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~~ISI~~ NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

OFFICE OF THE DIRECTOR

December 18, 1972

MEMORANDUM FOR MR. LAIRD

SUBJECT: Taking Stock of the National Reconnaissance Program

INTRODUCTION

This will be my last and most comprehensive report to you on the National Reconnaissance Program. I have enjoyed serving as the Director of the National Reconnaissance Office for longer than anyone else since the program was created over ten years ago; while my report is intended to be objective, my views are tempered by what I believe to be the overriding importance of maintaining the integrity of the Program for the security of the nation.

Satellite reconnaissance is undoubtedly the single most important tool available to the nation for the detection and assessment of foreign offensive capabilities. Satellites have been the sole means of identifying and locating all Soviet and Chinese offensive missile launchers; virtually all new major weapon system developments have been first identified by overhead collectors. And it is primarily satellites which provide the confidence in verification that permitted the President to enter Strategic Arms Limitation Agreements. The program has accomplished much that is vital--and there is much yet to do.

When I arrived early in 1969 I found a viable program, yet one facing changes in both the organizational environment and the system mix.

The CORONA photographic area search satellite, the evolutionary model of the first reconnaissance vehicle in space,

was still flying. Production had ceased, though, because the decision had already been made to replace it with the HEXAGON area search and surveillance spacecraft which was then in development. The GAMBIT high resolution system was continuing to provide technical intelligence quality photography, and we were looking at moving from the research domain into development of a "near-real-time" photographic reconnaissance satellite. Development of the [redacted] was proceeding, although that program was soon to be terminated.

In the SIGINT satellite field we were continuing to fly the [redacted] and the POPPY spacecraft, all of which had produced much valuable intelligence data over the years. And we were moving into the realm of [redacted] satellites. The [redacted] collector had demonstrated the feasibility of intercepting [redacted] from space, even though the first payload failed after a few days on orbit [redacted]. The [redacted] collector and the [redacted] ELINT collection systems were in development with first launches still over a year away.

A fleet of IDEALIST U-2R aircraft, and a development program to produce the high altitude, supersonic TAGBOARD drone, completed the active NRP hardware baseline in early 1969.

Our management baseline consisted primarily of the DOD-CIA Agreement of August 11, 1965, which permitted the program to be conducted in a streamlined manner as directed by the President. Yet this, too, was going to be subject to examination and tacit, if not formal, changes.

My objective over the last four years has been to build upon those capabilities which permit us to better satisfy the intelligence collection needs of the nation while paring away those activities which do not contribute adequately. In this report I point out our accomplishments, and identify our problems and shortcomings. The challenges--the thrust of the future for the NRO--close out my report.

PHOTOGRAPHIC RECONNAISSANCE

CORONA

In May, 1972 we launched the last of the CORONA medium resolution area search reconnaissance satellites. The capabilities of the CORONA were continually increased over the years since the first successful flight in August, 1960. Improvements included the addition of a second camera to permit stereo photography; a second recovery vehicle to increase film capacity; a lower orbital altitude capability to permit better photography; better optics, and numerous other changes. CORONA missions lasted for up to nineteen days and each mission photographed about seven million square nautical miles.

In 1969 we flew six CORONA missions, imaging some 35 million square miles of the earth's surface with a resolution ranging from about six to twelve feet. Four missions were launched in 1970, three in 1971 and two in 1972. These flights used up our inventory of CORONA vehicles and the program ended, replaced by the HEXAGON system. CORONA, having positively identified and accurately located all operational Soviet ballistic missile launch sites, served our intelligence needs very well indeed.

One of the first issues facing the program in 1969 was whether or not to reopen the CORONA production line to compensate for anticipated slippage in the first flight date of the HEXAGON. We adjusted the annual launch rate for CORONA, stretching the program out; events proved our judgements valid and the last CORONA flights briefly overlapped the first HEXAGON missions.

The CORONA vehicle launched in February, 1971 did not achieve orbit, because the Thor booster disintegrated shortly after liftoff. One mission in 1969 was terminated after three days on orbit, and the last mission in 1972 after six days, both due to anomalies in the flight control systems. For these reasons and because we had deliberately stretched out the launch schedule to prevent possible total loss of coverage, our satisfaction of USIB requirements was at times less than our goal.

HEXAGON

The first HEXAGON search and surveillance mission was successfully launched June 15, 1971, and three more flights have been completed. HEXAGON is designed to satisfy the area search requirements formerly assigned to CORONA, and in addition photograph some targets which require higher resolution surveillance.

The HEXAGON system has demonstrated its design goal of about two foot to seven foot ground resolution and has been notably successful for the introduction of a new and very complex system. Intended to fly initially for forty-five days, the first missions lasted thirty-one and thirty-nine days. We quickly moved toward a goal of extended life on orbit of sixty days, and the third and fourth missions performed for fifty-seven and sixty-eight days, achieving new records in area coverage of up to twenty-eight million square nautical miles.

The birth of HEXAGON was not without problems. The first launch date slipped incrementally from October, 1970 to June, 1971. Parachute failures experienced during the first mission resulted in the loss of one recovery vehicle and we conducted an intensive correction program. Other problems have been experienced during each mission, but none represents a fundamental system deficiency and on balance the performance of all elements of the system is remarkable. We are now achieving our USIB goals for HEXAGON coverage.

GAMBIT

In the first six months of 1969 we flew the last four of the single recovery vehicle GAMBIT satellites, each collecting high resolution photography for ten days. The last mission, launched June 3, 1969, provided read out of 4,032 targets, more than any previous mission, with a best ground resolution of [redacted].

The first double recovery vehicle GAMBIT was launched August 23, 1969, and mission life jumped to fourteen days;

fourteen of these vehicles have now been launched. We have carefully and deliberately improved the life on orbit and the resolution of the GAMBIT system, and the mission scheduled for December, 1972 is planned to have a useful life of 30 days. The introduction of a new longer focal length mirror in 1971 has resulted in a best resolution of [redacted]. Between six and ten thousand targets are regularly read out for each mission. We use improved films, and of the several types flown today, not one was used four years ago. Improvements to the GAMBIT have been evolutionary, with no drastic changes in the design of the system. This has been a cost-effective venture yielding high confidence in the successful outcome, and we foresee this pattern continuing in the future. Improvements to the GAMBIT are planned to increase its reliability, and to permit it to expose either of two different films on future missions. This latter feature will permit us to compensate for different lighting conditions or to take color and black and white photographs alternately.

As the orbital lifetime of NRO satellites has been systematically increased we have tended to fly fewer vehicles each year. While our launch rates are planned to satisfy USIB requirements, actual satisfaction has become more sensitive to schedule slippages and of course system failures. Three significant failures of the GAMBIT system have occurred in the last four years. Early in 1970 we lost a recovery vehicle in the Pacific Ocean when the parachute failed to deploy; during the summer of 1970 the spacecraft on-board command system failed and the spacecraft with the second recovery vehicle still attached re-entered the atmosphere, uncontrolled, and was lost. And in May, 1972, a GAMBIT vehicle failed to achieve orbit due to a malfunction in the Agena stage.

[redacted]

One of the key issues faced during this period was the decision to develop the [redacted] near-real-time photographic reconnaissance satellite. It will be one of the most [redacted] yet attempted by the NRO, [redacted] It is also a revolutionary system,

rather than one building on our knowledge of film return systems, and there is therefore greater technical and financial risk associated with the program. Other alternatives were proposed, including a modified spacecraft employing GAMBIT optics, on-board film processing, and electronic return of imagery. Because of the President's desire for an early near-real-time or crisis response information system, we intended to proceed with development of both the film readout GAMBIT and [redacted] with the former estimated to be operational perhaps two and one half years sooner. This approach would have permitted high confidence in development of a near-real-time capability with an interim system, while permitting an orderly development of the more technically advanced [redacted] system. The funding impact of this dual development caused us to readdress the question to the President for a determination of the need for an early capability; subsequently [redacted] was selected and work on the film readout GAMBIT terminated. I note that this is the only NRO system issue which was raised to the President in four years.

[redacted]

The near-real-time imagery produced by the [redacted] system may significantly alter the United States response in future

crisis situations. The exploitation of the [redacted] product is, I believe, an area which will require considerable creative thinking.

SIGINT RECONNAISSANCE

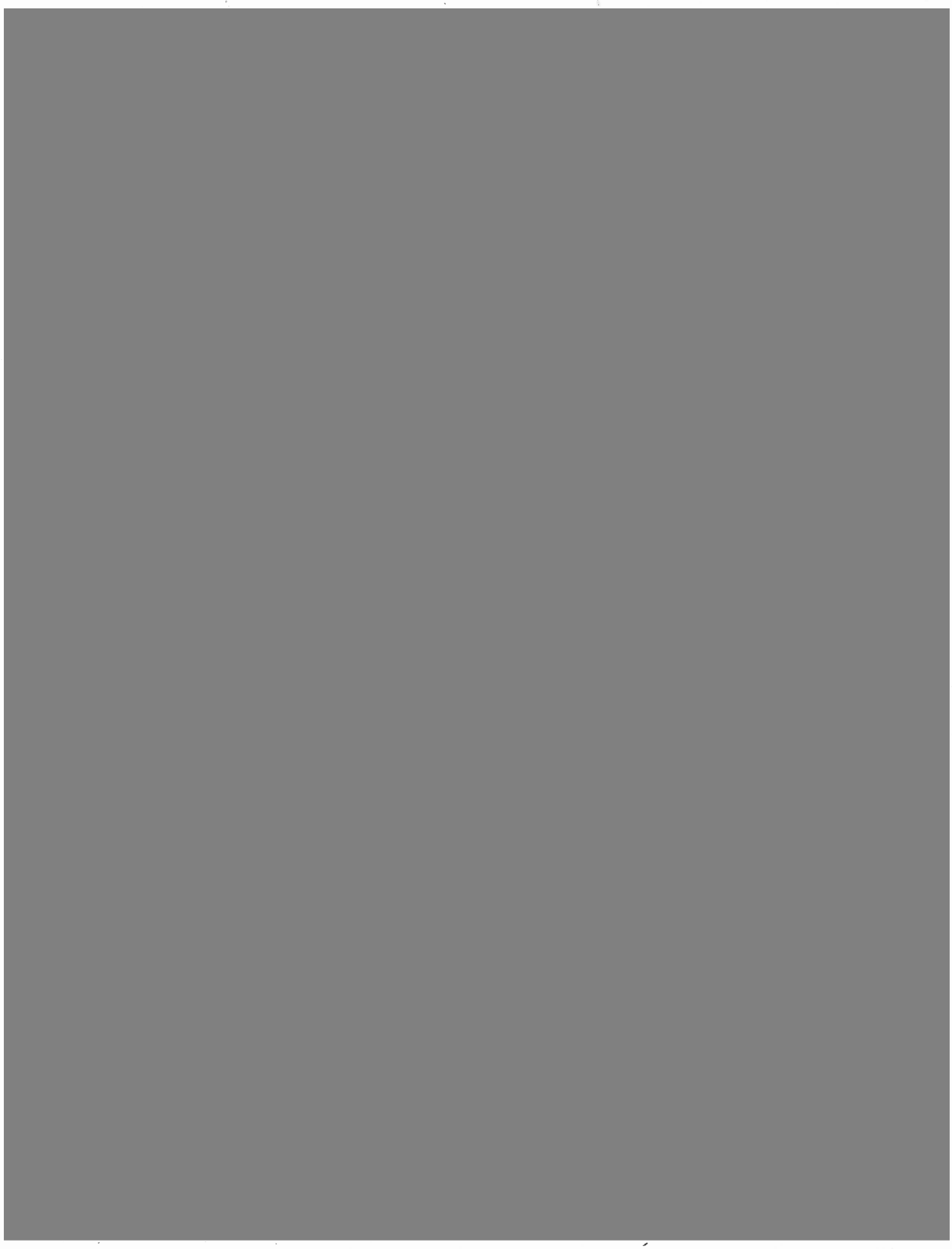
The SIGINT satellite program has entered a new era. In earlier years, collection was carried out by low-earth orbiting satellites which have relatively short dwell times over a particular target. [redacted]

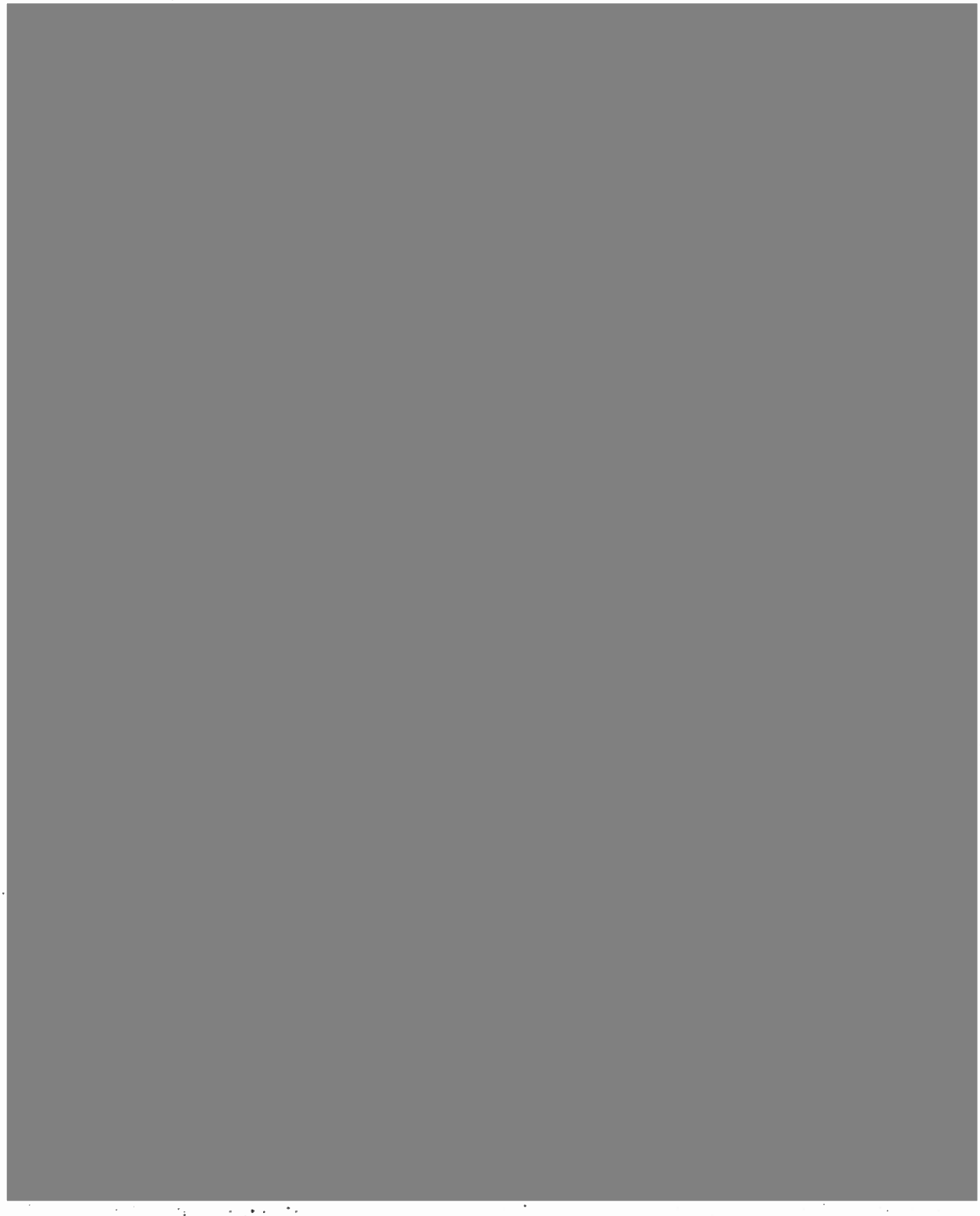
[redacted]

[redacted]

Mission Ground Station processing also provides an initial sorting of data from unwanted or low interest signals. Consequently, data are collected, processed and reported to intelligence consumers in a more efficient and timely manner.

[redacted]





[redacted]

[redacted]

POPPY [redacted]

The POPPY system dates to 1960, and is a program developed in the Navy but under the aegis of the NRO. Highly successful as an ELINT search collector, the current configuration employs four low earth orbit vehicles [redacted] and locates foreign emitters [redacted]. The system launched in December, 1971 continues in full operation; it was the last launch [redacted].

[redacted]

AIRCRAFT AND DRONE RECONNAISSANCE

IDEALIST

The NRO IDEALIST fleet in 1969 consisted of twelve U-2R aircraft operationally equally divided between the CIA and SAC. Because of the costs associated with the program in what appeared to be a marginally acceptable political environment for overflights, we looked at ways of combining or reducing the fleets. Although we lost one aircraft to an accident in November, 1970, an increasing use of the U-2R by SAC as a

Southeast Asia and peripheral South China COMINT collector has dictated the continued need for two fleets. We have, however, arranged to transfer the six U-2R aircraft operated by SAC to the Air Force in the entirety and NRP funds will not be provided for these aircraft after this Fiscal Year.

The IDEALIST missions operated [redacted]

On August 8, 1970 we deployed two IDEALIST aircraft to [redacted] to cover the Israeli-Egyptian crisis. You will recall that we did not have a good baseline on Soviet provided emplacements in Egypt at the time the cease-fire became effective; on August 9 we flew the first IDEALIST mission. [redacted] EVEN STEVEN missions were flown. This represents the only true crisis use of the IDEALIST for national intelligence collection in the last four years.

OLYMPIC FIRE overflights of Cuba continue, but at a greatly reduced rate. In 1969 we had a requirement to sample seven Cuban target categories every two weeks. I asked for a re-examination of requirements in early 1970, and we reduced this to a minimum of one flight each thirty days.

OXCART/SR-71

The nine remaining OXCART aircraft are all permanently stored and there is no likelihood of their ever being used. The Air Force has been authorized to cannibalize them for parts common to the SR-71.

The SR-71 has been tasked on several occasions to overfly North Korea. Flown by SAC pilots, these missions were performed on behalf of the NRO and contributed to national requirements. Following strong protests by the North Koreans in early 1971, we re-evaluated the value of these flights and no missions have been conducted since May, 1971.

TAGBOARD

The TAGBOARD high altitude supersonic drone program was initiated to provide a highly survivable crisis response alternative to manned aircraft reconnaissance. Following eleven test flights, the first operational mission over The People's Republic of China was air-launched from a B-52 aircraft on November 10, 1969. However, computational errors in the on-board guidance computer prevented the drone from flying its planned course and it was not recovered. A second mission was flown over China on March 5, 1971; this time the drone completed its mission but the air-dropped camera payload was not recovered because of parachute and procedural problems.

Because of the development and operational problems encountered in this program, I ordered a thorough investigation of the causes and cures. The recommendations include a proposal that complex systems such as this should be designed and tested in nearly the same manner we design spacecraft. For the TAGBOARD to be made reliable, it was estimated that [redacted] and several months time would be required. Overtaken by technical problems, political considerations, and the coverage provided by the HEXAGON system, the remaining TAGBOARD drones were ordered into dead storage by the ExCom in July, 1971 and the program was terminated.

MANAGEMENT OF THE NRP

Early in 1969 I saw the need for a good analytical staff in our office, one which would look at the validity of requirements as well as the alternatives to solving them, and I created an analysis shop. Two major studies have provided rationale for future direction on the SIGINT collection scene, and described needed interfaces with tactical intelligence users.

External influences were changing, too, four years ago. Although the NRP Management Agreement between DOD and CIA was based on a totally autonomous philosophy, the assignment of Bob Froehlke in April of 1969 as the Special Assistant

for Intelligence specifically encompassed the NRP. While I recognize that the DOD ExCom principal needs an independent counsel on NRP matters, it appeared that the trend was to be toward normalizing the way the NRO would operate, i.e., it would become more and more like any other DOD program and subject to the same kind of analysis, budget cycles, and decision process as any other project. The Fitzhugh Blue Ribbon Defense Panel Report to the President in July, 1970 validated the requirement for an Assistant Secretary of Defense for Intelligence, and since its creation there has been continual interaction between the NRO and the Office of the ASD(I). The tendency for the ASD(I) to become more involved in the NRP reflects, I believe, the attitude that this is equivalent to any other DOD program. It is not; one needs only to look at the tripartite decision body, the CIA involvement, and the derivation of the charter to recognize this. I am concerned that if the direction of the program is to change, the decision to do so should be well thought out and conscious by all agencies involved. Al Hall and I have no trouble understanding and working with each other, but the NRO is slowly drifting away from its former management autonomy and this tends to cause conflicts between our staffs.

The President's letter of November 5, 1971, directed ". . . retention of the present management structure of the NRP . . ." I believe this direction may need re-affirmation for two reasons: First, in the revised version of NSCID 6 there now appears a role for NSA in the on-orbit control of SIGINT satellite payloads. This modifies the heretofore monolithic structure for managing total satellite development and operation. And second, there is not today a revised directive or agreement for the NRP. We have NSCIDs formalizing the organizations which establish collection requirements, and exploitation; there should be a directive which charters the actual collection activities.

NRP FINANCIAL MANAGEMENT

The financial record of the last four years reflects, I believe, quite a change in our success in the control of costs. In FY 1969, 1970, and 1971 we had overruns totaling

[redacted] in four of our more involved systems. In FY 1972, we underran the budget by [redacted] in this same area which, I hope, is a sign of relative stability and maturing understanding of our problems. In all, we have been able to return over [redacted] during these four years.

NRO programs are dynamic in nature, and in each of the last four years we have initiated new efforts, not identified or included in the President's Budget. These involved at least [redacted] in the four years, including such efforts as a [redacted] capability for U-2R and U-2C aircraft, [redacted] earlier funding for [redacted] related to vehicle failures, and paying for costs which had previously been free issue, such as propellants and Eastern Test Range support. These costs were all absorbed within available NRP funds.

The voluntary reductions from the annual President's Budget and the New Obligational Authority experience have been unique in DOD. Historical NRP funding tabulation for the four years shows: [redacted]

	President's Budget	Voluntary Reduction	NOA Appropriation
FY 1969	[redacted]		
FY 1970			
FY 1971			
FY 1972			
Total			

The FY 1972 major reduction is largely attributable to the deletion of the GAMBIT Film Readout System and the TAGBOARD Drone programs. However, the bulk of the [redacted] reductions is related to internal NRP program and financial management. NOA was successively lower in each succeeding

fiscal year after 1969; this trend is not expected to continue because of anticipated increases due to the [redacted] programs.

This FY 1969-1972 financial management record was achieved during a period when the high unit-cost HEXAGON was replacing CORONA, [redacted] A major factor in the ability to hold total NRP costs down was the achievement of significantly-longer life for a number of systems, enabling a reduction in the launches per year. For example, there were eight CORONA launches in FY 1968, while the HEXAGON maximum will be four, and usually three per year; in FY 1968 there were eight GAMBIT launches, compared with four in FY 1972, and scheduled to be reduced to three in the future. There is greater risk associated with this long-life approach however, because any failures have a greater adverse impact on the satisfaction of collection requirements.

TACTICAL USES OF NATIONAL COLLECTORS

For many years the NRP has been managed as a very dedicated program, with virtually no operational interfaces with other activities. There are reasons for this position, but I believe that there are also useful ways in which the NRP can interact--useful in terms of best uses of expensive resources and to provide additional or alternative intelligence information to users.

Toward this end, I directed the collocation of the [redacted] CONUS Ground Station with the [redacted] We were not sure of what benefits would accrue, but the decision seemed logical. I am pleased to report that we have indeed found that there is a benefit to increased interaction between these systems. In late 1971 we established a [redacted] Mission Ground Station and regularly provide notice of Soviet and Chinese missile launches detected [redacted] Consistently furnished within [redacted] of occurrence of the

event, this information is regarded by NORAD to be valuable confirmation of data received from the DSP satellites and other sources. [redacted] This will reduce standby costs since it is expensive to keep boosters and spacecraft in a ready condition, but even more important, the number of DSP vehicles procured for spare purposes can be reduced. I regard this as a most significant accomplishment in terms of both increasing the national attack warning capability and reducing overall costs.

In other areas, we have conducted exercises with the First Fleet to determine the operational benefits to Fleet Commanders of using [redacted] satellite data. [redacted]

Rapid collection of Electronic Order of Battle information in the European Theater is another promising area for application of satellite borne sensors. The assets available to the theater commanders preclude seeing very far into Eastern Europe, while satellites offer very great visibility. A problem is caused, however, by the mobility of the emitters used by the European Communist nations. Since they can be moved to new locations and be operating within hours, the

U.S. forces would need constantly updated intelligence in the event of crisis or open hostilities, and need it with good location accuracy. One promising approach uses the [redacted] technique but with receivers carried by high altitude aircraft or drones. The NRO has assisted the Air Force in developing this application.

[redacted]

In May of this year the President announced the mining of North Vietnamese ports. We started to collect Signal Intelligence data to determine reaction to this event just [redacted] after the request was made tasking the first satellite passing over the area. I consider this an excellent example of the capability of NRO collectors to respond to tactical needs.

DECLASSIFICATION

A question that perennially arises is that of downgrading the classification of the products of overhead reconnaissance. This issue has been addressed--more than once--since 1969, and the answer has always been "not yet." There have, however, been other opportunities for making information from space programs more readily useable, and I have pursued several avenues. For example, the SPECIAL ACCESS REQUIRED caveat which applied to several military space programs has been totally abolished. While the relaxation of access controls makes information on these programs more accessible, it also makes the covert NRO programs more distinguishable and this factor was weighed carefully in the decision. I have seen no adverse effects on the cover programs--and do not expect any of significance.

The Defense System Application Program, formerly Program 417, is another example. This program was started in August, 1961 by the NRO to provide weather observations over the Sino-Soviet Bloc for our photographic reconnaissance satellites. Over the years the program has been successively removed from BYEMAN Controls, came under SPECIAL ACCESS REQUIRED Controls and this year was released from that control but retained a SECRET classification. It is vital to our successful operations; it has increased our clear target accomplishment from an expected [redacted] percent to over [redacted] percent. [redacted] This resolution is not sensitive from a reconnaissance standpoint, but is of higher quality than the weather satellite pictures released to the public from the national weather system. The DSAP photography has in the past been handled as SECRET information.

This year I initiated discussions with the Secretary of Commerce with the desire to join forces to make maximum use of the weather information from both the DSAP and the programs managed by the National Oceanic and Atmospheric Administration. We have proceeded remarkably well toward this goal, and have arranged to furnish NOAA DSAP data on an unclassified basis. This action requires that we be prepared to acknowledge the existence of a Department of Defense space system which provides meteorological data--but we will not, however, release any operational information. I regard this as a very significant achievement in best use of resources in the national interest.

NASA INTERFACE

We have maintained a continuing dialog with NASA for the purpose of insuring that the new technology applicable to their programs is transferred when this can be done within the bounds of security. We discussed the possibility of NASA flying CORONA satellites for their Earth Resource Program, hoping that this already developed system could result in cost savings for them,

but the system did not adequately meet their needs. Following the decision to cancel the MOL Program, residual hardware was offered to NASA and they were able to benefit from some of this development. Much was unclassified, such as the astronaut feeding system, sample pressure suits, small airborne computers and the large Laboratory Module Simulator, but some was reconnaissance mission related. Properly declassified, NASA has used the MOL Mission Development Simulator for development of their SKYLAB program along with optical technology of the Acquisition and Tracking Scope. Some of the large glass blanks remaining from the program were furnished to NASA for various non-reconnaissance optical projects.

In April, 1970, we removed from storage and loaned to NASA two U-2C aircraft for use in their Earth Resources Survey program. These aircraft have been flying for over one and a half years with NASA paying all expenses for maintenance and operation.

We continue to work with NASA in other ways--including offering them our mapping camera technology, highly refined optical manufacturing techniques applicable to their Large Space Telescope project, and, indirectly the Space Transportation System.

THE FUTURE

There are several goals which the NRO should strive to attain.

First, we need to concentrate on making all aspects of our systems more reliable. The most catastrophic failures have been those associated with failure to achieve orbit, and that has occurred four times in the last four years. Reliability of spacecraft components and systems is also a major concern, and degraded performance on several missions attests to the need for attention here. Early in 1972 I ordered a study of these problems and the recommendations which resulted are in fact being implemented. But it is a long and painstaking process to achieve small added increments of reliability, and we must continue to press toward perfection.

I believe that most of our goals can be satisfied through evolutionary improvements to existing systems, rather than by revolutionary solutions. This would appear to be particularly appropriate in the face of tight budget years.

We should continue to search for new means to collect [redacted] intelligence. Toward this end we are proceeding with a project to determine the feasibility of a space-borne [redacted] satellite and have planned about a [redacted] effort for the next three years. If results are promising, the development of a [redacted] satellite may be justified in one to two years.

The NRO should continue to pursue the development of concepts which could be quickly translated into systems to meet specific needs. We have studied ideas for and determined the feasibility of small, inexpensive satellites for crisis response--satellites which could be highly survivable because their low radar cross section would make them hard to find; could be [redacted] for specific missions; and could be launched in sufficient numbers that to attack them all would be an expensive undertaking for a determined adversary. We have looked at small camera payloads mated to ballistic missile boosters emplaced in hardened silos to provide a survivable post-SIOP reconnaissance vehicle, to be flown for only a few orbits before photography is returned to the earth. These concepts are among the many which are within the realm of possibility and which should continue to be pursued if the NRP technology base is to remain viable.

The decision to proceed with the [redacted] near-real-time system was, in effect, a decision against the development of an ultra high resolution (UHR) photo satellite system; the budget simply could not have accommodated two new high-cost photo systems. In my judgment, however, the need for an UHR system ought to be periodically re-examined. In time, I feel that the value of high resolution will be reasserted and given priority. I believe that resolution of [redacted] is possible; until that kind of performance is included in the inventory, I believe the UHR question will keep coming up, and it should.

The Space Transportation System has a potential impact on the NRO, and we are studying--at a low level of effort--ways in which we can benefit from its capabilities. The NRO has not yet designed or redesigned any payload specifically for STS launches but has participated in the continuing planning for this system, including studies of design changes which would take better advantage of shuttle availability.

Finally, the NRO should continue to be involved with Strategic Arms Limitation Treaty planners and analysts for both pre-agreement assessment and post-agreement verification. Successful verification of Strategic Arms Limitation Agreements depends in large measure upon the adequcy of the National Reconnaissance Program. As analytical experience is gained within the arms limitation environment, the NRO must be ready to incorporate systematically necessary changes in collection assets to meet the need.

The last four years on balance have been highly successful for the National Reconnaissance Program. Significant new intelligence collection capabilities have been brought on-line and more are under development. The future promises to be even more productive than the past in serving the vital intelligence needs of the country.

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