NATIONAL RECONNAISSANCE OFFICE
14675 Lee Road
Chantilly, VA 20151-1715

27 June 2001

Information Access and Release Center
(703) 808-5029

Mr. John Greenewald, Jr.
[redacted]

Case Number F00-0085 (Final Release)

Dear Mr. Greenewald:

This is in response to your Freedom of Information Act (FOIA) request dated 14 August 2000, received in the Information Access and Release Center of the National Reconnaissance Office (NRO) on 21 August 2000. Case Number F00-0085 is a request for "The History of the Satellite Data System;" "History of the Manned Orbiting Laboratory - MOL;" and "A History of Satellite Reconnaissance, ALL VOLUMES, by Robert Perry??? circa early 1970s - I think that there are either five or six volumes."

Your request was processed in accordance with the FOIA, 5 U.S.C. § 552, as amended.

This release consists of one record, NRO HISTORY, Volume IV. Volume IV, which consists of 136 pages, is being released in part to you. Portions of this record are being withheld pursuant to the FOIA exemption (b)(1), which applies to information that is currently and properly classified in accordance with Executive Order 12958, section 1.5(c), which applies to intelligence activities (including special activities), intelligence sources or methods.

Volume III of the Perry Histories is denied in full pursuant to the FOIA exemption (b)(1), which applies to information that is currently and properly classified in accordance with Executive Order 12958, section 1.5(c), which applies to intelligence activities (including special activities), intelligence sources or methods; section 1.5(g), which applies to vulnerabilities or capabilities of systems, installations, projects or plans relating to the national security.

With regard to your request for information on "The History of the Satellite Data System;" "History of the Manned Orbiting Laboratory - MOL;" the NRO has determined that the fact of the existence or nonexistence of records would be classified in accordance with Executive Order 12958. Your request is denied pursuant to 5 U.S.C. § 552 (b)(1). By this statement, the NRO neither confirms nor denies that such records may or may not exist.

You have the right to appeal this determination by addressing your appeal to the NRO Appeal Authority, 14675 Lee Road, Chantilly, VA, 20151-1715 within 60 days of the date of this letter. Should you decide to do this, please explain the basis of your appeal.

The FOIA authorizes federal agencies to assess fees for record services. Based upon the information provided, you have been placed in the "educational/scientific" category of requesters which means that a requester is responsible for duplication costs in excess of the first 100 pages. The cost for this release would be $20.40 (136 pages at .15 per page). You have already received the first 100 pages in the first interim release. We have waived the fees in this case.

If you have any questions, please call me at (703) 808-5029 and reference your case number.

Sincerely,

Barbara E. Freimann

Barbara E. Freimann
Chief, Information Access and
Release Center

Enclosure:
NRO HISTORY, Volume IV

UNCLASSIFIED

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[redacted]

NRO HISTORY

Author: Robert Perry

The Attached 131 Pages, Entitled "NRO HISTORY", ROUGH DRAFT was identified by the NRO History Staff on 10 June 1999 as being Robert Perry's Volume IV.

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XVII RECCE SATELLITE R&D: CAPABILITIES IN READOUT, CRISIS RESOLUTION AND VERY HIGH RESOLUTION

Although fundamental scientific research was the nominal mission of the first American satellites, reconnaissance had been the principal justification for virtually all space-focused research and development undertaken in the United States before 1957. While proposals for a variety of other space missions were advanced and debated in those years, the lack of funding kept most in a study status. Except in preliminary work on the Samos E-1 photo-readout system, the slightly funded scientific satellite program called Vanguard, and their respective vehicular components, relatively little progress was made. When more adequate funding became available after the respectability of satellite research was reestablished late in 1957,* there were in principle only nominal constraints on the scope and direction of space-relevant research and development. In actuality, constraints were real and extensive, particularly for military space programs.

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* Secretary of Defense Charles E. Wilson and Undersecretary Donald L. Quarles held space programs in disfavor. Military space programs were particularly unfashionable in the years between 1955 and 1958. The appearance of the first Soviet satellites in October and November 1957 changed a funding stringency policy that had been most obvious during the budget crises of fiscal years 1957 and 1958. The matter is discussed in some detail in Chapter I.

Although the annual investment in research for and development of military space systems increased from the $10 million available at the start of fiscal 1957 to a spending rate that approached (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] a year by fiscal 1962, that expansion was not accompanied by a comparable broadening of applications. One reason was that developing and operating military satellites proved to be many times more expensive than had been anticipated. Money that might otherwise have been spent on the development of new or special capabilities was needed to carry on development of early reconnaissance systems. The Air Force also invested heavily in several ambitious space programs that ultimately failed.*

Money was also at the heart of the second inhibitor: although a variety of attractive functions seemed to be operationally achievable by 1960, the transformation of a laboratory-demonstrated capability into a working orbital system proved to be enormously

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* Communications and missile-launch detection satellites were among the most favored and least successful of first-generation military space programs. Advent and Midas, quickly forgotten, were notorious examples. The tendency to understate probable cost was not confined to space programs, of course, and in terms of dollar overruns and program failures space programs could not be considered major offenders. Nevertheless, military satellites were notoriously undercosted, and the frequency of program failure was quite high.

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expensive. A capability that was attractive when initially proposed at modest cost became highly unattractive when real costs proved greatly larger. That there were few operational military satellite systems served to constrain efforts to adapt new capabilities to existing systems. Until [redacted] Corona was the only photo-reconnaissance system in operational use and for [redacted] Although eventual replacement of Corona by some more capable search system was all but certain as early as [redacted] The quality and reliability of Corona [redacted] operations tended to depreciate the attractiveness of competing systems with unproven performance and uncertain costs.

Samos E-1, the original photo-readout satellite system was clearly inferior to a successful Corona in all important respects; the program was therefore cancelled after one launch failure and one modestly successful flight. "Improved" film readout systems which had begun development in 1958 and 1959--Samos E-2 and E-3--were cancelled in embryo, their own technical deficiencies and their inferiority to Corona [redacted] being acknowledged in 1960 and 1961. (b)(1)1.5c [redacted] Samos E-5, the only photo-surveillance system that provided for recovering both camera and film, was a technical disaster tainted by severe cost problems; such defects led to its cancellation in December 1961. Samos E-6, once intended to supersede Corona, was abandoned in January 1963 after five successive flight failures. (Continuing improvements in Corona performance had made E-6 comparatively less appealing by the time cancellation became advisable, but doubts about the ability of E-6 to perform as specified also encouraged program termination.)* (b)(1)1.5c [redacted]

* The various Samos E-series programs are covered in Volumes IIA and IIB.

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the functions of [redacted] Corona and [redacted] was overtaken by events. The Corona program ended, [redacted]

Notwithstanding the repeated failure of efforts to provide new satellite reconnaissance systems with capabilities surpassing those of Corona [redacted] the decade of the 1960s was not in any sense a disaster for satellite reconnaissance. Those years saw a continuing progression through successively improved Corona [redacted]

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* The fate of various Corona model improvement proposals has been treated in Volume I and will not be further discussed here. However, it is notable that institutional rather than technical or cost factors were primarily responsible for the successive decisions to abjure further improvement of Corona, excepting relatively modest reliability and resolution enhancement, in the years after 1966.

Most new satellite reconnaissance systems proposed, sometimes started, and eventually abandoned in the 1960s could be faulted on risk and cost grounds. Generally, there were no such straightforward arguments [redacted] developed in the same period. Rather, requirements were never solidly validated for most, and there was constant high-level disagreement about whether attractive [redacted] or developed as largely new satellite reconnaissance systems. That proposals for such improvements were recurrent, and that the essential preliminary research and development were funded notwithstanding those circumstances could be explained by two factors. [redacted] second, the composite of technical misadventure and cost growth that had characterized several failed programs of the early 1960s had convinced senior National Reconnaissance Office (NRO) officials that it was better to modify existing systems than to invest in the more costly, riskier course of developing totally new systems. Cost tended to be the dominating consideration in such judgements.*

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* This section is concerned with trends in photographic reconnaissance. It should be recalled, however, that various combinations of the Agena vehicle and either Atlas or Thor boosters were employed successfully to orbit weather satellites, [redacted] experiment, and a comparatively large number of sensor systems

Incremental improvement and modification as alternatives to the development of new systems were not formally enunciated policies of the National Reconnaissance Program in the 1960s. Yet with the [redacted] no entirely new photo reconnaissance satellite progressed steadily toward operational employment in those years. [redacted] never faltered was more the consequence of institutional preferences than of any compelling advantages [redacted] provided. Proposed alternatives to [redacted] usually represented some multi-system scheme of flying an improved Corona [redacted] The only important exception was the S-2 system favored by the West Coast element of the National Reconnaissance Office** during the period [redacted] was chosen, and that preference too had

*(continued)capable of detecting, locating, and identifying [redacted] and electromagnetic emissions. Major subsystems developed in the course of the [redacted] programs sometimes were adapted to such applications. NASA (National Aeronautics and Space Administation) satellites also used techniques and devices developed initially for reconnaissance operations (notably the photo readout system of Samos E-1, which reappeared in Lunar Orbiter). And, of course, the Lanyard system represented a "growth capability" that actually went into orbit, although in the end it proved to be an incapable rival to [redacted] Corona [redacted] and was dropped. Nevertheless, new capabilities somehow were disapproved or demonstrated incapability before they could appear as "new" photo reconnaissance systems or as major modifications of existing system

** Directorate of Special Projects; Program A.

institutional overtones. (b)(1)1.5c [redacted]

Institutional learning--or perception--had a dominant influence on the course of reconnaissance satellite development during the 1960s, but that fact was not openly conceded by the participants. The two principal subgroups concerned with satellite reconnaissance developed strikingly different viewpoints about appropriate system development strategies. Even though neither the CIA nor the Directorate of Special Projects ever explicitly defined preferred strategies, those differences were evident in the extended controversy that preceded the eventual selection (b)(1)1.5c [redacted] for development. Acquisition strategy was also a significant but unacknowledged factor in disagreements about how the NRP (b)(1)1.5c [redacted]

As evidenced in the advocacy of the S-2 search system by the Directorate of Special Projects (SAFSP) (b)(1)1.5c [redacted] by the CIA

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* The origins and fate of the S-2, as a predecessor of what became (b)(1)1.5c [redacted] are detailed in Volume IIIB, Chapter XV.

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and as reflected in the sometimes disharmonious consideration of what to do about (b)(1)1.5c [redacted] two very different development approaches were in contention through the late 1960s. SAFSP had by 1964 become painfully acute to the risks associated with attempting to develop reconnaissance systems that represented "great leaps forward." (b)(1)1.5c [redacted] which in the end owed much to the exploitation of Corona concepts and technology, all of the many ambitious undertakings of the original Samos program had to be listed as failures. (b)(1)1.5c [redacted] They and the project specialists in SAFSP could not ignore or forget the problems that ultimately caused the pre-operational cancellation of all the original Samos photo-reconnaissance systems. Moreover, they were closely associated with a set of Air Force officers whose technical management

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* Those systems are discussed individually in the section that follows.

(b)(1)1.5c [redacted]

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of the Corona program in the years 1958-1963 had been strikingly marked by engineering pragmatism and design conservatism. Those officers, notably Colonels Paul E. Worthman, C. Lee Battle, and Frank Buzard, recognized that Corona had been conceived and initially operated as a low-risk system--at least as compared to its much more ambitious competitors of the time. Corona incorporated as much as possible from existing off-the-shelf technology: basic camera design, an existing satellite vehicle and booster, and whatever was available in the way of proven subsystems from contemporary missile and space programs. Yet with all that, Corona verged on failure for its first two years. Even the most radical of subsequent alterations of Corona, the incorporation of stereo capability, represented an accommodation of space-proven cameras to a rather obvious potential.*

[redacted] seemed another proof of the validity of a policy of incremental acquisition: [redacted]

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* That generalization, however accurate, does not in any way detract from the significance of innovation in Corona, which was not only the first successful photo reconnaissance satellite, but the first stereo system, the first multiple-capsule system, the first recoverable capsule system...and so on. All such innovations were marked by gradualism and incrementalism; that is the principal point.

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[redacted]
Thor and a Corona reentry system. Its SAFSP manager, Major David D. Bradburn* emphasized those qualities of incrementalism and low-risk technology espoused by King, Battle, Worthman, and Greer. [redacted] was a sparkling success.

Lanyard, though not competitive with [redacted] Corona because of inate optical limitations, represented a "partial success" in an era of failures, and Lanyard was an adaptation of Corona concepts to a much simplified Samos E-5 camera system. Greer and NRO Director Joseph V. Charyk made a determined effort to preserve the better parts of Samos E-6 in the short-lived [redacted] project, again postulating that chances of program success were good because an incremental, low-risk approach was possible.

The other major institutional element of the satellite reconnaissance program, the CIA,** was the sponsor [redacted] a radically new system with almost no technological antecedents in earlier experience. The advocates of [redacted] included no important participants in Corona, and thus no one with the perceptions and institutional memories common to the SAFSP group. Most senior [redacted] proponents viewed Corona from a perspective very different from that

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* Later Director of Special Projects, NRO, as a general officer.

** The NRO's Program B, originally created to house Corona, was nominally headed by the CIA's Deputy Director for Science and Technology -- who [illegible] voices on many committees and special groups concerned with satellite [illegible]

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of SAFSP, considering it to be innovative and technologically advanced and attributing program success solely to management enterprise, willingness to accept risks, and design ingenuity.*

In the effort to secure acceptance of S-2 rather than [redacted] the SAFSP sponsors of the S-2 eventually incorporated many elements of higher technical risk than were present in their early proposals. Nevertheless, [redacted] and Corona technology. [redacted] on the other hand, incorporated so much untried and uncertain technology that the originally favored CIA contractor [redacted] withdrew from the program in the course of a dispute about what should be attempted and how.**

The disagreements over how to proceed in developing new photo-reconnaissance systems never extended to an explicit discussion of development strategies. Yet in the end the [redacted]

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* That Corona had a higher failure ratio than Samos during the first 15 mission attempts of each program was a generally ignored fact of history. So was the circumstance that Corona had originally been intended solely to provide a relatively cheap, quickly available, interim satellite reconnaissance capability--the kind of requirement unlikely to encourage investment in high-risk technology. Excepting possibly the legend that concurrency was responsible for the rapid progress of the early Air Force ballistic missile program, there appears to be no comparable instance of institutional amnesia in recent technological history.

** The dispute involved other factors, too. But technical design was the central issue. See Volume V for details.

(b)(1)1.5c

[redacted]

reconnaissance system selection processes were characterized by a divergence of viewpoints that eventually became institutional. SAFSP, and for the most part the NRO staff in Washington, usually favored a relatively conservative, incremental-growth approach to the operational employment of new photo-reconnaissance technologies. CIA reconnaissance specialists, generally supported by the Land Panel (which reported to the President's Science Advisor) and respected senior scientists who advised the United States Intelligence Board and its subcommittees, consistently urged more adventuresome approaches: new high capability systems little related in concept to those in the operational inventory and frequently incorporating design approaches and technological elements untested in other than a laboratory environment. The "quantum jump" faction was excessively optimistic about the tractability of new technology and little concerned by the risks of technical, schedule, and cost difficulties. Advocates of an incremental advance strategy tended to be overly concerned about those factors. Neither the considerable scheduling, technical and cost problems of (b)(1)1.5c [redacted] nor the eventual success of that effort in overcoming such difficulties induced either

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faction to reappraise its basic position. (b)(1)1.5c [redacted] S-2 [redacted] Intervening experience and learning were interpreted in ways that reinforced existing institutional preferences. The process has been called mythography.

The importance of the events that marked development of (b)(1)1.5c [redacted] All were eventually rejected, either for lack of a validating requirement or in favor of new systems embodying more ambitious technical concepts. Such decisions reflected a preference for large advances over incremental growth; for higher rather than lower risk in schedule, cost, and performance; and for higher cost, multi-function systems rather than lower-cost specialized systems. That consistent expression of preference implicitly defined an acquisition strategy for new national reconnaissance systems and imposed three important constraints on the National Reconnaissance Program:

(b)(1)1.5c

[redacted] as compared to less than two for Corona, [redacted]

[redacted] The policy underlying the strategy (but again not explicitly voiced) seemed to be one of exploiting attractive major advances in reconnaissance technology shortly after their appearance rather than adapting more thoroughly proven incrementally evolved capabilities. In the first instance the technology usually dictated the requirement; in the second, technology was made responsive to a requirement. In both instances the requirements were expressed in terms of national needs for satellite reconnaissance.

Outside the reconnaissance community, a somewhat disorderly debate about system acquisition strategies had been in progress intermittently since 1967. Incremental development and technological conservatism were the nominal victors in 1970, as indicated

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by espousal of those policies at the highest levels of the Department of Defense. But there, as in the National Reconnaissance Program, the real choice of strategies for acquiring new systems was more accurately reflected by the allocation of funds than by policy statements. For example, the F-14, F-15, B-1 and Trident programs were financed; alternatives involving improvements of such as the F-4, B-52, and Minuteman were rejected. In each instance the admittedly much greater cost of wholly new systems was justified by citing requirements for higher performance than incrementally improved systems could nominally provide. At least in the National Reconnaissance Program, the strikingly effective performance (b)(1)1.5c [redacted] when it became operational showed that on occasion new, high-technical-risk systems could be successfully developed--though at the price of troublesome schedule slippages, initially limited system performance, and rather substantial cost growth. Whether (b)(1)1.5c [redacted] would have been operationally acceptable had they progressed to an operational stage could only be conjectured, of course. Critics of the "frontiers of technology" approach could cite the B-70, Skybolt, XF-103, Concorde, and similar examples in support of their view. Advocates

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had the Oxcart, [redacted] Minuteman and some comparable cases to offer in refutation. And, in the last analysis, the advocates of "quantum jumps" could argue that the failures of high-technology systems were more frequent in the "white world" than within the community of reconnaissance systems, that the bureaucratic institutions of normal military service were usually incapable of carrying ambitious high-technology programs to successful conclusions, and that the special circumstances of satellite reconnaissance plus the unique skills available to the reconnaissance community permitted developers to ignore or smash obstacles that would have crippled less favored programs.

That argument was at least partly endorsed by the advocates of incrementalism, who agreed that program unity and exemption from the frivolities of "conventional" program control were essential concommitants of most R & D success. But they argued also that cost, schedule, and technical performance goals were more likely to be realized through progress in regular increments than through spasmodic efforts to create new systems based on untried "quantum jump" technology.*

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* The argument had first been cogently voiced by Robert Watson-Watt, the "inventor" of the British air defense radar system of World

For systems with considerable national urgency, the arguments for and against incrementalism tended to be academic--at least through the early 1970s. In the real world, the United States was able to bear whatever costs might be incurred by investments in high-risk technology and could afford to support parallel and backup programs that lessened the dangers arising from the failure of a primary program. That advantage might vanish in a development

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*(continued) War II, who called his thesis "the policy of the third best." Much later, a small group of Rand Corporation analysts examined the evidence for and against the hypothesis and in a series of studies published between 1961 and 1970 suggested that historical and statistical findings made the selection of an incremental approach appropriate for all but a few exceptional programs of extreme national urgency. Even in such exceptional instances, they urged, the chances of program success were significantly enhanced by incrementalism. The core of their argument was that system performance dependent on new technology had to await the demonstration of that technology, that only rarely could the availability of new state-of-the-art technology be accelerated once an optimal rate of resource investment had been realized, and that generally it was less costly and more effective to develop the essential technology in recurrent increments. Major performance improvements stemming from a common base of technology appeared more or less at the same time regardless of whether developers used concurrent or incremental approaches; the "concurrent" developments generally were so delayed by the need to solve unanticipated technical problems that they became <u>operationally</u> available at the same time as incrementally developed systems with comparable performance. The central issue in most such disagreements was what risk each proposed new system actually would incur. For the most part, even obviously high risk systems were represented to be low risk by their advocates.

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environment characterized by severe funding constraints, of course. Then, adequate but less costly performance advances of the sort represented by [redacted] might be preferred to more costly, more risky, potentially more capable systems. One of the dominant variables in the choice process was requirements. If requirements were derived from a baseline of nominally accessible technology, the more advanced and riskier systems would almost always be chosen, whereas if a requirement were stated in need terms without regard for the apparent achievability of performance, incrementally derived systems could sometimes compete successfully.

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[redacted] became of pressing interest in 1969, when President Richard Nixon endorsed the notion of providing an operational near-real-time readout capability for satellite photography during his administration.*

But readout of film imagery, as a mode of satellite reconnaissance,

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* The statement had overtones of President John Kennedy's "to the moon in this decade" goal. How strongly President Nixon felt remains uncertain. He was quoted as having endorsed the goal and the supporters of readout seized on his "endorsement" as their warrant for action. Advocates of competing technologies sometimes questioned both the fact and the strength of the Presidential commitment to readout, but there was no serious attempt to obtain either a confirmation or a denial of the assumed Presidential decision. Not until the [redacted] had been rejected was there great concern abou the matter, and by that time [redacted] The only documentation of the President's "commitment" in the files of the National Reconnaissance Office is in the form of a minute citing a brief and general statement by James R. Schlesinger in 1969. He then was a member of the Bureau of the Budget management staff; in 1973 he became Secretary of Defense. Given the President's self-acknowledged ambiguity of expression in discussions with his staff, it is conceivable that his "commitment" to development of a photo-readout satellite was slight and casual. But Schlesinger's well known habits of precision in citation argue against that circumstance. In any case, by 1971 the matter was moot; [redacted] development had received CIA and USIB endorsement, reversal of the development decision was all but inconceivable. Eventual financial or technical difficulties might lead to program cancellation, of course, but that was quite another matter.

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had been a primary object of the satellite overflight program through most of the 1950s and had been recurrently nominated for operational development throughout the 1960s. For all practical purposes, the operational feasibility of film readout had been demonstrated in 1961 tests of Samos E-1; the probability that readout techniques better than those of E-1 could be developed had been experimentally confirmed by 1964. Objections to the original Samos E-1 film readout technique mostly concerned limitations on resolution and data transmission rates peculiar to the technology developed for Samos in the 1950s. By 1965 advances in film, optics, processing methods, and data transmission techniques had largely overcome those objections. In the interim, however, the original requirement had been overtaken by progress in film-recovery satellite technology and had been weakened by continuing reappraisals of the need for a readout capability. The objections to film readout as a basic mode of satellite reconnaissance were compelling in the early 1960s; only the appearances of a still more compelling requirement coupled with an intriguing new approach could make readout sufficiently attractive to insure the development of a readout system for the 1970s.

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In January 1960, at the height of early enthusiasm for the original E-1 and E-2, eleven development-operational flights of the two film readout systems were still in the schedule. By August of that year, owing to redirection of the Samos program away from readout and toward recovery, only six remained. In November the total was reduced to five. The initial success of Corona, demonstrating the operational feasibility of film recovery, had much to do with the cut-back but the increasing costs of such competing systems as E-5 and E-6 were the ultimate determinants. The data processing system known as Subsystem I (the initial, not the Roman numeral) was essential to Samos as originally laid down, and Subsystem I was much more costly, performance deficient, and delayed in development than had been predicted in 1959. Finally, the advocates of readout in 1960 tended to be Air Staff and Strategic Air Command officials who wanted a system that would be wholly owned by SAC rather than subject to the operational control of a non-Air Force agent. The Air Staff and SAC looked on photo readout as a means of providing early warning of Soviet weapons concentrations; few in either the project offices or the higher echelons of the Pentagon had realistic hopes that the achievable readout capabilities could provide that competence.

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In any case, considerations stemming from President Eisenhower's desire to keep satellite reconnaissance inconspicuous led the National Security Council to veto the assignment of operational photo-readout responsibilities to the Strategic Air Command.

The first E-1 flight failed in October 1960 because of an Agena malfunction arising in checkout errors during launch. The second, in January 1961, returned photography which demonstrated a best resolution capability of 100 feet from an altitude of about 260 nautical miles. The results were not sufficiently promising to alter plans to fly E-1 only enough to prove out inflight film processing, transmitting and receiving units, and image reconstruction techniques. Less than two weeks after the second E-1 launch, plans for additional on-orbit tests were cancelled.[1]

Interest in E-2 was limited even though that system promised considerably higher resolution than its immediate predecessor. The film processing, data transmission, and ground equipment of E-2 were at best modestly improved over those of E-1, and in mid-1961 all three subsystems were still experiencing serious development problems. Nevertheless, because most of the costs of a test launch had been incurred by that time, the first E-2 system was continued

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toward a test on orbit. When the launch attempt on 9 September 1961 ended in a booster explosion, Greer and Charyk decided to cancel plans for a second trial and to discontinue the remainder of the E-2 development program.[2]

Colonel King, project officer for the two early readout programs, concluded on the evidence of the E-1 flight returns and E-2 equipment tests that the original film readout approach was an uneconomical and technically defective solution to the earth reconnaissance problem. Speaking as the officer who had the longest and most direct experience with readout technology, he argued that there was no point whatever to an effort to transform disappointing 1960-level technology into a photo-readout system. An effective system, he maintained, required a capability for long orbital life, heavy payloads, boosters able to put them into orbit, and a ground-based readout capability considerably more effective than any then conceivable. He was convinced that except for reuse of tape, anything a readout system of the time could do a film recovery system could do better. In considerable part, his distaste for film readout arose in the fact that long on-orbit life implied relatively high orbits which, if only because of the greater camera-to-subject distances involved, would insure that a film-

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recovery system able to produce ten-foot-ground resolution would be limited to 20-foot or worse resolutions at the altitudes needed for long-life readout missions. The data transmission and reception problem then seemed intractable; for practical purposes, the six-megacycle transmission-reception system used in E-1 and E-2 needed six weeks to transmit to ground stations the quantity of imagery that a Corona-style system could gather and return in less than five days. He also observed that the electronic transmission of reconnaissance imagery was more vulnerable to political and physical interference than any variant of film recovery. "In summary," Colonel King wrote, "I don't favor diluting any of our [present] efforts [to develop a capable recovery system in order] to build a readout gadget. Despite the effort to get into readout and electrostatic tapes, etc., I'd say it was a wasteful effort. Started now it would chug along and we would cancel it later anyhow."[3] King's sometimes frightening prescience was rarely in better form.

Notwithstanding King's distaste for readout, SAFSP efforts to develop such a capability were not extinguished in the aftermath of E-1 and E-2 cancellation. In general, the product of the next several years of research and equipment development was an [redacted] process and better data transmission techniques than those first explored in the E-1 and E-2. But through the period there were persistent and ultimately futile efforts to develop some alternative based on the use of electronic or electrostatic tape as a readout medium.

The electrostatic tape concept had gained early favor in the Advanced Research Project Agency in 1959, when that organization briefly controlled the Sentry-Samos program. It was sponsored chiefly by Lockheed, which assured various audiences in July 1959 that such an approach would "provide the highest possible performance in the earliest time period at minimum cost," a position that reflected both wild optimism about technology and ignorance of one of the few indisputable maxims of basic economics. Assuming the availability of a 12-megacycle bandwidth for data transmission, various advocacy groups argued that a system with four-foot resolution could be constructed with a readout time requirement of only about nine seconds per frame as compared to the five- to eight-minutes-per-frame transmission time needed for the electronic-scan technique used in the E-2.*

* A 12-megacycle capability could in theory reduce E-2 transmission-reception times to about two or three minutes per frame--but no technology was available in the early 1960s which included both bandwidth growth potential and feasible long-time-unattended operation. In any case, most data transmission time estimates based on laboratory experiments were uncertain by about one order of magnitude--generally in the direction of optimism.

The E-1/E-2 system was based on the bimat technique of processing exposed film by pressing it against successive chemically impregnated web sections that carried the developing and fixing ingredients. The readout subsystem included a revolving drum associated with a line-scan lens system, a photo-multiplier tube, and a video amplifier. An electron beam that focussed on the phosphor-coated inner surface of the revolving drum was transmitted through a scanning lens that in turn moved a spot of light across the width of the processed film as the film moved through a readout gate. (The beam had the shape of a square wave, moving continuously top to bottom and bottom to top rather than returning to some fixed point for each scan operation.) That portion of the beam that passed through the less dense parts of the negative entered another lens system which relayed 75 percent of the transmitted light to a photomultiplier, the end result being the transformation of modulated light into electronic signals. Amplified, those analog signals were relayed by communication-transmitter-to-ground stations. The limiting technology of 1957 (when the system entered final design) was fundamentally a factor of bandwidth (megacycles per second) and scanning beam characteristics. (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] In practice, no more than one-tenth of an inch of low resolution, 70-millimeter film could be scanned every two seconds, or about one frame each minute. Data translation and transmission requirements added to the scan-time requirement imposed the data-rate constraint: five minutes of camera operation at one frame per second required a minimum of 180 minutes of transmission time. Higher film resolution or an expansion of gray-scale sensitivity imposed correspondingly longer scan times on the system. Because a single ground station had the transmitting signal within its listening cone for only eight minutes on each of five daily passes of a satellite within station range, no more than 60 frames per day could be captured for reconstruction. That represented approximately one percent of the imagery that the cameras were capable of recording in a single day (disregarding film capacity limitations). In gross terms, the system was constrained to transmitting the out put of one minute of relatively coarse photography to each ground station each day.[4]

An electrostatic tape system of the sort proposed in 1959 and 1960 used a multi-base tape containing a sensitive photo conductor and insulator, the tape storing an image transmitted through the primary lens system. Readout required the electronic modulation of scanning electron beams, amplification of the resulting video signal, and transmission of the modulated signal to a ground station. All other elements being equal (frame size, beamwidth, and frequency of passage over ground stations), the system was theoretically capable of transmitting equivalent imagery at equivalent ground resolution in about one-sixth the time of a fully effective E-1 system. The tape was nominally reusable, which implied that an electrostatic tape system could in theory continue to function until disabled by wearout of components or exhaustion of on-board power supplies. In practice, exhaustion of stabilization gas was more likely to limit operating life, given the continuing need for vehicle and camera stability on orbit.[5]

The originally proposed electrostatic tape system, the Samos E-3, was cancelled on Air Staff instructions when custody of Samos was restored to the Air Force late in 1959. The nominal reason was that no system which would require at least three years of additional development should be a candidate for funds.* Work on the basic

* In actuality, the Air Staff acted on grounds of technological mistrust and "not invented here" reasoning, but economy was a convenient justifier.

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tape concept continued, nonetheless, under the sponsorship of the Reconnaissance Laboratory at Wright Field.* (That organization not only performed most of the work, but provided roughly 85 percent of the required funds, as useful commentary on the importance Greer's people attributed to the activity.) Late in 1961 the laboratory urged an early operational test of a system based on an electrostatic tape process developed by RCA. Evaluation of the proposed system by SAFSP satellite specialists was less than encouraging: the RCA system promised to reduce the time lag between exposure of a picture and its receipt by photo interpreters to 12 hours or less, but the probable low quality of the imagery, doubtful durability of the components, and high system costs made the system less attractive than several others then in development. Only in timeliness of returns was the system competitive with the contemporary <u>Corona</u>.[6]

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* In the 1950s and 1960s, the laboratory complex at Dayton--Wright-Patterson Air Force Base--had several formal titles: Wright Air Development Center, Wright Air Development Division, the Aeronautical Systems Division, and (for part of the total establishment) Air Force Research Division. In the interests of narrative continuity, the generic "Wright Field" will be used here, the formal titles being of no conceivable interest to any but the pedants of bureaucracy.

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The Cuban missile crisis of October 1962 revived interest in readout, partly because the superb performance of a television readout weather satellite (P-35) developed under Greer's auspices greatly eased the task of monitoring Soviet activities during the period of greatest tension.* Charyk, who had been intimately involved in reconnaissance management during the crisis period, urged Greer to propose the development of a [redacted]

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* The periodic revival of interest in crisis reconnaissance at intervals during the 1960s was clearly a byproduct of individual crises. Once anxiety died away, the transient pressure to develop or deploy some system capable of performing near-real-time reconnaissance of designated areas rapidly diminished. Characteristically, the systems that could be made quickly and cheaply available, either for near-term use or for storage against some future need, tended to produce imagery with relatively little utility for crisis management. By the late 1960s there was general agreement that high-resolution-pointing systems were essential to crisis reconnaissance, and they were expensive. Early call down of one or more capsules of film usually satisfied fundamental requirements, so Corona [redacted] The demand for a near-real-time bomb damage assessment system generally focussed [redacted] because of the [redacted] of such [redacted] Objections to the use of [redacted] for either crisis management or post-strike bomb damage assessment were varied. They have been noted in Chapter XVI of this history. [redacted]

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system that could be used for real-time readout. Greer, with private misgivings, authorized a careful study of capabilities and needs. His own calculations had convinced him that ten ground stations supporting two satellites continually in orbit would be needed to provide information equivalent to that produced by one three-day <u>Corona</u> mission. He also pointed out that critical information requested senior U.S. officials would ordinarily take five days to deliver regardless of whether a film-recovery system or a readout satellite were tasked with the requirement. Cloud cover affected them equally. The operating costs promised to be from three to ten times as great for readout. Of course, there were circumstances in which quick receipt of information might justify the cost, but in Greer's view readout capability alone provided no real guarantee of quick information retrieval.[7]

By late 1962, three of the four most promising approaches pursued during the previous two years had been abandoned as hopeless. The RCA photo conductive tape system survived. Those dropped included a thermoplastic tape system invented by General Electric, a modified Xerox-tape process sponsored by Chance-Vought Corporation, and a Westinghouse-developed photoemissive tape system. The RCA tape seemed to promise much greater sensitivity than film (eventual exposure indices of better than E.I. 150 as compared to contemporary film sensitivities averaging E.I. 3.0), was reusable, and in concept could be quickly adapted to existing satellite optical systems. Utility for the sort of crisis capability Charyk envisaged depended on the availability of 20- to 80-megacycle-per-second data links--which also were alleged to be "available" even though they had been tested only in a laboratory environment.

In practice, even in a highly favorable laboratory setting, the RCA system did not perform as its developers had promised. Tests completed in March 1963 were wholly disappointing. (b)(1)1.5c [redacted] data was significantly poorer than RCA had postulated. Further, although it seemed possible to use the tape for surveillance operations requiring only relatively poor resolution, RCA's (b)(1)1.5c [redacted] tape [redacted] electrostatic tape system with a satellite environment.

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In the judgement of SAFSP reviewers, the proposed application had no operational promise for the near future, which effectively made it incompatible with the needs Charyk had defined in November 1962.[8]

In mid-1963, after eight years of system-focused effort and five years of preliminary development, no readout system even marginally capable of satisfying the need for either crisis reconnaissance or for long-term unattended surveillance operations was available or promised to be available in the near future. The bimat film system developed and tested in the E-1 still represented the only feasible approach to a photo-readout satellite and it was handicapped by data scan and data transmission rate limitations. Some of the resolution shortcomings of the original E-1 might conceivably be overcome by adapting a bimat system to one of the newer optical systems and a wide-band transmission link, but that too would require diligent effort. None of the several proposed electrostatic or electronic sensor systems could satisfy basic requirements for reconnaissance. On the other hand, the failings of various approaches were reasonably well understood and it was entirely conceivable that modest advances in technology would permit a system to be constructed that would provide sufficient in the way of resolution and frequency of coverage to satisfy the ill-defined requirement for a crisis reconnaissance capability. Alternatively, one or a series of major advances in technology could make of some new readout concept a reasonable prospect for system development.

The Purcell Panel which in the summer of 1963 evaluated the probable requirements for reconnaissance capabilities of various kinds essentially confirmed the judgement of General Greer's people, concluding that there were ". . . no evident opportunities in readout systems which ought to affect major plans for further development." Considering current and accessible capabilities, the panel concluded that film recovery was an entirely adequate mode of operating satellite reconnaissance, for the moment at least.[9]

Notwithstanding the conjunction of a technological impasse with the lack of a compelling requirement for readout, the sheer momentum of progress in satellite reconnaissance kept that option alive. (b)(1)1.5c [redacted] Within the [redacted] there developed a series of proposals to introduce an [redacted] which would at once exploit the (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] and provide for orbiting an optical system with greater (b)(1)1.5c [redacted] potential. The combination was both attractive and technically feasible. It almost surely would require the provision of a more powerful booster for the larger and heavier payload, however. At the same time, the persistent efforts to provide improved power sources for reconnaissance satellites began to pay dividends: long-time-on-orbit capability appeared in the multiple-capsule Corona-J (b)(1)1.5c [redacted]

Although the development of a multiple-capsule recovery system somewhat weakened the arguments for creating a readout system, extended-life capability had the secondary effect of enhancing the theoretical feasibility of readout missions. Payload growth required larger boosters and mission extension required long-term power sources, both essentials of a useful readout system. The decision to develop (b)(1)1.5c [redacted] had a similar element of serendipity: [redacted]

Late in 1964, the United States learned that the Soviet Union was operating a readout reconnaissance system with about 75-foot resolution capability.[10] The transmission of moon pictures from Soviet flyby satellites resolved any doubts about either capability or capacity. That development, continuing general interest in developing a readout capability for some future application, and the emergence of [redacted] combined to produce the first attractive application of advance in basic readout technology in several years.

In the summer of 1965, Brigadier General John L. Martin, Jr., General Greer's successor as Director of Special Projects (Director, Program A), sponsored what was briefly called "the [redacted] Experiment". For practical purposes, the goal was to test in orbital operation a combination of readout devices and [redacted] using the fundamentals of the [redacted] system for all essential functions. Martin postulated a flight trial within two years of the start of intensive development. The object was to be transmitted imagery at a resolution of four feet or better, covering a "useful number of targets per day". Recalling the generally sour outcome of earlier readout investments, Martin proposed to conduct the experiment in discrete phases so that it could be cancelled without severe financial penalties at any time that results did not warrant its continuance.[11]

Neither an experiment in the fashion [redacted] nor a formal system development program resulted, perhaps because Martin's proposal was ill timed,* but two efforts to develop applicable technology were funded, one conducted by [redacted] and the other by [redacted]

Although enthusiasm for the new technology development program was limited mostly to participants, the general requirement for readout gained some additional adherents during the first year of component development. In January 1966, the COMOR (Committee on Overhead Reconnaissance of the United States Intelligence Board--USIB) again evaluated the need for quick response satellite imagery, concluding that the development of a readout mode [redacted] COMOR essentially endorsed the preliminary development of a capability for near-real-time readout

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* In August 1965, McMillan was in the process of handing over his NRO post to Dr. Alexander Flax, a new NRO charter was in preparation, and senior NRO and CIA reconnaissance officials were all but totally preoccupied with the technical and institutional questions arising in the choice and approval of a new search-surveillance system--[redacted]

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supported by adequate data links and ground interpretation centers, but did not call for full system development.[12] That conservative approach was further endorsed by the NRP's Executive Committee* in August 1966; the committee approved the NRO's action in extending support of the [redacted] work at least through January 1967, concluding that applying technology of the sort then being investigated to [redacted] represented the only realistic prospect for [redacted] attainment of a useful readout capability. How useful it might be could only be judged in terms of national reconnaissance requirements, and that was a matter for USIB determination.[13]

Additional support came from the Defense Intelligence Agency, which saw readout at reasonably high resolutions as a "unique and valuable" means of augmenting Elint data on "special events of great interest to the scientific or technical areas."[14] But by late November 1966 the USIB had decided that little immediate urgency attached to the development of a readout system applicable [redacted] and in conformance to USIB wishes Dr. Flax ordered a halt to the component development program. USIB had again concluded that crisis reconnaissance was not an urgent requirement. If readout development were to be continued, USIB decided, it should be

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* Hereafter, "ExCom."

oriented toward a survivable system with application to either the surveillance or the search mission.

In the view of Colonel Lew Allen, who was directing the technology efforts at SAFSP, the only readout technology with potential relevance to USIB-validated requirements was (b)(1)1.5c [redacted] development sponsored by (b)(1)1.5c [redacted] Allen believed that it could have application to the [redacted] mission. He estimated that a laboratory model demonstrating system capabilities could be constructed at a cost of about (b)(1)1.5c [redacted] but cautioned that extended development of the technology after a laboratory demonstration had been conducted might well cost from (b)(1)1.5c [redacted] annually.[15]

USIB's refusal to sponsor development of a (b)(1)1.5c [redacted] affected system-directed effort and not the creation of new technological capabilities. (b)(1)1.5c [redacted]

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(b)(1)1.5c [redacted]

Appreciating that circumstance, General Martin saw no benefit to further supporting exploratory development of (b)(1)1.5c [redacted] film readout system. Should a requirement for its application later emerge, he believed, transition to system status would be relatively painless and not overly expensive. Martin opposed a suggestion that his organization accept responsibility for adapting (b)(1)1.5c [redacted]

Although the Six Day War of 1967 stimulated new concern about crisis reconnaissance capabilities, the conflict was too brief and too limited to influence technology or reconnaissance requirements. In the aftermath of that conflict the USIB asked the NRO to look into the feasibility and cost of a collection system applicable to "Warning/Indications Needs"--which suggested concern for the issue but no great urgency.

In the view of COMIREX, ". . . our requirements should be interpreted as calling for a flexible system that can carry out the warning/indications role and at the same time possess a capability to assist in satisfying routine, current intelligence, and special reconnaissance tasks." That implied resolution at about the [redacted] level, ability to do daily sampling of selected target categories, and an ability to transmit results to ground stations within [redacted] after passing over a target. Such a warning-indications system would have to be operated continually and in conjunction with constantly ready interpretation and analysis facilities. Otherwise, COMIREX argued, the considerable cost and difficulty of developing such a system would not be warranted. COMIREX also concluded that determining the feasibility of performing a "warning/indications" mission and assessing cost and scheduling implications was a task for the NRO.[17]

To those conversant with the state-of-the-art it was obvious that the only readout technology immediately applicable to the COMIREX-defined requirement was [redacted] .8 A formal finding of that conclusion was long in coming, however, and while the NRO was again evaluating the potential of various approaches [redacted] other USIB participants encouraged activity elsewhere. Probably at the prompting of Richard Helms, Director of Central Intelligence and chairman of the USIB, one of the "other interested groups" that began to look into readout capabilities was the Land Panel. Perhaps predictably, the Land Panel's assessment of the state of readout technology provided the eventual impulse for what became the first full scale readout system development since 1960.

In October 1968 the Land Panel completed its initial review of technology for near-real-time readout. (The formal NRO report was not ready until March 1969.) Reporting to Dr. D. F. Hornig, President Johnson's Science Advisor, Dr. Edwin H. Land said flatly that ". . . the necessary technology for a 'see it now' system has become available." Land held that system development could start in 1969.

The existent capabilities that made development success "a realistic expectation", Land said, (b)(1)1.5c [redacted] more in space; the feasibility of sending "great quantities" of information rapidly from satellite to ground stations and by satellite-to-satellite relay; and the emerging maturity of electro-optical-imaging (EOI) technology, said to be entering the stage of feasible application to an operational system.

(b)(1)1.5c [redacted] All, Land said, had promise and all deserved funding through a point of decision and choice late in 1969.

(b)(1)1.5c [redacted]

(b)(1)1.5c [redacted]

Land was no minor bureaucrat. He was a widely respected scientist who had advised three Presidents and whose influence had much to do with the original Corona program, the creation of a stereo capability for Corona, and the development of (b)(1)1.5c [redacted]

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* Italics in original

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~~TOP SECRET~~

Handle Via (b)(1)1.5c [redacted] Control System Only [redacted] The Land memorandum of October 1968 was potentially as significant as the Schriever decision, eleven years earlier, that invoked CIA support for the development of an interim satellite reconnaissance vehicle. Schriever's 1957 action led to Corona and in time to a generation of reconnaissance satellites radically different from those anticipated by the existing R&D establishment. The 1968 Land memorandum ultimately led to a national commitment to radically new reconnaissance technology which, if successful in application, would surely dominate the next decade of satellite reconnaissance.

There were objections to the course Land and his committee favored, and for two years the final outcome was in doubt. When the issue of readout first came up for renewed discussion during an ExCom meeting in November 1968, Dr. Flax pointed out that "if it were deemed imperative to go for expedited development of a readout system at this time [redacted]" Hornig responded, mildly, that the Land Panel would probably recommend alternative technologies and priorities for their support at its next meeting. The ExCom took no position on preferable approaches but approved the expenditure of [redacted] for research and development in readout, providing that efforts could be redirected as changing circumstances seemed to warrant.[20] The sum involved represented a ten-fold increase over the previous year's expenditures on readout and the largest single-year commitment to readout since the cancellation of the Samos E-2 in 1961.

Although Dr. Land's espousal of EOI as a preferred readout technology marked a watershed in the evolution of that concept, it was not the sole contributor to the turnabout that followed. The USIB-COMIREX expression of interest in readout applications in early 1968 had stimulated the Land Panel report, but it also stimulated a delayed reaction from the NRO. In March 1969, Dr. Flax urged a cautious approach to adoption of the EOI technology; the CIA promptly took an opposing position, urging rapid progress. Although the principals and details were new, in some respects the issue was that which had last surfaced as the (b)(1)1.5c [redacted] controversy: incrementalism versus concurrency.

Flax pointed out that only one readout system had been developed and demonstrated but that several promising approaches were available "which may offer potentially more effective and, in the long term, more economic[al] systems if full-scale development is initiated one or more years from now." He cautioned, however, that because they were in various stages of research and development it would be very difficult to predict the cost, effectiveness, or availability of any single system. Flax concluded that ". . . [redacted] readout system, previously carried by the NRO to engineering model demonstration of integrated operation of all components on the ground, offers a sufficient degree of confidence to warrant proceeding with development of an operational system at this time." Reliability and wearout limitations of various components were the greatest problems of development. Because of that and related factors, Flax urged, ". . . it does not seem advisable to initiate a full-scale development of [redacted] system at this time." Development [redacted] of a near-real-time-readout system would cost from [redacted] [redacted] Flax noted, with [redacted] representing the lowest cost approach. The limitation [redacted] readout, he said, was [redacted] which suggested that a [redacted] would be more attractive. He estimated that from three to five years would be needed to carry [redacted] system to first flight, that four to five years would be needed to develop [redacted] system, and that the development of [redacted] system would take four to five years after a demonstration of (b)(1)1.5c [redacted] feasibility had been completed--which probably would not be possible until mid-1970.

(b)(1)1.5c [redacted]

John S. Crowley, one of the senior CIA officials directly concerned with satellite reconnaissance technology, disagreed with several of Flax's

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Handle Via (b)(1)1.5c [redacted] Control System Only points. He suggested that the data Flax had used contained various technical errors, some of which had prompted "grossly misleading conclusions." He took particular exception to the ~~NRO~~ DNRO's appraisal of the (b)(1)1.5c [redacted] systems and the "associated systems implications of these transducers(U)." Crowley argued (b)(1)1.5c [redacted] Finally, he added, "this office [the CIA's Directorate of Science and Technology] has come to the conclusion that (b)(1)1.5c [redacted] should not be seriously considered in the context of the Electro-Optical Imaging Program."[22] When translated from bureaucratise, his contention was that (b)(1)1.5c [redacted] could not fairly be compared, that no trade-off analysis of the two would be accepted.

Nevertheless, the two systems did become directly competitive with one another and by 1969 had acquired system names. (b)(1)1.5c [redacted] And in the interval between the earlier statement of USIB/COMIREX requirements (January 1968) and the emergence of a contest between (b)(1)1.5c [redacted] a variety of nominally unrelated events had influenced consideration of the readout issue. For the most part, they stemmed directly or indirectly from the election of Richard M. Nixon as President in the fall of 1968. His inaugural in January 1969 brought on a comprehensive overhaul of budgets and priorities in the satellite reconnaissance arena.

At their onset, the budget and priorities questions were not obviously relevant to the if, when, and what of readout. The USIB requirement was vague; with the exception of Dr. Land's hearty endorsement of EOI there was little optimism about or enthusiasm for the prospects of any currently conceivable system. One reason was that several expensive and potentially valuable non-readout systems and proposed systems had acquired powerful constituencies. Included in the list of candidates for major funding support over the next several years were the (b)(1)1.5c [redacted]

[redacted] or a combination of [redacted] elements which, in one version, was briefly known [redacted] Readout, with a potential five-year cost ranging upwards from [redacted] seemed in early 1969 to be a somewhat less urgent requirement than [redacted]

The first major realignment of satellite reconnaissance programs undertaken by the Nixon administration resulted in the cancellation of the [redacted] That action may have been influenced by Dr. Land's argument that a readout system could be developed and put into operation within four or five years, but the immediate issue was whether [redacted] should be cancelled because the budget targets adopted by the new administration [redacted] But [redacted] cancellation freed about [redacted] for investment in advanced technology--and the successor issue became one of deciding whether [redacted] or readout should have priority.* In a memorandum to the President in May 1969, immediately

[redacted]

before the [redacted] decision was finally taken,* Land had urged cancelling [redacted] and continuing development of a [redacted] camera that [redacted] advances, but concentrating most reconnaissance R&D effort on the development of a near-real-time readout reconnaissance system. Explicitly, Dr. Land urged the President to direct the NRO to start the "highest priority" development of a [redacted] imaging satellite, using [redacted]

In the immediate wake [redacted] cancellation, Dr. Land asked Richard L. Garwin, one of the nation's foremost reconnaissance specialists, to oversee a review of the current status of [redacted] development. Garwin's findings confirmed earlier Land Panel views: ". . . the [redacted] technology is a viable approach and . . . there is a high probability that a system commitment and

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* President Nixon initially ruled in February 1969 against continuing [redacted] and in favor [redacted] but several of his principal advisors urged reversal of that decision and on second thought the President permitted both programs to continue through May 1969 while the consequences of the decision were appraised in greater detail. The events of that period are discussed in Volume I, Chapter III (Corona) and Volume IIIB, Chapter XV [redacted] President Nixon apparently solicited Dr. Land's views.

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choice of detailed approach could be made by December 1969 or by March 1970 at the latest." Garwin reported to Land that [redacted] which made that component a promising candidate for use as an [redacted] Both [redacted] appeared to be making "good progress" in developing photo sensor and readout system elements. Garwin concluded that "the availability of the [redacted] demonstrated performance removes all my doubts as to the achievability of the [redacted] approach." (Garwin also concluded that the [redacted] was too complex to qualify for operational use.)[25]

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* In an attempt to demonstrate the capability of the [redacted] in November 1967, the contractor became involved in what the SAFSP sponsors characterized as "a debacle." The [redacted] refused to work, a circumstance the review group attributed to faults distributed [redacted] and various elements of component technology.[24]

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[redacted]

Although Dr. Land was convinced that near-real-time-readout was an urgent national requirement--and that electro-optical imaging was the most effective technique for satisfying that requirement--official support for his views was slow to develop. In May 1969 following discussions with Land, David Packard (Deputy Secretary of Defense) advised Dr. Lee A. DuBridge (Science Advisor to the President), Dr. John L. McLucas (successor to Dr. Flax as Director, National Reconnaissance Office, and Undersecretary of the Air Force), and Helms,* the three officials most immediately responsible for reconnaissance system selection, that the Executive Committee for the National Reconnaissance Program should devote very serious attention to the issues raised by Land's espousal of readout system development. Packard proposed that Herbert ~~Bennington~~ [illegible] (a senior member of the Directorate of Defense Research and Engineering (DDR&E)

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* Packard, DuBridge, and McLucas were, of course, the Nixon Administration appointees to posts earlier held, under the Johnson Administration, by Vance, Hornig, and Flax respectively--although Flax had operated as Director, National Reconnaissance Office, from the official position of Assistant Secretary of the Air Force, Research and Development. Helms stayed on as Director, Central Intelligence, and Director of the Central Intelligence Agency until replaced by Dr. James R. Schlesinger in 1973. Packard, DuBridge, and Helms constituted the executive Committee for the NR[illegible] in May 1969; Packard was chairman.

particularly experienced in reconnaissance matters) "lead" a study team that would report to the ExCom on four dominant issues: (1) the value of near-real-time-readout for indication-warning, crisis, and day-to-day intelligence activities; (2) the relative merits of alternative approaches (in terms of area coverage, resolution, and frequency of coverage); (3) the status of technology and its effect on the prospects of various alternatives; and (4) the value and cost of alternative readout systems and the effect of their use on the "mix" of satellite photography systems. In the meantime before the next scheduled ExCom meeting, Packard added [redacted] in fiscal 1969 funds to the CIA's technology program to support continued work on technology studies of readout systems.[26]

Colonel Lew Allen, then Director of the NRO staff, advised McLucas about two weeks later that Helms, ~~the chairman and most influential member of the ExCom,~~ had concluded that more research and development was the immediate need of the readout program. Allen considered that view "substantially more conservative and constructive than Dr. Land's." Helms felt that for the moment, pending a more credible definition of capability and availability, neither the ~~Bennington~~ group nor the NRO-CIA establishment should attempt cost or performance comparisons of competing systems. Allen found Helms' views "extremely reassuring" to those who, like himself, had feared that Dr. Land's views had won substantial CIA and DoD support.[27]

Apart from the (b)(1)1.5c [redacted] Land-favored electro-optical imaging system (EOI), one other near-real-time-readout system had attractions, though almost entirely for crisis reconnaissance. It acquired the name (b)(1)1.5c [redacted] As described to the Bennington Committee in June 1969, it would consist of a (b)(1)1.5c [redacted] The concept had evolved by way of [redacted] unfunded studies that utilized the findings of earlier work performed by (b)(1)1.5c [redacted] at a cost (to the NRO) of [redacted] evaluated and seemed feasible. (b)(1)1.5c [redacted] King, now a brigadier general and director of the West Coast element of the NRO, said flatly that if immediate readout capability were wanted, (b)(1)1.5c [redacted] was the only feasible approach. If, however, the requirement were less than urgent, one of the (b)(1)1.5c [redacted] methods could possibly be adapted. [redacted] processing probably would cost somewhat more than [redacted] King's people estimated that research, development, and an orbital demonstration would probably cost from (b)(1)1.5c [redacted] The attraction of the system lay not only in its relative cheapness as compared to (b)(1)1.5c [redacted] but in the proposed operating mode. [redacted] At operating altitudes its resolution would be about that of Corona. In some respects, (b)(1)1.5c [redacted] represented an application to photographic reconnaissance techniques of approaches developed and tested in the (b)(1)1.5c [redacted]

The (b)(1)1.5c [redacted] still in a research and development stage, remained a poor prospect for near-term operation. His staff had told King some months earlier that the (b)(1)1.5c [redacted] as then designed would not work. (b)(1)1.5c [redacted] the component program was also deficient. Nearly [redacted] had been invested in the approach (through August 1969), but the resulting equipment had to be categorized as "in bad shape."[28]

Although a report to the ExCom from Bennington's study group had been anticipated by July, it was not then complete and the more urgent issues generated by Strategic Arms Limitations Treaty (SALT) negotiations dominated the agenda when the ExCom next met on 7 August. Fundamentally, although the United States proposed to verify Soviet compliance with the terms of any treaty primarily through satellite reconnaissance, the quality and quantity of required coverage had not yet been specified. Indeed, whether continual coverage or periodic coverage at (b)(1)1.5c [redacted]

[redacted] should be the primary goal remained uncertain. Given the inevitability of a tight NRO budget, Dr. McLucas bluntly asked the ExCom to decide whether the [redacted] work (based [redacted] should or should not be reduced in scope and more funds invested in the development of a real-time-readout system. Lacking any systematic understanding of the position the United States might take in the talks, the committee was unable to decide which might become the more important verifier, detail [redacted] or timeliness and comprehensiveness of coverage (readout).

Still lacking such information, the ExCom reconvened one day later (8 August 1969) to take up budget issues. Dr. McLucas set the stage by asserting that the fiscal 1970 NRO budget was so tight that it would not accommodate any new programs. If readout were to be approved for near term development, funds would have to be directed from the [redacted] The decision on whether to proceed, and with what, was scheduled for resolution at yet another ExCom meeting to be held one week later.[29]

By 15 August the NRO position had become firm. McLucas proposed sponsoring a technology-advance program for two years and avoiding the selection of a system until the technological uncertainties had been resolved. Dr. John Foster, holdover Director of Defense Research and Engineering, felt that (b)(1)1.5c [redacted] was a more important requirement but in the ensuing discussion accepted the premise that (b)(1)1.5c [redacted]

In the course of the 15 August meeting three different viewpoints surfaced. McLucas and the NRO staff favored a technology development program and a delay in any choice of readout approaches until technology was well in hand. The CIA position, expressed by Carl Duckett, the Agency's Deputy Director for Science and Technology,* was that it was essential to start a readout system program by January 1970 and that substantial funds should be committed to system definition work immediately. Helms backed him up, contending that real-time-readout was an urgent national requirement.

After listening to the various arguments, Packard ruled in favor of a more rapid technology analysis program than McLucas had

* And thus the director of NRO Program B, in addition to several other administrative assignments.

favored, a start on system definition work, and the establishment of a special task force to report to the ExCom on the status of [redacted] (General King's West Coast group--SAFSP--was pessimistic about the prospects of [redacted] but Dr. Foster suggested that it should be kept in development because although it might take longer to develop than EIO, it might ultimately prove cheaper to operate and in any case, would require [redacted]

In the end, Packard's compromise suggestion carried the day. DuBridge, although present and a participant in the discussion, made little use of arguments forwarded to him three days earlier by

[redacted]

Dr. Land.* Conceding that (b)(1)1.5c [redacted] was important, Land nevertheless maintained that (b)(1)1.5c [redacted] probably would satisfy national needs and that an EOI system was so attractive that system studies should begin at once. At that point, Dr. Land's panel was convinced that ". . . the electro-optical design is of such consummate simplicity, (b)(1)1.5c [redacted] that there seems to be no point in waiting for an examination."** The panel, Land said, was convinced that the state of technology was such as to make EOI an immediately obtainable capability.[31]

However attractive it seemed to the Land Panel and to the satellite reconnaissance group in the CIA, EOI did not impress all reputable evaluators as a system "of . . . consummate simplicity" or one that was

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* DuBridge did not have to cite Land's arguments. For practical purposes, Packard's "compromise" accepted most of them without defining them explicitly.

** Land explained the "simplicity" statement in these terms:

(b)(1)1.5c [redacted]

Handle Via (b)(1)1.5c [redacted] ntrol System Only "immediately obtainable." A special group headed by Gardner Tucker, Assistant Secretary of Defense (Systems Analysis) and Dr. Eugene Fubini, one of the most respected of senior advisors to the Secretary of Defense, had quite another view. In their opinion, electro-optical imaging represented very difficult technology characterized by needs for (b)(1)1.5c [redacted] equipment for which components still were unproven, and an integrating skill that would tax available resources. The Tucker-Fubini committee noted that a (b)(1)1.5c [redacted] system proposed by Land, and that [redacted]-which effectively demanded the provision of wholly new transmitters, antennas, and specialized components that had to be classified as "beyond the state-of-the-art." Tucker told Packard that in his judgement EOI was too difficult to attempt as yet, that instead of approving a system start, the NRO should invest additionally in research and technology improvement. If immediate or near-term results were wanted, (b)(1)1.5c [redacted] (b)(1)1.5c [redacted][32]

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Handle Via (b)(1)1.5c [redacted] Control System (b)(1)1.5c [redacted] Inasmuch as the [redacted] approach largely embodied off-the-shelf components and technology, Packard decided that a termination of funding would not be fatal to the prospect of building such systems at some later time.* The delay in obtaining operational systems and the additional costs of restarting intensive development were, in Packard's judgement, offset by immediate budget problems. Concurrently, the ExCom approved continued development of technology for (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] at annual costs of about [redacted] Foster felt that more should be spent on [redacted]

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* (b)(1)1.5c [redacted]

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particularly because General Electric was making encouraging progress in several areas of technology where (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] developer, seemed weakest, and because in the end [redacted][33] would prove less costly than electro-optical imaging. Such information as was available toward the middle of 1969 suggested that (b)(1)1.5c [redacted] system might be ultimately as effective as electro-optical imaging (b)(1)1.5c [redacted]

Nevertheless in deciding what system to support at what funding level, the NRO chose (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] was not a contender in late 1969, the "urgency" of readout still being nominal.) (b)(1)1.5c [redacted] and alternative (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] were essentially eliminated from the budget; an improved (b)(1)1.5c [redacted] received ExCom approval, though at a fiscal 1971-1972 funding level of only about (b)(1)1.5c [redacted]

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Readout work was approved at a funding level of [redacted] for fiscal 1971, with another [redacted] held in reserve against the possibility that acceleration of the program might later prove advisable. (Readout work was scheduled for additional sums in following years, [redacted] being the anticipated fiscal 1974 requirement.) The Bureau of the Budget voiced modest objections, arguing that readout might not be a major national requirement at all, a position to which Helms took exception. (Not much was being made of the President's interest at the time.)

The net effect of the studies, debates, and discussions of 1969 was a complex of decisions which provided for a relatively heavy investment in EOI technology, a lower level of support for [redacted] sustaining-level support for [redacted] and modest improvement of the [redacted] Because major questions of SALT requirements, readout needs, system costs, system capabilities, and technological status could not be resolved during the fall of 1969, no effort along the lines Dr. Land had advocated could realistically be approved. There was, moreover, an agreement within the ExCom that no new systems would be started through advanced development [redacted]

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(b)(1)1.5c [redacted] element of the discussions of mid-1969, was neither accelerated nor eliminated from consideration.[35]

During the winter of 1969-1970, development of EOI technology made progress that, in the judgement of the Land Panel, strongly reinforced earlier recommendations for the start of a system definition phase. Land reported to DuBridge in March 1970 that either feasibility experiments or demonstration trials had validated (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] aspects of EOI technology that had earlier been treated as high-risk elements. (b)(1)1.5c [redacted] Land estimated, the EOI system could provide a nominal resolution (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] The panel had concluded that [redacted] satellites would adequately serve other EOI functions and that system (b)(1)1.5c [redacted] (b)(1)1.5c [redacted] Finally, although the necessary (b)(1)1.5c [redacted] Land assured DuBridge that [redacted] Given that situation, Land maintained it was entirely feasible to schedule a 1974-1975 operational date--"if we get on with the development."[36] The points Land emphasized were those aspects of the Tucker-Fubini report which had reached Packard and DuBridge about three weeks earlier. In effect, Land was contending that Fubini's judgement of risk had been faulty.

Two months later, shortly before the next scheduled ExCom meeting, Land and his associates advised Dr. DuBridge that although both the (b)(1)1.5c [redacted] approaches to readout had "reached the stage of demonstrated feasibility and reasonable maturity," the [redacted] system was so complex and so limited in growth potential that it should be dropped and EOI should be started through the system development process as quickly as possible. (The EOI system had [redacted] The Land Panel conceded that an immediate start on [redacted] would create near-term funding and budget problems, but added, ". . . we believe very strongly that the ultimate gain to the nation, both in national photographic reconnaissance capability and in reduced long-term budgetary requirements, warrant a full commitment to [redacted] real-time system development."

The Land Panel had also concluded that the [redacted] system ". . . can reasonably be expected to satisfy the [redacted] surveillance requirement." With a [redacted] Land said, [redacted] could produce a [redacted]

(b)(1)1.5c [redacted]

Dr. DuBridge forwarded copies of the Land Panel report to Packard and Helms--and either from DuBridge or through one of the primary addressees another copy reached George P. Shultz, Head of the Office of Management and Budget. OMB's technical specialists tended to be rather more cynical about the near-term feasibility of an operational (b)(1)1.5c [redacted] in concert with budget authorities they convinced Shultz that it was essential to present an opposing view.*

Shultz assured Packard that the expenditure of even (b)(1)1.5c [redacted] in development funds over the next four or five years would not produce (b)(1)1.5c [redacted] system with either the coverage capability (b)(1)1.5c [redacted] (b)(1) [redacted] the (b)(1)1.5c [redacted] He expressed doubts about

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* In all likelihood, the various memos from OMB to Packard between July 1970 and September 1971 were prepared by Dr. James A. Schlesinger, who represented OMB at ExCom meetings and in other policy sessions concerned with DoD and CIA programs. Schlesinger subsequently became acting deputy director of OMB, then chairman of the Atomic Energy Commission, briefly Director of Central Intelligence and Director of the Central Intelligence Agency, and in January 1973, Secretary of Defense. Schlesinger, who had come to the Nixon administration from the Rand Corporation, had a pronounced aversion to high-risk technology and a notorious distrust of predefinition system cost estimates.

the need for such a readout system in the national reconnaissance program and cautioned strongly against a "premature choice among technical options." Urging that OMB staff members participate in a study of the requirement for readout and of alternative ways of satisfying whatever that requirement might be, Shultz encouraged Packard to adopt a cautious approach in deciding what--if any--readout approach should be fully funded.[38]

The arrival of the Shultz memo in the Pentagon coincided with Packard's receipt of the extensive NRP report Dr. McLucas annually prepared for the ExCom. The McLucas report to the ExCom and the Land Panel report were delivered two days and four days respectively in advance of the scheduled July meeting of the ExCom--the first such meeting in eight months. By the time McLucas's report arrived, Packard had assured Shultz that a careful study of readout reconnaissance needs and capabilities would be conducted before there were any binding commitments to a single system approach.

The McLucas report reflected EOI judgements more nearly those of the Land Panel than of OMB, notwithstanding the acknowledged preference of the NRO staff for a cautious approach to readout development and the frequently restated judgement of General King's people (SAFSP) that if readout were wanted in the near term the only reasonable chance of acquiring an operational system lay in adoption of (b)(1)1.5c [redacted] Although his opening statements were tempered by reservations addressed later, McLucas began by formally recommending that "essentially all new system effort [be focused on] . . . the development of a near-real-time readout imaging system." His advocacy, McLucas said, was ". . . based on the initial technical success of the development of the (b)(1)1.5c [redacted] and its associated subsystems and on USIB guidance that such a system is urgently needed and of higher priority than possible competitors for resources such as (b)(1)1.5c [redacted] On such grounds, McLucas favored proceeding with system definition studies "for a system based on the (b)(1)1.5c [redacted] sensor." If, as anticipated, those studies could be completed in about 12 months, a system development decision on (b)(1)1.5c [redacted] could be made by November 1971.

McLucas reasoned that the readout system would probably replace (b)(1)1.5c [redacted] Reflecting the Land Panel's findings, McLucas suggested that a fully developed [redacted] ". . . may permit imagery of a quality surpassing [redacted] Alternatively, he postulated that a system providing [redacted] was both appealing and achievable. He also speculated that if [redacted] development were ultimately successful, a [redacted] could eventually replace the [redacted] a viewpoint that countered the [redacted] argument against [redacted] Still the net effect of such suggestions was to strengthen the possibility that adoption of a readout system would lead directly to [redacted]

McLucas recommended support of a backup technology effort aimed at development of [redacted] and funding of a further backup effort supporting [redacted] explained, ". . . would deliberately be directed to low-cost, low-risk, and possibly reduced-performance systems to provide an alternative for consideration next year.

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In the 17 July 1970 discussion of his recommendations with the ExCom, McLucas noted his understanding of the "general agreement" that the EOI was a "preferred approach" to a next generation system. But he expressed concern about the selection of a best approach. It was conceivable, he told the ExCom, ". . . that the system based on the [redacted] may become too expensive in future years if the budget situation continues to deteriorate."*

Both SAFSP and the CIA's Office of Special Projects had conducted studies of the desirable mix of readout systems with contemporary imaging satellites in the interval between the November 1969 and July 1970 ExCom meetings. SAFSP had concluded that [redacted] afforded the most certain and shortest approach, and that the later incorporation of a [redacted] could well result in operating costs (for a mix of systems) ". . . as much as [redacted] per year less than launching [redacted] per year." SAFSP was also convinced that [redacted] development and fabrication could be conducted for about [redacted] cost of [redacted] development. The CIA, starting from the same point, had concluded

* Dr. McLucas reminded his audience [redacted] had effectively been cancelled because it became so much more costly than had initially been anticipated.

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that [redacted] rather than [redacted] should be the preferred new system. The CIA judgement was reinforced by the Land Panel's reaffirmation of its earlier stand: the major technical problems of EOI had been solved and commitment to development of [redacted] was immediately appropriate.

Packard plainly favored a cautious approach. Dr. Foster still urged the advisability of continuing development of the [redacted] system, and Schlesinger (for the Office of Manpower and Budget) urged consideration of a program stretchout* to avoid a premature commitment to some inappropriate technical option.

Packard suggested, as a compromise, that a total investment of [redacted] to support readout development was adequate for fiscal 1971 and that Dr. McLucas should decide how that total should be spent. DuBridge and Helms accepted that arrangement with the additional proviso that "early 1975" should be the target for first launch of a readout system. On that basis, McLucas on 27 July

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* Schlesinger apparently accepted the premise that EOI was technically feasible but did not believe that it could be adapted to an operational application "by 1974-1975," as the Land Panel contended, or that completing development would cost as little as the [redacted] or so mentioned in Land Panel and CIA summaries.

authorized the director of the CIA reconnaissance program to proceed with the system definition Phase I of [redacted] on 1 August at a fiscal 1971 funding level of [redacted] (The proposed spending ceiling in the original NRO budget submission of 15 July had been [redacted] although the CIA had requested a [redacted]) About [redacted] was therefore available to support [redacted] development--and [redacted][40]

To that point, the principal considerations in readout program decisions had been the state of technology, budget levels, and institutional views on pressing national needs. By late 1970, it was evident that readout system progress was also constrained by the need to develop [redacted] and by the capacity for processing the growing quantities of imagery being returned from existing and planned photo satellites. If all went well, between [redacted] days of U.S. photo-satellite operations would occur in 1971. By December 1970, the Director of Central Intelligence was cautioning that insufficient interpretation capability was available to handle the anticipated returns [redacted] might well create a problem at least as large as any it solved.

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(b)(1)1.5c

[redacted]

The [redacted] problem was not officially a matter for ExCom consideration because both budget and technical development responsibilities [redacted] But it was obvious that the operational utility of any readout satellite would be severely compromised if [redacted] were delayed in development or if they proved to have less performance than required. NRO dependence on the [redacted] marked the first occasion in more than a decade in which any crucial element of the National Reconnaissance Program had been paced by technological developments or budgets under "outside" control.*

The technical risk inherently invoked by the [redacted] approach continued troublesome. Although the earlier proposed [redacted] configuration of [redacted] had been effectively abandoned by mid-1970 (following the laboratory-reinforced conclusion that a [redacted] could be fabricated), a "high-risk" and a "low-risk" approach to [redacted] had subsequently emerged. The "low-risk" approach, called [redacted] envisaged reliance on data handling techniques which were more readily achievable--in the view

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* Rocket boosters nominally fell within that category, but in fact boosters had not been high-risk items since the early 1960s and there generally were more boosters available than needed from 1961 onward.

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of engineers--than those proposed for the more elegant (b)(1)1.5c [redacted] configuration. But the low-risk system also had degraded [redacted] (b)(1)1.5c [redacted] a cost that Dr. Land considered unacceptable. (Both the (b)(1)1.5c [redacted] configurations incorporated [redacted] but the [redacted] system[41] incorporated appreciably less ambitious data handling capabilities.)

Not all prominent scientists objected to a "low-risk" approach that would modestly compromise system capability. In October 1970, Dr. E. G. Fubini, who had earlier served as chief advisor on readout technology and needs for David Packard, independently protested several of the decisions implied by the ExCom's July 1970 action on (b)(1)1.5c [redacted] The Fubini committee had earlier concluded that although the CIA was doing a "fine job" in developing EOI technology, it was no more than prudent to avoid starting a system design process "before the technologies were adequately developed." The several specialists on Fubini's committee had been under orders from Packard to avoid questions of requirements and cost and to consider only the status of technology. They had concluded that EOI was as yet too demanding for the state-of-the-art. Of need and cost they said nothing.

But, Fubini told Packard in October 1970, ". . . I feel I must now speak to the subjects of the requirement and the cost."

In Fubini's judgement, the specific requirements being honored in the [redacted] system definition studies were ". . . actually a translation of what is technically possible with [redacted] rather than an optimum tradeoff between national needs and cost." Fubini reinforced that sharp criticism by reminding Packard that he--Fubini--had long been a readout advocate, even to the point of agreeing that new and presently unforeseeable opportunities "would result from the initial use of readout capabilities." But, he urged ". . . that the stated requirements be rewritten to represent more accurately the range of future applications," a procedure that would also lower system costs.

Fubini fundamentally mistrusted the requirement that [redacted] imagery reach the Washington intelligence community within [redacted] of [redacted] passage over a target. Pointing out that from [redacted] hours were required to position a satellite, he argued that [redacted] transmission time was wholly acceptable. He also challenged the assumption that primary data reception [redacted]

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(b)(1)1.5c [redacted]

Then Fubini turned to a requirement that he believed undermined future system capabilities because of its leniency. "I refer to the field of view," he told Packard. (b)(1)1.5c [redacted] "This requirement is simple extrapolation of present procedures rather than an imaginative view of the potentials of the new technology, "Fubini complained. "If strategic reconnaissance were the only basis for a readout system, I would strongly urge that the program be cancelled."

Dr. Fubini also called attention to one of the little mentioned consequences of improved satellite reconnaissance capability. By 1972 the nation would be able to attempt photography of (b)(1)1.5c [redacted] targets per year and would probably obtain exploitable photographs of (b)(1)1.5c [redacted] targets--but was presently finding it difficult to specify [redacted] targets of valid interest. In those terms, the need for constant [redacted] coverage of the sort promised by (b)(1)1.5c [redacted] seemed doubtful. In Fubini's view, (b)(1)1.5c [redacted] would inadquately conduct surveys

of national frontiers, determine aircraft deployment patterns, track the movements of naval forces, and perform similar assignments because the (b)(1)1.5c [redacted] He recommended * [redacted] and for acceptance of a [redacted]
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hour delay in the delivery of imagery.

The only system then definable that could satisfy the needs Fubini stated was (b)(1)1.5c [redacted] Fubini's conviction that the "near real time" aspect of readout development had been unwontedly emphasized found unexpected support in the Department of State, concerned with both crisis reconnaissance and SALT verification. Raymond Cline, State's specialist in intelligence matters, told the Committee on Overhead Reconnaissance and Exploitation (COMIREX) in January 1971 that a (b)(1)1.5c [redacted] wait for photography was wholly acceptable,

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* There were no means of storing the output of (b)(1)1.5c [redacted] system in 1970, and none had been suggested four years later. (b)(1)1.5c [redacted]

(b)(1)1.5c [redacted]

needed a "Model T" satellite system to produce declassifiable photography that could be used openly in dealing with other members of the United Nations. A "Model T" system, as Cline saw it, was one that could be developed in 18 months or less, used off-the-shelf technology, provided resolution at the (b)(1)1.5c [redacted] level, had (b)(1)1.5c [redacted] response times, and embodied technology the disclosure of which would not be damaging to national interests.

More than coincidentally, three months earlier, on 1 October 1970, (b)(1)1.5c [redacted] proposed to the NRO the development of such a system. Called (b)(1)1.5c [redacted] proposal, originated by ~~retired Air Force Major General~~ (b)(1)1.5c [redacted] had been stimulated by (b)(1)1.5c [redacted] correspondence with Cline on matters concerning crisis reconnaissance. (b)(1)1.5c [redacted]

(b)(1)1.5c [redacted]

Almost concurrently, Dr. McLucas had forwarded to Dr. Henry A. Kissinger, the President's ~~Special~~ Assistant for National Security ~~Matters~~ Affairs, a special report Kissinger had requested on crisis response capabilities. In brief, McLucas advised that for the near term the only promising approaches were those embodied in existing systems and in on-the-shelf technology: Corona, (b)(1)1.5c [redacted][44]

The accumulation of interest expressed in these several separate statements of concern for crisis reconnaissance suggested once more that a quickly available, relatively simple system with constrained resolution potential might be highly desirable. The intelligence-using community was more concerned than the intelligence-gathering community by the prospect that some system might be selected for development because it was technologically achievable rather than because it satisfied a valid national need. Finally, both users and developers were concerned that no new system might become available for several years.*

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* The State Department's views were at least partly influenced by apprehension that the impending final demise of Corona would effectively dissipate whatever marginal crisis reconnaissance capability the nation then had. State's efforts to revive Corona in 1970 have been described in Volume I of this account.

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Uneasiness on all of those grounds underlay a series of discussions that marked the ExCom's November 1970 meeting. Threatened delays in the scheduled development of a [redacted] had become real, the crisis response issue remained unsettled, and there was some desultory consideration of low-cost alternatives to the [redacted] approach. But decisions were put off until the following January, by which time the initial phase of [redacted] system definition was scheduled to end.[45]

Early in January 1971, Carl Duckett proposed to McLucas ("in accordance with previous discussions . . .") the establishment of an _ad hoc_ committee to define standards against which candidates for the crisis reconnaissance assignment could be evaluated. The problem, as Duckett saw it, was deciding how much to invest in a near-term system such as [redacted] or standby _Coronas_ when that investment would cause funds to be withheld from the development of [redacted] Duckett suggested that the Land Panel be asked to review criteria and added, ". . . in the meantime, I suggest we discourage any efforts to compare alternative systems until approved standards for comparison are available."

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Perhaps Duckett hoped to postpone detailed consideration of the [redacted] approach that State advocated. But if so, he failed. On 15 January, precisely two weeks before the ExCom meeting at which such matters again were to be taken up, the State Department escalated consideration of the crisis response question. William P. Rogers,-Secretary of State, formally urged Helms and Laird to support development of a new crisis reconnaissance system--but one that sounded little like [redacted] In Rogers' opinion, the United States needed ". . . an adequate [redacted] system giving us good photographic detail relatively quickly and cheaply." Waiting five years for an adequate system was not acceptable. Rogers argued that a crisis reconnaissance capability should enter system development status promptly, without regard for any systems presently in development or pending development. "As Ray Cline puts it, we need a 'Model T' or 'Volkswagen' to get us to the brushfire on time when our more expensive and less maneuverable Cadillacs are not able to cover that particular crisis on that particular day or week."[46]

By the time of the January 1971 ExCom meeting, the relatively straightforward question of whether [redacted] should be continued toward a November 1971 development decision point had been

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discussions of "GSD," "GRD" (ground resolution distance) and "resolution" in the broad had all the importance of earlier arguments (circa 1300-1400 AD) about the number of angels who could simultaneously stand on the point of a pin.

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complicated by a variety of peripheral issues. Crisis reconnaissance, as understood by Kissinger, Rogers, and Cline was one. The situation of the proposed (b)(1)1.5c [redacted] was no longer as simple as had been anticipated: [redacted] costs had increased, and the dependence of (b)(1)1.5c [redacted] were available for consideration, [redacted] were at least nominally attainable, and there was [redacted]

At the time of the January 1971 ExCom meeting, the situation of the various proposed readout and crisis response systems was roughly this: (b)(1)1.5c [redacted] had completed initial system definition phases in December 1970 and the "Phase II" system definition effort, intended to lead to "firm" designs and cost estimates, was scheduled to begin in February. At that point, what was being proposed was a (b)(1)1.5c [redacted]

* (b)(1)1.5c [redacted]

[redacted] As then planned, the system would have a useful life of about [redacted] on orbit and woudl first become operationally available in [redacted] Five-year costs as estimated by the CIA would presumably total about [redacted] (The estimate had increased by more than [redacted] in 20 months.)

[redacted]-which at that time conceptually included the [redacted] as an eventual replacement for the [redacted] gadgetry of the current design--was designed to use the [redacted] (b)(1)1.5c [redacted] Five-year program costs were then estimated to be [redacted] A three-year development phase seemed necessary.

(b)(1)1.5c [redacted] A 24-month development schedule was envisaged at a

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cost of [redacted] with individual vehicle costs averaging between [redacted]

[redacted] still was much as proposed by [redacted] several months earlier, [redacted] having potential [redacted] ground resolution and [redacted] data return time (counted from moment of decision to launch), based on recovery in the Atlantic. Development would presumably take 24 months and would cost about the same as [redacted]

Corona in a one-day countdown mode was also treated as a potential crisis response system, but was more a device for creating an additional option, an essential of the decision ritual in 1971.

Although all of the principals at the 29 January 1971 meeting had been provided with extensive advance information on all the proposed crisis response systems, the discussion nonetheless turned on questions of fact and cost.[47]

The principal change in [redacted] status arising from completion of the Phase I system definition studies had been agreement that [redacted] would be needed to support each EOI reconnaissance satellite. The principal attraction of [redacted] remained its cost [redacted]

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for [redacted] although being available two years sooner was also an attraction. Packard expressed considerable concern about probable funding needs and the accuracy of estimates, causing McLucas to observe that [redacted] had eventually cost more than twice their initial estimates. Packard did not doubt that a [redacted] system would also substantially exceed cost estimates and favored a backup for [redacted] He also expressed concern about schedule validity, commenting favorably on [redacted] availability. But in the end, the only ExCom action on crisis response was to approve continuation of both [redacted] at about their current rates in the expectation that a decision on full system development could be scheduled for November 1971.[48] The ExCom did nothing to enhance the potential for acquiring any "Model T" system of the sort State wanted. Ray Cline's ploy had apparently failed. So had Fubini's.

In April a large flaw appeared in the ExCom's expectation that nothing need be done until November, at which time it presumably would be feasible to approve full development of [redacted] The Office of Management and Budget (OMB) was the immediate source of pressure to act quickly on the readout question, but White House preferences were the cited justification. In January, Dr. J. R.

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Schlesinger, spokesman for the OMB at ExCom meetings, had remarked on President Nixon's continuing interest in an early-availability readout system. Although Schlesinger seemed willing to accept the ExCom's decision to postpone a decision, he cautioned that OMB Director George P. Shultz might not be of the same mind.[49]

Whether the renewal of Presidential concern about readout availability was prompted by Dr. Land, disturbed at the apparent lack of [redacted] progress, or by State or OMB, who appeared to prefer some less costly, more quickly ready readout system, cannot be established from the surviving NRO documents. But in any case, six weeks after the discursive and inconclusive ExCom meeting of January, Shultz wrote Packard ". . . to emphasize the President's interest in an NRT or crisis capability system."* As the OMB director interpreted the President's wishes, "it would be desirable if such a system could be operational at an early date and at a

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* It would appear from the Shultz letter that President Nixon was chiefly interested in a crisis capability system and that near-real-time readout was, in his judgement, the best way of getting that capability. However, various comments by Schlesinger and Shultz emphasize also the President's interest in readout as a function. Whether crisis response, readout as a national capability, or readout as an intriguing technology was the President's chief interest cannot be determined from the available evidence. It was a [redacted] whim, in the event.

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reasonable cost." Finally, said Shultz ". . . appreciable utility during the President's administration . . ." should be a goal of development.

The Shultz letter, dated 22 April, reached ExCom members on the day preceding their next scheduled meeting. Shultz had put the cat fairly among the mice.

Two key decisions emerged from the 23 April 1971 ExCom meeting. They were prompted solely by the Shultz letter and by Schlesinger's restatement of the President's wishes. In the phrasing of the ExCom minutes, ". . . the President has expressed vigorously the desirability of NRT and the President . . . wished to have this capability available during his second term in office."* In direct

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* That species of schedule definition appears to have been unique, at least within the National Reconnaissance Program. Presumably either some long-range plan that required reliance on near-real-time reconnaissance by 1976, or a strong desire to be remembered for having fostered near-real-time readout reconnaissance explained the President's emphasis on completing the work before another President was installed. In April 1971, the Nixon Administration had been in office but two years and the election of 1972 was still 18 months away, but no one questioned the assumption that President Nixon would occupy the White House for a full eight years.

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response to that statement, the ExCom voted to acquire [redacted] as an interim photographic reconnaissance system for crisis reconnaissance and to delay the scheduled first launch of [redacted] until early 1976. Fubini and Cline seemed to have won.

The range of options for crisis reconnaissance had once extended to twelve alternatives.* By April 1971 it included only three: (1) go directly to [redacted] relying on [redacted] for interim capability, (2) add [redacted] to the inventory, or (3) [redacted] (phasing [redacted] into operation later, in both cases). The CIA appeared to favor the first of those options; most other participants in the April 1971 meeting favored the second. Packard, who again dominated the discussion, forced through a decision to stretch the [redacted] development schedule by a year. He was emphatic in pointing out that he did <u>not</u> propose to delay the start of the program but rather to extend its term and thus to provide additional time for solving development problems.

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* Those were the options formally considered by the ExCom. Other choices were conceivable, of course, but considerations of time, money, risk, technical achievability, and operational utility weighed heavily against all. In fact, the [redacted] option appears to have been more illusory than real in April 1971. Packard had spoken well of [redacted] on earlier occasions, but neither he nor any other speaker at the April meeting favored [redacted] over [redacted]

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When the implications of the basic decision had been worked out it appeared that a reasonable initial operational date for [redacted] was January [redacted] and for [redacted] "calendar year 1976." Refined cost estimates based on those target dates specified five-year costs of [redacted] and [redacted] -plus a [redacted] (The estimates were respectively [redacted] than those current in January 1971.) Given the additional circumstances that the system performances did not greatly differ, Dr. McLucas in early June suggested to Packard that [redacted] should be delayed past its scheduled 1976 availability date and redesigned to [redacted] His suggestion that [redacted] should be cancelled when [redacted] became available indicated a belief on his part that [redacted] McLucas also observed that although Richard Helms still preferred the course charted at the April ExCom meeting, Dr. David, Dr. Foster, Robert ~~Froehlke~~ (~~acting~~ Manager, ~~of the~~ OSD intelligence ~~function~~), Dr. Robert Seamans (Secretary of the Air Force), Dr. Schlesinger, Admiral G. W. Anderson (FIAB chairman) "and others" agreed that [redacted] should be delayed for major redesign.[51] For practical purposes, McLucas was proposing that [redacted] rather than [redacted]

On the day that McLucas so advised Packard, the President was discussing readout with his Foreign Intelligence Advisory Board. Dr. Land, presumably unaware of McLucas' current proposal, expressed his strong disapproval of the earlier ExCom decision to [redacted] Land maintained that such action would delay or even defer [redacted] development--which, of course, was precisely what McLucas had just advocated. Speaking directly to the President, Land told Nixon that bureaucrats were unwilling to assume large financial risks without "strong Presidential backing," that [redacted] was a cautious step, and that [redacted] was "a quantum jump which would give the U.S. an unquestioned technological lead in this field."[52] Nixon seemed to be much more impressed by such contentions than by more mundane considerations of risk, cost, or need.

Ten days later, Land challenged Brigadier General Lew Allen (who had succeeded General King as NRO Director of Special Projects--SAFSP) on several basic points while Allen briefed the complete Land Panel on [redacted] The accompanying [redacted] briefing (by the

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CIA got a friendlier reception. One of the fascinated witnesses of the events was Colonel David Bradburn, who had succeeded Allen as head of the NRO staff. He reported to McLucas that Land was ". . . not conscious of any fundamental technical problems in the EOI system and . . . is not especially critical of the looseness of the requirements situation (e.g., why do we need [redacted] response time). To put it another way," Bradburn told McLucas, "if EOI is a technology-driven development, Dr. Land is the main driver."[53]

Inevitably, the McLucas suggestion that [redacted] be postponed and [redacted] extended had the effect of generating a strong counter proposal from the Central Intelligence Agency. Although Helms had supported the earlier ExCom decision to develop [redacted] as an interim [redacted] and [redacted] as a [redacted] by mid-June the CIA position was that a [redacted] would serve adequately as an interim crisis reconnaissance satellite. [redacted] as then proposed, was not needed. Indeed, Helms said, merely buying a few more [redacted] and keeping them on standby for crisis use might satisfy needs--without any investment in [redacted] development or operation.

In essence, the CIA chief argued that ". . . the [redacted] proposal as currently perceived is structured as a competitor to EOI and, therefore, is not necessarily the only or best hardware approach to an interim system."[54]

Concurrently, CIA representatives met privately with the ranking senators who reviewed and approved the "black" appropriations used in NRO procurement activities. As one product of those informal background sessions, during the week of 14 June 1971 Senator Allen J. Ellender, Chairman of the Senate Committee on Appropriations, informally advised David Packard that he saw no ~~of his doubts~~ ~~that it was~~ need ~~necessary~~ to develop both [redacted] To Ellender, [redacted] looked more attractive.

All the classic behavior patterns of institutional infighting had become apparent by late June. The Shultz-Schlesinger-McLucas maneuver of April--citing the President as an authority--had made [redacted] an approved but temporary ("interim" in the vernacular) system choice. Fubini and Cline had set the stage. The subsequent move by McLucas to further postpone [redacted] nominal first flight date would have had the effect of making [redacted] a semi-permanent element of the National Reconnaissance System and would have made a later

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decision to adopt [redacted] dependent on [redacted] demonstration of some essential capability [redacted] lacked. "Essential" was the operative word. State and OMB were satisfied with [redacted] s a crisis system, David and McLucas believed that [redacted] would adequately serve relatively long-term national needs for a readout system. Packard, a devotee of the Watson-Watt philosophy on development choices, mistrusted easy assurances of [redacted] low cost and ready availability. Land, on the other hand, saw that [redacted] delayed could well be [redacted] cancelled. That, after all, was the traditional route of program termination. Land's reaction, and that of his CIA supporters, was to propose reversal of the [redacted] decision of April. Their premise was that [redacted] once begun was [redacted] forever, that any alternative to [redacted] would lead promptly to [redacted] Neither side was prepared to compromise. Indeed, once McLucas had abandoned the concepts embedded in the April ExCom decision and had endorsed [redacted] as a viable alternative to [redacted] rather than an interim predecessor, the lines were so drawn that only one system could survive. Senator Ellender made compromise impossible by introducing a budget issue accompanied by a polite but unmistakable ultimatum: develop one of the two systems, not both. Getting Ellender to take that position

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was a masterful stroke of bureaucratic infighting. Ellender's endorsement of [redacted] however tepid, and Land's marvelously skillful approach to President Nixon effectively made [redacted] the favorite and [redacted] the underdog. That reversal of position resulted from the CIA's skillful shepherding of Ellender's interests and Land's complete understanding of President Nixon's desire to be remembered as a more forceful, incisive, and astute decision maker than his immediate predecessors. Land's appeal to executive insight and his slighting of bureaucrats was a masterstroke. Demonstrating that [redacted] was inferior to [redacted] was an obvious next step; the reaction to Allen's briefing of mid-June signaled that such a phase had begun. Ellender's stand, the President's preferences, and convincing testimony that [redacted] was less risky than [redacted] -and much more valuable, would inevitably cause the ExCom's April endorsement of [redacted] to fail. Alternatively, however, if the President, or perhaps even Ellender and other senior senators, could be convinced that [redacted] was too risky, that EOI still was premature, or that the cost estimates for [redacted] had been grossly understated, the [redacted] program might yet go forward.

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Some of the maneuvers that followed were strikingly reminiscent of events of the [redacted] contest of 1965. For one, [redacted] -had initially been represented to be a relatively straight-forward advance on existing hardware, an embellishment of an existing or demonstrated capability. But by May of 1971, after the ExCom had decided to proceed with [redacted] development, the program's technical managers privately looked on [redacted] as ". . .a new program with some hardware common to [redacted] operational capability had grown strikingly, at least in concept, in the several years since the system was invented. In the view of a principal [redacted] designer, "there are many more characteristics of this system, its mission, hardware and operation that are [redacted] than similar."* Of the [redacted] only the [redacted] survived. Few of the [redacted] subsystems were unaltered, while the software and satellite control facility operations were totally new, he added. "The operational philosophy is nearly all new. Many of the key development areas bring totally new fields of technology to the current program."[55]

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* Italics added.

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That view, current in the program office, was in several respects inconsistent with the ExCom's image of [redacted] and with Packard's. It is unlikely that either was aware of the inconsistency. In a letter he proposed to send Senator Ellender, the Deputy Secretary of Defense said without qualification that [redacted] was the only feasible way of acquiring a readout capability in [redacted] because as compared to [redacted] task was "system integration rather than system development." Packard told Ellender, "I am convinced we will eventually need the added capability and speed of response which the EOI system can provide--but that we cannot wait until 1976 for this system."

Dr. David, who was even less enthusiastic about [redacted] than Packard, wanted to tell Ellender that there was a good case for developing both systems but that [redacted] could profitably be delayed for a year or two. David felt that the decision had to be either to continue both programs, with [redacted] more slowly paced because the budget could not simultaneously support two costly readout programs, or to cancel [redacted] [56]

By that time, the Land Panel report on its meeting of 11 June and subsequent deliberations had reached the President--and, by all indications, Senator Ellender as well. In the Land Panel's view, [redacted] performance was "substantially inferior" to that of [redacted] (a statement wholly contradictory of the judgement McLucas had forwarded to Packard only two weeks earlier), [redacted] was a higher risk program because more new subsystems and components had to be developed and operated in [redacted] The report was nowhere marked by a discussion of "quantum jump" technology.*

The Land Panel report was nominally dated 14 July 1971. On 9 July, Senator Ellender formally advised Packard that only one readout system should be supported in the pending NRO budget and that in his judgement[57] [redacted] should be that system.

Dr. Land's argument, with which Senator Ellender appeared to be familiar, was that [redacted] could be developed for a first flight by late 1974 and to proceed with [redacted] would cost the nation [redacted] in additional money "to get an inferior product one year sooner (with substantial risk) and with . . . probable . . . delay of the superior capability."[58]

Apart from Ellender, who controlled appropriations, the most influential senator in such major program decisions was Senator

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* Although "draft copies" dated 1 July were circulated.

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John Stennis, Chairman of the Committee on the Armed Services. McLucas arranged to meet with Stennis shortly after learning of Ellender's views, but a confusion of schedules caused Colonel Bradburn to become the spokesman for the ExCom view that [redacted] rather than [redacted] should be immediately developed. On 15 July, Bradburn carefully explained to Stennis why readout was considered essential and why [redacted] seemed to afford a quicker and less costly avenue of approach to that capability. But that was at best a backfire strategy. The Ellender letter, which emphasized budgets rather than technology,[59] had redefined the issues.

By 15 July it was evident that no binding decision could be made at the level of the ExCom. Helms completely disagreed with Packard and David. All that could be done there was to draw together a set of options, price them, and forward them (together with recommendations) to the President. The difficulty was that two diametrically opposed positions had developed within and external to the ExCom. The CIA and the Land Panel maintained firmly that the [redacted] system could be developed by 1975, that costs would be reasonable and controllable, and that program risks would be relatively slight. Dr. David and the non-CIA part of the NRO argued that a better

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course would be to develop [redacted] operation and delay [redacted] until 1976-1978, [redacted] being the lesser risk and the lower cost approach. In one view, [redacted] was preferable because although it incorporated radically new technology the new elements were well understood and, in the end, operational capability would be appreciably greater for [redacted] The other view was that although [redacted] would require a complex integration of many complex subsystems, [redacted] attempted only a modest advance on the state-of-the-art and should therefore be readily achievable without much technical risk. For practical purposes, technical risk was a surrogate for financial risk, given that cost growth in satellite reconnaissance programs was invariably associated with underestimation of technical difficulty. The memorandum addressing those issues would have to go to the President from the ExCom--or from its individual members, although that was not a desirable course.

That portion of the ExCom meeting of 15 July 1971 devoted to briefings on and discussions of [redacted] was intended to disclose and develop the range of choices available. Formally, the ExCom had to choose among three options: Option 1 anticipated a January 1976 first launch of [redacted] at a cost of [redacted]

[redacted] Option 2, priced at [redacted] postulated delaying [redacted] initial launch until June 1976; the third option assumed a June 1975 first launch of [redacted] The two primary options assumed continuance of [redacted] operation in [redacted] the third did not.

Schlesinger and Packard flatly disbelieved the cost estimates for [redacted] even though they now were about [redacted] higher than those of January 1971. They emphasized [redacted] potential for cost growth and cited [redacted] as an unhappy example of the tendency. The CIA (whose spokesman was Carl E. Duckett, Deputy Director, Science and Technology) defended both the [redacted] estimates and [redacted] record, excusing [redacted] rather substantial cost growth on the grounds that not enough had been known about [redacted] when the program approval decision was made but protesting that [redacted] estimates were reliable because [redacted] technology was well understood.*

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* The 15 July discussions was confused and misleading mostly because none of the participants except Duckett had other than casual knowledge of [redacted] experience and none was familiar with the details. In fact, as early as [redacted] had been represented to be a system completely ready for rapid completion of development, and only the considerable bureaucratic skill of [redacted] NRO Director at the time, prevented a precipitate commitment of funds and design details. As noted elsewhere in this history, [redacted]

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David Packard "did not quite agree" with Duckett's view of [redacted] prospects, feeling intuitively that it was unrealistic to postulate a 1975 launch date whatever the level of funding. If the EOI approach were to be adopted, Packard said, the ExCom should frankly tell the President that 1976 was the earliest possible launch date and that only with luck could that schedule be maintained. Almost as an aside, Packard observed that it was foolish to construct a program schedule around unachievables, that for [redacted] the better course would be to select a conservative schedule from the onset. Neither the first nor the third of the "options" was realistic, in Packard's judgement, and he urged abandoning consideration of them.

Packard found [redacted] costs and schedules somewhat more credible if only because there was a smaller gap between the time of the

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development substantially exceeded early cost and schedule estimates, optimism about technological risk was sadly misplaced, and early program planning was chiefly distinguished by its misconceptions. Schlesinger had some limited knowledge of those circumstances. [redacted] the NRO Comptroller, was thoroughly familiar with their financial consequences and said little. Duckett had managed the CIA effort of [redacted] Otherwise, no participant in the discussions appeared to have either studied or inquired closely into the [redacted] experience and in consequence only Schlesinger and [redacted] quibbled with Duckett's explanation of that experience. Much of that explanation was at variance with fact, but in the absence of an NRO institutional memory that was not apparent at the time.

estimates and the estimated time of program completion. In such terms, the principal choice to be afforded President Nixon was between an [redacted] available no earlier than 1976 and [redacted] available in the first quarter of [redacted] There was an undercurrent of agreement that in the existing budgetary environment whichever system was approved was likely to have a long operational life. The earlier bureaucratic maneuvering had insured acceptance of the premise that [redacted] if developed at all, was likely to remain in the inventory well past [redacted] the nominal date for introduction of a fully operational [redacted]

In the course of the tortured discussion of 15 July, McLucas suggested that a way out of the financial imbroglio would be to delay the start of system development on [redacted] until R&D for [redacted] had ended. That would cause [redacted] availability to slip until 1978, but it would resolve the budget problem and would result in the initial operation of [redacted] Schlesinger endorsed the notion and Packard seemed interested (partly because he did not believe [redacted] could be developed on the schedule then assumed), but Duckett was very negative, signaling Helms' opposition. Dr. David, who had never warmed to the notion of a rapid development program for [redacted] seconded the McLucas proposal wholeheartedly.

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~~TOP SECRET~~

Handle Via [redacted] Control System Only

For practical purposes the only product of the extended discussion was a decision to forward a draft memorandum to the President.[60] The content of the memo remained unspecified.

Between 15 July and 9 August 1971, David, Packard, and Helms attempted to produce a memo they could jointly sign. By 5 August Helms had concluded that he could not agree with the position taken by Packard and David; on 9 August he sent his own to President Nixon. Six days later, on 17 August, Laird sent <u>his</u> own recommendations and a summary of ExCom views to the President.* For the next five weeks the question simmered, various of the participants attempting to ensure acceptance of their positions. On 23 September the decision was announced. President Nixon elected to quantum jump.

The most interesting and significant events of those two months were not the decision and its effect on the budget, as suggested by the subsequent discussion during the ExCom meeting of 30 September. Far more important were the developments that led to a complete split between Helms, on the one hand, and Packard and David on the other and the fundamental differences of viewpoint thus disclosed.

¶ insert [illegible]

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* The "Laird position" [illegible], of course, Packard's position

[illegible]

¶ Significantly, the ExCom had traditionally compromised when questions of resource allocation became crucial, generally balancing the CIA and SAFSP levels of effort. The [redacted] [redacted] decision was an exception without real precedent: [redacted] was representative of the customary balance. In hard fact, however, [redacted] promised to be so costly that no parallel development could be simultaneously supported. Thus the CIA straightforwardly set forth to insure that [redacted] was funded and [redacted] cancelled. In the words of one observer, "... there was little attempt at secret maneuvering on the part of the CIA."

[redacted]

Although an advance copy of the Land Report dated 14 July had been informally circulated earlier that month, no fully authenticated copy went forward to Dr. David until 24 July, and one member of the Land Panel withheld his assent to the conclusions past that date. Dr. Allen Puckett had consistently expressed reservations about the technical feasibility of the [redacted] approach and although he approved the addition of his name as a signator on 26 July he privately continued pessimistic about the prospect of meeting [redacted] program goals. At best, he felt, [redacted] were equally risky, and because of that reluctant judgement he eventually agreed to add his name to the list of Land Panel members in agreement with the basic report. Dr. Richard L. Garwin, who handled preparation of the final report, was able to bring Puckett to that compromise only after extended discussions.

Fundamentally, the Land Panel recommended that [redacted] be dropped and [redacted] be developed toward a November 1974 first flight date. On the day that he received the formal copy of the Land Panel report, Dr. David completed the first draft of a proposed ExCom memorandum to the President recommending [redacted] in 1976 or later but favoring delayed development of the EOI system. On 2 August, Helms proposed that the ExCom present five options to the President: (1) (b)(1)1.5c [redacted] (2) (b)(1)1.5c [redacted] (3) (b)(1)1.5c [redacted] and a "low cost interim system" earlier, (4) (b)(1)1.5c [redacted] (The options were nominally in order of increasing cost, although in the terms of discussion employed during the 15 July ExCom meeting the fifth option, (b)(1)1.5c [redacted] was by a considerable margin less costly than [redacted][62]

Packard, writing on 5 August as chairman of the ExCom, advised Laird that there was a fundamental disagreement within the ExCom on what to recommend to the President and how. Owing to the apparent impossibility of reconciling their divergent opinions, he told Laird, ExCom members proposed to send two memoranda forward, one from Helms and the other from Packard and David.

Packard's draft emphasized that readout was desirable because of its crisis capability and not because of any potential for the subsequent development of (b)(1)1.5c [redacted] through an improvement of electro-optical imaging technology. (b)(1)1.5c [redacted]

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(b)(1)1.5c [redacted] The techniques had been basically demonstrated as early as 1961 (in the E-1 Samos), had been again operated successfully in the 1966 Lunar Orbiter mission, and had been so improved in various respects since that time that (b)(1)1.5c [redacted] satisfied "most but not all" intelligence requirements: [redacted]

The EOI schematic, in the Packard-David view, represented "a more exciting technical approach". (b)(1)1.5c [redacted] The EOI system promised imagery better than [redacted] and had a [redacted] but not all components were proven and the system was certain to be very expensive. Packard and David noted that the EOI system could presumably become available no earlier than 1976 and at a development cost of (b)(1)1.5c [redacted] although if technical progress were good program acceleration might be possible.

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From that status summary, Packard and David proceeded to a statement of choices and justifications. If a readout system were wanted at an early date, as the Shultz letter of April 1971 had suggested, the better course would be to begin immediate development of the (b)(1)1.5 [redacted] system. It would surely be cheaper than (b)(1)1.5c [redacted] and would very probably be available relatively early in [redacted]. Because of the Senate's pressure on budget elements, the memo continued, the President must choose between two basic alternatives: develop only the (b)(1)1.5c [redacted] in fiscal 1972; or develop [redacted] at once and start [redacted] system development upon completion of [redacted]

The decision on which course to follow should be based entirely on whether early readout availability were wanted, Packard and David concluded. If 1976 were an acceptable date, then EOI probably was the best choice. If an earlier date were wanted, (b)(1)1.5 [redacted] was the obvious preference.[63]

* The (b)(1)1.5c [redacted] ceiling for EOI development was informally discussed in the ExCom meeting of 15 July but seems not to have been seriously considered at that time. Dr. McLucas observed at one point that (b)(1)1.5c [redacted] was an optimum expenditure rate, given program needs and a 1976 operational goal. Only development costs were being considered.

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* Said certainly had no personal awareness of the details of the NRO charter. His memo almost certainly was prepared by Packard, who got his information from McLucas and Naka, but who wrote his own memo rather than accept any of several drafts offered through NRO channels.

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In a prompt response to the draft, a copy of which reached Helms on 5 August, one of Duckett's deputies advised McLucas of what had become the CIA position: the (b)(1)1.5 [redacted] option should be deleted as too costly and [redacted] should be used until EOI could be developed. Duckett wanted the ExCom to urge, "Thus we cannot recommend any other course than to go ahead with EOI in an expeditious way."[64]

Laird's response upon learning that the ExCom had split was to remind Helms of the provision in the ExCom charter (the 1965 NRO charter) which specified that ExCom disagreements should be referred to the Secretary of Defense for resolution.* In the circumstances, Laird said he would assess Helms' views before taking any further action. Laird proposed to prepare a memorandum to the President that would appropriately summarize different viewpoints but one that nonetheless addressed the principal issues in a focused way and, in the end, recommended a course of action.

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* How Laird learned of the provisions of the 1965 charter is a mystery. There are hints in NRO files, however, that a member of the NRO staff was responsible for that ingenious bit of infight strategy.

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Unfortunately, Laird's message reached Helms after Helms had dispatched his own memorandum to President Nixon. Laird's memo was dated 9 August, a Monday. Helms on Wednesday, 11 August, sent to Laird a copy of a Helms-to-the-President memo dated 9 August. Helms' ~~11~~ August note to Laird mentions ~~a~~ Packard-David recommendation that does not appear ~~in any~~ of the surviving correspondence, a recommendation to ~~delay~~ EOI ~~for~~ two years. That suggestion, although discussed at various times, was not the Packard-David recommendation of early August. On the surface, Helms appeared to have misunderstood the Department of Defense position on EOI. His memo to the President proceeded from the assumption that the choice was EOI now or never, and that David and Packard ~~favored~~ "never". In fact, Helms would not have been so dense; misrepresentation was a wholly acceptable ploy used by both sides. The stakes were quite high enough to justify any means. ~~It is also~~ reasonable to assume that Helms fully appreciated the probable consequences of Laird's action. Laird, although eminently fair in the way of all truly skillful politicians, was wholly dependent on Packard to operate the Department of Defense. That Laird would be likely to reflect Packard's viewpoint, and to recommend it, seems probable. Packard mistrusted the [redacted] estimates and had a healthy cynicism about the feasibility of quickly and cheaply transforming exotic electronics technology into useful operational systems. (Packard, it will be recalled, was a highly successful electronics executive and an experienced R&D manager in private life.) Laird was not equipped by experience or inclination to evaluate technological problems--and Laird too was sensitive to cost uncertainties. There was slight likelihood that Laird would recommend the high cost, high risk option to President Nixon, or would present such an option in a favorable light if other choices were as attractive.

Knowing those probabilities, Helms did not delay in sending off his own memo to the President. The apparent two-day delay in getting a copy to the Pentagon was a bit more difficult to explain--but then nobody really asked any embarrassing questions along that line.* In his memo to the President, Helms argued that the budget could not support a combined [redacted] effort, that [redacted] had no

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* The sequence: Laird's memo to Helms on 9 August, probably delivered that afternoon, but at the latest the morning of Tuesday, 10 August; Helm's 9 August memo to the President, and his transmittal memo to Laird, not written or sent until Wednesday, 11 August 1971. It would perhaps be ungentlemanly to suggest that Helm's 9 August memo was backdated (it had to be 9 August if it was to predate Laird's instructions not to send it) and that the 11 August date on the Helms-to-Laird memo did not need to be backdated.

long-term potential, and that better ways of getting a 1976 capability existed than that of starting with [redacted] and later moving to EOI. Helms also suggested that in reality EOI was likely to appear only a year later than [redacted] and that there was little sense in acquiring a one-year advance in capability if it meant that EOI might be postponed in consequence.

The option that Helms urged on President Nixon was to begin EOI system development in December 1971, aiming at a June 1976 launch, and to rely on [redacted] for any necessary interim crisis reconnaissance capability. The primary alternative (which Helms identified as that favored by Dr. Land) was to start EOI development immediately and schedule an initial operational launch for late 1974 [redacted] higher than the cost of the favored option). A different alternative, Helms noted, would be to add to the favored option a provision for the development of an interim quick response capability for crisis reconnaissance (at a potential [redacted] and two years of development).

Most of the arguments in Helms' memorandum to the President focused on assumed shortcomings of [redacted] the [redacted] was too long for crisis management, [redacted] provided no enhancement of existing technical intelligence capabilities, [redacted] was costlier than other quick-response systems, and [redacted] development difficulties had been understated.[65]

The Helms memo could be faulted on several grounds. It did not present any real alternatives to the recommended primary action, it did not objectively evaluate the faults and failings of the two systems, it ignored potential cost growth and schedule slip problems in the more advanced of the systems being contrasted, and it employed an extreme best-case worst-case set of arguments that unfairly biased the options. But it could not be faulted on effectiveness grounds: all of the potential shortcomings of [redacted] and all of the arguments against [redacted] were laid out skillfully. The better of the EOI attractions were displayed and the risks depreciated. If the favored option seemed unwisely optimistic as regards costs and schedules, it could be contrasted with a still more glowing and optimistic option endorsed by Dr. Land, one of the most respected and successful of the scientists associated with satellite reconnaissance. And if Helms did not emphasize Land's "quantum jump" verbiage in discussing comparative risk, neither was he able to quote [redacted] program office statements that contradicted the "low-risk [redacted] thesis Packard and McLucas had come to believe.

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The rationale for the Helms memorandum was not obscure. If [redacted] were approved for development and EOI development were postponed, several events would follow. First, the CIA's reconnaissance system development specialists would have no major imaging program in their inventory. [redacted] would be operational, as would [redacted] and the principal new system [redacted] assigned to the West-Coast element of the NRO for development. Should [redacted] be successful, various of the improvements then being proposed for [redacted] might well be incorporated, and the operational life of [redacted] could well be extended thereby. In the meantime, the EOI approach would be competing for funds with [redacted] improvement schemes, and perhaps with an [redacted] that in a few months could seem considerably more attractive. The attraction of [redacted] with appreciable and proven low-cost growth potential might overcome the dubious advantages of investing in a [redacted] program of uncertain potential, however attractive it seemed on paper or in a laboratory. Once [redacted] entered the inventory, the prospects of EOI diminished. Such factors the CIA fully appreciated.

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On the day a copy of Helms' memo to the President reached the White House, McLucas learned that David too seemed to be departing from the earlier agreed ExCom position. David had told McLucas that in the interests of unity he had heretofore been inclined to go along with Packard's views, but now that a consensus seemed unachievable he had decided to "bring forward some of his more basic feelings." David really believed that EOI should not be recommended as a feasible option, that Land was wholly wrong, that a more deliberate course was advisable than any heretofore proposed, that [redacted] should be deployed regardless of other considerations, and that once experience in gathering and using readout products had been acquired it would be time enough to consider investing in a high-cost, high-technology system like [redacted][66]

McLucas himself wanted Laird to present to the President three options that extended from a 1976 EOI program to a [redacted] plus a 1978 EOI. McLucas was willing to consider what he then assumed was Helms' favorite: acceleration of EOI development for 1975 availability.

In the end Laird decided to recommend one specific course that the ExCom could agree on. The wording was peculiar: Laird told the

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President that the ExCom had agreed that the best option was to develop EOI toward a 1976 operational date but at a spending rate of [redacted] a year, adding ". . . I strongly recommend" that decision. But, Laird continued, Helms felt that an earlier operational date was achievable. Packard had considerable doubts about acceleration and was somewhat pessimistic about 1976 availability, and David favored starting with [redacted] because to him the 1976 availability date for an EOI system seemed highly unlikely. Helms opposed [redacted] in any event, favoring alternative early capability systems if one were to prove necessary. In Laird's judgement, the availability of [redacted] negated any need for readout capability at an early date, so (he told the President) the best course was an order program of EOI development toward 1976 operation "or possibly somewhat earlier."[67] Helms and Land had taken that round.

On 23 September, Dr. Henry Kissinger advised all concerned that the President had concluded that the development of the EOI system should be undertaken toward a 1976 operational date and "under a realistic funding program." Further, the President had decided that ". . . there should be no further development of the [redacted] system."[68]

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[redacted] Via [redacted] Control System

That settled the main question. Conversations among ExCom members later in September uncovered some uneasiness about the "realistic funding program" caveat, by which the White House had intended to mean a ceiling of [redacted] a year on EOI expenditures. Packard concluded that costs "in the range of [redacted] would probably pass muster, given uncertainties about inflation rate and the like. As for what remained, it was necessary to advise Senator Ellender of the decision and get on with [redacted] shortly after named[69] [redacted] was officially dead.

The 30 September meeting that considered the effects of the [redacted] cancellation was the last ExCom session Packard ever attended, he left the government later that year. About a year later, the President abolished the Office of Science Advisor; both Dr. David and the Land Panel vanished thereby, although Dr. Land continued to advise the CIA. McLucas survived to become Secretary of the Air Force in the second Nixon Administration; Helms was named Ambassador to Iran shortly after the election. None of those actions appeared to be related to the [redacted] decision, but they constituted an interesting footnote to the events of that decision.

[redacted]

NOTES ON SOURCES

1. MFR, BGen R. E. Greer, Dir/Samos Proj, 16 Feb 61, subj: Trip Report; see Vol IIA, Ch VII, this mss, for details of E-1 experiment.

2. Samos Program Chronologies, Jul-Dec 61, in SAFSP files; see Vol IIA, pp 168-172, this mss, for details.

3. Memo, Col W. G. King, Program I, to Col J. W. Ruebel, SAFSP [redacted] 21 Nov 61, in Greer files, SAFSP.

4. Various Samos E-1 tech manuals dating from 1959 and 1960; 25 May 59 Rand paper by Amrom Katz, "Observation Satellites . . ."; paper, "Anatomy of Readout," MGen R. E. Greer, Nov 62.

5. Rpt, "Sentry Program E-3 Reconnaissance," Lockheed Missiles and Space Div, 29 Jul 59.

6. Rpt, "Samos Applied Research System," 9 Nov 60; rpt, "Aerospace Corp Evaluation of the RCA Electrostatic Imaging and Recording System," 18 Nov 61; ltr, Maj D. W. Denby, Sys Br, D/Tech, ASD, to SAFSP, 13 Dec 61, subj: Development of a Photo Tape Sensor.

7. "Anatomy of Readout," Greer, Nov 62; ltr, Maj Gen R. E. Greer, Dir/SP, to Capt F. B. Gorman (USN), [redacted] 19 Nov 62, subj: Establishment of Special Study Group.

8. Samos Program Chronology, May 63; rpt, "Photo-Tape Reconnaissance System," prep by T. J. Fulton, ASD Recon Lab, 9 Apr 63; amended mo rpt, "Photo-Tape Reconnaissance System," 15 Apr 63, all in [redacted] files.

9. Memo, E. M. Purcell, Chm, Recce Panel, to DCI, Jul 63, subj: Panel for Future Satellite Reconnaissance Options.

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10. Memo, B. McMillan, DNRO, to SoD, 11 Jan 65, subj: Quick Reaction Surveillance System, in DNRO files.

11. Msg, [redacted] BGen J. L. Martin to Dr B. McMillan, DNRO, 28 Jul 65.

12. Rpt, "The Application of Image Forming Satellite Reconnaissance to Crisis Management," prep by COMOR ExCom, 24 Jan 66.

13. Min, NRP ExCom Mtg, 17 Aug 66.

14. Memo, LtGen F. P. Carroll, Dir/DIA, to Dr J. Foster, Dir/DR&E, 18 Nov 66, subj: Assessment of New Technology for Intelligence Collection (quoted in msg, [redacted] SAFSS to LtCol L. Allen, SAFSP, 21 Nov 66).

15. Msg, [redacted] Col L. Allen, SAFSP, to BGen J. T. Stewart, Dir/NRO Staff, 6 Dec 66.

16. Msg, [redacted] MGen J. L. Martin, Dir/SP, to Dr A. Flax, DNRO, 17 Jan 67.

17. Rpt, "Requirements for Image Forming Satellite Reconnaissance Responsive to Warning/Indications Needs," prep by COMIREX, 5 Jan 68.

18. See memo, A. H. Flax, DNRO, to Chm, USIB, 12 Mar 69, subj: Study of Requirements for Image-Forming Satellite Reconnaissance Responsive to Warning/Indications Needs, in NRO policy files.

19. Memo, E. H. Land to D. F. Hornig, Pres Sci Advsr, 16 Oct 68, no subj, in Land Panel papers, NRO files.

20. Min, NRP ExCom Mtg, 13 Nov 68.

21. Memo, Flax to Chm, USIB, 12 Mar 69.

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22. Memo, J. J. Crowley, Dir/Spec Projs, DDS&T, CIA, to DNRO, 16 May 69, subj: Review of Report Entitled "Satellite Image-Forming Reconnaissance Responsive to Warning/ Indications Needs," in DNRO files.

23. Memo, E. H. Land to Pres US, 6 May 69, no subj.

24. Notes, SAFSP orientation briefing for BGen W. G. King, Dir/SP, Feb 69.

25. Memo, R. L. Garwin to Dr Edwin Land, 23 Jun 69, subj: Major Review of [redacted] for Electro-Optical Intelligence [sic] Satellite ("EOI"), in Land Panel files, SAFSS.

26. Memo, D. Packard, D/SoD, to R. Helms, DCI. L. A. DuBridge, Pres Sci Advsr, and J. L. McLucas, DNRO, 16 May 69, subj: Real-Time Readout.

27. Memo, Col L. Allen Jr, Dir/NRO Staff, to Dr J. L. McLucas, DNRO, 5 Jun 69, subj: Real-Time Readout.

28. Viewgraphs of briefing, "Study of a [redacted] " prep by SAFSP for Bennington Cmte, 12 Jun 69; viewgraphs of briefing for BGen W. G. King, Dir/SP, Feb 69, in [redacted] files.

29. Min, NRP ExCom Mtgs, 7 and 8 Aug 69, as revised 12 Sep 69.

30. Min, NRP ExCom Mtg, 15 Aug 69.

31. Memo, E. H. Land, et al, to Dr L. A. DuBridge, Pres Sci Advsr, 12 Aug 69, no subj, in Land Panel papers, DNRO files.

32. Memo, G. T. Tucker, Asst SoD (SA), to D/SoD, 14 Feb 70, subj: Interim Report on the Committee for Immediate Recovery of Imagery (Fubini Committee); rpt, Report of the Committee for Immediate Recovery of Imagery, 16 Feb 70; memo, A. L. Latter to E. Fubini, 6 Feb 70, subj: Immediate Recovery.

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33. Min, NRP ExCom Mtg, 16 Sept 69; see also memo, Col L. Allen, Jr, Dir/NRO Staff, to D. Packard, R. Helms, L. DuBridge (ExCom) 12 Sep 69, subj: (b)(1)1.5c [redacted]

34. Viewgraphs of briefing, 14 Aug 69, prep by SAFSP for D. Packard, D/SoD.

35. Min, NRP ExCom Mtgs, 25 Nov 69, 16 Sep 69.

36. Memo, E. H. Land, et al, to Dr L. A. DuBridge, 13 Mar 70, subj: (b)(1)1.5c [redacted] in Land Panel files; see memo, Tucker to Packard, et al, 14 Jul 70.

37. Memo, E. H. Land, et al, to Dr L. A. DuBridge, Pres Sci Advsr, 13 Jul 70, subj: Photographic Reconnaissance Systems Status, in Land Panel Papers, DNRO files; memo, DuBridge to D. Packard, D/SoD, and R. Helms, DCI, 13 Jul 70, subj: Land Panel Report.

38. Memo, G. P. Shultz, Dir/OMB, to D. Packard, D/SoD, 15 Jul 70, no subj, in SAFSS files; see also memo, Col L. Allen, Jr, Dir/NRO Staff, to Dr J. L. McLucas, DNRO, 31 Jul 70, subj: Activity Report, 27 Jul - 31 Jul 70.

39. Rpt, Director's Report to the NRP Executive Committee on FY 70 Status and FY 71 Program, 15 Jul 70, prep by NRO Staff for J. L. McLucas, DNRO; ltr, G. P. Shultz, Dir/OMB, to D. Packard, D/SoD, 15 Jul 70, no subj, in NRO files.

40. Memo, J. L. McLucas, DNRO, to Dir/CIA Recce Prog, 27 Jul 70, subj: Approval of Electro-Optical Imaging Program System Definition Phase; min, NRP ExCom Mtg, 15 Jul 70.

41. Memo, E. H. Land, et al, to Dr E. E. David, Jr, Pres Sci Advsr, 14 Sep 70, subj: Real-Time Photographic Systems Definition Studies (b)(1)1.5c [redacted], in Land Panel papers, DNRO files; min, NRP ExCom Mtg, 20 Nov 70.

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42. Ltr, E. G. Fubini to D. Packard, D/SoD, 29 Oct 70, no subj.

43. Memo, Maj W. F. Craig, NRO Staff, to Dr J. L. McLucas, DNRO, undated (written 11 Jan 71), subj: Ray Cline's Views on Crisis Response; MFR, Maj F. L. Hofmann, NRO Staff, 16 Nov 70, subj: [redacted] Briefing on [redacted] both in NRO staff files.

44. Memo, J. L. McLucas, DNRO, to Dr H. A. Kissinger, 18 Dec 70, subj: Photographic Capabilities During Crises, in DNRO files.

45. Min, NRO ExCom Mtg, 20 Nov 70.

46. Ltr, W. P. Rogers, SoS, to R. Helms, Dir/CIA, 15 Jan 71, no subj (identical ltr sent to M. Laird, SoD, same date); ltr, C. E. Duckett, Dir/CIA Recce Prgms, to Dr J. L. McLucas, DNRO, 11 Jan 71, no subj.

47. Background information from NRP ExCom Agenda for 29 Jan 71 ExCom Mtg, dtd 27 Jan 71, prep by Maj W. Craig, SAFSS; memo, R. Kahal, NRO staff, to Dr J. L. McLucas, DNRO, 21 Jan 71, subj: [redacted] Near-Real-Time Readout.

48. Min, NRP ExCom Mtg, 29 Jan 71.

49. Min, NRP ExCom Mtgs, 20 Nov 70, 29 Jan 71.

50. Ltr, G. P. Shultz, Dir/OMB, to D. Packard, D/SoD, 22 Apr 71, no subj: min, NRP ExCom Mtg, 23 Apr 71; interview, LtCol W. Craig, NRO Staff, by R. Perry, 10 Sep 73.

51. Memo, J. L. McLucas, DNRO, to D. Packard, D/SoD, 4 Jun 71, subj: Actions Approved at the ExCom Meeting (23 Apr 71).

52. Memo, Adm (ret) G. W. Anderson, Jr, Chm, PFIAB, to D. Packard, D/SoD, 17 Jun 71, no subj, DNRO files.

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53. Memo, Col D. D. Bradburn, Dir/NRO Staff, to Dr J. L. McLucas, DNRO, 14 Jun 71, subj: Highlights of the Land Panel Meeting, 11 Jun 71, in DNRO files.

54. Memo, L. C. Dirks, Actg Dir SP, CIA, to D/DNRO, 17 Jun 71, subj: Interim Near-Real-Time System--Vehicle and Operational Alternatives, encl study, same subj, by [redacted] D/Ch Des and Anal Div, Dir SP CIA, which also cites SAFSP Study Apr 71 "60-Day Study," and COMIREX "Study of Intelligence Requirements for Crisis Response Satellite Imaging," Apr 71.

55. Memo, [redacted] Grp IV, Aerospace Corp, to [redacted] Grp I, 27 May 71, subj: [redacted] files.

56. Msg, [redacted] LtCol F. Hofmann to Dr J. L. McLucas, DNRO, 24 Jun 71, forwarding cy of draft Packard ltr to Ellender (McLucas was in Los Angeles); memo, E. E. David Jr, Pres Sci Advsr, to D. Packard, D/SoD, 30 Jun 71, no subj, in DNRO files.

57. Draft rpt, "The Near-Real-Time Photographic Reconnaissance Program [redacted]," prep by National Recce Panel to the President's Science Advisor, 1 Jul 71; see msg [redacted] F. R. Naka, D/DNRO, to BGen L. Allen, Jr, Dir/SP, 3 Aug 71, transmitting basics of rpt; ltr, Sen. A. J. Ellender, Chm, Senate Cmte on Appropriations, to D. Packard, D/SoD, 9 Jul 71, no subj, in DNRO files.

58. Rpt, signed by E. H. Land, Chm, Natl Recce Panel to the President's Science Advisor, "The Near-Real-Time Photo Reconnaissance [redacted]" dtd 14 Jul 71.

59. MFR, J. L. McLucas, DNRO, 14 Jul 71, subj: Notes for Use at Meeting with Senator Stennis at 3:00 o'clock, 14 July (n.b.: memo annotated to show its use by Col D. D. Bradburn, Dir/NRO Staff, in 15 Jul mtg with Stennis).

60. Min, NRP ExCom Mtg, 15 Jul 71.

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61. Land Panel Rpt, 14 Jul 71; ltr, R. L. Garwin, Land Panel, to Dr E. E. David, Jr, Pres Sci Advsr, 24 Jul 71, no subj; ltr, Garwin to David, 26 Jul 71, no subj, both in Land Panel papers, DNRO files.

62. Memo, E. E. David, Pres Sci Advsr, to D. Packard, D/SoD, and R. Helms, DCI, 24 Jul, subj: Memorandum to the President on [redacted] memo, Helms to Packard, 2 Aug 71, no subj.

63. Memo, D. Packard, Chm ExCom and D/SoD, undated, about 5 Aug 71, to M. Laird, SoD, subj: Readout Satellites, with encl, draft memo, D. Packard and E. David, ExCom, to Pres undated, subj: Readout Satellites. The Packard to Laird memo was handwritten, in pencil, and can be dated only from a notation on a transmittal slip for a copy sent to the DNRO.

64. Informal memo, [redacted] CIA D/Sci and Tech, to J. L. McLucas, DNRO, 5 Aug 71, no subj.

65. Memo, R. Helms, Dir CIA, to SoD, 11 Aug 71, subj: Readout Satellites, w/encl, memo, Helms to Pres, 9 Aug 71, same subj.

66. Draft memo, J. L. McLucas, DNRO, to D. Packard, D/SoD, 11 Aug 71, no subj. The file copy has been torn into several pieces and then reassembled with the aid of transparent tape. It may not have been sent to Packard at all--but in that it describes a conversation between McLucas and David, it accurately reflects the situation as of 11 Aug.

67. Draft memo for M. Laird, SoD, to Pres, prep by J. L. McLucas, 11 Aug 71, subj: Readout Satellites; M. Laird, SoD, to Pres, 17 Aug 71, subj: Readout Satellites.

68. Memo, H. A. Kissinger to SoD, Dir/OMB, DCI, Pres Sci Advsr, Chm PFIAB, 23 Sep 71, subj: Near-Real-Time Satellite Reconnaissance System, in DNRO files. Italics added.

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69. Min, NRP ExCom Mtg, 30 Sep 71; ltr, D. Packard, D/SoD, to Sen A. J. Ellender, Chm, Cmte on Appropriations, 4 Oct 71.

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