~~TOP SECRET~~ Com - 4

HANDLE VIA BYEMAN CONTROL SYSTEM

NRP EXECUTIVE COMMITTEE
Washington, D. C.

February 18, 1971

MEMORANDUM FOR MR. PACKARD
MR. HELMS
DR. DAVID

SUBJECT: Approval of ExCom Minutes (ExCom-M-24)

I would appreciate your approval or correction to these minutes within seven days. (Telephonic approval is satisfactory. My office telephone number is OX 7-8531 or on Green, 2123.)

F. Robert Naka
F. Robert Naka
Secretary

Attachment
ExCom-M-24, BYE-12620-71

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HANDLE VIA BYEMAN CONTROL SYSTEM

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~~TOP SECRET~~

HANDLE VIA BYEMAN CONTROL SYSTEM

NATIONAL RECONNAISSANCE PROGRAM
Washington, D. C.

ExCom-M-24

NRP EXECUTIVE COMMITTEE

Minutes of Meeting Held January 29, 1971
Office of Deputy Secretary of Defense
Room 3E 928, The Pentagon
2:25 - 4:25 p.m.

Members Present

Mr. David Packard	Deputy Secretary of Defense
Mr. Richard Helms	Director of Central Intelligence
Dr. Edward E. David, Jr.	Science Advisor to the President

Others Present

Dr. John L. McLucas	Director, National Reconnaissance Office, Ex Officio
Dr. F. Robert Naka	Secretary, NRP Executive Committee and Deputy Director, NRO Ex Officio
Lt. Gen. Donald V. Bennett	Director, DIA
Mr. Robert F. Froehlke	ASD/A
Dr. James R. Schlesinger	Assistant Director, OMB
Dr. John J. Martin	Office of Pres. Sci. Advisor
Dr. Donald H. Steininger	ADD/S&T/CIA
[redacted]	NRO Comptroller

(b)(3)

ZAMAN Phase II Issue

Mr. Packard asked Dr. McLucas to begin the session.

Dr. McLucas said that the major topic for this ExCom meeting had to do with the Electro-Optical Imaging (EOI) system development as everyone had been briefed. The questions are "Should we go into Phase II?" and "If so, how fast should we proceed with it?"

~~EARPOP GAMBIT HEXAGON~~ [redacted] ~~CORONA TAGBOARD~~

(b)(1)
(b)(3)

HANDLE VIA BYEMAN CONTROL SYSTEM

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We have looked at a number of variations. At the time of the ExCom meeting in November 1970 we were awaiting the results of Phase I; we have high confidence that by the fall of this year we can have a system design to meet the requirements. The reason for meeting today is to decide whether we can proceed as planned.

Dr. McLucas said that he believed we should have a review in July and a decision in November 1971. He did not expect any surprises. The three questions which can be asked today are then

1. Are there any reasons for not proceeding into Phase II?

2. What should the program be in Phase II?

3. How does the decision affect alternative systems?

Dr. McLucas said that he believed we can produce the Film Readout System (FRO) for half the cost of EOI plus the Data Relay Satellite (DRS). These two cost about [redacted] over the next five years. FRO would cost about half that. The Tape Storage Camera (TSC) system is not far enough along at present to be able to discuss it. However, it might be in November. He believed that studies and experiments should be continued to determine the system's reliability in space. On the other hand, the FRO technology has been demonstrated and we need only more firm scheduling information. (b)(1) (b)(3)

Dr. McLucas asked what has changed on EOI in the last one and a half years, rhetorically. First, we had a presentation by Dr. Land and a review by the Fubini Committee; now we have two satellites instead of one as was earlier thought to be adequate. The system has more growth potential. It also has the possibility of replacing one of our present systems. For instance, we are talking about a resolution equaling that of our best system, an [redacted] seems to be possible, as does [redacted] photography. He said that, overall, he was impressed with the magnitude of the project. (b)(1) (b)(3)

What then should he recommend? Since he feels that there will be no surprises, he believed that we should continue with the work, proceeding as planned. He agreed with the CIA that three contractors should be funded for the Phase II imaging satellite effort. He believed we should go into Phase II but not speed things up (to a September decision) particularly since there may be some changes in requirements. We find we can handle the cases examined but we are not sure yet that we have examined all possible cases. The situation is like trying to shoot at a moving target.

Dr. McLucas said he felt confident that the EOI was a viable system that could do all the things we had asked of it to date. He did not want to be rushed on a systems start. He would like to hold costs at the present level and not have them climb rapidly. He would propose that we continue the studies on the backup systems. Dr. McLucas proposed that a decision be made in November on system acquisition.

Dr. David said that Dr. McLucas had mentioned growth and inquired if that included increased resolution. Dr. McLucas replied that resolution probably can be increased but he is not sure exactly how that would be done. For example, the aperture could be increased to [redacted] or we could fly the satellite at a lower altitude. Mr. Packard inquired whether the detector size could be improved and Dr. McLucas replied that the present size of [redacted] might be improved. Then Dr. David inquired about signal-to-noise ratios, saying that if the area of the detector were lower the signal-to-noise ratio could be lowered. He asked the advantage of higher signal-to-noise ratio. Dr. McLucas replied that the satellite could be operated at higher latitudes in winter, also one could see more in the shadows. He said that the good pictures are not affected but the poorer ones are. Dr. David was not sure how GAMBIT operated and asked if an exposure control was involved. Dr. Naka replied that there was a slit to optimize film exposure since the range of the scene brightness exceeds the dynamic range of film. (b)(1) (b)(3)

Mr. Packard said that EOI was a large program and that we had funding and technical reasons to spread the project to 1976. There was a question of doing interim things which was the issue as he saw it. He asked Dr. McLucas whether he planned any discussion on this subject. Dr. McLucas replied that he had planned to discuss this subject because of the increasing interest on crisis reconnaissance in the community. He referred to a letter from Secretary of State William Rogers. Dr. McLucas asked what is the influence of interim systems on EOI. If, for example, we proceed to acquire SPIN SCAN it would take money from EOI in the NRP budget because it is the only money set aside for developments in this area. Further, our predictions of costs involved in HEXAGON and [redacted] development turned out to be low by factors of two or three. At the (b)(1) (b)(3) beginning, we estimated that HEXAGON would take three years and now it is taking five. [redacted] noted that the program plan had been from October 1966 to March 1969 (first launch)--a period of 29 months. At the present time, it is 53 months. Mr. Packard noted that there was supposedly no new technology in HEXAGON whereas there was new technology in EOI. (b)(3)

Mr. Packard then asked that we address Phase II EOI again. Dr. David said that he wanted to make firm what Phase II is. He inquired whether it would result in a firm system design. Dr. McLucas replied that Phase II would produce a firm system design, firm costs, more accurate estimate of system performance, full-scale sensor arrays, and demonstrated [redacted] for example. (b)(1) (b)(3)

Dr. David inquired about the table which Dr. Naka had passed out. Dr. McLucas asked Dr. Naka to respond. Dr. Naka said that the table was an abstract of the data which accompanied the agenda for the ExCom meeting. It was not as thorough as he would like to see it but he was chairing a group which was attempting to evaluate the parameters in more detail. For example, under response time there was the time to task, the time from tasking to access, the time from access to delivery of the photographic data, the time for processing, and the time for interpretation, etc. Under costs, it was not yet possible to list the appropriate parameters. There were various costs to be considered such as the cost per day, the cost per year, the cost per mission, the cost per target, and the cost per unit area covered.

Mr. Packard asked about the costs of FRO. [redacted] replied that the estimated five-year cost from FY 1971 through FY 1976 was $435M. In a comparable period, EOI plus DRS was [redacted] as estimated by CIA. Mr. Packard then observed that FRO would cost a little less than $100M per year. Dr. McLucas pointed out that the estimated development cost for SPIN SCAN was $55M as he recalled. [redacted] clarified that by saying SPIN SCAN cost $48M for development, $6M for one vehicle, or $22M for four vehicles. This leads to an estimated five-year cost of $147M. This cost was predicated on a February 1971 go-ahead. Mr. Packard said SPIN SCAN looked like the best system analyzed. Dr. David inquired which one of several SPIN SCANs was being talked about. Dr. McLucas said his favorite version was to launch one in [redacted] (b)(3) (b)(1) (b)(3) (b)(3) (b)(1) (b)(3) it as required; then we would need others, so maybe we would need four. General Bennett said his version was if one were left in a given quarter-year period to expend it and go on to the next one. In response to a question, Dr. Naka replied that the three-foot resolution shown for SPIN SCAN was for 90 nm altitude which could not be sustained for more than a few weeks because of atmospheric drag.

Mr. Packard said that another approach was to use what we had. He asked what CORONA cost. Dr. McLucas replied that CORONA cost about $15M per launch and GAMBIT cost about $35M. He noted that the more we buy per year the cheaper each one would be. [redacted] expanded on the point by saying that (b)(3)
two CORONA vehicles cost $40M, or $20M apiece; three cost $53M, or about $18M apiece; and six cost $93M, or about $15M apiece. Mr. Packard inquired about putting more recovery vehicles on CORONA and Dr. McLucas replied that it could be done. Mr. Packard observed that we should examine CORONA versions versus SPIN SCAN.

Dr. David inquired about the cost to keep CORONA in stand-by one day from launch. [redacted] replied that it would cost about $17M per year and that the subject will be reviewed at the July ExCom meeting. We used to hold CORONA at R -15 but we are now holding it at R -25 for reasons of economy.

[redacted] said we ought also to consider the impact (b)(3)
of longer life vehicles as Mr. Packard had implied earlier. Dr. McLucas referred to the meeting when he briefed Secretary Rogers and said that he had been asked why there could not be a satellite in orbit every day of the year. Dr. McLucas said he had replied that it took money, like
[redacted] per year. Dr. David said that once we bring down a (b)(1)
bucket we lose that capability and it does not help to have (b)(3)
the satellite in orbit. Dr. McLucas replied that the case Dr. David was describing was different from the one Secretary Rogers was inquiring about. To bring down a bucket every day required a near-real-time system. Dr. David felt that we ought to find out the value of every-day coverage because it was expensive. Dr. McLucas pointed out that Lockheed had proposed a so-called "six-pack" where we could bring back a bucket each day for a few days at least. Mr. Packard felt that a number of things needed to be explored. Both Mr. Helms and Dr. David felt that some of the interim systems should be examined. Mr. Helms added that there were two paths and we should follow both. Mr. Packard went on to say he thought SPIN SCAN looked the most attractive but he would like to

examine the six-bucket CORONA or GAMBIT. Mr. Helms said he would like to feel we had examined all these options.

Mr. Packard said that the second question and the more difficult one was whether we were going to continue with three approaches, namely EOI, FRO, and Tape Storage Camera (TSC). He said FRO looked straightforward. Everyone agreed. (b)(1)
Dr. McLucas concurred and said that through Lunar Orbiter and (b)(3)
[redacted] the system had been demonstrated. Mr. Packard noted that the TSC had more uncertainty and that we should consider whether we wanted to put all our funds on EOI. He inquired about the status of the budget. [redacted] explained (b)(3)
the EOI Phase II schedule with three contractors as noted on his table. For Option 3 of Phase II system definition, FY 1971 required [redacted] including technology through November 1971. System acquisition in FY 1972 was estimated at [redacted] The President's (b)(1)
budget had earmarked [redacted] The FRO system Configuration I (b)(3)
required \$2.2M in FY 1971 already funded and \$54.6M in FY 1972. Mr. Packard asked for the comparable costs for TSC and Dr. McLucas replied that those figures were not yet available from the studies. Mr. Packard inquired what money had been set aside in FY 1972 for FRO and TSC. Dr. McLucas replied that nothing had been set aside. A total of [redacted] had been budgeted. This is shown for EOI with the intent of making adjustments to EOI budgets if we needed to carry the backup systems into FY 1972. Dr. David then inquired if we decide to buy an interim system did that reduce the funding for EOI. Dr. McLucas replied that it reduced either EOI or some other program. Mr. Packard said: "Either that or Dr. Schlesinger provide more money." Dr. McLucas said that he would like to think there would be no irrevocable decisions and that he would like to look to next November for the "crunch date." Dr. David agreed that there should be no irrevocable decision, that the correlation of requirements and system design would affect the decision.

Mr. Packard was bothered that the quickie systems took only two years whereas the FRO took three years to develop. He felt that the quickie systems were better. Dr. McLucas pointed out that the FRO cost more. Dr. David inquired what would be required to make SPIN SCAN have better resolution like FRO. Dr. McLucas responded that SPIN SCAN could be made better by adding weight and cost. Mr. Packard said he would like to take a hard look at FRO, then if we needed interim systems to look at those. Although FRO competes with EOI, he likes FRO because it could provide an interim system in three years and a backup to EOI. Dr. David inquired whether TSC had the capability of replacing FRO and Dr. McLucas said it did. Dr. David believed tape had better signal-to-noise ratio than film. Dr. McLucas said it also had better life capability. He said he had visited CBS a couple of days ago and everything looked rather good.

[redacted] pointed out that Option 3 involving three contractors would commit up to [redacted] from July through November. Dr. McLucas added that he wanted to be sure we did not start escalating the effort so that it could not be controlled. Mr. Packard inquired why three contractors were selected instead of two. Dr. McLucas replied that, although [redacted] was third, it had done a good job and was an experienced space company.

(b)(3)
(b)(1)
(b)(3)

Mr. Packard inquired of the principals whether there were any objections to keeping three contractors. Mr. Helms replied he thought it desirable. Dr. David said he had only objected to the shorter time which had been proposed for Phase II. Mr. Helms proposed that we agree on Option 3 as shown. Mr. Packard said he agreed and that we should try to have a hard look at FRO, keep TSC at a low level, and take a hard look at SPIN SCAN or FRO for interim capability. Dr. David inquired what the decision times were. Dr. McLucas replied that the major decision would occur in November which would be followed by a three-year acquisition program. Mr. Packard inquired if we made a decision now what interim system would be obtained and Dr. McLucas replied that we did not have any designs at the moment. Dr. David wondered if we should start a design now. Mr. Packard asked Mr. Helms if he had any objections to that idea and Mr. Helms said "No." Dr. David observed that in November EOI would have a firm design and wondered if there should not be another approach, that way we would be sure to have a good design. Dr. McLucas assumed that new data would be fed to the contractors immediately; however, he felt that no major change would occur. If there were one, we, of course, would have wasted money. Dr. David said he is worried about these changes. The requirement earlier had been one hour reporting time whereas it is now less than twelve hours. This kind of change could affect the relay satellite. It might be possible to store the data instead of relaying it. Another change is the idea of an area requirement. Mr. Packard responded by saying that the trouble with storage is we now cannot accomplish it electronically. If we must store, we must use film, which leads us to the FRO system. Dr. McLucas added: "Or to the TSC." Mr. Packard continued that bandwidth was important on EOI and he cannot see how storage could be accomplished. Dr. David was worried that a sensor satellite without storage was the right approach. Mr. Packard reiterated that he did not see how it could be accomplished and Dr. David said that he was not suggesting it could be. Dr. McLucas pointed out that Dr. David was really saying we were "trying to hit a moving target." Mr. Packard said EOI was the earliest way to handle the problem although there were trade-offs. If we were going to pay for near-real-time capability, he believed we ought to go all the way. Dr. David inquired then why the EOI system. Mr. Packard said the question was hard to answer. If we did not need near-real-time readout then we should go to the Film Readout system. Dr. David reiterated that he could not believe the present requirement. Mr. Packard said he could not disagree completely, that he could not debate the need for one-hour return of data. However, the system was within reach so we should try to obtain it. Mr. Helms said he agreed with that position completely. Dr. David asked why the design should be frozen now. Mr. Packard said he did not disagree with that but Dr. David pointed out that Phase II was to freeze the design. Dr. McLucas said Phase II will do more than that. He said the real question is whether to have an option of buying a system. Dr. David felt we wanted more, we wanted an option of what to buy. Dr. McLucas agreed with this point. Mr. Packard went on to say: "Somebody should give us a better answer on what to buy." He agreed with Dr. David that we needed to look at a wider range of options in November and keep things open. Dr. Schlesinger asked if we wanted to wait until November to consider the result or have an interim progress review. Dr. McLucas said we need not wait, we could call for a special meeting when we were ready. Dr. Schlesinger also inquired whether the B version was being abandoned. It was not very appealing but, if it was going to be forgotten, it should be done explicitly. Mr. Packard felt the B version should be abandoned. Dr. Steininger inquired about instructions which he should give to their contractors. Mr. Packard responded that three contractors should be permitted to proceed on the imaging satellite for Phase II but be subject to modifications. Dr. Steininger said he assumed Configuration A was being selected. Mr. Packard replied that we needed to look at all systems. We must have Configurations A and B and any other alternatives. We should not get frozen. Dr. David felt we must keep feeding COMIREX changes to the contractors. Mr. Helms, Mr. Packard, and Dr. McLucas agreed.

Dr. McLucas said he wanted to make sure the slope of the dollar funding to the contractors is zero. Dr. Schlesinger inquired when, and Dr. McLucas replied in the next couple of months. Dr. Schlesinger said he inquired because the President keeps talking about a readout system.

Mr. Packard asked for a progress report in about two months. Dr. David said he liked that and Mr. Helms said sure. Mr. Packard observed that EOI was an important program and expensive so we must keep an eye on it.

Crisis Reconnaissance

Mr. Packard asked Dr. McLucas to continue with the agenda. Dr. McLucas said there were several other matters to take up. One, we were in a period of transition. We have Dr. Cline of the State Department stirring the water on crisis reconnaissance and we have the letter of Secretary Rogers to Mr. Helms. Mr. Packard suggested he might write a letter to the State Department that there was nothing possible in the photographic area for the next three years except launching more of the satellites in the present inventory. Dr. McLucas pointed out that he had written a letter to Dr. Kissinger on this subject but had had no response and was not even sure Dr. Kissinger had read the letter. Dr. David said that Dr. Kissinger had read it.

Dr. McLucas continued that Dr. Cline also says the classification of the photographs is too high. He would like an unclassified photograph which he could take to the U. N., for example. Dr. McLucas pointed out that he had proposed giving left over CORONA vehicles to NASA for unclassified work. Mr. Packard asked that Dr. McLucas not be too quick about that and to refer the matter to Mr. Helms. Dr. Steininger pointed out that for crisis reconnaissance, resolution better than that obtained from CORONA was usually necessary, hence CORONA was not satisfactory.

Data Relay Satellite (DRS)

Dr. McLucas opened the subject by saying that when the white Air Force was given the DRS program we were all convinced that it could be multi-purpose; for example, Program 647 was thought to be a candidate user. The Air Force study reviewed [redacted] satellite. The (b)(1) (b)(3) [redacted] appealed to Dr. McLucas although the [redacted] was recommended by the SPO. Since Program 647 can relay between its own satellites, the principal conclusion was that the DRS be dedicated to EOI. Assistant Secretary Grant Hansen says he is reluctant to go to Congress to support a dedicated relay satellite for EOI in a white Air Force program. On the other hand, SAMSO wants to continue the program and is studying ways in which it can be accomplished. Mr. Packard asked Dr. McLucas if the cost of the relay was in the NRP and he replied that it was not. However, the [redacted] required was briefed as a cost related to EOI. Mr. Packard asked if the DRS should not be a black program and Dr. McLucas said it should if we finally agree that it is a dedicated (single user) system. Mr. Packard felt that it would be a simple matter because putting the program into the NRP would not change the Air Force budget. Dr. McLucas said it was not as simple as that because Secretary Seamans and General Ryan, to name a few people, would object. Mr. Packard felt this was an internal DOD problem. Dr. McLucas replied that he was not looking for a decision but rather only wanted to keep the ExCom informed. [redacted] felt it was too late to change the budget for FY 1972. Dr. McLucas was not concerned about FY 1972 but he was concerned about the larger amounts required for acquisition later on. Dr. Schlesinger asked if [redacted] (DRS) would be out of phase if the EOI program were slowed down. Dr. McLucas replied that we are keeping the two programs in phase. Mr. Packard wondered whether it would not be possible to combine various functions with the DRS. Dr. McLucas felt it could be done but it seemed better not to do so for this application. In response to Mr. Packard's question of there being a great deal of dead time in the DRS, Dr. McLucas replied that for [redacted] pictures a day at 10 seconds each there would be a great deal of dead time. Mr. Packard suggested that the situation be re-examined. Dr. McLucas responded that Program 647 was not a good program to multiplex with the DRS because of the 24-hour a day operational requirement. At the present time, the TACSAT and the DCSP are not fully loaded; likewise he is not sure that the DRS can be fully loaded.

(b)(1) (b)(3) (b)(1) (b)(3) (b)(3) (b)(1) (b)(3)

PINE RIDGE

Dr. McLucas continued that two years ago there was a drone program called SANDY HOOK. It had a 30-foot wing span, flew at 120,000 feet, and had interesting characteristics among which was that it cost $500M to develop. Thus the ExCom decided not to proceed. Air Force funding was terminated. As a consequence the contractor, Ryan Aeronautical Corporation, approached the CIA for a continuation. The present thinking is to build a one-third scale version producing a radar cross-section one-tenth that of SANDY HOOK flying it lower with a developed engine and bringing the total cost down to one-tenth. Dr. McLucas said he had considered spending $250K to $500K to find out if it were possible to build a .001 square meter cross-section drone complete with camera window. Spending this small amount posed no problem. However, he wanted to assign the program to the organization which would operate the drone. Neither the CIA nor the Air Force will be affected immediately by the choice but it may have a long-term effect. His choice was to assign the program to the Air Force. He asked what the ExCom's opinion was. Mr. Packard asked what the principal use would be and Dr. McLucas replied photographic. Dr. Schlesinger inquired why we needed a drone when we were going to have EOI.

Mr. Packard said that he was not sure we can obtain permission from the 40 Committee to operate the drone over denied territory. A good example is the TAGBOARD program. Mr. Helms said that he was not enthusiastic about PINE RIDGE, not only was there a policy question of its use but he would question what it could be used against. Mr. Packard said that it was not a question of radar cross-section, it was a question of reliability. After all, the drone might come down in Peking. Dr. McLucas noted that such circumstances had a finite probability--an Army general flew into Russia recently in a manned aircraft.

Mr. Packard said that we needed drones to replace manned aircraft but not to overfly Russia. Mr. Helms commented that any money we had should be put into TAGBOARD to make it work. Dr. McLucas did not want to push the matter if the ExCom were unenthusiastic about PINE RIDGE. He would ask the Air Force to study it for tactical applications. Mr. Packard asked if Dr. McLucas was referring to the white Air Force. Dr. McLucas replied that he was. Mr. Packard said: "It is yours."

[redacted]

(b)(1)
(b)(3)

each other. Nevertheless, the Soviets could be developing a capability to shoot down one of our reconnaissance vehicles. [redacted] The NRO is convening the Interdepartmental Contingency Planning Committee shortly to produce a policy position. The reason for bringing the subject up to the ExCom was that Mr. Helms, Dr. McLucas, and Dr. Naka had had a conversation on this subject and Mr. Helms had suggested a presentation at the ExCom meeting.

(b)(1)
(b)(3)

Mr. Packard felt that if the Soviets shot down one of our satellites it would be an act of war. Mr. Helms commented that Dr. Naka was correct in taking the matter up with the ICPC. For the information of ExCom, Mr. Helms said that his opinion is that the GAMBIT vehicle must be [redacted] because the President would be put in an embarrassing position if the Soviets shot down one of our satellites. We should learn from the Pueblo incident.

(b)(1)
(b)(3)

Dr. McLucas replied that we must estimate the intent of the Soviets: What should we do if the Soviets only come close? Mr. Helms replied that if they come close that does not create a war. In fact, the Soviets are doing that all the time in other areas of our relations. The abrogation of the Mid-East cease-fire is a good example where the Soviets dared us to take any overt action. Mr. Helms said he did not look forward to going into the cabinet room immediately after the Soviets had shot down one of our reconnaissance satellites. He would, therefore, [redacted]

(b)(1)
(b)(3)

Dr. David inquired what would happen if we allowed the Soviets to shoot down one of our satellites. Mr. Helms replied that it would be hard to believe it was accidental. He made a plea that we get all arguments ready so the NRO can act with proper instructions.

Mr. Packard noted that our own anti-satellite system (437) is half-baked. Dr. Schlesinger pointed to the need for cheap satellites. Mr. Packard commented that this also raised the question of relying on satellites for war-time reconnaissance. Mr. Helms noted that the Pueblo did not cost much money but caused a great deal of trouble.

Status of HEXAGON

Dr. McLucas asked Dr. Naka to brief the ExCom. Dr. Naka reported that the entire development vehicle is mated at Vandenberg Air Force Base and is undergoing launch pad validation checks. Test completion is expected on March 10. The first satellite vehicle is expected to be shipped to Vandenberg AFB on March 23 and mated with the booster. Launch is projected for not earlier than April 9.

Dr. Naka then employed a launch schedule chart to show the consequences of a first launch of HEXAGON on April 9. He pointed out that one and a half years ago the last CORONA launch was scheduled for November 1971. The schedule had now been carefully stretched for the last CORONA launch to be in March 1972 and a GAMBIT Higherboy kit to obtain CORONA resolution photography is being developed for the earliest possible launch in November 1971. The Higherboy flight is tentatively scheduled some time after the last CORONA. It is apparent then that there is a year's overlap in search coverage.

Reviewing the confidence of the launch on April 9, the situation is as follows. In the last ten working days, ten days' work has been accomplished. On the other hand, in the last 100 days, only 50 days' work has been accomplished. Putting these facts together, Dr. Naka estimated the first launch would occur about May 10, 1971.

Dr. David asked about buying more CORONAs and also asked if it was not already too late to do so. Dr. Naka replied that the best time for ordering CORONAs was last fall but an order today would provide CORONAs, at best, 18 months from now which would not be too much of a gap. Mr. Helms felt the programs were being managed properly and the appropriate place for any additional money would be in the HEXAGON program. Mr. Packard asked Dr. David how he felt about the overall situation and he replied that he felt better about it. Mr. Packard suggested that we let the matter stand until the April launch date. Dr. David inquired again what kind of gap we could stand and Dr. McLucas said that if HEXAGON shows great difficulty, we would stretch the CORONA launches from 3- to 4- month centers.

The meeting was adjourned.

F. Robert Naka

F. Robert Naka
Secretary

~~TOP SECRET~~

CONTROL NO. Bye-12562-71

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[redacted]							

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Com-4

Handle Via Indicated Controls

BYEMAN

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HANDLE VIA BYEMAN CONTROL SYSTEM

NATIONAL RECONNAISSANCE PROGRAM

Washington, D. C.

January 27, 1971

NRP EXECUTIVE COMMITTEE

AGENDA

Office of Deputy Secretary of Defense
Room 3E 928, The Pentagon
Friday. January 29, 1971
2 - 5 p.m.

1. ZAMAN Phase II Issue

   A. Scenarios
   B. Results of Source Selection
   C. Status of Film Readout and Tape Storage Camera Systems Studies

If time permits, the following will be discussed:

2. PINE RIDGE Drone

3. GAMBIT [redacted] Capability (b)(1) (b)(3)

4. HEXAGON Status

F. Robert Naka
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Secretary
NRP Executive Committee

Attachments
Background Material: EOI,
Film Readout and TSC,
SPIN SCAN, FASTBACK, AXUMITE,
[redacted] CORONA (R -1), GAMBIT (b)(1) (b)(3)
HEXAGON

CORONA GAMBIT HEXAGON

HANDLE VIA BYEMAN CONTROL SYSTEM

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ELECTRO-OPTICAL IMAGING

The Electro-Optical Imaging (EOI) system initial system definition effort was completed in December 1970. The final part (Phase II) of system definition is scheduled to begin in February 1971 and last through early FY-1972. The following comments and description refer to the system design resulting from the Phase I definition effort as recommended by the EOI program office.

The system is configured to return imagery in [redacted] via relay satellite to a [redacted] ground station. Some of this imagery is to be available for viewing within [redacted] of acquisition. The imaging satellite near-polar orbits are to be elliptical with a perigee altitude of 188 NM and an apogee altitude, yet to be selected, of 283 to 424 NM. The ground sampled distance (GSD) varies with altitude, with the best value being [redacted] The nadir frame size varies similarly with the smallest frame, about 2 NM on a side, corresponding to the [redacted] GSD.

(b)(1)
(b)(3)

[redacted] imaging satellite system can obtain [redacted] frames per day total with some stereo coverage. Imaging satellite design life is [redacted] with an expected useful life of [redacted] Availability is presently planned to be April-June 1975.

(b)(1)
(b)(3)

ELECTRO-OPTICAL IMAGING

Cycle Times:	
Tasking Decision Through Target Acquisition	[redacted] to one day
Data Acquisition Through Imagery Viewing	
Operational Lifetime	[redacted]
Representative Orbit	188 X 283 to 424 NM elliptical
Ground Sampled Distance (Best)	[redacted]
Frame Size (Minimum)	2 X 2 NM
Capacity: Per day	[redacted] frames (some stereo)
Earliest Availability	April 1975

(b)(1)
(b)(3)

FILM READOUT AND TAPE STORAGE CAMERA

The Film Readout System (FRO) and the Tape Storage Camera (TSC), presently under study by the NRO, are being designed to use the GAMBIT-3 R-5 (175 inch focal length) optical subsystem. With the FRO approach imagery would be recorded on film, developed on-board, stored, and later scanned by a laser to produce a video output signal. With the TSC approach, a somewhat more advanced concept, the camera would convert a photon image to an electron image which would be stored on tape and later read out by a scanning electron beam to produce the video output signal.

A number of data return options are available for either approach. A relay satellite could be used but would not be required. Direct readout to a [redacted] ground station would accommodate 400 frames (three-by-three nm) a day from a two-satellite system with image return times ranging from one to twelve hours. Readout also could be accomplished by existing ground stations (with modification) to decrease the image return times. Use of a high latitude ground station with subsequent retransmission to Washington, D.C. would provide data return times on the order of one to two hours. (b)(1) (b)(3)

Either system would provide monoscopic coverage (stereo on demand) and, if operated in a 170 nautical mile circular orbit, normally would produce nadir strips three nautical miles wide and of arbitrary length, and with a ground resolved distance (GRD) of two feet. Both systems would have alternative strip widths--5.8 nautical miles for the FRO and 8.75 nautical miles for the TSC--which could be used as necessary. Expendables for two-satellite systems (including film for the FRO system) could support operations for two years at the daily rate of 400 three-by-three nautical mile images.

Earliest availability of an FRO system would be approximately three years from contract initiation. The TSC system could be available approximately three years after camera demonstration (anticipated during late CY 1971).

FILM READOUT AND TAPE STORAGE CAMERA

Cycle Time:	
Tasking Decision through Target Acquisition	1 hr to 1 day
Data Acquisition through Imagery Viewing	1-12 hours
Operational Lifetime	2 years
Representative Orbit	170 nm circular
Ground Resolved Distance	2 ft (nadir)
Swath Width	
FRO	3 or 5.8 nm
TSC	3 or 8.75 nm
Swath Length	Variable
Capacity: Per Day	400 frames (two-satellite systems)
Earliest Availability	
FRO	3 yrs
TSC	4 yrs

SPIN SCAN

The proposed SPIN SCAN system was the subject of four studies (two funded) which were completed in mid-1969. Due to lack of interest at that time, the SPIN SCAN concept was not funded for system definition.

The term "SPIN SCAN" presently is used to describe a family of satellite designs characterized by spin stabilization and a panoramic mode of image acquisition resulting from this spin. In a typical design the spacecraft would be orbited as a piggyback payload. Once on orbit it would separate from the host payload, and go into "storage" in a 200 nautical mile circular orbit where it could remain dormant for up to one year. During this time it could be called up and transferred into a lower elliptical orbit selected on the basis of specific mission requirements.[1]

Imagery would be acquired on film which would be processed and stored on board the satellite. Later this stored imagery would be scanned by a laser and the video output signal would be passed to a ground station for retransmission to Washington, D.C. Tasking (including initial call-up) through imagery-availability-times would vary between about four hours and 36 hours with a probable mean cycle time of less than one day. Active satellite life after call-up would range from about three weeks upward depending on the orbit, and the rate of film use.

Monoscopic ground resolved distance would vary between 2.4 and five feet at nadir, depending upon the orbit selected. The camera would acquire imagery between plus and minus 45 degree obliquity limits, or any combination of the four 22.5 degree segments therein. Using the maximum obliquity limits, a swath 180 nautical miles wide could be accessed from a height

1. A probable range of operational perigee altitudes would be 72 to 150 nautical miles.

of 90 nautical miles. The data link is sized to transmit about 14,000 square nautical miles of imagery per day from this altitude to a single ground station.

Earliest system availability from go-ahead would be approximately 24 months.

SPIN SCAN

Cycle Time:	
Tasking through Target Acquisition	3 hrs to 1 day
Data Acquisition through Imagery Viewing	< 1 hr to 12 hours
Operational Lifetime:	
Dormant	1 year
Active	3 weeks and up
Representative Orbit:	
Dormant	200 nm circular
Active	72-150 nm perigee (elliptical)
Ground Resolved Distance (mono)	2.4 ft (nadir-72 nm alt) 3.0 ft (nadir-90 nm alt) 5.0 ft (nadir-150nm alt)
Swath Width/Length	12 x 180 nm (90 nm alt)
Capacity: Per Day	14,000 nm^2 (90 nm alt) 40,000 nm^2 (150 nm alt)
Per Mission	180,000 nm^2 (90 nm alt) 505,000 nm^2 (150nm alt)
Earliest Availability	24 months

FASTBACK

The FASTBACK concept was developed independently by a contractor and was submitted to the NRO for evaluation. This proposed system is based on recoverable, reusable panoramic photo payloads launched with surplus refurbished MINUTEMAN I boosters. A typical mission would involve launch warning (at least 4.5 hours prior to launch), final target selection (at least three hours prior to launch), launch from Johnston Island, nine to ten hours in orbit, East Coast recovery and film processed and ready for viewing - all within a cycle of less than 24 hours. The system would be capable of four to nine revolutions per mission flying in an elliptical orbit of 65 x 300 nautical miles. Targets could be overflown on three to seven of these revolutions and orbits could be optimized to obtain double coverage of 10-15 target groups. The system would be capable of approximately 3.5 foot ground resolved distance at nadir and could provide stereoscopic coverage[1] of 10,000 nautical miles along track with a swath width of 130 nautical miles. Earliest availability would be approximately 24 months from go-ahead.

1. An alternative approach using a heavier camera together with a higher energy injection motor could produce 2.5 foot monoscopic coverage at nadir.

FASTBACK

Cycle Time: Launch Warning through Imagery Viewing	19-24 hours
Operational Lifetime	6-15 hours (on orbit)
Representative Orbit	65 x 300 nm
Ground Resolved Distance (stereo)	3.5 ft (nadir)
Swath Width/Length	130 x 10,000 nm (max)
Capacity: Per Day/Msn	1,300,000 nm^2
Earliest Availability	24 months

AXUMITE

The AXUMITE concept was developed independently by a contractor and was submitted to the NRO for evaluation. The proposed system consists of a panoramic photo satellite payload and associated boosters. The entire vehicle would be launched from an F-4 aircraft, and the film capsule could be recovered in the Atlantic or Pacific with tasking through imagery-availability times ranging between 15 and 24 hours. The vehicle would fly between three and nine elliptical orbits with a perigee of approximately 85 nm. The maximum imaging run would be about 1000 nautical miles long with from five to seven foot monoscopic ground resolved distance (nadir) at 85 nautical miles. Cross-track coverage would be approximately 150 nm. Earliest availability would be approximately 24 months from go-ahead.

AXUMITE

Cycle Time: Tasking through Imagery Availability	15-24 hours
Operational Lifetime	6-15 hours (on orbit)
Representative Orbit	85 nm perigee (elliptical)
Ground Resolved Distance (mono)	5-7 ft (nadir)
Swath Width/Length	150 x 1000 nm (max)
Capacity: Per Day/Msn	150,000 nm^2
Earliest Availability	24 months

(b)(1)
(b)(3)

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(b)(1)
(b)(3)

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CORONA (R-1)

The CORONA system, which consists of a panoramic photo satellite with two recovery vehicles, is being phased out as an operational search system. The capability exists to procure additional hardware and maintain a CORONA at an R-1 status. This would involve hiring another launch crew and reopening a second launch pad. The R-1 status would be alternatively maintained at each launch site on about a three week cycle. Mission times could vary from a minimum of three days to a maximum of 21 days based on the assumption of one day (R-1) on pad, one day on orbit to include recovery, and one day for processing and interpretation. The average operational life of 19 days could provide a second recovery vehicle as soon as the second day after launch or as late as 19 days after launch. The system provides a 6 foot stereoscopic ground resolved distance (nadir) and a swath of 8.0 x 124 nautical miles while flying an elliptical orbit with an 85 nautical mile perigee. Total mission capacity at this altitude is about 7,000,000 nm^2 gross coverage. Orbits with perigees between 80 and 120 nautical miles can be flown with resulting variations in resolution and coverage. Earliest availability involving new procurements would be approximately 20 to 24 months.

CORONA (R-1)

Cycle Time: Launch Warning through Imagery Viewing	3-21 days
Operational Lifetime	1-19 days
Representative Orbit	85 nm perigee (elliptical)
Ground Resolved Distance (stereo)	6 ft (nadir)
Swath Width/Length	8.0 x 124 nm
Capacity: Per Msn	7,000,000 nm^2 (gross)
Earliest Availability	20-24 months (new procurements)

GAMBIT

Operational Lifetime	18-30[1] days
Recovery Vehicles	2
Representative Orbit	75 x 240 nm (Elliptical)
Ground Resolved Distance: 160"FL (Stereo)	[redacted] 12" (nadir-96 nm alt)
175"FL[2]	[redacted] 12" (nadir-124 nm alt)
Swath Width: 160"FL	3.7 nm (72 nm alt)
175"FL[2]	3.4 nm (72 nm alt)
Swath Length	Arbitrary
Capacity: CY 70 Ave. Per Msn	17,000 tgts 10,000 frames

(b)(1)
(b)(3)

1. Present mission lifetime is 18 days. Thirty day life is programmed for late 1972.

2. Present missions utilize a 160 inch focal length optics. A 175 inch focal length optical system will be introduced in mission number 4332 scheduled for the summer of 1971.

HEXAGON

Operational Lifetime	30 days
Recovery Vehicles	4
Representative Orbit	82 x 144 nm (Elliptical)
Ground Resolved Distance (Stereo)	2.5' (nadir-82 nm alt)
Swath Length	8.4 nm (82 nm alt)
Swath Width[1]	44-294 nm (82 nm alt)
Capacity Per Msn (Stereo)	20×10^6 sq nm gross

1. Swath widths across track vary dependent on the scan sectors which vary from 30 to 120 degrees.