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HANDLE VIA BYEMAN CONTROL SYSTEM

~~(S)~~ NATIONAL RECONNAISSANCE OFFICE

WASHINGTON, D.C.

THE NRO STAFF

MEMORANDUM FOR MR. PLUMMER

SUBJECT: HEXAGON Program Plan

SAFSP's Block IV HEXAGON briefing on 24 June and the recently completed Search Performance Study (SPS) form the basis for the following review of HEXAGON planning. Each of the major planning factors--Block IV, launch rate, rewind, ultra ultra thin-based (UUTB) film, readout (RED SHIRT), and Space Transportation System (STS)--are summarized below, with supporting discussions at the TABS. Of these points, only the camera competition for Block IV requires a decision now; the other points are provided for your information.

Block IV

Because program termination or major modification for STS is likely for FY 84 or 85, the Block IV HEXAGON buy, if any, should incur only those development costs which can be amortized in two or three years at one vehicle per year. Therefore, SAFSP should be directed to give no further consideration to a funded competition for the Block IV camera.

Launch Rate

The results of the SPS indicate that HEXAGON launches should be spaced so that the maximum gap between missions is 90 days until KENNEN IOC, 120 days until KENNEN has a search capability (1979) and 180 days thereafter. The most favorable back-up posture consistent with budgetary restrictions should be maintained. A launch plan incorporating these features is compatible with a further slip of the current delivery schedule. Increasing the launch rate in FY 78-81 may increase the total program cost through Block III by $15-30M, while Block IV procurement could be slipped by approximately six months.

Commitment to another HEXAGON schedule stretch can be delayed until July 1976, when the status of KENNEN IOC will be much better known. No decision is required at this time.

HEXAGON KENNEN

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Rewind and Ultra Ultra Thin-Based (UUTB) Film

Achievement of the film load studied in the SPS requires both full rewind and use of UUTB by SV-13. The impact of not providing these film supply increases on the results of the SPS is small, as the limiting factor in that study was the gap between missions, not total coverage. The results of SAFSP's efforts to evaluate the use of UUTB (to be complete in April 1976) and efforts to reduce contaminants to a level compatible with rewind will be reviewed when they are available. Cost effective changes to increase the film supply should be supported. No decision is required at this time.

RED SHIRT and Space Transportation Systems (STS)

Readout technology development studies should be continued at a low level by SAFSP. If they produce a feasible approach, a community study to access need will be required.

Any major redesign, such as RED SHIRT, should be incorporated in the buy after Block IV, so that the design can be compatible with launch via the STS. No decision is required at this time.

Recommend you sign the message at the right which summarizes the above for General Bradburn.

HAROLD P. WHEELER, JR.
Colonel, USAF
Director

BLOCK IV

The SPS shows that the current film-return HEXAGON might well be supplanted by an advanced KENNEN in 1981. Even if advanced KENNEN was to slip until 1984 in order to be compatible with the STS, Block IV HEXAGON would be the last film-return block and consist of no more than two or three vehicles. A major redesign of any system launching around 1984 may be expected, as compatibility with STS will be required. Since Block IV vehicles will be limited to two or three, changes which require amortization over longer runs should not be considered for Block IV. Specifically, a total redesign of the two-camera assembly to permit competing the Block IV buy should not be considered further.

LAUNCH RATE

The Search Performance Study (SPS) showed that adequate search coverage of the critical built-up portion of denied areas requires:

a. Maximum gaps of 90 days between HEXAGON missions during the period before KENNEN has a search capability (April 1979) and maximum gaps of 180 days thereafter.

b. A 60-day backup in case of launch or early orbit failure.

c. An overlap between HEXAGON and any advanced KENNEN system designed to replace HEXAGON.

Given the current 120-day life for SV-11 and 12, 150-day life for SV-13 and 14, and 180-day life for SV-15 and on, the attached schedule shows that the baseline delivery dates are more than adequate for the SPS requirements.

SV-15 through 18 will have a capability to carry a maximum propellant load of 4,540 lbs. For 4,540 lbs of propellant to provide a 180-day mission the height of perigee must be 91-92 nautical miles. On these vehicles, the present booster capability is inadequate to orbit two 650 lb subsatellites, a mapping camera module, 650 lb pallet, and 4,540 lbs of propellant. In the worst case, where priorities require these added payloads be carried, approximately 470 lbs of propellant would have to be off-loaded. In this case, a higher perigee altitude of 93-94 miles would be required to accomplish a 180-day mission. Given successful KENNEN surveillance operations starting after SV-13, such a perigee change will be satisfactory, as current HEXAGON image quality (at perigees of 87-88 nautical miles) exceeds that needed for search.

The attached launch schedule represents eight missions in 5.75 years or 1.4 mission per year. SAFSP's cost estimate for an average of 1.5 missions per year exceeds the Block II/III baseline by $5M in FY 78, $5M in FY 79, and $4M in FY 80, or $14M in all. The approximately six-month slip of Block IV is not considered in these cost figures. The cost of an improved back-up posture from the six-month backup presently contemplated for SV-15 and on is not expected to exceed $15-30M, but SAFSP has not been officially tasked for this data.

HEXAGON/SPS COMPATIBLE SCHEDULE

SV	AVAILABLE	LAUNCH	THROUGH	GAP
11	Aug 75	Jan 76	Apr 76	90
12	Dec 75	Aug 76	Nov 76	90
13	Jun 76	Mar 77	Jul 77	90
14	Dec 76	Dec 77	Apr 78	120
15	Jul 77	Sep 78	Feb 78	120
16	May 78	Jul 79	Dec 79	120
17	Apr 79	Jun 80	Nov 80	150
18	Apr 89	Jun 81	Nov 81	180

Comments:

1. Current planning is for SV-11 to launch in November/December 1975.

2. The dates contained in the "AVAILABLE" column are too early to be consistent with our present backup philosophy. Under the 60-day backup concept, the N+1 vehicle would not be ready for launch until a minimum 60 days after the launch of the Nth vehicle.

3. In the present Block III stretch negotiation, SV-14 is the last launch that will be supported by a 60-day backup; i.e., SV-15 could launch a nominal 60 days after the launch of SV-14. SV-15 and up will have a nominal six-month backup capability; i.e., SV-16 could launch a nominal six months after SV-15.

REWIND AND ULTRA ULTRA THIN-BASED (UUTB) FILM

Full coarse path rewind and use of the negative constant velocity unit are necessary on the current HEXAGON design to prevent wastage of approximately 15 percent of the film, depending on the exact distribution of operation sizes. Full rewind was originally unsuccessful due to improper stacking of the film in the reentry vehicle (RV) which caused mis-tracking when the film was rewound out of the RV. This was remedied on SV-10, but subsequent experience with rewind in the presence of particulate contamination showed that the film could be torn during rewind if contamination was present. Such contamination has been discovered on orbit or in the factory on all units to date.

Because of contamination, SAFSP has decided not to attempt full rewind before SV-13, and then only if the contamination problem has been solved.

UUTB film offers an approximate 21 percent increase in film footage, but initial ground tracking tests were not totally successful. Further tests are underway to define the hardware changes needed to allow the use of UUTB. The last phase of the test, flight of a few thousand feet at the core of the last bucket of SV-11, is scheduled for April 1976. The cost deltas above the baseline for use of UUTB should not be large but will be unknown until then.

The SPS was conducted assuming full rewind and UUTB, or 139,000 feet of film per camera versus the current 116,000 feet. Since the results of the SPS show gross coverage to be adequate, the failure to achieve all or most of the delta between 116,000 feet and 139,000 feet would have small impact on the results of the SPS--a roughly 10 percent reduction in unique cloud-free coverage. However, with the longer, more infrequent missions planned, increased film availability is a worthwhile goal.

With respect to UUTB and rewind, we should wait for the results of efforts already underway.

The Modified Film Transport (MFT) which allows for no rewind wastage through larger loopers and increases efficiency up to 30 percent by allowing more flexible operations (variable scan widths and centers during operations, 2^{o} scan center/width selectivity) would have considerable cost impact if incorporated in Block III (at least $10M in FY 76) and would not be available until SV-17. It should be an option for Block IV.

A simplified version of the MFT which realizes less wastage than full coarse path rewind can be considered for SV-17 incorporation. This concept uses a larger looper (compatible with Block IV MFT) but retains current electronic boxes and adds two boxes. Operational modes are the same as the current design with respect to scan widths, centers, etc. ROM cost for this change is $1.525M for incorporation in SV-17 and 18, spread as $ .725M in FY 76, $ .300M in FY 76T, and $ .500M in FY 77.

The 9 percent increased film supply and takeups could be effective on SV-17 and cost $1M in FY 76. Lesser increased film supply increments of 2.5, 4.3 and 5.3 percent are also possible at significantly lower costs. The studies to design the required changes and evaluate incorporation costs are underway. Results should be available by December 1975. Increased supply diameter may be an attractive option if the use of UUTB should prove too difficult or costly.

RED SHIRT AND SPACE TRANSPORTATION SYSTEM (STS)

A near real-time film readout device (RED SHIRT) is not considered as a Block IV option for HEXAGON. A film readout option may have a place in the post 1980 NRP imaging system mix, but such a determination should be made only after the community has gained considerable experience with baseline KENNEN, and the shortcomings of the mix at that time are understood, especially with respect to crisis monitoring. RED SHIRT or a comparable near real-time film readout device, because of its cost, will surely be a competitor with proposals for KENNEN improvements. Studies which focus on ways to optimize the various major readout subsystems should continue in order to provide a practical baseline if a crisis monitoring capability is desirable in the 1980's.

Major changes such as RED SHIRT should be planned to be compatible with STS. Otherwise, major redesigns will be required within two or three years of each other, increasing total costs.