962, the necessary formal approval was received and the facility construction a[redacted] was able to continue, but for about a month before approval was received the question--and the soundness of [redacted] delivery schedules--seemed very much in doubt.[26]

Another aspect of the apparent reluctance to commit additional money t[redacted] was the steady increase in estimated program costs. Between [redacted] estimates had gradually climbed from [redacted] an increase only partly caused by configuration changes. The contractor explained away some of the puzzling increases as arising from unanticipated technical difficulties but also conceded to "just some bad estimating." Neither Greer nor Charyk was particularly happy about a contract performance which the general charitably described as ". . . somewhat less than expected."[27]

Equally important to the trend o[redacted] development were technical questions which had persistently bothered General Greer through the early months of 1962. They stemmed, in the main, from Greer's long-held conviction that the need for land recovery of film capsules had been considerably overemphasized. The original [redacted] program directives had specified land recovery as one of the prime development objectives, for reasons which had seemed more than sufficient to the high administration officials who had conceived and pushed the notion. In the climate of 1960, when Corona recovery had been infrequent, uncertain, and expensive, land recovery seemed a useful option. But land recovery was more complicated than air catch in several ways, and the very grave risks inherent in such an approach had continued to trouble Greer. On several occasions during the first [redacted] development he had raised the issue in discussions with Dr. Charyk. In each instance, however, Charyk had acknowledged the question and reconfirmed the requirement. All of those discussions were informal. Only once did the question of an alternative to the original land recovery scheme receive consideration at the level of the program office. In January 1962 a member of the [redacted] contingent advised Colonel Riepe that air retrieval was "being considered," but that it was quite impractical.[28] [redacted]

By July of 1962, General Greer's concern had put down roots more substantial than an academic distrust of land recovery as a technique. [redacted] Moreover, the reasons for distrusting air-sea recovery modes had become much less valid since 1960. Successful Corona recoveries were proving to be less difficult as time passed. The anticipated danger of losing a capsule to a Soviet trawler or submarine had largely dissipated; over-water recovery plans contained provisions for dealing with virtually every imaginable contingency, while the possibility that a slightly misdirected land-recovery capsule might descend in either Canada or Mexico--or might drive into some populated area of the western United States--had not diminished.

Equally important, the disabilities arising from land recovery had not been appreciably lessened in the intervening years. Indeed, in many respects they had come into sharper focus. Over-water recovery, as developed in the Corona program, seemed a very simple process when compared to the planned land recovery scheme. In its descent toward the sea, a Corona reentry vehicle could safely shed all sorts of accessories--hatch covers and the ablative cone being the most obvious. Such jetsam fell into the ocean without danger to anything below, and then sank into the secure obscurity of a cluttered sea bottom. A land recovery vehicle could shed nothing that might come to earth as a lethal projectile or which, if discovered, might breach the security of the satellite reconnaissance effort.

Everything that re-entered with a land-recovery vehicle had to remain with it. Finally, experience with the E-5 and E-6 reentry vehicles, and particularly the latter, did encourage great optimism about the feasibility of recovering bulky, weighty capsules.

Toward the end of July 1962, General Greer again raised the question of the desirability of land recovery with Undersecretary Charyk. Although still dubious, Charyk agreed that Greer should look into alternatives. In point of fact, the most desirable alternative had occurred to Greer some days earlier. Thoroughly familiar with Corona, he had concluded that it might be entirely feasible to modify the [redacted] vehicle to accept a Corona-type recovery capsule. After mulling over the idea, he decided that was the sensible and logical way out of the current dilemma. Having broached the thought to Charyk and gotten agreement that the idea had merit, he went directly from Washington to the [redacted] senior satellite program official, was absent when Greer arrived, so the general settled down at [redacted] desk and wrote a longhand memo authorizing [redacted] 29

Encouraged by preliminary findings, General Greer induced Charyk to formalize the inquiry. On 28 July the undersecretary agreed that a major policy decision was necessary on "the question of land recovery in the entire satellite reconnaissance program." He acknowledged doubts about the wisdom of relying too fully on ". . . the more complex and larger vehicles being developed toward land recovery" and asked for a "white paper" on the merits and short-comings of land recovery. He also suggested a study of the feasibility of designing a capsule which could be retrieved in any of several different modes as individual mission circumstances dictated. Later that day Charyk added a requirement for a broader study of simplifying [redacted] to provide "possible alternative modes of operation" including sea recovery.[30]

Apart from Greer himself, at least one other senior officer in the West Coast establishment had given serious thought to the land recovery problem during the early summer of 1962. Colonel Paul Heran, director of the E-6 program (which was then entering its flight test phase and had begun to encounter problems in recovery techniques), had looked into land recovery options for his satellite and had concluded that while the technique was feasible for E-6 it was not particularly attractive. Charyk was familiar with this conclusion as well as with Greer's severally expressed reservations. On 30 July 1962, General Greer discussed the Corona-capsule idea with Colonel J. L. Martin, Charyk's principal staff officer for the satellite program, in Washington. By the start of the following week he had received an advance report from [redacted] He promptly advised Martin and Charyk that a relatively minor modification to the Discoverer capsule would provide "a vastly simpler scheme for recovering record data [redacted] He asked for authority to start [redacted] on a full investigation and, [redacted]

In the meantime, Greer had assigned to Colonel Riepe the task of responding to Dr. Charyk's formal query of 28 July. Riepe was cognizant of Corona, [redacted]

[redacted] Then there were considerations involving facilities: [redacted] control station had been pressed (though with no particular success), and a start had been made toward the construction of buildings on the Wendover range, in Utah.

On the other hand, more than [redacted] by going to an overwater recovery mode. The elimination of the land recovery requirement would also permit earlier testing with less risk, would reduce requirements for orbit adjust, and would (at least in theory) enhance the probability of recovering film, since over-water recovery techniques were by then well proven. Such reasoning was based on the little that [redacted] people knew about the details of the Discoverer recovery vehicle.[32]

Some among General Greer's people believed that land recovery should be continued at almost any cost, considering its eventual adoption inevitable. In his summary study, forwarded to Charyk on 4 August 1962, the general took the opposite view, noting that many of the original motives for developing a land recovery capsule had been invalidated by the passage of time. The enormous expense of maintaining a sea recovery force to back up air catch operations had been a point in favor of land recovery in 1960, when the first Discoverer recoveries were successful, but with the refinement of air catch techniques the need for such elaborate surface forces had disappeared; air catch with limited ship and frogman backup had been well proven in the previous several months. The danger of capsule capture, the probability of loss, and the logistics of an air-catch technique had become less significant and techniques improved, while development of a land-recovery capsule had underscored new problems: weight, complexity, reliability, and performance penalties. In retrospect, the disabilities of land recovery seemed to have overtaken any earlier advantages. So, said General Greer, it was his conviction that the mobile air-sea recovery mode was "far simpler and has overwhelming operational advantages over fixed base recovery."* He predicted that the continued evolution of guidance systems would further reduce logistic requirements and increase accuracy, making multiple recovery feasible in the process. (The general was also thinking in terms of a capsule suitable for use

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* Such opinions were supported by extensive comparison tables which showed the air-sea techniques to be best on the basis of all possible considerations. Land recovery showed up as the least promising technique, with island recovery next lowest. Among the factors considered in the study were all-night and all-weather operations, the dangers of dropping a capsule into a neutral country, requirements for precision, the status of several recovery techniques, the use of multiple capsules, the ability to conceal a recovery operation, and hazards to population.

in any of several recovery modes--land, island, sea, and air-catch--with fewer specialized requirements than the contemporary land-recovery designs.)[33]

On 6 August, Captain Frank B. Gorman (USN), General Greer's plans chief, summarized the status of various recovery techniques in a special presentation to Undersecretary Charyk. Almost simultaneously, General Greer was mulling over a problem of funding which bore directly on the newly pregnant question of continuing land recovery plans; he recommended on 14 August that requests for [redacted] in facilities funds for the Wendover range be withdrawn from the fiscal 1963 budget totals, concluding that they would be extremely difficult to defend in the existent climate. Ten days later, Colonel Riepe made a separate presentation to Charyk on recovery matters and at its conclusion received instructions to plan for initial systems tests over the Pacific rather than over the Wendover range. The undersecretary also decided that development activities related to the original land-recovery capsule should be reduced to a minimum expenditure rate, accepting the probability of program slippage if it were later reinstated.[34] Separately, Charyk authorised Greer to begin immediate development of a Corona-type recovery system for [redacted][35]

For two weeks following Charyk's 24 August decision, both the new and the old approaches to recovery were kept in being. In that interval, the undersecretary consulted with CIA members of the National Reconnaissance Organization. The situation was complicated by the fact that all matters involving use of the Corona capsule were in CIA custody; the agency maintained a jealous control of Corona security, opposing as a matter of policy all proposals for broadening the dissemination of information on the Corona recovery system. Although to many observers CIA's caution seemed to verge on the psychotic, there was no denying that the use of the "Discoverer" capsule system in a non-CIA reconnaissance system would increase the chance of compromising Corona. Memories of the U-2 incident were too fresh to encourage any laxity. In 1962, the consequences of a disclosure that the "science oriented" Discoverer program had always been a CIA-sponsored reconnaissance scheme were too frightening to contemplate. The agency therefore insisted from the start that any provisions for using the Corona capsule configuration [redacted] had to begin with thorough protection of all aspects of Corona security. [redacted]

On 18 September, General Greer and Undersecretary Charyk met in Los Angeles to settle the main question. Charyk had by that time come to the viewpoint that land recovery was a sophistication of reconnaissance techniques which, though highly desirable, might take another decade to perfect. He still felt that operational costs, system efficiency, and security would benefit from land recovery, but he agreed that it was not immediately essential or feasible. General Greer commented mildly that land recovery was a useful emergency capability, but one not necessary in the current situation. He added, as an aside, that he had never firmly believed that the land recovery mode would be used [redacted] The need to recover was too compelling to risk the additional complications of an entirely new technique when a proven recovery system was readily available.

Charyk capitulated, approving use of the [redacted] (Corona) capsule on the first [redacted] shots and withholding a decision on later launches. He authorized cancellation of current studies on precise land recovery but added the proviso that Greer should undertake a study of modifying the [redacted] for land recovery as an option to be considered after the first [redacted] The approved plan,

[redacted]

then, involved adapting the original [redacted] to the first [redacted] and developing a mildly modified [redacted] with a capacity for emergency land recovery, for later use.[36]

[redacted] suggested several possible ways [redacted] and on 18 September, the day of the actual decision to proceed along the Corona capsule route, CIA recommended adoption of one of these. To the Greer people on the West Coast, the [redacted] recommendation seemed unduly complex; they proposed a compromise. On 28 September, CIA agreed. The final procedures (which were complex because they were designed to keep knowledge of Corona from the [redacted] people who would be using the device) provided for design of the [redacted] for [redacted] within [redacted] establishment and the performance of qualification tests at [redacted]

Final orders cancelling the mid-continent station proposal were issued on 20 September 1962. A further refinement of [redacted] station requirements, in February 1963, led to the abandonment of earlier plans for using the Annette Island site (in Alaskan waters) as a doppler radar tracking site.

[redacted] The purpose of the arrangement was to keep non-Corona people from learning that for more than three years the CIA-purchased Discoverer series of satellites had actually been carrying reconnaissance devices.[37]

The effect of the transition from a land-recovery system to the Corona recovery system included a slippage of at least one month in launch schedules. At that cost, the very troublesome weight difficulty that had earlier afflicted [redacted] was eliminated, the complexity of the early design was materially reduced, and the requirement for a separate recovery force within the continental United States could be cancelled. On the whole, it seemed a worthwhile exchange.[38]

Dr. Charyk was not entirely happy with the outcome, however. His reluctance to abandon land recovery [redacted] almost certainly stemmed from his original commitments to that mode during the Samos realignment period of 1960 and from the fact that the President and the National Security Council had been encouraged to expect a land-recovery system to become operational during 1963. Although he accepted the inevitability of the change, he never displayed any special fondness for the thought [redacted] Greer, more pragmatic, was well pleased with the course events were taking. Not merely had the uncertainties of [redacted] film recovery been reduced by the change in recovery techniques, but it appeared that the whole [redacted] system had been markedly simplified.[39] In the wake of E-5 and E-6 experience, simplicity was a virtue for which he had a marked respect.

Prompted in part by hard questioning during a meeting with the Foreign Intelligence Advisory Board and the "special group" of the National Security Council, Dr. Charyk in early October 1962 questioned the adequacy of project-office-level management. Charyk characterised [redacted] as "imperative" and urged that it be pressed with a "maximum sense of urgency," noting that the "extreme political sensitivity of any other method of obtaining such photography" made it essential that "no reasonable steps should be omitted to guarantee its success at the earliest possible time." Discouraged about the rate of [redacted] progress Charyk specifically suggested to Greer the appointment of an extremely able project manager and the start of an exhaustive technical review to locate any problems remaining in the [redacted] program. Resolution better than the two-foot requirement of 1960 was desirable, he emphasised. He also cautioned that money was not unlimited and that greater management talent rather than more funds should be applied to the program.[40]

In all probability, the prevalence of over-runs, [redacted] the threat of new schedule slippages, and the increasing cost of the [redacted] program prompted Charyk's sudden outburst of concern for the validity and future of the development. Such factors certainly were at the heart of his indirect suggestion that Colonel Riepe be relieved--a suggestion that he separately discussed with General Greer by telephone. Charyk, who had made efficient management his fetish at the time he acquired custody of the satellite reconnaissance function, tended to ascribe most of [redacted] contemporary difficulties to deficiencies in management at the program office level. He was particularly concerned at the possibility of further schedule slippages since [redacted] offered the most promising approach to the task of discovering, at any given time, whether the Soviets were actively preparing their military forces for use.

The coincidence of Charyk's anxiety with the start of the Cuban missile crisis of 1962 could scarcely be ignored; even though the United States did not have clear evidence that Soviet nuclear-warhead missiles were being emplaced in Cuba until the second week of October, concern for that possibility had been mounting since the previous August. Obviously, it would have been much easier to deal effectively with a Soviet missile threat in Cuba if the administration had detailed information on the degree of Soviet preparation for quick use of strategic striking forces. This, then, was a central consideration in Charyk's desire to accelerate [redacted] progress and to improve the quality of [redacted] products. The prospect of program delay rather than acceleration, and of photographic degradation rather than improvement, certainly influenced him to suggest the assignment of a new program office chief.[41]

General Greer, who had to decide the fate of both the program and its immediate manager, was scarcely indifferent to the circumstances that had moved Charyk to such a position. The E-6 program was in grave technical trouble in October 1962, having experienced four failures in as many flight attempts. Nor was there available any convincing evidence on which to base a rebuttal of Charyk's stand. Through a succession of misfortunes mostly originating in the pre-1961 Samos program, it had been necessary to cancel each of the major photo-oriented reconnaissance programs originally assigned to SAFSP except E-6 [redacted] And E-6 had taken on a distinctly unhealthy cast. True, the most obvious defect in [redacted] had been eliminated with the decision to adopt air-catch recovery techniques and the Corona recovery vehicle. But the prospect of program slippage [redacted] could not be banished and there was no ready means of insuring that the rather complex [redacted] camera system would function with complete propriety during its early flight trials.

On 5 October, Greer told Charyk "with some reluctance" that the most certain way to strengthen [redacted] management along the lines Charyk had indicated would be to transfer official custody of the program from SSD to SAFSP.* He reaffirmed his desire to keep Colonel Riepe in charge of [redacted] development. Moving the program into SAFSP, he told Charyk, would give the development the benefit of prestige that adhered to any effort identified with the secretary's office, although it seemed possible that identification of [redacted] with reconnaissance objectives might follow. In Greer's eyes, that was not a disqualifying handicap. He reminded the under-secretary that the United States had constantly maintained the basic legality of satellite reconnaissance under international law and that the nation had never denied either the existence or the employment of orbiting camera systems. The chief purpose of concealment now, he suggested, was to cloak the scope and operational success of such operations. That much could be done within SAFSP. The remote possibility that national policy might shift, in which case it would be difficult to continue any effort even indirectly associated with reconnaissance objectives, was the chief argument against moving [redacted]

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* The desirability of shifting [redacted] into the SAFSP structure had been examined in some detail as early as July 1962. By October, Colonel J. W. Ruebel, General Greer's special assistant, had worked out the basic details of the transfer plan later adopted and had composed a "rationale" for public consumption.

The general was not optimistic about the prospect of improving the quality of [redacted] photography, at least in the first several flights. He told Charyk that the original definition requirement, two to three feet in resolution, would very probably be satisfied--though he observed that not all experts agreed with him on that score. [redacted] Greer cautioned that results from the first few flights might not bear out his conviction that [redacted] would prove itself; past experience with "new" space vehicles (into which category the [redacted] certainly fell) was not such as to encourage undiluted optimism.

As for priorities and emphasis, General Greer noted separately that ". . . it is difficult to convince either contractors or military personnel involved in administration of this program that it enjoys any special priority or importance. The one infallible indicator of status--timely and adequate funding--is and had been consistently absent since the turn of the fiscal year."[42]

Although General Greer had essentially reacted to Charyk's message of 3 October by defending the status quo, he thereafter set afoot major changes which, within 60 days, markedly altered both the configuration and the character of [redacted] On 30 October he announced to members of the [redacted] office that Colonel

William G. King was assuming management responsibility for their project and that Colonel Riepe had been detailed to a new and demanding SSD program.[43] Four weeks later, Colonel Riepe was officially named director of Program [redacted] identified by Air Force headquarters as an extremely high priority project aimed at the [redacted][44] General Greer had earlier discussed SSD's need for an experienced space program manager with SSD's commander, Major General B. I. Funk, and with Colonel Riepe's knowledge had worked out a transfer arrangement.[45]

King, who had been intermittently associated with satellite reconnaissance for nearly 10 years, had special qualifications for the [redacted] assignment. As Samos program director during 1959 and 1960, he had been a participant in the bloody infighting that accompanied the Samos reorganizations. He had been one of the first to recognize the superiority of film recovery over readout techniques for Samos and had been notably outspoken in his support of recovery as a technique. Since cancellation of the E-5 program the previous winter, he had served mostly as a special plans officer for General Greer, conducting detailed studies and comparative analyses of the various systems proposed and in development, [redacted]

Admittedly, th[redacted]program was a bit out of hand when King took it over. Riepe had reacted to Charyk's continued pressure for insuring a first flight success by creating an elaborate test regime which had substantially increased the cost and complexity of the development. There were indications that Charyk did not have a high regard for Riepe's ability; General Greer, who thought well of him, nevertheless conceded that in his dedication to the assignment Riepe had tended to overelaborate the program and the program office. In the circumstances of October 1962, simplification of both seemed necessary. King's job, then, was to devise and put into effect measures for restoring full confidence in program success--a commodity not always abundant that fall.

Immediately after taking over the program, Colonel King discovered that the adaptation of the Corona capsule to [redacted] uses had gone thoroughly off course. The situation had its origin in a series of basic misunderstandings complicated by a lack of knowledge in the program office and [redacted] engineers.

Greer's original intent, confirmed by Charyk, was to "glue on" the Corona recovery vehicle. Elaborate or extensive modification of either the capsule or the orbital midstructure was neither intended nor desired. Because of the rigid compartmentation of programs, however, only Colonel Riepe among the [redacted] program office people had a reasonably full knowledge of the Corona program. Corona provided two years of carefully concealed experience with [redacted] Reasonably enough, lacking any indication that [redacted] was possible [redacted] people concluded that [redacted] engineers must certainly have taken into account in responding to Greer's July inquiry on the feasibility of [redacted] to a Corona recovery vehicle.

In the course of changing over from land recovery to air catch, th[redacted] office had eventually authorized [redacted] to develop a recovery vehicle essentially capable of accepting the [redacted] than the Corona [redacted] had scaled up the Corona [redacted] Such changes presented the program office with what was neither a Corona [redacted]

[redacted] It was, for practical purposes [redacted] Colonel Riepe's inquiry about the procedures to follow in schedulin[redacted]program first brought the matter of capsule configuration forcefully to the attention of General Greer's immediate staff. Obviously there was no justification for [redacted] was entirely unnecessary.

As it happened, one of [redacted] senior people in the [redacted] program was aware of the fact that the requirement for [redacted]ad long since been invalidated. [redacted] deeply involved in the early Corona effort, had retired from the Air Force and [redacted] Imbued with the security consciousness of the Corona activity and no longer active in that program, he did not consider himself entitled to pass his information to fellow workers at [redacted]Major John Pietz (of Greer's staff) solved that difficulty by flying to the [redacted] and briefing a [redacted] people on Corona. Thereafter, [redacted] could work on an [redacted] with some confidence that it would not fail because of the lack of [redacted] But by this time (mid-October 1962), [redacted] was well along in the final design of a [redacted] A full-scale mock-up had been built, substantial sums added to the contract totals, and an extensive test program planned.

One of Colonel King's first moves after moving into [redacted] management was to advise General Greer that he thought the design [redacted] represented much more of a change than Greer had intended. Greer, who had ordered that changes to the [redacted] should be minimal, was disconcerted. He forcefully endorsed Colonel King's suggestion that the original intent of the modification be reinstated and that the rapidly burgeoning [redacted] development effort be stopped in its tracks. King met with key [redacted] officials two days later and defined the objective of the capsule change in terms of General Greer's appreciation of the need. Cross-briefing of [redacted] people on Corona, [redacted] eliminated any excuse based on technical uncertainty.

The episode apparently was partly the consequence of a semantic gap. Colonel Riepe and the [redacted] office people considered that the modification [redacted] proposed to make were "minor" in the terms of General Greer's original instructions. The problem was compounded by a general lack of Corona information among [redacted] people, both in the program office and on contractor staffs. If [redacted] was either essential or highly desirable, [redacted] and in the absence of knowledge to the contrary it was not illogical of [redacted] program people to continue to believe in a need for [redacted] In Colonel King's view, the new [redacted] version of the Corona capsule represented a sharp departure, a more-than-minor change. General Greer, it developed, agreed with King.[46]

The main issue was finally disposed of early in December 1962. Stating his preferences plainly, General Greer told Colonel King: "The name of the game is to adopt it [the Corona capsule] [redacted] without introducing a change external or internal which will result in failure on the first try or otherwise prejudice its reliability." King responded with the advice that he had imposed an "absolute minimum" change policy and that earlier changes in the external configuration had arisen from too strict interpretation of instructions that adoption of the Corona recovery system was to have a minimum effect on the payload.[47] As it happened, the payload was the least risky element of the system, command and control representing the most difficult.

By that time, Colonel King had made it entirely clear to both [redacted] that system changes were to be minimal. Deviations from the original [redacted] had to be cleared personally by King before approval. By all indications, the external changes would be slight. The general policy, King added, was to use flight-proven components wherever possible, keeping all change at a minimum but altering the details of payload configuration as essential to the requirement for limiting external change.[48] Early in November, while Colonel King was in the early stages of sorting out the technical complications of [redacted] and subjecting them to a detailed analysis, General Greer reactivated the suggestion of transferring the entire [redacted] to SAFSP. Answering earlier objections, he explained to Charyk that such a move did not imply "surfacing" the development and acknowledging its reconnaissance objectives, [redacted]

[redacted]

[redacted]

That much out of the way, Greer and King set about changing the technical character of [redacted]

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In 1962, the Air Force Systems Command embarked on a determined campaign to return control of satellite reconnaissance to "normal" Air Force channels. "Loss" of [redacted] represented a defeat in that campaign. Charyk later quashed the whole activity, but it experienced a brief revival after his departure in early 1963.

[redacted]

[redacted] long enough to secure operating experience and proof of system feasibility. Greer and King, with memories of E-5 and E-6 cancellations caused by on-orbit failures, were determined that the [redacted] flight should return at least one good picture. That achievement in the E-2, G-5, and E-6 projects might well have insured their continuance, at least temporarily. Greer was adamant that nothing of the sort would be said of [redacted] Charyk was not convinced that the "one picutre above all" outlook was the correct one, but it seemed possible that he could be brought around.

[redacted]. An elaboration of the scheme involved use of the [redacted] invented for Lanyard. Should the [redacted] prove generally unreliable, it might be possible to introduce the Lanyard [redacted] eliminating reliance on the [redacted] elements of [redacted]

On 29 November, General Greer took the results of a preliminary analysis of the [redacted] ideas to a meeting with Undersecretary Charyk. The undersecretary showed interest. On his return to Los Angeles, Greer drafted an authorization for continued study of these options and sent it to Washington for endorsement. Later that day (30 November) the second major change to [redacted] in two months was tentatively approved.

The chief difficulty in the latest idea was devising a non-compromising means of bringing the [redacted] into the [redacted] program. As was the case with the Corona reentry capsule, the [redacted] was quite unknown to most [redacted] people and because of the security compartmentalization that existed within the reconnaissance program structure it seemed highly unwise to disclose the existence of Lanyard to large numbers of [redacted] workers. So "Charyk's" message of 30 November, actually written by General Greer, contained the "suggestion" that Greer contact [redacted] about the [redacted] as ". . . he [Charyk] believes a similar idea was once proposed and possibly designed in connection with another space program."

[redacted]

In his conversation with Dr. Charyk on 29 November, General Greer had promised that additional measures for insuring the success of the first [redacted] flight would be proposed in the course of a full-scale program review on 14 December. On that date, he, Colonel King, several program people, and a team from [redacted] ot only reviewed the program but proposed still another technical innovation. (Charyk had earlier approved a contract technique change which eased the financial pressure on the first six flight vehicles, agreeing that they could be purchased on a cost-plus-fixed-fee basis with the seventh and later [redacted] being funded on an incentive fee basis.) The latest change provided for incorporating "Lifeboat" provisions in [redacted] "Lifeboat" was another technique originated in the Corona program; [redacted] If the primary reentry systems became inoperative for any reason, "Lifeboat" could be separately actuated. [redacted] In several experiences with Corona vehicles, "Lifeboat" had proved highly reliable.

On 19 December, the undersecretary formally authorized the [redacted] incorporated in the first four vehicles (but a determination on use would be made on a flight-by-flight basis), while [redacted] was to be developed [redacted]

At the time that these additions were made, General Greer approved a proposal by Colonel King to delete rather substantial portions of the elaborate test program earlier scheduled. There was no real alternative if the launch schedule, now specifying first flight in July, was to retain any validity. Both King and Greer were uncomfortably aware that reducing the number and scope of development tests was risky. They were also aware, however, that another contract overrun or a new schedule slippage represented an equally grave danger to long-term program stability. Experience--not always the best criterion, but in this instance the only one available--seemed to indicate that the simplest and most direct technical approaches worked best for reconnaissance satellites. Although it was possible that

[redacted]

pruning away tests might lead to the failure of some major component, the program innovations of September-December 1962 provided considerable insurance against a major catastrophe. Air-catch and use of the [redacted] capsule overcame objections to the faults of the original [redacted] recovery technique, and [redacted] On these counts, [redacted] was a much more realistic program in late December 1962 than had been the case four months earlier.[53]

Finally conceding that the most vital initial objective of [redacted] was to return one good picture (Greer's frequently stated goal), Dr. Charyk nevertheless insisted that all flights subsequent to the first had to be programmed to return useful pictures of pre-selected intelligence targets. He specifically rejected the concept of a step-by-step approach to an operational configuration through research and development improvements. His philosophy was the key to the reason for incorporating the [redacted] if it were necessary to rely

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* [redacted]

[redacted] Degradation of picture quality was a probable consequence, but the degree of degradation could not be accurately estimated in advance. Theory had it that the greater delicacy and precision of [redacted] was essential to [redacted] about one-third to one-fourth of the current expectation for the [redacted] and one-sixth of the original requirement. [redacted] In late 1962, [redacted] experts were not optimistic about the prospect of [redacted] in the event, more than a year later, experience

[redacted]

[redacted]

was to show that they had been far too pessimistic about the [redacted] and too exacting in their requirements for camera stability in [redacted])[54]

The first [redacted] would cost on the order of [redacted] of which roughly [redacted] had been expended by December 1962. (Some [redacted] more was budgeted against flight and operation costs through June 1965.)[55] In such a context, measures which would hold down costs were in order. There was no ignoring the need for program insurance applicable to several aspects of the total program. General Greer's instructions to King in October had emphasized three critical goals: staying within the budget, staying on the schedule, and obtaining one good picture. The prospect that Lanyard could fill the role earlier reserved for [redacted] was but one reason for discernible concern at the possibility that [redacted] might be terminated if it encountered major difficulties. In the reconnaissance program, none of the ordinary reasons for avoiding program cancellation situations had much weight. No embarrassment could result because news of a cancellation would be confined to a small circle of familiars. Neither the public nor Congress would have occasion to carp at a program cancelled, a factor of some importance to the normal program management structure and one of the more important influences in continuing programs which in a totally rational world would probably have been terminated. Either budget overruns or significant schedule slippages could degrad[redacted]prospects.

By early January 1963, Colonel King had pared off[redacted] in fiscal 1963 and[redacted]in fiscal 1964 program fund requirements. (The total largely represented cuts in engineering work not essential to program success, the purchase of fewer spares, a reduction in the requirement for post-flight data reduction, tightened quality control, elimination of much documentation earlier called for, simplification of reentry vehicle tests, and a reduction in qualification tests.) King proposed that program funding be further reduced by eliminating some of the work earlier scheduled, and suggested to General Greer several areas which seemed ripe for attention. Some [redacted]dditional might be gained by cancelling parallel efforts and alternative subsystem developments.

Although Greer was attracted by the possibility of reducing program costs, he was reluctant to adopt all of the measures suggested by his ne[redacted]manager. Although agreeing that it was feasible to cut a rather extensive vendor reliability program "to the minimum essential" and to employ an earlier scheduled ground test system in the flight program, he was extremely dubious about the wisdom of halting work on an[redacted] since there still was some uncertainty about the utility of those then programmed.* He expressed similar reservations about King's proposal to halt work on a[redacted] But in both instances, he told [redacted] if it appeared that funding the work into an indefinite future would cause invalidation of established budget ceilings, he would be quite willing to reconsider his decisions.[57]

* [redacted]

Unexpected funds problems rose to plagu[redacted] shortly after the question of what to cut and how deeply had apparently been resolved. In reviewing his budget, Colonel King discovered that the Agena cost estimates given to Dr. Charyk in December "were grossly low."* The total of costs for the modified program would be abou[redacted] higher than planned, chiefly because of configuration differences which had not been adequately weighed in costing the adoption of Agena vehicles based on the Discoverer program. Because of the earlier budget overhaul, however, the deficiency was substantially less of a problem than it might otherwise have been.[58]

[redacted]

* Italics in original correspondence.

Funding difficulties were scarcely unique in satellite reconnaissance. There were times, however, when [redacted] seemed to have its own special affinity for such difficulty. Colonel King remarked at one point, early in 1963, that the program had been stigmatized as a high cost development and [redacted] a high cost producer--and that both characterizations might be justified. He told General Greer, "It is my feeling that we may have outlined a program to the contractor that is inherently expensive; our scheme of managing, reviewing, and presumably safeguarding a high degree of success is a big order to be swallowed. Certainly it isn't the cheapest way of doing all things. We may have built such a super foundation that we cannot afford the remainder of the structure."[59]

Yet despite such obstacles, which were both very real and very important, [redacted] continued pretty much on schedule. In late 1962 the main uncertainties which affected expectations of operational success concerned the [redacted] aspects of the program. Those areas received greatest attention, [redacted] and the concentration of effort on [redacted] In other respects, the program was doing quite well. The camera, in particular, seemed to be coming along nicely. [redacted]

[redacted] The only problem that appeared to offer any particular difficulty was the [redacted] and it was far from insurmountable. [redacted] problem, that had earlier given trouble [redacted] had been essentially solved by November 1962.[60]

One additional change in the basic configuration of [redacted] was recommended in January 1963 and approved for adoption on 28 February. This was a [redacted] earlier treated as "purely an auxiliary package" but now considered quite important. The National Photographic Interpretation Center made the original recommendation, CIA's Herbert Scoville endorsed it, and Charyk approved its inclusion. [redacted] was to be that developed for the Corona-Mural. Because of procurement and installation delays arising from the advanced stage of completion of the first lot of [redacted] ayloads, the fourth [redacted] was the first which could be scheduled to incorporate a [redacted] system. Each installation would cost about [redacted][61]

[redacted]

[redacted]

The standby requirement had appeared rather suddenly, in mid-March 1963, although its origin could readily be traced to the Cuban Crisis of the previous October. The [redacted] schedule in effect since early program approval had envisaged [redacted] By March 1963, the several high level agencies that maneuvered national policy in accordance with intelligence inputs had concluded that provisions should be made for launching a [redacted] in the event any primary mission was not successful. Second, the intelligence community saw a need for an emergency crisis reaction capability for the rapid launch of reconnaissance satellites. Once the basic need had been defined, what remained was a series of unanswered questions concerning potential: how much notice was required, what additional facilities would have to be built, would additional vehicles be needed, were there options on launch systems?

Colonel King's office responded to the original query of 12 March 1963 with the information that a backup capability could be provided by May 1964, that at least three and preferably four additional launch pads at Vandenberg would have to be modified to accept the [redacted] and that additional orbital vehicles were the critical items from a time standpoint. The answer was sufficiently comprehensive to permit the issuance of the 27 March order for six additional [redacted] (Authorizations for pad modification, which were included with the procurement approval, involved changing at least two launch pads to a dual configuration capable of accepting either thrust-augmented Thor-Agenas or Atlas-Agenas in [redacted] configuration.) The end objective of this program expansion was to satisfy plans for "a minimum intelligence cycle capability for coverage of the very highest priority special tasks, including only sufficient orbital duration to achieve the specific coverage. . ." Resolution at the level of the [redacted] was desired. The problem, General Greer learned, ". . . is not to locate targets, but to inspect in detail activities at selected known targets."

Further complications of the already complex problem thus outlined lay in a subsequent directive to study the use of [redacted]

[redacted]

By early May, study of the problems of supplementary launch, standby, and quick reaction had been sufficient to show that a high launch rate could be maintained by keeping at least [redacted] configuration and by building up a modest stockpile of boosters and [redacted] The chief difficulties lay in procurement, since the only way to accumulate spares was to accelerate production rates or to reduce the frequency of launches. Either promised to be costly. There was some indication that fundamental changes in the [redacted] might ultimately be needed, including provision for both multiple recoveries and for an Atlantic Ocean recovery force.

Although the basic actions needed to provide a standby capability had been approved early in March, it was not until May that a persistent uncertainty over funding arrangements was eliminated. In some degree, the difficulty arose because Pentagon officials did not fully appreciate the intricacies of contract negotiations, particularly when they involved a manufacturer [redacted] who apparently felt that the need for continued production was sufficiently great to elicit particularly generous terms. In order to keep the contractor responsive, General Greer had broken [redacted] into blocks; [redacted] was not aware of the total programmed and Greer did not propose to give the firm such information until the unit price became reasonable. Nevertheless, in order to maintain the required rate of production, Greer had to have in his funding reserve sufficient money to finance the complete approved production order. To accountants who looked at the [redacted] ituation without knowing these facts, it appeared that Greer's organization had a comfortable reserve of uncommitted money. In actuality, what seemed to be a "reserve" was required for technical contingencies and for satisfying vehicle requirements not yet formally on contract. Once these facts were made sufficiently plain, the funding difficulty began to diminish.[64]

Another pending uncertainty, involving the possibility of [redacted] mained unsettled. The notion seemed feasible if certain rather substantial changes were made in the [redacted] and [redacted] But the cost was a bit high, reaching [redacted] for development and [redacted] for each vehicle. In general configuration, the proposed [redacted] None of its elements were technically

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* See Chapter IX.

unrealistic, though reliability might be low. In any event, General Greer's judgment was that nothing serious should be attempted in the matter of [redacted] until [redacted] had been well proven.[65]

By the time such matters had been resolved, attention was turning toward the impending first launch o[redacted] Booster-payload assembly had begun in February, after some delay because of the late arrival of prime components [redacted] In order to protect schedules, Colonel King had agreed that it would be permissible to put the missing components into the total system during functional testing.

The [redacted] had to be modified late in January 1963 to eliminate a [redacted] but fixes proved possible without delaying the test program appreciably. The Agena for flight number one passed final acceptance tests at Sunnyvale on 21 March, slightly later than desired but still within the boundaries of the desired launch timing schedule. Early in April, [redacted] located and corrected [redacted] and later that month static tests of the assembled system showed [redacted] superior to that required of th[redacted] All seemed to be going rather well.

Then, during the late afternoon of 11 May, a faulty valve in combination with a deficient fuel loading sequence caused a loss of internal pressure in Atlas 190D, that being used in checking out procedures for the first [redacted] flight. The booster collapsed on its stand, [redacted] and the Agena on the concrete hardstand. The [redacted] was severely damaged, the Agena to a lesser degree. Surprisingly, there was neither explosion nor fire, although 13,000 gallons of liquid oxygen and a full load of fuel sloshed over the stand and the nearby terrain. Equally fortunate, the payload did not split open, so there was no compromise of [redacted] security. But the camera system was rendered permanently useless, a large part of the optics being demolished, and the recovery vehicle was so battered that further use seemed imprudent. Neither the camera nor the orbital vehicle was that scheduled for the first [redacted] test; the Agena, however, was supposed to be used in that launch.

Through a quick scavenging operation the program office secured an Agena to replace that damaged in the accident, using

considerable overtime work to adapt the [redacted].*
But hope for meeting the 27 June launch date lessened as the degree of launch stand and vehicle damage was assessed.[67] There was a possibility of further delay in a requirement from the undersecretary's office that the Agena and Atlas for the first [redacted] shot be subjected to the same sort of "tiger team" pre-flight check that had resulted in a perfect booster operation record during E-6 launches the previous year. Both through SSD channels and in his own right, General Greer set up special review procedures to insure the basic reliability of the booster elements, assuring McMillan in mid-June that every conceivable means of assuring reliable operation had been employed. No program delay resulted.[68]

While boosters were attracting attention, final checks of the [redacted] Fixes and a

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* Agena damage proved to be less than originally estimated. Undersecretary Brockway McMillan, who had replaced Charyk in that post in March 1963, initially directed that the repaired vehicle not be used in the early [redacted] program but General Greer subsequently urged its reinstatement. He reported that exhaustive tests had disclosed almost no harm to the vehicle and that having been subjected to even more thorough checks than most Agenas it was qualified for its intended use. McMillan accepted the recommendation. The Agena in question was numbered [redacted]

re-test required two weeks, setting the launch date back to 10 July. As it happened, some delay was by then inevitable, the Agena modification [redacted] having taken several days longer than predicted and pad repairs having continued until 22 May--which left too little time for a complete pre-flight checkout before the original 27 June launch deadline.[69]

[redacted]

[redacted]

[redacted]

One of the problems peculiar to [redacted] The problem decreased appreciably when [redacted] ran a careful study of needs and discovered that no more than [redacted] were actually needed. In dress rehearsals for the first launch, [redacted] The practice was dropped, however, when the driver wrecked the empty truck while returning from one delivery run. [redacted]

There was some concern for the mode of getting recovered film from the mid-Pacific drop zone to the [redacted] chiefly because it seemed possible that a clever agent could trace back along the capsule's route and identify both the facility and the fact that film was the payload. But a succession of package transfers, arrangements for which were made immediately before the first launch, eliminated most worry.[75]

Apart from such precautions, which were not at all unusual in other satellite reconnaissance programs and which were routine in the case of Corona, [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Los Angeles was experiencing one of its recurring sieges of "unusual" warm weather during the early afternoon of 12 July 1963. From General Greer's office on the fourth floor of the six-story building that housed the Air Force space program organization, the mountains around the basin seemed no more than slightly solid chunks of the prevailing smog. It was an uncommonly quiet Friday afternoon. Most of the fourth floor offices were empty of officers and senior civilians. General Greer's secretary, and Colonel King's, turned away visitors and telephone inquiries with politely vague phrases: "the general is on TDY," or "[redacted] is out of the complex this afternoon." The double doors at the east end of the main hallway on the fourth floor were closed and latched, which was somewhat unusual, if not unprecedented. Behind them, in a small conference room equipped with a speaker system, project people who could not get to Vandenberg listened intently to the piped-in verbal traffic of launch controllers on the site.

Shortly after two o'clock the gathering broke up. [redacted] responsible for much of the [redacted]

[redacted]

opened the electrically secured door to his office to resume his afternoon routine and found an occasional visitor punching vigorously at his secretary's typewriter. The visitor, a sometime historian, asked in a carefully casual voice, "How'd it go?"

He got a quick grin and the answer, "It's off. It looks good. Real good."

At that moment, 22 months and 17 days after the National Security Council decision to proceed with development of a "covert" alternative to Samos, a new phase in satellite reconnaissance was beginning. The first [redacted] had lifted into orbit at 1344 hours, Pacific Daylight Time, on 12 July 1963.

Many of the [redacted] program office people had managed to get to Vandenberg to watch the launch. General Greer and Colonel King were at the Satellite Control Facility, at Sunnyvale, watching the launch on remote television and listening to the countdown. Earlier in the day the launch crew had notified Greer that during the final checkout they had uncovered a fault in the Atlas booster that would either force delay or cause reliance on a component not tested to the extent required by specifications. Shouldering aside the oppressive memory of unbroken failures and "partial successes" in the E-5 and E-6 programs, Greer ordered continuation of the countdown. It was a personal decision, taken without consultation with others, based as much on instinct as on the confidence of a program director who had done all that could be done to insure success. For an instant during the launch itself, most observers experienced the horrified conviction that the decision had been wrong, that disaster had come again to the Air Force satellite reconnaissance program. The splashing rocket exhaust of the Atlas knocked out all electrical connections to telemetry and cameras, giving the impression of a major launch stand explosion to observers at [redacted] But seconds later the signals began to come through again, and they said that the Atlas was climbing stolidly toward its selected launch window.

Climbout, separation, and orbital injection occurred as planned. Then [redacted] the tense group in the control center had to wait until the [redacted] Only then could there be complete assurance that the firs[redacted] was actually in its intended orbit and that the delicate and complex stabilization equipment was performing its assignment. And after that, anothe[redacted] before the [redacted] payload, that complex of optics, electronics, and mechanical devices conceived more than three years earlier, came to life. And then [redacted] before a recovery attempt could be made, and still another wait for information that the capsule had re-entered, had survived its passage through the upper atmosphere, had been arrested in its descent by parachutes, and had been recovered. Even if all possible combinations of failure during orbit, re-entry, and recovery stages were avoided, there remained the ultimate uncertainty: what about pictures?

Both the Atlas and the Agena operated normally, [redacted] When excess propellants were dumped from the Agena the reactive force caused an unprogrammed series of vehicle motions that used up considerable portions of the Agena's control gas supply, but enough remained for Agena stabilization during [redacted]

On the [redacted] revolution, command controllers turned on the camera for [redacted] commanding an identical maneuver on each of the next [redacted]

[redacted] ground control activated the "Lifeboat" circuitry during the [redacted], and on [redacted] an "execute" signal from the ground station went to "Lifeboat." Routine separation and recovery followed. There was no drama. And nobody minded.

After the reentry capsule had been safely retrieved by C-119 aircraft circling near Hawaii, the [redacted] Greer's expectation of the unpredictable had proved reasonable: not only had the [redacted] In the end, the successful operations of "Lifeboat" and "BUSS" (the backup stabilization system) had been essential to the success of the initial mission.

Evaluation of the recovered film indicated an out of focus condition [redacted] Nevertheless, best resolution on the [redacted]

[redacted] was on the order of 3.5 feet; 5-foot ground resolution occurred on several stretches of the [redacted] of exposed film, and average resolution was about 10 feet. With all, it was the best photographic return ever obtained from a reconnaissance satellite, "best" resolution being better than anything previously obtained by a factor of [redacted][77]

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1. Notes by A.H. Katz, Rand Corp, 7 Jul 60, on meeting with STL representatives, in Rand (Katz) files.

2. TWX TEC 648/002, [redacted] to BMD, 20 Dec 60; notes by BGen R.E. Greer, Dir/SAFSP, attached, in SP-3 [redacted] files.

3. Rpt, "Presentation on [redacted]" June 61, prep by SAFSP for SAFUS, in SAFSS files, [redacted] interview, MajGen R.E. Greer, Dir/SP, by R.L. Perry, 23 Jan 64.

4. TWX AFDSD-MS-83304, DCS/D USAF to Hq AFSC, 5 Jul 61, in SP-3 files, [redacted] memo, J.V. Charyk, SAFUS, to C/S USAF, 8 Aug 61, subj: Atlas Boosters for Support of Space Projects, in SAFSS files, [redacted] Charyk also sent a 23 Jun 61 memo to the C/S ordering the Agena procurement but it did not appear to have found its way to the [redacted] files.

5. TWX SAFMS-M-1 163, SAF-MS to SAFSP [redacted] 11 Aug 61; memo, [redacted] SAF-MS, to Maj J. Sides, 10 Aug 61, no subj; TWX SAFMS-M-1 162, SAFMS to [redacted] 11 Aug 61; TWX SSZA 11-8-349, SSD to AFSC, 12 Aug 61; ltr, MajGen J.R. Holzapple, Asst DCS/S&L, to SAF-RD, 21 Aug 61, subj: Boosters for Support of Space Projects.

6. TWX AFCVC 64852, Gen F.A. Smith, VC/S USAF, to Gen B.A. Schriever, Cmdr, AFSC, 25 Sep 61, in SAFSS files, [redacted]

7. TWX SCGN 26-9-50, [redacted] AFSC, to SSD, 26 Sep 61; TWXs SAFSP-F-19-9-1114, SAFSP to SAF-MS, 19 Sep 61, SAFMS-M-1 172 SAFMS to SAFSP, 11 Sep 61, all in SP-3 [redacted] files.

8. Memo, MajGen R.E. Greer, Dir/SP, and MajGen O.J. Ritland, Cmdr SSD, to all [redacted] cleared personnel, 14 Nov 61, subj: [redacted] Project, in SP-3 files; memo,

Greer to [redacted] cleared personnel, 16 Nov 61, subj: [redacted] Security Precautions, same file; TSXs SAFMS-M-1198, SAFMS to SAFSP, SAFSP-F-15-11-143, SAFSP to SAFMS, and SAFMS-M-1197, SAFMS to SAFSP, all 15 Nov 61, all in SAFSS files, [redacted]

9. Memo, J.V. Charyk, SAFUS, to DCS/S&L, 24 Nov 61, no subj; ltr, BGen M.C. Smith, Dir/Sys Services, DCS/S&L, to AF Compt, 27 Nov 61, subj: Project [redacted] TWX AFSSV-82581, DCS/S&L, USAF, to AFSC, 27 Nov 61; ltr, Dir/Proc, DCS/S&L, to Hq AFSC, 13 Dec 61, subj: Program Adjustment AF-62-62-600, with MFR on SAFSS copy, initialed by [redacted] no date but apparently written on 14 Dec, detailing contacts with the budget people; TWX SCGN-22-1-46, AFSC to DCS/S&L, 31 Jan 62 (requesting release of the additional [redacted] all in SP-3 files, [redacted]

10. Memo, Maj J. Sides, SAFMS, to BGen R.D. Curtin, 19 Jan 62, subj: [redacted] TWX SAFSP-F-1-2-190, MajGen R.E. Greer to Curtin, 1 Feb 62, both in SP-3 files; memo, LtGen James Ferguson, DCS/S&L, to SAFUS, 22 Jan 62, subj: [redacted], in SAFSS files, [redacted]

11. TWX SAFMS-INS-M-2017, BGen R.D. Curtin to Maj[redacted] R.E. Greer, 16 Feb 62, in SP-3 files, Funding; ltr, [redacted] Ch, R&D Programs Div, DCS/S&L, to AFSC, 13 Feb 62, SAFSS files, [redacted] MFR, Maj J. Sides, SAFMS, 7 Mar 62, subj: Trip Report, SP, 28 Feb 62, [redacted] in SAFSS files.

12. MFR, Col J.L. Martin, SAFMS, 13 Feb 62, subj: SAFUS SAFSP West Coast Conference 9 Feb 62, in Martin's files, SAFSS; MFR, Sides, 7 Mar 62.

13. MFRs, BGen R.E. Greer: 6 Jan 61, subj: Trip 4-5 Jan 61, and 16 Jan 61, Time and Materials Contract [redacted] both in SP-3 [redacted] files.

14. Memo, MajGen R.E. Greer, Dir/SP, to J.V. Charyk, SAFUS, 10 Jul 61, no subj, in SAFSS files, [redacted]

15. TWX SAFSP-F-18-9-10, SAFSP to SAFMS [redacted] 18 Sep 61; TWX SAFMS-M-1-187, BGen R.D. Curtin, SAFMS to MajGen R.E. Greer, SAFSP, 20 Oct 61, both in SAFSS files, [redacted] TWX SAFSP-F-12-8-99, SAFSP to [redacted] 23 Aug 61, in SP-3 files, [redacted]

16. Briefing charts, 9 Nov 61, "Project [redacted]" in SP-3 files.

17. MFR, Maj J. Sides, SAFMS, 30 Jan 62, subj: Trip Report [redacted] 22-26 January 1962), in SAFSS [redacted] files; ltr, MajGen R.E. Greer, Dir/SP, to SAFUS, 28 Feb 62, subj: Action Pursuant to 9 February 1962. In SP-3 files.

18. MFR, Sides, 30 Jan 62; TWX SAFMS-DIR-62-25, BGen R.D. Curtin, SAFMS, to MajGen R.E. Greer, Dir/SP, 1 Feb 62, in SP files, General.

19. MFR, Col J.L. Martin, D/Dir SAFSS, 8 Mar 62, subj: SAFUS-SAFSP [redacted] Visit on 5-6 Mar 62, in SAFSS files, [redacted]

20. Ltr, Greer to SAFUS, 28 Feb 62.

21. TWX SAFSS-DIR-M-2024, SAFSS to SAFSP, 19 Mar 62, in SAFSS files, [redacted]

22. Memo, MajGen R.E. Greer, Dir/SP, to J.V. Charyk, SAFUS, 14 Mar 62, subj: [redacted] Program Enhancement, in SAFSS files, [redacted] orres.

23. TWX SAFSS-DEP-M-2023, SAFSS to MajGen R.E. Greer, Dir/SP, 19 Mar 62, in SP-3 files, [redacted]

24. Memo, MajGen R.E. Greer, Dir/SP, to J.V. Charyk, SAFUS, about 15 Mar 62, subj: Contractor "X" in SAFSS files, [redacted] TWX SAFSS-DIR-M-2024, 19 Mar 62; memo, Greer to Charyk, 14 Mar 62.

25. TWXs: SAFSP-F-10-4-299, SAFSP to SAFSS, 10 Apr 62; SAFMS-INS-M-2035, SAFSS to SAFSP, 20 Apr 62; SAFSS-PRO-M-2038, SAFSS to SAFSP, 20 Apr 62; SAFSP-F-28-4-239, SAFSP to SAFSS, 30 Apr 62, all in SP-3 Funding files; MFR, Martin 8 Mar 62.

26. TWXs: SAFSP-F-4-5-243, SAFSP to SAFSS, 4 May 62; SAFSP-F-10-247, MajGen R.E. Greer, Dir/SP, to J.V. Charyk, SAFUS, 10 May 62; SAFSP-F-10-5-248, Greer to BGen R.D. Curtin, Ofc Space Sys, 10 May 62; SAFSS-DIR-M-2041, SAFSS to SAFSP, 14 May 62; SAFSP-F-15-5-255, Col Q.A. Riepe to Greer (in SAFSS), 15 May 62; SAFSP-F-17-5-257, SAFSP to SAFUS, 17 May 62, all in SP-3 files, [redacted] memo, T.D. Morris, Asst SOD/Instal and Log, to SAFUS, [redacted] 62, subj: Industrial Facilities Expansion, Project [redacted] in SAFSS files, [redacted]

27. Memo, [redacted] to J.V. Charyk, SAFUS, 17 Apr 62, no subj, in SP-3 files, Funding; TWX SAFSP-F-17-4-232, MajGen R.E. Greer, Dir/SP, to BGen R.D. Curtin, Ofc Space Sys, SAF, 17 Apr 62, in SP-3 files, [redacted]

28. Memo, [redacted] to Col Q.A. Riepe, Dir/[redacted] 19 Jan 62, subj: Air Retrieval for Program [redacted] in King files; Interview, MajGen R.E. Greer, Dir/SP, by R.L. Perry, 11 Sep 64.

29. Greer interview, 11 Sep 64; msg, [redacted] 2280, MajGen R.E. Greer to J.V. Charyk, SAFUS, and Col J.L. Martin, Dir/NRO Staff, approx 3 Aug 62, in SAFSS files, 162-Disc.

30. TWX, SAFSS-DIR-M-2072 and 2073, both J.V. Charyk, SAFUS, to MajGen R.E. Greer, Dir/SP, 28 Jul 62, in SP-3 files.

31. Msg, [redacted] 2280, approx 3 Aug 62.

32. Memo, [redacted] to Col Q.A. Riepe, Dir/Prog [redacted] 1 Aug 62, subj: Pro-Con-Overwater vs Land Recovery, in SP-3 files, Land Recov; the affair of the [redacted] is covered in MFR, Maj J. Sides, SAFSS, 7 Mar 62, subj: Trip Report, SP, 28 Feb 62, [redacted] in SAFSS files, [redacted] in TWX, Dean Rusk, Secy/State, to American Embassy, [redacted] 2 Jul 62, cy in SAFSS [redacted] files, and in various TWXs in those files.

33. Study, "Pros and Cons of Satellite Recovery Methods," MajGen R.E. Greer, Dir/SP, 4 Aug 62, in SP-3 files, Land Recov.

34. Memo, prep by Capt F.B. Gorman (USN), SAFSP Plans Ofc, 17 Aug 62, subj: Program Recovery Information Desired by Dr. Charyk; TWX SAFSP-F-14-8-321, MajGen R.E. Greer, Dir/SP, to Col J.L. Martin, Dir/NRO Staff, 14 Aug 62, both in SP-3 files, Land Recov; TWX AFSSA-AS-1-7768S, DCS/S&L, USAF, to Cmdr AFSC, 24 Aug 62, in SAFSS files, [redacted]

35. TWX SAFSS[redacted]82, SAFSS to Dir/SP, 24 Aug 62, in SAFSS files, [redacted]

36. TWX SAFSS-DIR-M-2082, SAFSS to Dir/SP, 24 Aug 62; msg, [redacted]6708, CIA to SAFSP, 18 Sep 62, in [redacted]files; TWX SAFSP-F-7-9-333, Col R.A. Berg, [redacted], to Col J.L. Martin, Dir/NRO Staff, 7 Sep 62, [redacted] summarized the course of the earlier [redacted] negotiations and the uncertainty as to their [redacted] SAFSP-F-21-9-343, MajGen R.E. Greer, Dir/SP, to Martin, 20 Sep 62, confirms agreements of the 18 Sep 62 meeting, details [redacted]d in memo for the record, prep by [redacted] 19 Sep 62, in Col King's files; TW[redacted], SAFSP to SAFSS, 20 Feb 63, concerns the Annette Island station and the doppler radar requirements.

37. Msg, [redacted]6708, CIA to SAFSP, 18 Sep 62; TWX SAFSP-F-21-9-343, MajGen R.E. Greer, Dir/SP, to Col J.L. Martin, SAFSS, 20 Sep 62, in SP-3 files, Finance; [redacted] BLADE 2423, SAFSP to CIA, 24 Sep 62, and msg, [redacted] 7121, CIA to SAFSP, 28 Sep 62, both in SAFSS file[redacted]

38. [redacted] Report for FIAB, 28 Sep 62, in SAFSS files, [redacted]

39. Greer interview, 11 Sep 64.

40. TWX SAFSS-DIR-M-2095, J.V. Charyk, SAFUS[redacted]en R.E. Greer, Dir/SP, 3 Oct 62, in SAFSS files, [redacted]

41. Interview, BGen J.L. Martin, D/Dir/SP, by R.L. Perry, 18 Sep 64; interview MajGen R.E. Greer, Dir/SP, by Perry, 22 Nov 63.

42. TWX SAFSP-F-5-10-364, MajGen R.E. Greer to members of the [redacted] 30 Oct 62, subj: New Assignments, in SP-3 files, Progms.

44. SSD Spec Order, 28 Nov 62, in SSD Mil Pers Div files.

45. Greer interview, 22 Nov 62.

46. Interviews: [redacted] 14 Sep and 7 Oct 64; Col W.G. King, 7 Oct 64; MajGen R.E. Greer, 15 Sep 64, all by R.L. Perry.

47. Memo, MajGen R.E. Greer, Dir/SP, to Col W.G. King, D/Dir/[redacted] 7 Dec 62, subj: [redacted] Capsule, and 1st Ind, King to Greer, 10 Dec 62, in King's files.

48. Memo (1st Ind), King to Greer, 10 Dec 62; King interview, 7 Oct 64.

49. TWX SAFSP-F-8-11-409, MajGen R.E. Greer, Dir/SP, to J.V. Charyk, SAFUS, 8 Nov 62, in SP-3 files, Programs; rpt, Security of Satellite Reconnaissance Activities, 25 Jun 62, in SAFSS files, Basic Policy; interview, Greer by R.L. Perry, 23 Jan 64.

50. TWX SAFSS-1-M-2119, SAFSS to SAFSP, 20 Nov 62, in SAFSS files, [redacted]

51. TWX SAFSP-F-30-11-432, MajGen R.E. Greer, Dir/SP, to Col J.L. Martin, SAFSS, 30 Nov 62; TWX SAFSS-1-M-2129, Martin to Greer, 30 Nov 62, both in SAFSS files, [redacted] interview, [redacted] SP-3, 6 Jun 63, by R.L. Perry; Greer interview, 22 Nov 62.

52. TWX SAFSS-1-62-178, SAFSS to SAFSP, 11 Dec 62; interview, [redacted] SP-3, by R.L. Perry, 22 Jul 64; TWX SAFSS-1-M-2138, SAFSS to SAFSP, 19 Dec 62 (confirming the [redacted]

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53. Greer interview, 22 Nov 64, 11 Sep 64; [redacted] interview, 6 Jun 63.

54. [redacted] interview, 6 Jun 63; Greer interview, 22 Nov 63; TWX SAFSS-1-M-2138, 19 Dec 62, msg, [redacted] 2602, MajGen R.E. Greer, Dir/SP, to J.V. Charyk, SAFUS, 6 Dec 62, in SAFSS files, [redacted]

55. Rpt, [redacted] Detail Schedule, Oct 62, in SP-3 files, Progms; rpt, [redacted] Bi-weekly Activities, Rpt, 2 Dec-22 Dec 62, in SP-3 files, [redacted]

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58. Memo, Col W.G. King, D/Dir/[redacted] 22 Jan 63, subj: Estimate of Funding Required to Provide Program Changes Directed by SAFUS, 19 Dec 62, in King's files.

59. Memo, Col W.G. King, D/Dir/[redacted], to MajGen R.E. Greer, Dir/SP, 27 Feb 63, subj: [redacted] and Current Contract Negotiations, in King's files.

60. Memo, LtCol J. Sides, SAFSS, to Col J.L. Martin, Dir/NRO Staff, 31 Oct 62, subj: [redacted] Camera, in SAFSS files, [redacted]

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62. TWX SAFSP-F-5-3-548, SAFSP to SAFSS, 5 Mar 63; TWX SAFSS-1-M-0070, SAFSS to SAFSP, 28 Mar 63; TWX SAFSP-F-16-4-641, SAFSP to SAFSS, 16 Apr 63, all in SAFSS files, [redacted]

63. TWX SAFSS-6-M-0059, SAFSS to SAFSP, 12 Mar 63; TWX SAFSP-F-14-3-579, SAFSP to SAFSS, 15 Mar 63; TWX SAFSS-1-M-0070, 27 Mar 63; TWX SAFSS-1-M-0071, Col J.L. Martin, Dir/NRO Staff, to MajGen R.E. Greer, Dir/SP, 28 Mar 63, TWX SAFSS-6-M-0074, Martin to Greer, 2 Apr 63, all in SAFSS files, [redacted]

64. TWX SAFSS-1-M-0105, SAFSS to MajGen R.E. Greer, Dir/SP, 10 May 63; memo, B. McMillan, D/NRO, to Greer, 10 May 63, no subj; memo, Greer to SAFUS, 15 May 63, subj: Budgeting and Procurement, all in SP-3 files, Funding.

65. Memo, Col W.G. King to MajGen R.E. Greer, Dir/SP, 10 May 63, subj: Preliminary Feasibility Report - Dual Recovery Capability for [redacted] indorsement, Greer to Col J.L. Martin, SAFSS, 13 Jun 63, same subj, both in SAFSS files, [redacted]

66. TWX SAFSP-F-11-2-517, SAFSP to SAFSS, 11 Feb 63; TWX SAFSP-F-13-3-575, SAFSP to SAFSS, 13 Mar 63; TWX SAFSP-F-27-3-608, SAFSP to SAFSS, 27 Mar 63; TWX SAFSP-F-2-4-619, SAFSP to SAFSS, 2 Apr 63; TWX SAFSP-F-16-4-642, SAFSP to SAFSS, 16 Apr 63, all in SAFSS files, [redacted]

67. TWX SAFSP-F-16-5-706, Col W.G. King to LtCol J. Sides, SAFSS, 17 May 63; TWX SAFSP-DIR-15-5-1, SAFSP to SAFSS, 15 May 63; TWX SAFSS-1-M-0119, SAFSS to SAFSP, 23 May 63; TWX SAFSP-F-6-737, King to Col J.L. Martin, SAFSS, 5 Jun 63, TWX SAFSS-1-M-0134, 6 Jun 63, all in SAFSS files, [redacted]

68. TWX SAFSS-1-M-0109, SAFSS to SAFSP, 15 May 63; memo, MajGen R.E. Greer, Dir/SP, to MajGen B.I. Funk, Cmdr, SSD, 15 May 63, subj: [redacted]; memo, Funk to Greer, 31 May 63, same subj; TWX, SAFSP-F-17-6-758, Greer to B. McMillan, SAFUS, 17 Jun 63, all in SP-3 files, [redacted]

69. TWX SAFSP-F-22-5-718, Col W.G. King, SAFSP, to LtCol J. Sides, SAFSS, 22 May 63, in SAFSS files [redacted]

70. Msgs [redacted]1279, CIA to D/NRO, 4 Jan 63; and [redacted]1940, CIA to SAFSP, 18 Jan 63, both in SP-12 (Leach) files.

71. TWX SAFSP-F-19-1-498, SAFSP to 6594th ATW, 29 Jan 63, in SP-3 files, [redacted]

72. Interview, [redacted], SP-3, by R.L. Perry, 29 May 63.

73. Interview, [redacted]SP-3, by R.L. Perry, 17 Sep 64.

74. Interview, [redacted]SP-3, by R.L. Perry, 29 May 63.

75. Msgs, [redacted]to CIA, 11 Jul 63; and [redacted]0521, D/NRO to SAFSP, 1 Jul 63, both in [redacted] files, TWX SAFSP-8-21-588, SAFSP to SAFSS, 21 Mar 63, in SAFSS files [redacted]

76. [redacted] 63, prep [redacted] files; ltr, [redacted] Oct 63, subj: Memo Report on STL Payloads, [redacted] in SP-3 files; [redacted] interview, 14 Sep 64.

77. Author's notes, 12 Jul 63; rpt, [redacted] Program Summary Report 1960-1967, prep by R. Perry, Sep 67 (hereafter cited as [redacted] Summary); rpt, Summary Analysis of [redacted] prep by [redacted] 29 Aug 67 (hereafter cited as [redacted] Summary).

XIII [redacted] OPERATIONS

The flight portion of the [redacted] Project offered interesting departures from the "normal" cycle of research, development and operations observed by most DoD development agencies. It owed much in that respect to the precedent of the Corona program, the only earlier satellite reconnaissance activity that could even casually be called successful. [redacted] the de facto value of each flight was measured in various ways.

[redacted]

Criteria ranged from the performance of the [redacted] As for operational value, data of appreciable intelligence worth were collected as early as the [redacted] flight, and the quantity of such data continued to [redacted] throughout the life of the original [redacted] program.

While technical developments including the refinement of hardware and the introduction of new manufacturing techniques were of obvious significance, other and perhaps less tangible aspects of [redacted] project had greater potential long-term value. They were mostly of a program management sort. They included such areas as security devices necessary to "black" programs and management techniques for ushering a program through flight test into operations. General Greer's stubborn insistence that "one good picture" was the only valid goal of the first flight lost much of its dramatic impact once success became the norm rather than the exception for new programs. But it was almost certainly one of the pivotal reasons for the early success of the [redacted] project.[1] Other projects in the space reconnaissance program had fallen almost entirely from the weight of overly ambitious early flight objectives. The result, with uncommon regularity, had been catastrophic failure and consequent abandonment of the program. Whatever had been invested was lost. Greer's forte had been that of a midwife to the new project--overseeing and guaranteeing a successful birth and infancy. His successor, Brigadier General John L. Martin, Jr.*, proved to be particularly adept at raising the child to maturity. Martin's handling of a mid-stream crisis [redacted] by re-orienting contractual incentives served as a model for future contracting practices as well as solving the problem of the moment. The elements of the incentive program were probably of less importance than its conceptual basis. It represented an acknowledgement that the goals of a project changed as it outgrew its developmental constraints, and that incentives suitable for one phase were not necessarily appropriate to another.

Less than two weeks after the [redacted] flight aimed at "one good picture," General Greer advised the project director, Colonel W. G. King,** that he very much wanted [redacted] 2 That was to become the watchword for the [redacted] flight. While Greer was gratified by the success of the [redacted] flight, he appreciated that unwisely ambitious [redacted] flight objectives could

* Both Greer and Martin retired as Major Generals.
** Later a Brigadier General, and Martin's successor.

damage the program just as much as an unsuccessful [redacted]. Paradoxically, the very success of the [redacted] raised expectations for [redacted] and could be expected to make later failures even more unsettling to those who ultimately controlled project funding. If enough success could be tucked away in the flight history of the basic hardware, then downstream failures could be treated as local problems rather than indications of a flawed conception. While no one knew how many successful flights or how much good output was required to create this aura, King and Greer were both quite positive that at least the [redacted] would have to be a pronounceable success.

The operational plan for the [redacted] flight called for [redacted] During the first flight control over the [redacted] had been lost after seven orbits, which did not represent enough of a test to justify making the success of the second flight dependent on its proper functioning. King decided that [redacted] that portion of the flight when primary mission objectives were to be satisfied. Those objectives were the demonstration of best resolution from the camera and successful recovery of the film. The secondary mission goal was to demonstrate [redacted]

[redacted] 4

Although master schedules called for one [redacted] launch [redacted] making [redacted] nominally six days late,[5] early [redacted] flights were acknowledged to be development flights, so neither the schedule nor the slippage was considered critical. What was important was to precede each flight with a full analysis of the failures of the previous flight--and to incorporate corrective features. The [redacted] years of [redacted] flights were to be marked by steady increases in pre-flight testing and by the installation of telemetering devices to monitor in-flight failure modes. That trend developed from a gradual understanding that although the proper dictum was to correct each flight's failures before the next, the extent of effort needed to successfully perform that task had initially been underestimated.

Underestimating may have been the least important of several influences. In the early stages of the program, its managers were justifiably worried that it might be cancelled. The record of earlier failure in other satellite reconnaissance efforts, and financial overruns in the [redacted] program provided reason enough for that worry. In any case, Greer perceived the urgency of extensive pre-flight tests to enhance the probability of program success even at the cost of schedule slippages. He had gone a long way toward hedging his bet by massive simplification of the [redacted] and early flight operations. While lack of adequate test data continued to trouble the program for some months, it was clear in retrospect that Greer made the right tradeoffs. They were clearly responsible for the regular success and smooth progress which marked the program for all but the middle portion of its life.

Another factor of some considerable importance in the perceived [redacted] was a fundamental difference of viewpoint between the CIA and the photo-intelligence community, on the one hand, and Greer's organization plus the NRO staff, on the other. Admittedly, the [redacted] group saw their mission as one of correctly exposing and efficiently recovering film. They were less concerned with the intelligence content of the product, as such. The intelligence community was preoccupied with the information content of the film: its members were willing to accept the risks of mission failure if the quality and quantity of intelligence returns might be enhanced thereby. Greer's people were not, arguing reasonably enough that failed missions returned nothing of value to anybody.[6]

The [redacted] countdown on [redacted] was uneventful; launch occurred at [redacted] local time. All went well. Perigee was [redacted] nautical miles. [redacted] The mission covered ten different intelligence targets. On the [redacted] the reentry vehicle was detached and successfully recovered by air catch.[7]

[redacted]

[redacted]

The [redacted] flight program developed three major classes of problems. The first and least frequent but most persistent appeared

3rd
of problem

as failures of [redacted] Another class of problems included one-time failures, which once corrected did not reappear.

The third class of problem was intellectually the most interesting and operationally the most frustrating. Throughout the program instances of seemingly random failure occurred in components which had functioned correctly for many flights. The problem would persist through three or four flights, notwithstanding strenuous correction efforts, before succumbing. While there was nothing mysterious about the recurrence of a given failure, the sudden appearance of one where none had existed earlier was unusual for space vehicles, used only once and normally immune to wearout as such. No fully satisfactory explanation of the phenomenon ever appeared, although transient quality control and test program faults were generally blamed.

The aftermath of the [redacted] flight brought a renewal of controversy about the paramount objectives of early [redacted] An analysis of the photographs recovered from the [redacted] showed consistently [redacted]

[redacted] First, Corona had returned coverage of areas most U-2's could not reach or could not safely overfly, [redacted]

But the [redacted] returns had been limited; [redacted] Although the [redacted] achievement represented remarkable progress and excellent research and development results, it did not yet constitute a basis for good recurring coverage of the Soviet Union. And information of that sort, [redacted] was an urgent national goal.

[redacted]

[redacted]

McMillan approved Greer's decision on 17 September, after which King forwarded the formal statement of objectives and priorities to Washington.[9] [redacted]

That operational plan prevailed [redacted] McMillan reversed his earlier position, telling Greer he wanted to "clarify" the objectives of the [redacted] program. He explained that the effectiveness of the program could not be judged by the ground area covered or the amount of film exposed successfully. Rather, effectiveness would be judged in terms of the number of high priority targets for which high resolution [redacted] could be obtained. [redacted] operational missions were wanted at the earliest achievable date.*

In historical summaries, the primary objective of [redacted] flight is duly recorded as obtaining maximum information from high resolution photography, [redacted] 12

But post-fact notations do not necessarily reflect the course of real events. [redacted] were what had been specified in Greer's message of [redacted] in any case. The only other relevant evidence concerning real objectives of the flight is the amount of film used and

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* In September and October 1963, McMillan had the first of several major brushes with Dr. Albert D. Wheelon, who had become the CIA's Deputy Director, Science and Technology, in July. Even earlier, McMillan had been exposed to several pointed suggestions that Greer's organization be instructed to subordinate its R&D orientation to an intelligence-return orientation. Although no directly relevant documents from that period have survived that detail the [redacted] flight goals disagreement of July-October, indirect evidence of the pressures on McMillan and of his reluctance to reorient [redacted] flight objectives is found in his own memoranda. The instructions to Greer on 24 October reflect an effort to compromise existing differences, requiring--or formally stating--an unwritten agreement between McMillan and Roswell Gilpatric, Deputy Secretary of Defense, to place greater emphasis on quickly ending the R&D phase of the [redacted] program. 11

the number of targets photographed. [redacted]

Greer's principal concern was to demonstrate, systematically, that each essential element of [redacted] hardware was functional. He was satisfied that sufficiently high resolution photography could be obtained. If he had doubts, they were resolved by the results of the [redacted] missions. His next concern was for the [redacted] Dr. McMillan had to cope with different constraints. One of his problems was that [redacted] flights had been represented to "high authority" as developmental. While he and Greer were completely agreed on the need for more developmental flights, McMillan also wanted to be able to display intelligence returns that could substantiate claims of operational utility for [redacted] He was not prepared to reverse Greer, in any case. On 12 February 1964, he authorized developmental flights to continue [redacted] Indeed, he ruled that flights would only be designated operational after [redacted].[13] Since the first such mission was not scheduled until [redacted] Greer's arguments clearly had prevailed.

By February 1964, however, it had become almost certain that [redacted] would return large quantities of highly valuable photographic intelligence, and in the reasonably near future. McMillan therefore broadened his position in dealing with "users," and supported Greer's well-based convictions both privately and publicly.

Some additional cause for anxiety about the success potential of the [redacted] resulted from the history [redacted]

Whatever the preliminary uncertainties about mission objectives and equipment, the result was a mission that conformed to flight goals from first to last. [redacted]

[redacted] Of the 38 [redacted] flights ultimately undertaken [redacted] this was one of only three which was perfect in the sense that it was unmarred by any failure, major or minor. [redacted]

The general quality of the photography was judged to be "...better and more consistent..." [redacted]

Its first [redacted] flights having been successful, [redacted] secured the virtual guarantee of continued funding Greer had sought. [redacted] 16 [redacted] The [redacted] space vehicle and payload having been proven, the [redacted] necessary in the future was an operational one, satisfied by the production of [redacted] vehicles for continued use.

Although photography obtained from the first [redacted] The problems thus far encountered appeared to be manageable.

[redacted]

[redacted] Such changes had once been planned for the [redacted] mission, but success in the [redacted] had been so encouraging that program managers concluded that [redacted]

[redacted]

Launch controllers were slightly uneasy [redacted]

[redacted] was considered random; [redacted] In any case, no corrective action was considered necessary. In any event, [redacted] but the anticipation of "no problem" proved accurate.

[redacted]

[redacted]

[redacted] 18

[redacted] Limited mission objectives in combination with budget problems partly explained the omission. After the first [redacted] flights, that rationale evaporated, to be replaced by another: program success. Hindsight suggested that instrumentation was inadequate to the needs of development.

For various reasons, the launch schedule for the [redacted] was allowed to slip to the extent of about a month. During the interval between missions [redacted] McMillan accepted the premise that [redacted] development flights should be programmed [redacted]

[redacted]

Greer's confidence in the capability [redacted] was increasing, but he remained cautious. It was reasonable to assume that the [redacted] The criteria settled on by the director of the NRO assumed these accomplishments and asked, if somewhat imprecisely, for considerably more: [redacted] To that time (1964), [redacted]

[redacted]

BYE 17017-74

Handle via Byeman/Talent - Keyhole Controls Only

[redacted]

[redacted]

[redacted]

[redacted]

fee which had a potential range of [redacted] around a mission-success midpoint. Penalties and rewards were on a pro rata basis between the two extremes. Because of various [redacted] failures [redacted] had a full fee penalty assessed [redacted] was deducted from the normal contract fee.

Incentives of that sort became increasingly important to [redacted] as the program progressed. Although cost, performance, and schedule were all covered by the contract incentive clauses, cost was the principal early target. [redacted] costs had substantially exceeded early program estimates, although later developments in satellite reconnaissance were to make that program seem quite inexpensive. In any case, the arrangement that took effect [redacted] provided that [redacted] retain as profit a large part of whatever underrun occurred, but would pay an equivalently large share of overruns out of fee. The fee variation associated with performance was only about half the size of the cost function variation. That difference was partly accounted for by the expectation that [redacted] would be extremely reliable, a notion strengthened by the [redacted] The schedule incentive was small, consisting of penalties amounting to [redacted] up to a maximum of a [redacted] As might have been expected--indeed, as was intended, after [redacted] concentrated effort on reducing costs, paying less heed to performance. Under the terms of the agreement, for instance, if [redacted] delivered a minimum-cost [redacted] on schedule (collecting [redacted] more or less) and the [redacted] the contractor still would earn the full scheduled fee plus an incentive bonus amounting to more than three percent of actual costs. Of course that sort of arrangement would not be continued if failure became a major problem, but it was an interesting condition of the program and one that [redacted] exploited--briefly.[24]

[redacted]

[redacted]

Even though the [redacted] had been less than successful from the standpoint of program personnel and the intelligence community alike, [redacted] That circumstance was acknowledged by Greer's near-term plan for flights [redacted] Greer maintained that the plan was flexible, providing a "...deliberate approach to completing the development program. It can and will be adjusted to either unusual success or catastrophic failure." McMillan's concurrence in that general plan reached Greer, without additional comment, on 17 March 1964.[27]

The subtle increase of emphasis on obtaining operationally useful photography [redacted] was in some respects a further acknowledgement of the pressure McMillan was experiencing from users of the satellite photography. The failure of [redacted] that put [redacted] on its launch pad well ahead of normal delivery and checkout schedules. [redacted] That striking accomplishment was made possible by energetic refurbishment of the launch station and by making detailed adjustments in delivery schedules for [redacted]

[redacted]

[redacted] (That event brought on a short, sharp controversy over operational direction of intelligence gathering.)

Despite such problems, some [redacted] were commanded and took place of a programmed total [redacted]

[redacted]

[redacted]. Corona, the only predecessor system to provide much in the way of useful operational intelligence, had not recorded its first success until 15 launches had been attempted, only three of which could be accounted technically successful. All five of the E-series Samos payloads that had progressed as far as completed hardware had been cancelled, as had Lanyard, the repackaged E-5 camera system. The whole concept of readout that originally underlay the program had been dropped, and in the entire series of Samos-derived mission attempts that started in January 1961, only the E-1 and the Lanyard had returned photography in which photo interpreters could honestly express the slightest interest. As compared to Corona, E-1 had been thoroughly inferior, while Lanyard displayed various defects of system and product that made its cancellation inevitable [redacted]

[redacted]

With the success of the [redacted], operational proving had been extended in several areas, helping to determine the character of the [redacted] Two events were of particular significance. [redacted]

Greer, King, and McMillan were agreed that they should take the final step of flying [redacted]

The circulation of [redacted] photography through the intelligence community had one effect on [redacted] plans that neither Greer nor McMillan appeared to have foreseen, and which they and the members of the [redacted] project group justifiably regarded as both unwelcome and unwarranted. [redacted] two weeks before the scheduled launch of the [redacted] McMillan received from the Committee on Overhead Reconnaissance (COMOR) a request [redacted]

[redacted]

[redacted]*

McMillan and Greer were in agreement about the importance of maximizing the amount of photography of priority targets on each mission. To that end, Greer had set in motion the technical effort required to plan each mission systematically, [redacted] Mission tinkering might not have that effect, of course, but it could.

Dr. McMillan turned over the problem of reply to General John Martin, head of the NRO Staff. Martin's response was swift and deft. He provided a primer on the technical capacity [redacted]

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* J. Q. Reber, who later became Deputy Director, National Reconnaissance Office, was the chairman of COMOR and its acknowledged spokesman; [redacted]

and the means of utilizing it, explaining that [redacted]

The problem went away. The later success o[redacted]pera-tions precluded its resurrection.

One point Martin did not make was that mission event planning was already [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] The generally good records of the [redacted] had roused sanguine expectations of returns thereafter, yet the three men most responsible [redacted] McMillan, Greer and King, were too canny about research and development to count overmuch on a run of good luck.

[redacted]

[redacted]

[redacted]

[redacted] responded to such prodding by agreeing to a series of remedial actions: [redacted] and a general tightening up of personnel control and training.

The terms on which agreement was reached indicate that [redacted] was very concerned [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]* Those specific developments and several subsidiary aspects of [redacted] evolution lent both respectability and urgency to the effort to obtain more definitive information on potential reliability enhancement, and that in the end was the object of the instrumentation effort. But it was not merely capability enlargement that encouraged attention to flight instrumentation; project officers were painfully aware of the possibility that the

[redacted]

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* [redacted] the terms Corona-Mural (or Corona-M) and Corona-J have been used here even though contemporary documents did not distinguish among the several variants of that system. It is [redacted]

[redacted]

[redacted]

On that unhappy note, Major General Robert E. Greer left the program, and the Air Force, on 30 June 1965. He, more than any other individual in or out of government, had been responsible for instigating the [redacted] program and for carrying it to its mid-1965 level of proficiency. With Colonel W. G. King, he had been personally responsible for all of the major, and quite difficult, technical and management decisions that marked the program's first five years. [redacted] had been invented, in a sense, in the summer of 1960, although it had not taken form as a system program until December of that year.) By the only valid standard of comparison then available, the early Corona program, [redacted] represented the most comprehensive and striking success yet achieved by the American reconnaissance satellite program. It had recorded its successes earlier and with greater regularity than the early Corona, and the returned photography was in its own special way of equivalent or greater value. And by the summer of 1965, there was abundant evidence that [redacted] could be improved at least as markedly as Corona had earlier been improved, with a consequent equivalent benefit to the overall satellite reconnaissance program. On balance, the achievement was quite remarkable.

Brigadier General John L. Martin, Jr., who had earlier headed the NRO staff in Washington but who had most recently been Greer's deputy, succeeded to Greer's post in Los Angeles. Virtually from the day of his accession, he was confronted with the question of whether to proceed [redacted] Martin decided to proceed in accordance with existing plans. In any case, he was immediately confronted by a massive problem in contracting and procurement.

Nearly two months earlier, program officers had advised Lockheed Missiles and Space Company of their increasing distaste for the high prices reflected in Lockheed bids on new Agena vehicles.

Costs were much higher than for earlier deliveries of approximately the same equipment. Procurement officers concluded that Lockheed was negotiating to protect a position rather than "in good faith." They were also concerned that Lockheed might be maintaining a large reserve pool of engineers who did not work on [redacted] but were funded by that contract. Even more than was usually the case for a sole-source supplier to the government, Lockheed was in a very favorable situation for negoitating follow-on procurement. Agena production had continued at a regular rate for years and bid fair to continue for several more. NRO people had long since explored and discarded as unfeasible the possibility of establishing an alternative production source. It promised to be an extremely costly course, and one involving considerable technical risk. Nor, in general, could Lockheed be faulted for inferior Agena performance. Although some quality control problems had occasionally appeared, the Agena was widely regarded, at the time, as a reliable vehicle- [redacted]

[redacted]

[redacted] the sole--or even the paramount--concern of the NRO during the summer of 1965. The Washington staff had been involved in institutional bickering between the Pentagon and the CIA which in September 1965 led to the departure of Brockway McMillan, for more than two years the Director of the NRO. Although the possibility that the NRO might be entirely abandoned as an instrument of national reconnaissance policy was dispelled by the appointment of a successor to McMillan (Dr. Alexander Flax) and by the issuance of a new NRO charter, the whole of the reconnaissance program was in some disorder. Corona operations had been reasonably successful during that summer, only one major mission failure having occurred in three flights, but Corona did not return the detail that intelligence analysts had begun to expect and interpretation of Soviet force status had become heavily dependent on information elicited from [redacted] photography. Some part of the institutional infighting of 1965 was occasioned by disagreement over the management of the Corona program and some of the Corona project people on the West Coast were convinced that a serious failure of Corona operations could result if the authority for technical and operational control of that bifurcated activity was not promptly sorted out. Although in retrospect that appeared to be no more than a minor possibility, it contributed to uneasiness on both coasts. And finally, an extended controversy about the nature and timing of a replacement system for Corona, [redacted] was complicating plans for the continuation and improvement of both systems.

Flax had to turn his attention to several of these issues almost simultaneously; his immediate reaction to [redacted] problem was to suggest study of the possibility that [redacted] launches might be conducted each year. [redacted] He was also very attentive to measures initiated by General Martin that were intended to improve markedly the general quality and reliability of delivered [redacted] particularly the Agena [redacted] the Atlas [redacted] being infrequent offenders.)

General Martin's response to his problem of the moment--[redacted]--was to obtain approval of his proposal [redacted] to insure mission success. He, too, was keenly aware of widespread uneasiness about [redacted] potential. The decision to delay launch was not lightly taken; it guaranteed, at the least, [redacted]

[redacted]

[redacted]

While some of these changes were routine enough and cheap enough to be continued thereafter, others were extraordinary measures adopted temporarily in response to what was widely regarded as a transitory crisis. The Air Force lacked the resources to support such a complex process of test and checkout through the life of an operational program. Recognizing that circumstance, General Martin began to plan for the adoption of a novel contract incentive scheme he had originated earlier, while serving as Greer's deputy. It was pointed more at [redacted] at first, [redacted]

[redacted] Martin's point of attack was the incentive fee contract [redacted] His study of the existent contract incentive provisions led him to conclude that they were most appropriate for the development stages of the program and decidedly inadequate for the operational phase [redacted]

The incentive structure earlier installed emphasized the importance of cost over operational performance. It had been, at least in part, prompted by lost control problems characteristic of [redacted] But it also reflected the experiences of Greer and King with previous satellite reconnaissance programs in the older Samos series. With few exceptions, they had incurred major cost growth. King's reputation for bringing high-cost, high-risk programs under control was highly regarded, and in assuming control of [redacted] he had done precisely that.

But [redacted] was no longer a development-focused activity, despite the continuation of engineering improvement activities. To the extent that the nature of satellite reconnaissance vehicles would permit, [redacted] was a production item--withal one that little resembled the usual military article.

A second point seems to have been the expectation that as the [redacted] program continued, the contractors, as a matter of course, would strive to earn the bulk of the performance incentive fee. The original contract incentive program perfectly reflected such considerations and beliefs.

The incentive structure had three major parts: schedule incentives, cost incentives and performance incentives. The schedule consideration was in fact a disincentive for late delivery of the vehicle. The maximum penalty for late delivery was [redacted] a day, with a ceiling o[redacted] On the other hand, a cost overrun of 23 percent carried fee penalties of more tha[redacted]would be penalized at a 20-percent-of-fee rate for overruns until the fee was wiped out completely, and would profit at a 20-percent rate for underruns. Since the return to capital is computed by dividing fee by gross cost, that arrangement meant that the rate of return on gross costs was a variable function of vehicle cost, dropping sharply for overruns and rising sharply for underruns.

The performance incentive, unlike the cost incentive, was linear, being unrelated to the gross outlay for a given vehicle. A scoring system was devised on a scale from zero to 100. The critical region initially fell between 65 and 95, but these numbers increased as the system became more fully operational. A score of 80 was the breakeven point where no incentive fees were either gained or lost. For scores above or below 80, the fee changed in proportion to the change in the score. The maximum gain or loss in fee that was possible under such a system was on the order of half the amount that could be gained or lost via the cost incentive. To any rational contractor, that arrangement was an imperative to worry about cost far more than about performance.

One result of the bias [redacted] was motivated to delete as many control and test procedures as possible in order to save money in the production of the vehicle. If, for instance, the deletion of a given test procedure had the same effect on reducing cost as on decreasing the probability of a failure, it would rationally be deleted, since half of the savings would be returned as an incentive fee on cost--over and above any penalty for inferior performance. Because that accommodation also reduced the captial outlay of the contractor, the resulting fee increase would be proportionately larger than the fee differences arising from flight performance bonuses or penalties.

Taken to its logical extreme, the formula could result in the delivery of a minimum-cost vehicle (23 percent less than negotiated price) which failed catastrophically, but nevertheless earned a premium o[redacted] over and above the standard fee. The rate of return on invested capital in that case would be greater than 33 percent--about twice the normally acceptable return on fairly risky investments by private firms.

General Martin's arrangement left the schedule incentive essentially unchanged, but radically altered the relationship between cost and performance incentives. The new system paid no bonus for a cost underrun, a reflection of the belief that the cost of a vehicle built at that relatively late stage in the program could be estimated rather precisely. The maximum penalty that could be incurred for cost overruns was about what it had been-[redacted] The major change was in the performance incentive. From a maximum or minimum of [redacted] under the old system, it became a maximum or minimum [redacted] It no longer made sense to sacrifice performance for cost savings because costs below negotiated price brought no incentive fee, while performance shortfalls would reduce the fee at a much more rapid rate than before. Furthermore, even with an overrun of more than 25 percent, perfect performance meant a fee bonus of [redacted] dollars. Most military procurements of the period were suffering from overruns at least as large as 25 percent, so no rational contractor would quarrel with the conjunction of a large price increase coupled with an incentive fee.

In retrospect, General Martin's incentive system represented probably the most significant non-technical accomplishment [redacted] program. It recognized the fact that contractor performance could, in some instances, be "fine tuned" to the objectives of the contracting agency. In this case, shifting the focus of the incentive system from development to operations had precisely its intended effect-[redacted]

Hindsight illuminates what General Martin saw: the contract performance of [redacted] during 1965 steadily deteriorated, while fees did not. It seems clear that [redacted] was reacting to an inappropriate incentive structure. Perhaps the change could have been made earlier. But the signs that seemed to stand out clearly after the fact--workmanship deterioration, faulty inspection, inadequate testing, and catastrophic failures resulting from such causes rather than from basic engineering design problems--were not readily detectable in the normal events of the early [redacted] program. The success of early [redacted] flights did nothing to make the identification of these problems any easier; when all goes reasonably well, prophets of doom have small voices.[52]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] 57

The original [redacted] program had been completely phased out by the end of June 1967, not quite three years after the first of its 38 missions. [redacted]

[redacted]

Even after [redacted] became one of the several casualties of technological obsolescence in the American satellite reconnaissance program, the system added another "first" to its considerable record of accomplishment. It became the first of the satellite reconnaissance systems--the first of all clandestine reconnaissance systems--to leave behind both a careful historical record* and a full set of system "hardware" deliberately stored against the day when it could be openly displayed.

* Somewhat sketchy historical accounts of the early Samos program appeared in the Air Force histories prepared at Wright Air Development Center (later the Aeronautical Systems Division of the Air Force Systems Command) in the mid-1950s but even then access to program details was difficult to acquire. Still sketchier records appeared in early chronological summaries of activity at the Ballistic Missiles Division (later the Space and Missiles Systems Organization of the Air Force Systems Command) from about 1956 until early 1960. The

*(continued) first serious attempt to write a history of any such program was sponsored by Major General (then Brigadier General) Robert E. Greer in 1962. He arranged to have Robert Perry, at that time the Air Force historian for the Air Force Space Systems Division, assigned to his organization, the Special Projects Office, on an informal, part-time basis. Greer's expressed purpose was to insure that accounts of the increasingly complex Air Force reconnaissance satellite program were prepared before the vital records disappeared. His support was continued and enlarged by his successors (Generals J. L. Martin, W. G. King, Lew Allen, and D. D. Bradburn). The activity to be covered by the history also expanded substantially, largely at the urging of Colonel Paul E. Worthman, an early Corona program manager and subsequently the long-term chief of plans for successive heads of the National Reconnaissance Office staff in the Pentagon. Perry continued to work toward a comprehensive satellite reconnaissance program history after leaving his Air Force position to join the research staff of the Rand Corporation in 1964, and became a contract historian after transferring from Rand to Technology Service Corporation in 1972. He was briefly assisted by W. D. Putnam, another former Air Force historian employed by Rand, in 1969-70. Bureaucratic considerations (the "blue suit" Air Force would not agree to the expenditure of Project Rand contract funds on such work) interrupted the preparation of the history between 1969 and 1973, and relatively little was done in the years 1967-69 because of Perry's primary commitment to the Rand Corporation assignments. The work was taken up again late in 1972 under contract between the Special Projects Office and Technology Service Corporation, at which time Robert A. Butler, a consultant with that firm, became a collaborator. The product of that spasmodic work over a period of ten years (to the time of this note) is this manuscript--which includes coverage of the background of Samos, the several E-series Samos programs, Corona and its descendants, [redacted] the evolution of the National Reconnaissance Office and its early activities, and related issues and programs. To the best knowledge of the present authors and present and past members of the NRO staff, there is no formal history of any other reconnaissance program ever conducted by the United States. A CIA-sponsored hostory of Corona was nominally in preparation late in 1972, and apparently some effort within CIA has been devoted to preserving records of the Idealist (U-2) and Oxcart (A-12) aircraft programs, but that represents the sum of such history. The ancestor of all such programs, the balloon-carried reconnaissance camera system of the mid-1950s, appears to have disappeared from the records. Given the volume of documentation of reconnaissance program activity by 1970, that is unlikely to happen again--

[redacted]

* (continued) but detailed source material of the kind available in the early years of [redacted] and Corona had become a casualty of the records destruction process by 1970, so there is no assurance that all of the important events can ever be captured for historians. (RP, March 1973)

[redacted]

[redacted]

NOTES ON SOURCES

1. SAFSP [redacted] Program Summary Report 1960-1967, prep by R. Perry, Sep 67, p -124 (hereafter cited as [redacted] Summary).

2. Memo, MGen R. E. Greer to Col. W. G. King, 24 Jul 63, subj: Instructions on [redacted] SP files.

3. [redacted] Program Report, Rough Draft, Document No. DIN 500200-34-1, (undated, prep Jul 67), p 11-6, (hereafter referred to as [redacted]

4. Memo, Greer to King, 24 Jul 63.

5. [redacted] Summary, p 1-25.

6. For details, see Vol V this history, p 112, et seq.

7. For Mission details, see [redacted] p 11-7.

8. Msg 7028, [redacted] to SAFSS, 10 Sep 63.

9. Msg, SAFSP-F-13-9-936, MGen R. E. Greer, Dir/SP, to B. McMillan, DNRO; 13 Sep 63. Msg, SAFSS-1-M-0196, McMillan to Greer, 17 Sep 63; msg, [redacted] 3462, Greer to McMillan, 18 Sep 63.

10. Msg, 0698, B. McMillan, DNRO, to MGen R. E. Greer, Dir/SP, 24 Oct 63.

11. See Vol V, pp 120-135; see also: MFR, MGen R. E. Greer, Dir/SP, [redacted] in SP-3 files; memo, R. Gilpatric, Dep Sec Def, 5 Sep 63, subj: Discussion with Mr. McCone regarding NRO, in NRO Staff files; ltr, A. D. Wheelon, D/Dir (Sat), CIA, to Dr. B. McMillan, DNRO, 5 Nov 63, no subj, NRO Staff files.

12. [redacted] p 11-8.

13. Msg, [redacted] 0918, B. McMillan, DNRO, to MGen R. E. Greer, Dir/SP, 12 Feb 64.

14. Rpt, National Reconnaissance Program Status, 29 Jan 64, SP-3 files; [redacted] pp 4-22 and 4-25.

15. NRP Status, 29 Jan 64, p 3.

16. See Vol IIB, Lanyard, nominally and occasionally called a [redacted]" did not pretend to [redacted] resolutions.

17. [redacted] pp 11-4, 11-9.

18. Ibid; NRP Status, 29 Jan 64.

19. Msg. [redacted] 0918, McMillan to Greer, 12 Feb 64.

20. [redacted] p 11-4.

21. Ibid, pp 5-18 to 5-21.

22. Msgs, [redacted] 1139 and 1141, STC to SAFSP, 26 Feb 64; [redacted]

23. Msg [redacted] 1161, STC to NPIC, 27 Feb 64; msg, [redacted] 1165, STC to SAFSS, 28 Feb 64; msg, [redacted] 2528, SAFSS to NPIC, 28 Feb 64.

24. See Quarterly Program Review, December 31, 1965 (hereafter cited as QPR) for details of [redacted] Programs. The scoring system had changed slightly up to that time and was overhauled completely in December.

25. Msg, [redacted] 4267, SAFSP to SAFSS, 18 Feb 64.

26. [redacted] 4357, SAFSP to SAFSS, 3 Mar 64.

27. Msg, [redacted] 4362, BGen R. E. Greer, Dir/SP, to B. McMillan, DNRO, 4 Mar 64; msg, [redacted] 1030, BGen J. L. Martin, Dir/NRO Staff, to Greer, 17 Mar 64.

28. Msg, [redacted] 4562, MGen R. E. Greer, Dir/SP, to BGen J. L. Martin, DNRO Staff, 25 Mar 64.

29. Ibid; msg, [redacted] 2061, NPIC to AF Processing Lab (AFSPPL), 27 Mar 64.

30. Msg, [redacted] 4562, 25 Mar 64.

31. Memo, J. Q. Reber, Chm, COMOR, to DNRO, 26 Mar 64, subj: Request for Epheimeris Data for Next KH-7 Mission, in SS files.

32. Memo, BGen J. L. Martin, Jr, Dir/NRO Staff, to Chm COMOR, 27 Mar 64, subj: Target Priorities, in SAFSS files.

33. Msg [redacted] 1458, STC to SAFSS, 27 Mar 64.

34. Msg, [redacted] 1601, STC to SAFSS, 16 April 64.

35. [redacted]

36. [redacted]

37. [redacted]

38. [redacted]

39. [redacted]

40. [redacted]

41. SAFSP, Quarterly Program Review, 31 Dec 64.

42. [redacted]

43. Interview, MGen R. E. Greer by R. Perry, 20 Nov 64.

44. [redacted]

45. Ibid.

46. [redacted]

47. QPR, 30 June 65.

48. [redacted]

49. QPR, 30 Jun 65, Procurement Section.

50. QPR, 30 Sep 65; 31 Dec 65; see also Ch V of Vol V, this mss, and particularly pp 211 et seq.

51. QPR, 31 Dec 65.

52. Memo, BGen J. L. Martin, Dir/SP, to DNRO, 29 Aug 67, subj: Summary Analysis [redacted] atch 4; Interview, Martin by R. Perry, 8 Aug 67.

53. [redacted]

54. QPR, Sep 65.

55. QPR, 31 Dec 66.

56. [redacted]

57. QPR of 31 Mar 67; 30 Jun 67.

58. [redacted]

59. [redacted]

XIV THE DEVELOPMENT AND OPERATION OF [redacted]

Background and Nomenclature

[redacted] was the first operational American satellite system to return high resolution photography.* Originally designed around a [redacted] to produce photographs with ground resolutions of two to three feet, the [redacted] was boosted to orbit by an Atlas-Agena combination. [redacted] The camera system was a product of [redacted] design; the recovery capsule was adapted from one first developed [redacted] for the Corona satellite. Operational use of the [redacted] system began on 12 July 1963 and continued until 4 June 1967. During that time 38 vehicles were launched. [redacted]

During its development and operational life, [redacted] was identified by several designators other than its code name. [redacted] and [redacted] were respectively a classified non-Byeman cover name

As noted elsewhere, the abortive Samos E-3, E-5, E-6, and Lanyard systems were intended to perform surveillance functions of one sort or another, but none ever became operational and only Lanyard produced satellite photography.

[redacted]

[redacted]

In the Talent-Keyhole designation system used to identify the products of photographic reconnaissance operations, [redacted] products were labeled KH-7, [redacted]

[redacted]

[redacted]

[redacted]

*

Apart from Corona, which had been operational for three years, one Lanyard flight of May 1963 which produced a few photographs of no great intelligence worth and the returns from one Samos E-1 mission (with resolution limited to about 100 feet), represented the only previous successes of a satellite reconnaissance effort that had been in existence for nine years and had been heavily funded for five. Corona, sponsored by the CIA, was not considered an element of the "Air Force" satellite reconnaissance program, being classified as an "interim" capability system even though developed, managed, and operated mostly by Air Force people. Both the Samos E-5 and Samos E-6 programs had failed and had been cancelled by the end of 1962-- after eight consecutive mission failures (nine, if the first Lanyard were counted). An effort that very probably cost more than [redacted] had yet to produce useful photography. Greer's concern for "one good picture" was all too understandable in those circumstances.

[redacted]

Disagreements and uncertainties marked subsequent developments. A major contributor was a bureaucratic competition for control of the satellite reconnaissance program. But for the most part such skirmishing concerned matters other than the [redacted] which in July 1963 received the endorsement of

Dr. E. M. Purcell and a special panel he headed* and in September became the subject of preliminary plans for contractual actions.[2]

[redacted]

[redacted] system to Dr. Brockway McMillan* and (subsequently) to General Greer. As a result of the presentation, Greer formally proposed the development of [redacted]

[redacted]

---

* Director of the National Reconnaissance Office from February 1963 to October 1965.

[redacted]

[redacted]

[redacted]

[redacted]

McMillan informally authorized Greer to proceed with the [redacted] program [redacted] Formal approval appeared on [redacted]

[redacted] Greer had been predisposed toward the combination of Atlas and Agena, [redacted]

[redacted]

[redacted]

~~TOP SECRET~~

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

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[redacted]

[redacted]

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[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

During the summer of 1965, the NRO experienced administrative changes which, while of considerable internal significance, had only minor influences on the [redacted] After some two years of struggling with the CIA over control and direction of the National Reconnaissance Program, Dr. McMillan left his post as Director of the NRO in September. He was replaced by Dr. A. H. Flax, Assistant Secretary of the Air Force (R&D).* General Greer, [redacted] retired from the Air Force, to be replaced as Director of Special Projects by Brigadier General J. L. Martin, Jr. Martin, in turn, was suceeded as head of the NRO staff by Brigadier General J. T. Stewart. [redacted]

[redacted]

* Flax served as Acting Director at various times between July and September 1965, during McMillan's temporary absences. McMillan's plans were known to the NRO staff in July.

[redacted]

[redacted]

[redacted]

[redacted] He concluded that the procurement policies hitherto used for the program were best suited to a developmental program relatively low in technical and high in financial risk. The environment in which [redacted] ad been developed explained adequately the kind of incentive structure which could be thus described. [redacted]

Enough experience had been gained wit [redacted] production to give the project office considerable confidence in its ability to estimate the cost of a satellite. [redacted] In particular, existing contractual incentives for saving money in production were greater by a factor of about two than those for performance. Appreciating such considerations, General Martin developed a new incentive system which not only reversed the order of priority, emphasizing performance over cost, but deleted all reward for cost saving. That policy was consistent with Martin's belief that the cost of the hardware was the least of existing uncertainties; he perceived on-orbit performance to be the crux of the problem. That [redacted] contractors accepted the new incentive structure strongly suggested that the new system made more sense than the old. In fact, the new incentive structure subdued several contract disputes that had been continuing for several months.*

---

* The "Martinized" incentive structure was described in his 1969 paper, "A Specialized Incentive Structure for Satellite Projects." It discussed, clearly and in detail, the thesis and its application, although (of course [redacted] was not identified as the program to which the policy was first applied. General Martin's approach was intended for application to mature programs, those past the stage of schedule and cost uncertainties but still subject to performance improvement. Its attractiveness, and the obvious success of its application to [redacted] had the unfortunate effect of inducing others to attempt to apply it to programs that lacked the fundamental character General Martin specified. In particular, it was occasionally applied, in part or in whole, to the development phases of new programs--where the structure devised by Generals Greer and King for the initial stages of [redacted] was almost certainly more suitable. Misapplication of the Martin strategy to immature programs was particularly unfortunate because what may have been General Martin's major contribution was the demonstration that the incentive structure could be "fine tuned" to the needs of almost any procurement problem. He did not intend, and certainly did not recommend, that it be applied to development enterprises characterized by cost, schedule, and technical uncertainties of real consequence. The success of the Martin approach resulted from his recognition that [redacted] had changed as it matured, and that a mature [redacted] required contract incentives different from those of developmental [redacted] He did not suggest, and did not believe, that the incentives of the original [redacted] contracts were in any sense incorrect--merely that they were no longer appropriate to the circumstances he had to contend with. The incentives he devised could, or may have been, of indifferent quality, in an absolute sense. But they were better suited to the circumstances than those they replaced. There lay the explanation of the success of General Martin's approach. And there lay the seed of failure when his techniques were applied, in inappropriate circumstances, to other programs.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

United States Intelligence Board (USIB) approval of [redacted] development [redacted] further complicated the problem; early expectations of [redacted] though unreasonably optimistic, [redacted] were even moderately successful, the need for [redacted] keeping a [redacted] capability in being would be essential to continuance of the [redacted] mission. [redacted]

Despite Dr. Flax's reluctance, the Director of Central Intelligence, Richard Helms, felt that the [redacted]

[redacted] in fiscal year 1967 was too much. He pointed out that the schedule developed for fiscal 1967 dated from January 1966. [redacted] On 17 August, therefore, the Executive Committee for the National Reconnaissance Program decided to delete [redacted]

USIB's Committee on Overhead Reconnaissance in September 1966 proposed that [redacted] missions be conducted during fiscal year 1967. USIB, as a whole, somewhat reluctantly accepted the recommendation of its subcommittee, several members expressing concern that success in all of the scheduled missions would cause the exploitation elements of the intelligence community to be swamped in high resolution photographs. [redacted]

[redacted]

For the moment, the decision to proceed with [redacted] The convincing argument, advanced by the staff of the National Reconnaissance Office, was that the [redacted]

One of the growing national concerns during the period of [redacted] As early as January 1965, Dr. McMillan had informed Secretary McNamara of impending studies of a [redacted] While funds had been allocated in the fiscal 1966 budget for this purpose, little work had been done;- [redacted] The costs involved were two years in the future and the technology involved was, by that time, low risk. [redacted] required photographs would be taken and returned for analysis [redacted] But another requirement for [redacted] was that either a satellite be [redacted] One was largely a matter of luck and the other was, during 1966, ultimately constrained by the rate of production of reconnaissance satellites.

[redacted]*

* In September 1966, Colonel King left the [redacted] office for a new assignment. In some respects, the timing was unfortunate; King had been the prime mover in [redacted] development for several years, and the [redacted] mission still was pending. General Martin, therefore, arranged for King's continued availability to oversee [redacted] missions--a task that had precedence over any he incurred in his new assignment.

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[redacted]

[redacted] was an issue of considerable concern generated partly by political considerations (the mounting CIA-NRO differences of the time) but also by the complete [redacted] Largely because of Greer's stubborn insistence on step-by-step progress, [redacted] and had come to assume, almost placidly,

[redacted]

[redacted] The introduction of recoverable film capsules, with Corona, and the indifferent quality of returns from early readout systems (Samos E-1 and E-2) had relegated readout to a research enterprise by 1962, however. During 1966, the concept of readout was again raised to system design status, [redacted] attractive at the time, however, and in November 1967 the NRP Executive Committee decided against any [redacted] application [redacted] It recurred more and more frequently to consideration of new system possibilities thereafter, however.[77]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

In a separate effort to conserve funds, the NRO altered its earlier disaster recovery policy [redacted] That commitment was revoked in February 1967 in favor of a policy of quick rebuilding and repair in the event of launch stand damage. The newer approach had the undeniable advantage of being less costly, particularly if no severe damage occurred. It invoked a degree of greater risk, of course, but in that no occasion for either major repair or the use of an alternate launch stand arose through the end of 1972, the policy subsequently justified itself.[84]

[redacted]

[redacted]

[redacted] Late in July, [redacted] left a note on General Berg's desk* which provided a good indication of progress: "After many disappointments it appears that we have a good [redacted] We still need to hold a reservation [redacted] but our experience leads us to feel success is here. Hooray!"

[redacted]

[redacted]

The elusive goal of photo-satellite reconnaissance was resolution of objects [redacted] It was a threshold number for photo interpreters, who foresaw in it marvelous possibilities for obtaining hitherto unobtainable information. By 1967, some seasoned veterans of the National Reconnaissance Program had begun to suggest that [redacted] Commenting on a draft study by [redacted] General Berg conceded that, [redacted] may be just too tough a development problem. But compare that to the theoretical statement that 'we will get [redacted] become completely vexed with anyone talking it down. [redacted]

[redacted]

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Handle via [illegible]
Control [illegible]

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1. Rpt. SAFSP Quarterly Program Review, 10 July 1964; (hereafter cited as QPR, with date).

2. Memo, E. M. Purcell, Chm, Reconnaissance Panel, to DCI, Jul 63, subj: Panel for Future Satellite Reconnaissance Operations; memo, B. McMillan, DNRO, to Dir CIA, 11 Sep 63, subj: Implementation of Purcell Panel Recommendations, both in SAFSS files.

3. MFR, MGen R. E. Greer, Dir/SP, 15 Aug 63, subj: Plans [redacted]

4. [redacted]

5. Memo, MGen R. E. Greer, Dir/SP to Col W. G. King, Dir/ [redacted] Ofc, 13 Dec 63; subj: [redacted]

6. Msg, [redacted] 3952, MGen R. E. Greer, Dir/SP to BGen J. L. Martin, Dir/NRO Staff, 27 Dec 63.

7. Memo, MGen R. E. Greer, Dir/SP to Col W. G. King, Dir/ [redacted] Ofc, 2 Jan 64, subj: [redacted] msg, [redacted] 0822, BGen J. L. Martin, Dir/NRO Staff, to Greer, 3 Jan 64.

8. Ltr, MGen R. E. Greer, Dir/SP, to Col W. G. King, Dir/ [redacted] Ofc, 7 Jan 64, subj: Letter of Instructions; msg, [redacted] 0837, B. McMillan, DNRO, to Greer, 8 Jan 64; ltr, Greer to King, 8 Jan 64, subj: Appointment of a Special Evaluation Board [redacted] in SP files.

9. [redacted]

10. Ibid, pp 14-1, 14-2.

11. [redacted]

12. QPR, 10 Jun 64.

13. [redacted].

14. Msg, [redacted] 1311, BGen J. L. Martin, Dir/NRO Staff, to MGen R. E. Greer, Dir SP, 2 Jan 64; msg, [redacted] 5002, Greer to Dr. B. McMillan, DNRO, 3 Jan 64; msg, Whig 1319, Martin to Greer, 4 Jan 64, in SP files.

15. [redacted]

16. QPR, 30 Sep 64.

17. QPR, 31 Dec 64; memo BGen W. G. King, Dir/SP, to Dr J. L. McLucas, DNRO, 28 Apr 70, subj: [redacted]

18. Msg, [redacted] 6158, MGen R. E. Greer, Dir/SP, to Dr. B. McMillan, DNRO, 22 Oct 64; msg, [redacted] 2209, McMillan to Greer, 30 Dec 64.

19. Memo, B. McMillan, DNRO, to DepSecDef, 4 Jan 65, subj: [redacted] in DNRO files.

20. Msg, [redacted] 2242, BGen J. T. Stewart, Dir/NRO Staff, to MGen R. E. Greer, Dir/SP, 8 Jan 65; msg, SAFSP [redacted]

21. QPR, 31 Mar 65.

22. Msg, [redacted] 2215, BGen J. T. Stewart, Dir/NRO Staff, to AFSC, 4 Feb 65.

23. Msg, [redacted] 7214, SAFSS to [redacted] 4 Mar 65.

24. QPR, 31 Mar 65.

25. Msg, [redacted] MGen R. E. Greer, Dir/SP, to Dr. B. McMillan, DNRO, 8 Mar 65; msg, [redacted] 2621, BGen J. T. Stewart, Dir/NRO Staff to Greer, 9 Mar 65.

26. QPR, 31 Mar 65.

27. QPR, 30 Jun 65. There is some ambiguity in this source, however. [redacted]

28. QPR, 30 Jun 65.

29. QPR, 30 Sep 65.

30. QPR, 30 Jun 65.

31. Ibid.

32. QPR, 30 Sep 65; 31 Dec 65.

33. QPR, 30 Sep 65.

34. QPR, 31 Dec 65.

35. [redacted]

[redacted]

36. QPR, 31 Dec 65.

37. [redacted]

38. QPR, 31 Mar 66.

39. [redacted]

40. QPR, 30 Jun 66. Such optimism, a consistent problem for several years, was sometimes as much as 60 percent off from results actually achieved. See memo, [redacted]

41. [redacted]

Note that "z" time is Greenwich Mean Time (GMT). When daylight savings time is in effect, there are seven hours difference between GMT and Pacific Time; when not, the difference is eight hours.

42. [redacted]

43. QPR, 30 Sep 66; memo, [redacted] 28 Apr 70.

44. [redacted]

45. [redacted]

46. Msg, [redacted] 5591, Dr. A. H. Flax, DNRO to BGen J. L. Martin, Dir/SP, 10 Aug 66.

47. Min, NRO ExCom Mtg, 17 Aug 66.

48. Memo, Dr. B. McMillan, DNRO to R. McNamara, SecDef, 11 Jan65, subj: [redacted]

49. Min on NRP ExCom Mtg, 17 Aug 66.

50. Msg, [redacted] QPR, 30 Sep 66.

51. Msg, [redacted]

52. Memo, [redacted]

53. Msg, [redacted] 1434, 31 Aug 66.

54. QPR, 31 Dec 66.

55. QPR, 30 Sep 66, 31 Dec 66; memo, BGen J. L. Martin, Dir/SP, to Dr. A. H. Flax, DNRO, 2 Feb 67, subj: [redacted]

56. Msg, [redacted] 3375, 14 Dec 66.

57. Msg, [redacted] 3733, 23 Dec 66.

58. Memo, [redacted] to McLucas, 28 Apr 70, Atch 1, Tbl 1, and main report.

59. See Ch XIII.

60. [redacted]

61. Msg, [redacted] msg, [redacted]

62. Msg, [redacted]

63. Msg, [redacted] See also MFR, BGen R. A. Berg, Dir/NRO Staff, 23 Mar 67, subj: Telephone conversation with Gen Martin.

64. [redacted]

65. QPR, 30 Jun 67. "The contractor appears to have significantly improved his component and manufacturing quality control," was the project office evaluation.

66. QPR, 31 Mar 67.

67. MFR, Berg, 23 Mar 67.

68. Msg, [redacted] QPR, 30 Jun 67; msgs, [redacted]

69. [redacted]

70. QPR, 30 Jun 67; [redacted]

71. Msg, [redacted]

72. [redacted]

73. Msg. [redacted]3375, 25 Jul 67.

74. Memo, Dr. A. H. Flax, DNRO, to DepSecDef, 6 Jul 67, subj: National Reconnaissance Program (NRP) Issues and Pending Decisions.

75. Ltr, Dr. A. H. Flax, ASAF/R&D, to C/S, USAF, 13 Oct 66, subj: SLV-3A Launch Vehicle Requirements, SAFSS files; msg. [redacted]5849, Dir/NRO staff to Dir SP, 24 Oct 66; msg. [redacted]3461, SP to SS, 16 Nov 66.

76. Rpt, [redacted] in SAFSS Proj Ofc files.

77. Min NRO ExCom Mtg, 23 Nov 66.

78. Min NRO ExCom Mtg, 17 Aug 66.

79. Memo, A. H. Flax, DNRO, to DepSecDef, 20 Sep 66, subj: The DNRO Recommended FY68 Budget for the National Reconnaissance Program.

80. Min, NRO ExCom Mtg, 23 Nov 66.

81. Memo, MGen J. T. Stewart, Dir/NRO staff, to DNRO, 30 Jun 67, no subj, NRO files.

82. Memo, James Reber, Sec NRP ExCom, to DNRO, 9 Dec 66, subj: Agenda; Min, NRP ExCom Mtg, 16 Dec 66.

83. Msgs, [redacted]6102, 20 Jan 67; [redacted]4889, 14 Feb 67.

84. Memo, [redacted]

85. QPR, 31 Mar, 30 Jun, 30 Sep 67.

86. BGen R. A. Berg, Dir/NRO Staff, to DNRO, 25 Jul 67, no subj.

87. [redacted]

88. Memo, BGen R. A. Berg, Dir / NRO Staff, to A. H. Flax, DNRO, 1 Sep 67, no subj.

89. QPR, 30 Sep 67.

90. Memo, A. H. Flax, DNRO, to C. Vance, DepSecDef, 6 Jul 67, no subj.

91. [redacted]

92. Msg. [redacted] 1923, 26 Oct 67.

93. QPR, 31 Mar 67, and 31 Dec 67.

94. [redacted]

95. [redacted]

96. Ltr. Chm, USIB, to SecDef, 4 Apr 68, with atch, New Coverage Requirements, 27 Mar 68.

97. Memo, A. H. Flax, DNRO, to Chmn, USIB, 10 Apr 68 (draft), subj: [redacted]

98. [redacted]

99. [redacted]

100. Msg, [redacted] 0199, 16 Aug 67.

101. Mission Summary No. 7, 15 Sep 67.

102. [redacted]

103. [redacted]

104. Msg. [redacted]

105. [redacted]

106. Msgs, [redacted] 9431, 23 Oct 67; [redacted] 1897, 25 Oct 67.

107. [redacted]

108. Min, of NRP ExCom Mtg, 17 Nov 67.

109. Memo, MGen J. M. Reynolds, USAF (Ret), Office of the Dir, CIA, to BGen R. A. Berg, Dir, NRO staff, 15 Sep 67; subj: Utilization of the KH-7 [redacted] Reconnaissance Systems for Mapping, Charting and Geodesy Requirements, in DNRO files.

110. Memo, BGen R. A. Berg, Dir/NRO Staff, to A. H. Flax, DNRO, 26 Sep 67, no subj. (Flax's marginal note in reply is quoted here); memo, L. J. Schadegg, [redacted]

111. [redacted]

112. [redacted]

113. QPR, 31 Dec 67.

114. [redacted]

115. Msg, [redacted] 4229, 18 Jan 68.

116. Msg, [redacted] 4834, 29 Jan 68; msg, [redacted] 4858, 30 Jan 68; [redacted]

117. Memo, [redacted]

118. Msg, [redacted] 5298, 13 Mar 68.

119. [redacted]

120. [redacted]

121. Memo, BGen R. A. Berg, Dir/NRO staff, to Dir, [redacted]

122. Msg, [redacted] 1800, 9 Apr 68.

123. Msg, [redacted].

124. Msg, [redacted] 7756, 6 Jun 68.

125. Msg, [redacted]

126. [redacted]

127. Msg, [redacted] 4222, 17 Jul 68.

128. Msg, [redacted]

129. Ltr, BGen R. A. Berg, Dir/NRO Staff, to Dr. A. H. Flax, DNRO, 14 Nov 68, no subj.

130. [redacted]

131. [redacted]

132. [redacted]

133. [redacted]

134. [redacted]

135. [redacted]

136. Memo, LCol F. L. Hofmann, NRO Staff to Dr. J. L. McLucas, DNRO, 25 Oct 72, subj: [redacted] msg, H. Cohen, SAFSP (SP-3) to McLucas, 25 Oct 72; interview, H. Cohen by R. Perry, 21 Dec 72.

137. QPR, 30 Jun 72.

138. [redacted]

139. Msg, BGen L. Allen, Dir, SAFSP, to Dr. J. McLucas, DNRO, 7 Oct 70.

140. [redacted]

141. QPR, 30 Jun 70.

142. [redacted]

143. [redacted]

144. Memo, J. L. McLucas, DNRO, to SecDef, 18 Dec 72, subj: Taking Stock of the National Reconnaissance Program; memo, McLucas to SecDef, 21 Dec 72, subj: Taking Stock, both in SAFSS files.

145. Memo, BGen D. D. Bradburn, Dir/SP, to Dr. J. McLucas, DNRO, 20 Mar 73, subj: [redacted]

146. Memo, BGen D. D. Bradburn, Dir/SP, to Dr. J. McLucas, DNRO, 23 Jul 73, subj: [redacted]

147. [redacted]

148. [redacted]

149. [redacted]

150. [redacted]