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3 MAR 1966

MEMORANDUM FOR GENERAL EVANS

SUBJECT: Status of MOL Readout

Introduction

1. A survey was made to determine the status of all effort relative to the photographic readout link in the MOL system. Information was collected through available documentation and informal contact with persons listed in Tab A.

Readout Requirement

1. MOL Program Office Directive 65-2 of 25 August 1965 states that the Laboratory Module, "will be equipped with a wide bandwidth communications system capable of rapid relaying of selected payload output and telemetry data." It further directs that, "channel capacity and reliability to support wide bandwidth data transmission to selected stations in ConUS . . . will be provided."

2. The Phase I efforts required of EKC and GE are defined by tasks 4 and 6 respectively and are extracted from the respective work statements in Tab B. DAC is responsible for the TT&C Sub-system which would include the wide band data link.

3. The requirements for the MOL readout equipments are defined in the Preliminary General System Specification of December 1965 (SSS-149) as summarized in Tab C.

Discussion

1. System Definition - the MOL readout system as presently conceived consists of the major components listed below arranged according to the responsible contractor.

- EKC - Film Viewer
 - Binocular Microscope
 - Film Chemical Storage
 - Processor and Dryer
 - Frame Selector and Splicer
- GE - Film Scanner
- DAC - Wide bank link (part of TT&C Sub-system)



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The film scanner assigned to GE by their work statement must also include signal processing after film scan such as is provided by analog to digital conversion, amplification, and modulation equipment. Some confusion exists as to contractor responsibility in the interface between the scanner output equipment and the wide band transmitter. No definition of ground reconstruction and/or recording equipment responsibility has been made. Since use of the 20-megabit wide band link presently being developed for the satellite control facilities' SGLS system is contemplated, the readout system capacity is being molded around these specifications. The readout system parameters outlined in Tab C (General System Specification) can be expected to change to conform with this SGLS system. (GE has estimated the maximum output quantity over the 20-megabit link at about 12 square inches per five minutes as opposed to the specification value of 50 square inches.)

2. MOL Activity - As of this date very little program effort has been expended on the MOL readout system. EKC was given the job (see Tab B) of investigating all methods of readout. As seen by the extracts of their monthly progress letters (Tab D), only preliminary investigations have been made. GE has reported no progress through their report of 10 January 1966. No documentation other than that referenced herein could be uncovered. Discussions with SAF-SL1, SAF-SP and Aerospace supporting personnel indicate a lack of understanding as to the requirement for photographic readout and a lack of emphasis on this part of the MOL system in favor of "more pressing problems."

3. Other Activity - Two related activities not originated by MOL program are summarized below:

a. Philco WDL has submitted an unsolicited proposal entitled "MOL Surveillance Mission" which describes a 30-inch cassegrainian optical system, the complete output of which is transmitted to the ground via a wide band link. The proposal contains a very comprehensive analysis of the readout problem, including a comparison with re-entry capsules, and recommends and establishes feasibility for up to 500 mcps links to transmit photographic information. During his visit to Philco on 8 February 1966, Colonel Norman witnessed a demonstration of the breadboarded system. The complete proposal is available in Mission Planning Division.

2

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b. CBS - Bell Telephone Laboratories - Contractual effort has been conducted by CBS and BTL on wide band readout systems for other programs. GE personnel plan to contact these companies for detailed information. Additional information is also available from SAFSS if desired.



LEWIS S. NORMAN
Colonel, USAF
Mission Planning Division

Gen Evans - This is a status report -
Maj Haas will continue to track accident
effort. We'll have some relevant
recommendations to you at a later date

Norman

Col. Norman,
Progress seems too slow. As you
will recall at the last Mgmt. Review mtg
I requested that the next mtg contain a
briefing on accident - lets bypass suspense
on that request.



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Persons Contacted

SAF-SP

Colonel L. Allen
Major J. Wallace
Major R. Burke

SAF-SL1

Lt Colonel P. O'Toole
Lt Colonel R. Dees
Major R. Pipher
Captain W. Greenwood

Aerospace

Mr. R. Brandell

SAFSS

Colonel D. Carter

GE

Mr. H. Bried

EKC

Mr. B. Herrington

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Work Statement Requirements

EKC Work Statement, 28 September 1965

Task 4 System Performance Analysis

4. "Specifically identify performance requirements and potential methods for implementing readout to the ground and ground reconstruction of selected portions of imagery developed on board. Air-ground data link mechanization will be determined by SAF-SP program office."

GE Work Statement and Addendum No. 1, 13 January 1966

Task 6 Detailed Design

3. Data Readout Subsystem (Preliminary submittal of detailed design specification, 29 March 1966). In addition, integrate into MM & Lab items to be furnished by EKC.

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6

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General System Specification (SSS-149) December 1965

Readout

- a. Capacity - Readout 50 square inches of basic photographic take in five minutes required with a goal of 100 square inches. This is expected to be changed to 15 square inches and 30 square inches respectively in the next specification revision, to be consistent with the 20-megabit channel being developed for the Space Ground Link Subsystem(SGLS).
- b. Degradation - The system should degrade the reconstructed photo by less than 20% from the original processed photo.
- c. Security - With an effort expenditure of \$1,000,000 and 1 year the probability of unauthorized photo reconstruction will be less than 10^{-3} . NSA will review design for security.
- d. Ground Support - The ground stations and equipment used will be a function of cost. Decryption and processing at the receiving station are not required.
- e. Manual Functions - The design will be such as to require minimum time of the astronauts.

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Page 6 of 7 pages
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CONTRACTOR PROGRESS

EKC Monthly Progress Letter for October 1965, dated 16 November 1965

"2.4.3 Photographic Readout - A study which includes literature search of various photographic readout techniques has been initiated. A preliminary development plan for major items such as Bimat Soaker, processor, and readout breadboards was completed and a detailed plan of job assignments and responsibilities has been initiated."

EKC Monthly Progress Letter for November 1965, dated 15 December 1965

"2.4.2 Photographic Readout - To achieve the design objectives of the Dorian Program three possible methods of converting imaged data to transmittable information are being considered. These methods are direct electron beam scanning, scanning with a laser beam source, and scanning with a phosphor illumination source. The results of these considerations will be reported at a later date. The report will describe the advantages and disadvantages of each system and will recommend the optimum choice.

Initial design studies for a processor and dryer have been started and preliminary sketches of several possible designs have been completed."

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Page 7 of 7 pages
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