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14 May 1971

MEMORANDUM FOR: Director of Special Projects

SUBJECT : Photo Reconnaissance Systems Report No. 92

I. CORONA

A. Accomplishments

1. CR-15 (Mission 1115) is proceeding into flight preps under the assumption that the scheduled 16 June flight will actually be launched on that date.

2. LMSC personnel have supported the pre-mission launch window studies for Mission 1115. Included in this effort is the planning for a possible ascending-descending mission.

B. Problems

No major problems.

C. Projected Status

1. CR-15. Flight preps.

2. CR-16. Pre-storage.

3. CR-8. Dr. "A" tests.

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SUBJECT: Photo Reconnaissance Systems Report No. 92

II. HEXAGON

A. General

1. Messrs. Maguire and Robertson met with the Project Office on 13 May to discuss revised acceptance tests for SN-004 (discussed in detail later) and to negotiate a schedule relief change to SN-004 as a result of the Project Office decision to change the slit and shutters on SV-1. Mr. Maguire asked for ten days and seven days were agreed to. Thus, no fee will be lost if SN-004 is delivered on or before 7 June. In addition, the scheduled delivery dates and their respective grace periods for the remaining mid-sections under DH-7776 were negotiated. These are as follows:

MS#	DELIVERY DATE	END OF GRACE PERIOD
SN-005	31 JUL	26 AUG
SN-006	31 SEPT	26 OCT
SN-007	31 NOV	26 DEC

2. Perkin-Elmer was authorized to undertake a $45.6K study of a collimator moving scene target and intends to authorize a study to investigate the camera error budgets in light of the follow-on design and the measurement tolerances achieved to date. Other hardware changes authorized include deletion of the UCC and ISCCU electronic box (and incorporation of their remaining functions into the MFA box) and modifications to the PDS box to eliminate failure modes and improve reliability. The NRO has been asked to approve the relocation of two of the Danbury Chamber "B" collimators to the west coast's Chamber "A-2" to assist in evaluating camera performance in the event of future platen field removals.

B. Advanced Planning & Management Support Activities

1. In response to the request from the Comptroller, NRO, for clarification of the 1972-1977 budget submittal regarding

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SUBJECT: Photo Reconnaissance Systems Report No. 92

Sensor Subsystem Block I and Block II estimates, budgets are being prepared to reflect the options of continuing with Block I beyond unit 19 and Block II starting with unit 19. Major Schow reported that, since the FY '73 NRP budget is likely to be cut by 6 or 14%, [redacted] would have to go to the EXCOMM at the 29 July meeting for the additional costs of a major Block II effort. In this regard, the Project Office is currently looking into a "Mod I" to the current HEXAGON design, with SV-13 effectivity, having a multi-bucket crisis management capability, longer life, and relatively minor systems improvements for higher reliability. The then-Block II might have an even later effectivity than SV-19 but would be able to utilise the EOI technology and existing relay satellite and ground station equipment in a HEXAGON near real time capability and could be the basis for a valid competition.

2. A travel budget for PRS personnel was prepared for the last quarter FY '71. The planned travel and other TDY expenses to support the June 1971 launch are within the authorized funding.

C. Engineering

1. Testing is continuing with a segmented builder roller on the takeup. Spilling of the film occurred for the first time today but taper measurements have not been completed to determine if the new roller design was an improvement. Stacking tests with the film spool made up of film with large (.000080") taper have not begun because of the high priorities placed on SN-004 testing.

2. The slit and shutter assemblies have been replaced in SV-1 and SV-3, and the SV-2 assemblies are being shipped to the west coast tomorrow. The SV-4 assemblies are now being rebuilt with the modified closing blades and will be complete by 21 May. The qualification slit and shutter assembly will then be built up, exposed to qual level vibration and life cycled. Qualification will be completed by 28 May.

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SUBJECT: Photo Reconnaissance Systems Report No. 92

3. A supply core and film requirements review was held at PE on 12 May. It appears that all film requirements can be met without having to take the cores out of the Development Model. The core vendor has been reinspecting and reworking the cores ahead of his projected schedule so the outlook is fairly optimistic. In addition, another flight-worthy core (No. 5016) which does not require any rework has been identified.

4. A meeting was held at EK on 13 May to review their high pressure spooling tests for the no-supply-caging design in the follow-on program. EK has determined that the desired pressures (750 ± 250 psi) can be achieved and will cause no spooling machine problems. The winding parameters will be 10 lbs. film tension and 100 lbs. builder roller force. Pressure will be checked at each splice to insure that 1000 psi is not reached.

5. Two hundred feet of SO-255 color film has been placed at the core on a high pressure test roll at EK to determine any effects caused by this high pressure on the photographic performance of the film. The two follow-on manufacturing rolls will be instrumented with optical targets so that core pressure decay can be monitored over a long period of time.

6. Approximately 2,000 feet of "low-curl" SO-255 will be available for PE's evaluation about the first of June. The current plan for SO-255 is to fly 10,000 feet on SV-4 if sufficient ground tests on other models have been completed to assess any risks. This film will be next to the core so all other mission objectives will be satisfied before the color film is used.

D. Operations and System Analysis

1. Considerable time was spent reviewing the results of special test runs on SN-004 aimed at evaluating the potential

SUBJECT: Photo Reconnaissance Systems Report No. 92

causes of the high in-track mean smear at 55° on Camera "B" and the high mean cross-track smear on Camera "A." In particular, a special film wander test was run on Camera "B" which attempted to evaluate the in-track problems. This test consisted of locking the optical bar into two positions (0° and 55°) and exposing two lines (with a laser) on the film while it was transporting. The test showed that film wander was different when the optical bar was in the 55° position than in the 0° position, but did not show the source of the high mean errors, as the test was poorly configured to do that. That is, the reference between the lines for the 0° and 55° optical bar positions was lost due to the fact that the collimators had to be moved.

The tests requested aimed specifically at evaluating the cross-track smear on Camera "A" were not done, and the contractor has now indicated that he is unwilling to run these tests. The real cause of concern relative to these high mean smears is as follows:

a. The high mean smear in-track on Camera "B" (55°) has been characteristic of all Camera "B's." Aside from the deleterious effect on performance of such smears is the fact that the error may really be at 45° and 0° and not 55°. That is, the contractor has always had to adjust the platen skew angle by 100-250 arc sec at 45° and 0° to get the in-track performance acceptable at those positions.

b. The cross-track mean smears cause similar concern, mean smears causing a continous dc loss in performance. Also, all Camera "A's" have produced errors of similar magnitude. The cross-track mean errors cause a disparity in the in-track and cross-track resolution (on-orbit predicted), on the average of approximately 40 l/mm and as high as 50 l/mm. An attempt was made to determine if these errors were caused by gravity-induced motions in the

SUBJECT: Photo Reconnaissance Systems Report No. 92

optical bars, but these tests were negative. The gravity effects on Camera "A" are no worse than the other optical bars, and do not explain the high mean smears evidenced.

Additional tests (not necessarily on SN-004) are warranted to further attempt to define the sources of these high mean smears. The specific tests currently recommended by Operations and System Analysis are:

a. Dynamic optical bar gravity tests (all tests to date have been static). This test is currently in process.

b. A dynamic in-track test using a small slit mask in the shutter and the format illuminator. This would help sort out if the high in-track means are due to film wander or platen position.

c. Cross-track tests aimed at evaluating the smear across the entire format, and further aimed at evaluating if the source of the errors are due to film speed errors or image velocity errors.

d. A test aimed at determining if the errors seen are truly system errors or due to test equipment. It was suggested that this problem could be sorted out by putting SN-004 in Chamber "A" backwards, but the contractor was very reluctant to do this due to the impact on his schedule.

The contractor has indicated a reluctance to run tests b. through d.

2. Considerable effort was spent finishing the final draft of the NRO Color Task Force report, due to be submitted to Dr. Naka in two-three weeks. This office has done the majority of the writing and coordinating of this report for the

SUBJECT: Photo Reconnaissance Systems Report No. 92

CTF. The report will draw specific conclusions relative to the use of color photography in the NRP, and make specific recommendations for its use in the future.

3. Several sets of CRYSPER runs were made for the SOC in support of planning for HEXAGON Mission 1201. Predictions of performance were made for specific high priority targets, and estimates of average performance for various sun angles were also made.

E. WCPO

1. A HEXAGON Exposure and Ephemeris Program (HEEP) meeting was held on 7 May with WCPO, PE/WCFO, and LMSC computer support personnel in attendance. The purpose was to finalize the output format for SV-1 support. The LMSC personnel anticipate no problems in completing the program modifications prior to SV-1.

2. TRW personnel delivered the latest HEXAGON Operations Performance Estimate (HOPE) program to the WCPO this week. PE/WCFO personnel will use this version for in-house rehearsals during the week of 21 May.

3. Agreement was reached with [redacted] with regard to the loss of exposed film during wrap-and-cut operations. [redacted] will extend the last operations of a RV to insure that all the exposed film is clear of the film path before the wrap-and-cut operation. PE will advise [redacted] on the amount necessary to clear the path and [redacted] will extend the operations.

4. A number of operational sequences were recently submitted to the SPO by the WCPO. The SPO disapproved three sequences without coordination with the SSPO or the WCPO. Two sequences have to do with the increase of operation time from 20 to 25 min per rev and are controlling flags. The system is now inconsistent as other parts of the software are geared to the 25 minutes while the flags still

reflect the 20 minute limit. The other sequence was for a change in the SS health check. We had agreed to forego this and use a night engineering sequence for the first launch when we expected to launch on 20 May, with the sequence to be changed for SV-2; however, with the delay in launch of SV-1 the change in the sequence was desirable and proper. Although these sequences are not flight critical, the SPO should not be allowed to decide these matters which are clearly SSPO responsibility.

5. The development rehearsal is scheduled for the period 18-30 May, with a FTFD rehearsal readiness meeting to be held on 17 May 1971.

6. The parameters for the system generation of the IBM 360 operating system version 20 are now complete, and the system generation is now planned for 21 May.

F. Model Status

1. SV-1 (MS SN-003)

The in-air portion of the A-2 Chamber test was completed at 1200 hours 13 May 1971, and the test data is being reviewed. Chamber pumpdown and stabilization to the required in-vacuum test conditions are in process.

2. SV-2 (MS SN-002)

SV-2 is undergoing SBAC tests while awaiting receipt of refurbished platens (slit and shutter units) on or about 17 May.

3. SV-3

a. Forward Section

Receiving inspection of F/S elements continues. The following operations have been completed:

(1) Cable inspection, installation and checkout

(2) R&I of all passive articulators

(3) R&I of two TUA's (S/N 018, 021).

R&I of the articulator/steerer is 90% complete. R&I of the third TUA will begin on 13 May 1971.

b. Midsection (SN-004)

The MFN 3.09 acceptance tests are currently underway after having been delayed for a gas leak problem. The vacuum acceptance test plan has been abbreviated to conserve film since the "B" side supply is now down to 60,000 feet. Barring further anomalies, all testing will be completed on 1 June, but the system will remain cabled up pending completion of the government review of the acceptance data.

4. SV-4 (MS SN-005)

The tracking tests of MFN 3.05 have been completed but must be repeated after the slit and shutters are replaced in the platens. The full test load of film will be installed in the system either late today or tomorrow.

III. Meetings Requiring Participation of Headquarters Personnel

Date	Subject	Attendees
HQ		
17 May	HEXAGON Mod. I Working Session	[redacted] Kohler
19 May	Advanced HEXAGON Planning	[redacted]

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SUBJECT: Photo Reconnaissance Systems Report No. 92

PE

18 May	RADINC Program Review	
18 May	Review Collimator Measurements and Test Procedures	
19 May	Discuss Remaining Development-Type Tests vs. Test Vehicles	
19 May	Discuss Transfer of Film Processing Facilities to Westover AFB	Kohler

Horisons

20 May	Program Review	Kohler

RCA

18 May	P6-1&2 Takeup Buy-off	

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SUBJECT: Photo Reconnaissance Systems Report No. 92

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