

~~TOP SECRET~~

HANDLE VIA

BYEMAN

CONTROL SYSTEM

(S) NATIONAL RECONNAISSANCE OFFICE

WASHINGTON, D.C.

THE NRO STAFF

31 October 1975

MEMORANDUM FOR THE RECORD

SUBJECT: Briefing to Mr. Goulder

The attached briefing was given to Mr. Goulder, ASD(I), on 28 October 1975. His comments indicated that he was pleased with the briefing, but that he still feels that the MPS is more resource than DMA needs. He also seemed to feel that the PE approach is too sophisticated.

[Signature]
DANIEL B. HUTCHISON
Lt Colonel, USAF

Attachment

HEXAGON

10-31-75

WORKING PAPERS

✓

HANDLE VIA
BYEMAN
CONTROL SYSTEM

CLASSIFIED BY BYEMAN - 1 EXEMPT FROM
GENERAL DECLASSIFICATION SCHEDULE OF
EXECUTIVE ORDER 11652 EXEMPTION CATE-
GORY 5B2 DECLASSIFY ON IMP DET.

~~TOP SECRET~~

CONTROL NO Internal
COPY 1 OF 2 COPIES
PAGE 1 OF 1 PAGES

HEXAGON

ATTITUDE REFERENCE CONCEPTS

- STAR TRACKERS - REQUIRED EXTENSIVE INTEGRATION TO GYROS
- ACCURACY
- STELLAR INDEX CAMERAS - FILM PATH COMPLEXITY
- STELLAR INDEX ON INTEROP - UNDESIRABLE IMPACT ON
PRIMARY VEHICLE

MAPPING CAMERA SYSTEM STATUS (\$ MILLIONS)

	APPROVED PROGRAM (1)	CURRENT PROGRAM (2)	INCREASE
MCS ACQUISITION -			
MAPPING CAMERAS (SV 17 & 18)	\$17.2	\$22.3	\$ 5.1
RECOVERY VEHICLES	<u>2.2</u>	<u>3.9</u>	<u>1.7</u>
SUBTOTAL	\$19.4M	\$26.2M	\$+6.8M
FUND PROTECTION -			
MCS/SPACECRAFT INTEGRATION		\$ 2.3M	
UNDEFINED STUDIES	<u> </u>	<u>0</u>	<u> </u>
SUBTOTAL	\$ 6.0M	\$ 2.3M	\$-3.7M
TOTAL	\$25.4M	\$28.5M	\$+3.1M

NOTES:

(1) BASED ON CONTRACTOR ESTIMATES

(2) BASED ON NEGOTIATED CONTRACT

HEXAGON KENNEN

CURRENT NRP MC&G ALTERNATIVES

(\$ IN MILLIONS)

	<u>FY76</u>	<u>FY77</u>	<u>FY77</u>	<u>FY78</u>	<u>FY79</u>	<u>FY80</u>	<u>FY81</u>	<u>TOTAL</u>
APPROVED PROGRAM	9.7	-	9.7	2.0	2.0	2.0	-	25.4
CURRENT ALTERNATIVES:								
MAPPING CAMERAS FOR								
HEX 17 AND 18*	9.7	-	7.1	4.6	3.2	3.0	.9	28.5
METRIC PAN SYSTEM								
HEX 17 AND 18*	7.7	2.0	5.9	4.0	3.2	2.3	.3	25.4

* DOES NOT INCLUDE NAVPAC HARDWARE OR INTEGRATION

HEXAGON

S³ SOLID STATE STELLAR CAMERA

HEXAGON

BRIEFING OUTLINE

- BACKGROUND
- S³ STUDY ACCOMPLISHMENT
- FUNDS REQUIRED
- RISK ASSESSMENT
- CONCLUSIONS

BACKGROUND

- DMA/SP-6 STUDIES ON METRIC PAN IDENTIFIED:
 - IMPROVED INTERNAL GEOMETRY KNOWLEDGE
 - IMPROVED GEOGRAPHIC REFERENCE
 - IMPROVED ATTITUDE REFERENCE
- CHANGES IN PROCESS
 - NAVPAC (SV-13)
 - 1° SCAN ANGLE DOTS (SV-14)
 - FIDUCIAL X-HAIRS (SV-14)
 - OB CALIBRATION (SV-14)
- REMAINING REQUIREMENT IS TO DETERMINE THE ATTITUDE TO
5-10 ARC SECONDS

PREVIOUS RISK AREAS

CALIBRATION/STABILITY

TCA QUAL & VIB MODES

SIGNAL TO NOISE RATIO

CHIP DEV/QUAL/PROD

HEXAGON

STUDY OBJECTIVES

- PURCHASE AND TEST SOLID STATE DEVICES
- DEVELOP ERROR BUDGET BASED ON
 - LABORATORY TESTS
 - TCA THERMAL/VIBRATION TESTS
 - DETAILED ANALYSIS
- DEMONSTRATE COOLING TECHNIQUE
- PRELIMINARY DESIGN
 - FOCAL PLANE
 - MECHANICAL
 - ELECTRONIC
 - OPTICAL

HEXAGON

STUDY SCHEDULE

- BEGAN SEPTEMBER 74
- COMPLETION FOR JULY 75 DECISION FOR SV-17 & 18
- DIRECTION TO CONSIDER FOR BLOCK IV ONLY
- REVISED COMPLETION DATE OF 31 DEC 75
- FOCAL PLANE DEMONSTRATION DELAYED TO SPRING 76

HEXAGON

STUDY PROGRESS TO DATE

- DETECTOR TESTING
 - TESTED LINEAR 1728 x 1 CCD's
 - TESTED LINEAR 1800 x 1 PHOTO-DIODES
 - TESTING 244 x 190 AREA ARRAY
 - SUCCESSFULLY COOLED DETECTORS TO -10°C
 - BEGUN SENSITIVITY AND ACCURACY MEASUREMENTS
 - RELIABILITY PROGRAM UNDERWAY
- ERROR BUDGET ANALYSIS
 - TCA THERMAL TESTS COMPLETED
 - TCA VIBRATION MEASURED
 - DETAILED ANALYSIS PERFORMED
 - PRELIMINARY REPORT PUBLISHED

HEXAGON

STUDY PROGRESS (CONT'D)

- PERFORMED SV-9 STELLAR EXPERIMENT
- COMPLETED PRELIMINARY DESIGN
- OPTIMIZING DESIGN FOR AREA ARRAY
CHEAPER
LIGHTER
SMALLER

KENNEN HEXAGON

NRP MAPPING REQUIREMENTS REVIEW

- ASD(I) - 17 JAN 1975 - APPROVED ACQUISITION OF MAPPING CAMERAS FOR HEXAGON MISSION 17 AND 18. DIRECTED DNRO STUDY OF METRIC PAN MODIFICATION.
- CURRENT STATUS REVIEW:
 - MAPPING CAMERA COST INCREASES
 - SCHEDULE STRETCH OF HEXAGON MISSIONS 17 AND 18 BY ONE YEAR
 - METRIC PAN STUDY STATUS
-
- DMA REQUIREMENTS SATISFACTION
- REQUEST ASD(I) DIRECTION PRIOR TO 1 NOVEMBER 1975 MCS VS. MPS ACQUISITION

Page Denied

Page Denied

27 Oct 75 ~~TOP SECRET~~

HANDLE VIA
BYEMAH
CONTROL SYSTEM

MAPPING CAMERA SYSTEMS SUPPORT (C-911442)
(Approval Subject to NSA funding)

	<u>FY76</u>	<u>FY77</u>	<u>FY78</u>	<u>FY79</u>	<u>FY80</u>	<u>FY81</u>	<u>TOTAL</u>
<u>RELATED TO HEXAGCI PROGRAM (Data provided in current FY budget)</u>							
Metric capability on Panoramic camera effective w/ Vehicle 17 on the Alternate 1 Schedule.	9.7	-	8.3	1	1.5	2.3	0.3 25.4
NAVPAC hardware for Vehicles 16-18 on the Alternate 1 Schedule.	1.0	-	2.2	0.9	1	0.1	0.1 4.2
NAVPAC integration on Vehicles 16-18 on the Alternate 1 Schedule.	-	-	0.5	0.3	0.2	0.1	0.1 1.2
Subtotal	10.7	0	11.6	2.7	2.8	0.5	30.8

CONCLUSIONS

- COST, SCHEDULE AND PERFORMANCE RISKS ARE ACCEPTABLE
- WE ARE PREPARED TO PROCEED ON AN S³ DEVELOPMENT FOR SV-17 AND 18
- DECISION TO PROCEED SHOULD BE BASED ON OVERALL SITUATION

OTHER CONSIDERATIONS

- S³ DECISION COULD PUT ITEK OUT OF GOVERNMENT BUSINESS
- S³ DEVELOPMENT + SV-17 AND 18 COSTS ARE ABOUT THE SAME AS MAPPING CAMERAS FOR SV-17 AND 18
- SUBSEQUENT S³ COSTS WOULD BE SIGNIFICANTLY LOWER THAN ITEK MAPPING CAMERAS
- DUE TO ITEK BUSINESS OUTLOOK WE ARE AT LEAST AS CONFIDENT IN S³ COSTS AS WE ARE IN ITEK COSTS

ROM ESTIMATES OF S³ FUNDING REQUIREMENTS

<u>FY-76</u>	<u>7T</u>	<u>77</u>	<u>78</u>	<u>79</u>	<u>80</u>	<u>81</u>	<u>TOTAL</u>
6.5	2.0	5.9	4.0	3.2	2.3	0.26	24.16
1.24 (75 AND 76 COMMITMENT TO ITEK)							<u>1.24</u>
							25.40

- NEAR YEARS OK (76-77)
- OTHER YEARS COST WILL BE REFINED AFTER DESIGN COMPLETION (AUG 76)
- DOES NOT INCLUDE COST TO NRO DUE TO IMPACT ON ITEK

RISK ASSESSMENT

<u>SCHEDULE</u>	<u>COST</u>	<u>PERFORMANCE</u>	
		<u>5 ARC SEC</u>	<u>10 ARC SEC</u>
LOW */SV-17	LOW	SOME HOPE	LOW

* BASED ON A STRETECHED SCHEDULE WITH LAUNCH OF SV-17
IN 1980

REASONS FOR REVISING RISK ASSESSMENT

- FOCAL PLANE NOW EXTERNAL TO LENS
- BETTER COOLING ARRANGEMENT
- 10 LINE ARRAY REPLACED BY 4 LINE OR AREA ARRAY
- FIRM PROPOSALS FOR FOCAL PLANE
- ERROR ANALYSES COMPLETE
- SATISFACTORY VIBRATION PERFORMANCE DEMONSTRATED
- ON ORBIT CALIBRATION CAPABILITY DEMONSTRATED
- CCD PERFORMANCE HAS BEEN DEMONSTRATED
- ELECTRONICS HAVE BEEN BREADBOARDED

HEXAGON

STUDY EFFORT REMAINING

- SELECT OPTIMUM FOCAL PLANE CONFIGURATION
- FABRICATE FP ASSEMBLY
- REFINE ERROR ANALYSIS
- COMPLETE RELIABILITY TESTING
- PUBLISH FINAL REPORT

10 LINE HYBRID FOCAL PLANE PROPOSALS

<u>MARTIN-DENVER*</u>		<u>FAIRCHILD</u>	<u>RETICON</u>
<u>CCD</u>	<u>PHOTODIODE</u>	<u>CCD</u>	<u>PHOTODIODE</u>
282K	271K	379K	245K

* MARTIN HAS GIVEN A VERBAL QUOTE OF 90K FOR A 4 LINE ARRAY