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HANDLE VIA BYEMAN CONTROL SYSTEM

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

THE NRO STAFF

January 16, 1970

Dear Gene,

You asked that I write you a letter describing my views on the "Immediate Recovery" development. I interpret your request to imply a desire for a rather personal and informal statement and what follows is only that.

Through the years we have examined a number of techniques to improve the responsiveness and timeliness of systems. It is useful to mention some of these to insure an understanding of the merits of current ideas.

1. CORONA readiness: For much of the history of CORONA we have maintained a reserve of vehicles at various states of readiness (a few days from launch) to permit a quick launch on request. This capability was never used. Similarly, we have had the opportunity on several occasions, Czech and Sinai crises e.g., to return film early in the mission but it was always concluded preferable to complete the mission. Therefore, historically, the interest in crisis situations has never transcended the importance of strategic intelligence.

2. Radar: As you have observed frequently, any optical immediate recovery system is limited by Kepler, clouds and sun. One way to attack clouds and sun is radar and we conducted a test to show that a side looking radar would do at least as well in a satellite as it did in an F-4. However, the value of radar imagery for these purposes has always been questionable. We seem to agree that 30 feet resolution is not much good. Perhaps 10 feet resolution would be; therefore, we are now supporting tests using a U-2 and a high resolution

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CORONA GAMBIT HEXAGON

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radar with the idea that if the imagery proves of value in such areas as NVN or NK then perhaps we would reopen satellite questions.

3. GAMBIT film readout: Although we have examined some schemes of multiple re-entry vehicles, the film readout technique seems superior for decreasing return delay. We seriously proposed a development using GAMBIT, film readout and transmission to a single CONUS station. The idea was that a kit would be built to replace the recovery front end and that an option would be obtained to operate occasional GAMBITs in a crisis mode. Life would have been only about 30 days with growth to 60 easily and to a year with major modifications. This idea was soundly rejected. I think the main reasons were: a crisis capability to be called into action after some delay is not very useful; GAMBITs were limited by production rate then and were preferred for their high resolution role. When this program was terminated the readout gear was turned over to the Air Force and became [redacted] (b)(1) (b)(3)

At this stage we were forced to conclude that a crisis response capability was not really much needed or, at least, not worth much money in spite of some words still expressed by those who remembered Cuba painfully.

4. SPIN-SCAN: Nevertheless there was one more scheme related to crisis reconnaissance. This idea was actually developed as a response to the impressive existing Soviet anti-satellite capability. If they chose to harrass a system like HEXAGON, the expense and low launch rate would cause us to have very long periods of no coverage even if the Soviets interferred at a very low level, perhaps imperfectly assessed as hostile by us. SPIN-SCAN was a small spinning satellite which panned in mono as it spun and read out the film to CONUS. Six to nine could be launched at once to permit early search and readout before effective interception was possible. It was observed that a single satellite could be flown piggyback on HEXAGON, [redacted] give 4-5 ft resolution imagery daily of a crisis area for several weeks. The approach was very cheap; $20-40 million development and designs based on competitive studies seemed reasonable. Again there was little interest. (b)(1) (b)(3)

One obvious defect was that its use would require a decision as to what three-week period was important and in cases such as the Sinai that seemed difficult. The other defect was that by now people felt the "ultimate" system was achievable and SPIN-SCAN would be a distracting interim step. Thus, probably, died crisis response schemes and with their demise came the conclusion that an "immediate" system should be a long lived, continuous system.

The tape storage camera was started with the premise that transducer development should lead to a system design consistent with the experience obtained in previous film systems. Specifications were for image plane characteristics similar to film, storage and high data rate readout. These specifications are difficult to meet and progress is slow; however, no better technique (other than film readout) has appeared to meet those specifics and if the camera were successful a system could then be developed with confidence in performance, schedule and cost.

The solid state array system was conceived on the idea that if one accepts sensor performance which is readily achievable (at least in small arrays) the system, while difficult, is feasible based on a fortuitous set of modern advancements. These are: very large optics, LSI, high torque precision gyros, very high data rate transmission, long lived communication satellites, and high capacity digital data processing for image reconstruction. None of these things has been done as envisioned but all seem feasible. The key issue is a difficult one to me, it is not whether a few photo transistors meet specifications, but it is more what is required to obtain a reasonable basis for estimating cost, performance and schedule of the total system. Sometimes people take offense when the term "high risk" is assigned to these advanced subsystems but the meaning is that there is uncertainty in predicting the development and uncertainty in the definition of the system when most subsystems have major developments to face.

If there were an urgent need, then a film system with a year's life would be a reasonable approach and it may even be

that a realistic cost analysis would show advantages over as much as a ten-year period. I am not convinced that any such urgent need exists. If no urgency exists, it would seem prudent to develop subsystems for a solid state array system in an orderly way. It is not unreasonable to ask for some experience in real imagery obtained by a large array and fully processed to hard copy out before committing to any large engineering effort. It seems to me that the urgency assigned to this development is mostly based on a conviction that the opportunity is great and the government should commit promptly to an aggressive program. But there are many ways a program can fail, one is by large apparent cost growth caused by poor initial knowledge, another is by disappointing performance caused by arbitrary system design decisions too early in a program. These errors can kill a program even if the concept is sound and "feasible."

A major management concern is whether the overall budget will bear the addition of a new very expensive system. I am very worried that we have managed, in almost every part of the NRO, to devise a second generation system which is very complex and very expensive and very much better in capability. But in every case there is now at least some question as to whether the increased capability is worth the increased cost. We used to think that the demand for improved coverage would result in six HEXAGON launches per year. There are many now who feel that considering the great capability and cost of the system, really only two would meet essential needs. One can't help but wonder if eight CORONAs would not have been a better buy under those circumstances. Therefore, in the current situation one must search for some way to bring this new capability into being which will permit cancellation of either HEXAGON or GAMBIT. If options appear possible, they should be kept open and explored fully before any system decision is made. I feel that, even with SALT, there is a finite need for imagery which is not very far above what we now obtain.

For these reasons I am forced to be negative with regard to a system start in the next several years of the specific solid state concept now proposed. A system start of either film readout or tape storage seems unlikely, the first based

on lack of urgent need, the second on inadequate technology. During the next several years it seems that there is every reason to place highest priority on subsystem technology for the solid state. The current programs seem good although I fear that too much industry anticipation has been created and the planned growth of expenditures may be excessive. I have a hard time rationalizing the effort in the tape storage camera with the progress--work should continue but looks at photo-conductive tape and at perhaps less demanding performance requirements may be indicated. Laboratory model work, not engineering model work, is needed. With regard to film I think little effort is indicated except that a search for a plan that allows a capability to be achieved reasonably may include film readout as a high confidence start to grow as technology permits.

I apologize for all the words, my negative views are not meant as opposition to progress but rather a strong desire that we start on a plan we can realistically expect to finish--we can't stand another MOL.

Sincerely,

Lew Allen, Jr.
Brigadier General, USAF
Director

Dr. Eugene Fubini