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2 July 1975

TO: SAFSS (Lt Col Daniel Hutchison)

SUBJECT: HEXAGON Program Plan

Your Memorandum, dated 30 June 1975, has been reviewed and suggested changes are identified by margin lines.

Raymond E. Anderson

RAYMOND E. ANDERSON
HEXAGON Program Office

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MEMORANDUM FOR MR PLUMMER

SUBJECT: HEXAGON Program Plan

SAFSP's Block IV HEXAGON briefing on 24 June and the recently completed Search Performance Study form the basis for reviewing the current HEXAGON plan prior to the July ExCom meeting. Each of the major points of the plan (launch rate, Block IV, rewind, ultra ultra thin based film, read-out (RED SHIRT) and Space Transportation System) are summarized below, with supporting discussion at the Tabs.

Launch Rate

HEXAGON launches should be so spaced that the maximum gap between missions is 90 days [redacted] and 180 days thereafter. At least a 60-day backup should be maintained. Such a launch plan is compatible with the current delivery schedule. Increasing the launch rate in FY 78-81 may increase the total program cost by $15-30M, while Block IV costs would be unaffected.

The launch schedule will not require official change for approximately one year; i.e., until the status of KENNEN IOC is much better known.

Block IV

The next HEXAGON buy, if any, should incur only those development costs which can be amortized in three or four years at one vehicle per year. Therefore, no further consideration should be given to a funded competition for Block IV.

Rewind and Ultra Ultra Thin Base Film (UUTB)

Realization of the film load studied in the SPS requires achievement of both rewind and full use of UUTB by SV-13. The impact of not increasing the film supply 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 be a level compatible with rewind will be reviewed when they are available. Cost effective changes to increase the film supply should be supported.

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RED SHIRT and Space Transportation System (STS)

Read-out technology development studies should be continued by SAFSP. If it produces a feasible approach, a community study to assess need will be required.

Any major redesign, such as RED SHIRT, or Modified Film Transport, should be incorporated in the buy after Block IV, so that the design can be compatible with launch via the STS.

Request your concurrence in the above plan.

HAROLD P. WHEELER, JR.
Colonel, USAF
Director

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LAUNCH RATE

1. 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 [redacted]

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.

2. 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 current baseline delivery dates are compatible with the SPS requirements.

3. SV-15 thru 18 will have a capability to carry a maximum propellant load of 4540 lbs. For 4540 lbs of propellant to provide a 180-day mission, the height of perigee must be approximately 91-92 NM. On these vehicles, the present booster capability is inadequate to orbit two 650 lb subsats, a mapping camera module, 650 lb pallet, and 4540 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 approximately 93 to 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 HP of 87-88 NM) exceeds the requirement for search.

4. The attached launch schedule represents eight missions in 5.75 years or 1.4 missions per year. SAFSP's cost estimate for an average of 1.5 missions per year exceeds the baseline by $5M in FY 78, $5M in FY 79 and $4M in FY 80, or $14M in all. Another $15M for increased operations over those costed by SAFSP can be inferred for 1981 under the attached plan, giving a total of almost $30M for the increased stretch. The six-month slip of Block IV is not considered.

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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	Nov 77	Mar 78	90
15	Jul 77	Jul 78	Dec 78	90
16	May 78	Apr 79	Sep 79	90
17	Apr 79	Apr 80	Sep 80	180
18	Apr 80	Apr 81	Sep 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 not 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 of 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, ie., SV-15 could launch a nominal 60 days after the launch of SV-14. SV-15 and up will have a nominal 6 month backup capability, ie., SV-16 could launch a nominal 6 months after SV-15. However, the FY78-80 funds identified in this paper will provide a 60 day backup capability for SV-15 and up.

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BLOCK IV

The SPS shows that the current film return HEXAGON might well be [redacted] in order to be compatible with the STS, Block IV HEXAGON will 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 is expected anyway, as compatibility with STS will be required. Since Block IV type 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.

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REWIND AND ULTRA ULTRA THIN BASE FILM (UUTB)

1. Full coarse path rewind and NCVU use is necessary on the current HEXAGON design to prevent wastage of approximately 15% 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), causing mistracking 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.

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

3. UUTB offers an approximate 21% 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 above baseline deltas for incorporation of UUTB should not be large but will be unknown until then.

4. 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% reduction in unique cloud-free coverage. However, with the longer, more infrequent missions planned, increased film available is a worthwhile goal.

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

6. A simplified version of the modified film transport which realizes less wastage than a coarse path rewind design is being 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.

7. The 9% increased film supply and takeups, could be effective on SV-17 and cost $1M in FY 76. Increased film supply increments of 2.5, 4.3 and 5.3 percent are 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.

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RED SHIRT AND SPACE TRANSPORTATION SYSTEM (STS)

1. A near real-time film readout device (RED SHIRT) is not considered as a Block IV option for HEXAGON. It is not clear at this time if a film readout option would have a place in the post-1980 NRP imaging system mix. 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 real/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.

2. Major changes such as RED SHIRT [redacted] 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.

(8)