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20 September 1967

SUPPORT MODULE

STATEMENT OF WORK

EASTMAN KODAK COMPANY

20 SEPTEMBER 1967

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DEFINITIONS

LABORATORY VEHICLE

Laboratory Vehicle System Segment is the contractual package including but not limited to the following items and services: the integrated Laboratory Module with attendant software and AGE, the Mission Module structure, accommodation of experiment equipment within the Laboratory Module, and accommodation of interfaces with the other MOL System Segments.

SUPPORT MODULE (SM)

The Support Module is the specific grouping of flight hardware specified by CEI Specification _____ and consisting of the Structure, DRV's, film transport, expendables sufficient for a 60 day on-orbit life (propellants, cryo, DRV's and film), and associated equipment unique to the unmanned automatic mode MOL film return process.

CCN FOR PHASE I SUPPORT MODULE STUDY

1. The Photographic Payload Contractor shall conduct a Phase I Program leading to definition for contract negotiation of the Phase II tasks required to design, develop, manufacture, assemble, test and operationally support the automatic mode photographic subsystem of MOL/DORIAN Flight Vehicles 6 and 7. For purposes of this CCN, Phase I includes the following elements:
 - a. Analyses and trade-off studies leading to an optimized re-definition of the modular structure description and the Support Module roles and responsibilities, as defined in Paragraphs 1.4 and 3.0 of the Support Module System Segment Phase I Work Package, Air Force Document L-1532, EKC Document [REDACTED]. The trade-off studies of this element shall result in the determination and recommendation to the Air Force of one specific configuration and the location of interfaces (roles and responsibilities) for each Associate Contractor.

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- b. Design studies and interface negotiation culminating in definition of PPC-supplied hardware and PPC-required exchange hardware items in sufficient detail to permit contractual baseline description of each item.
- c. Review of and support for preparation of a revision to SS-MOL-1A that will incorporate and update system requirements for the automatic mode. Inputs of requirements for incorporation into Flights 6 and 7 Lab Vehicle, Orbiting Vehicle, Flight Vehicle and Support Module Specifications shall be supplied to GE and DAC.
- d. Initial design effort on the selected configuration through a conceptual design review. This effort shall comprise the preparation of layouts and design specifications for the components of the film handling subsystem and associated support equipment.
- e. PPC shall provide requirements to GE on DRV takeup alignment, thermal control, space allocation, weight and cleanliness.
- f. PPC shall provide DAC with necessary drawings required to build a 3-dimensional model of the automatic mode LM/SM.
- g. Establishment of a test flow compatible with program technical requirements. Inputs will be provided to DAC for the MOL System Test Plan.

The following studies are required to accomplish the effort described above.

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- a. A study on the use of a dual platen arrangement for an eight DRV configuration shall be conducted. The V configuration shall be considered a baseline for both single and double platen.

Trade-off study of the impact of supply film quantity on LM design. Includes evaluation of accessibility for loading and installation of flight film, film handling dynamics, possible use of a two-reel supply and of the secondary camera for one of these strands of film, and camera operating life. The film quantity shall be compatible with 8 fully loaded DRV's. Examine LM modifications (hatch) required for using a single reel (with DAC support).

- b. Study LM/SM thermal-vacuum test requirements to determine need for such tests in qualification or acceptance testing. If needed, a plan for implementing the test shall be proposed. These test requirements will include consideration of thermal distortion effects, if such distortions are a problem area. A copy of the study will be sent to AF/AS and copies of the test plan, if they are needed, will be sent to the Associate Contractors.
- c. Study automatic mode MM, LM and SM assembly and test flows at Rochester, Associate Contractor and field sites to optimize delivery schedule, exchange hardware, manpower requirements, and compatibility with manned/automatic mode test flow requirements. Facility and SIR requirements shall be considered.

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- d. Study the need for and define additional requirements for developing a capability for automatic mode OV performance prediction for MM operational dynamics test data. Support development of a mass spring math model of the LM/SM by modeling the EK components, so that an Associate Contractor can perform an automatic mode OV dynamic analysis. A copy of the EK component mass spring math model inputs will be sent to the Associate Contractors. A report on this effort should be submitted to the SPO.
- e. Study needs for acoustic acceptance test with flight fairings as opposed to use of a test fairing.
- f. Trade-off study of automatic film handling design requirements versus SM structural alignment tolerances.
- g. Trade-off study of SM film handling enclosure design impact versus launch pressure differential for normal and failure mode differentials of 5.8 and 6.4 psia respectively. A report on this effort should be submitted to the SPO/AS.
- h. Establish mechanical, electrical, thermal and environmental interface requirements for AFE, ASE, special test equipment, and software for the SM and LM for Flights 6 and 7. A copy of the interface requirements will be sent to AF/AS and the Associate Contractors.
- i. Conduct preliminary design studies and analyses for the 60 day mission using eight DRV's. This is a change from the baseline 6 DRV configuration.
- j. Establish requirements for structural support and environmental control of the film transport subsystem and associated components. These requirements will reflect appropriate supporting analysis. Analyses will be referenced. A copy of these requirements will be sent to AF/AS and the Associate Contractors.

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- k. Assist DAC in the integration of the film transport subsystem into the SM and LM overall design.
- l. Establish AGE requirements for EK-supplied components for Flights 6 and 7.
- m. Establish requirements for exchange hardware required from Associate Contractors.
- n. Prepare specifications for exchange hardware to be delivered to Associate Contractors.
- o. Study instrumentation requirements peculiar to PPC LM/SM hardware and integrate with system capabilities. A copy of this study and the resulting requirements will be sent to AF/AS and a copy of the requirements will be sent to the Associate Contractors.
- p. Study command requirements peculiar to PPC LM/SM hardware and integrate with command system capability.
- q. Establish requirements and criteria for test alignment and checkout of the film transport subsystem. A copy of the requirements will be sent to both AF/AS and the Associate Contractors.
- r. Perform trade-off study with GE to determine DRV modification required to accommodate up to 70 pounds of film. The study shall include evaluation of weight, footage, number of photographs and tolerances. A copy of the trade-off study will be sent to AF/AS.
- s. Establish access requirements for assembly of the SM film handling components to the LM film handling components. A copy of the requirements will be sent to both AF/AS and the Associate Contractors.

- t. Support DAC study to determine the optimum LM atmosphere and pressure (2.0 vs. 5.0 psia) for use in automatic mode operation. Design considerations should include ground safety and airborne fire hazard.
- u. Establish power requirements for flights 6 and 7 including peak and average power. The time-line baseline for the manned automatic mode shall be used in this study. Initial transmittal of this data to DAC shall be in 60 days.
- v. Establish preliminary mass properties characteristics of the PPC-supplied hardware for Flights 6 and 7.
- w. Fabricate breadboards and perform breadboard tests as required to establish feasibility of the configuration and design concepts.
- x. Conduct trade-off study of the effect of pressurization on the SM chute section on the film tracking in the film transport subsystem. This study shall include effects on PPC hardware and the DAC structure to which it is mounted. A copy of the trade-off study will be sent to AF/AS.
- y. Study thermal environmental control requirements of the film transport subsystem for compatibility of ground conditioning and on-orbit configurations, i.e., before and after the fairing is removed. A copy of the study will be sent to AF/AS.
- z. Determine the impact of performing acoustic testing of the structural test vehicle of the SM at Rochester. The study shall include considerations of cost, facilities, scheduling, manpower, etc. A report on this effort will be sent to SPO/AS.

- aa. Study, with GE, the implication of engaging in a joint qualification program at the SM level. A copy of this study should be sent to SPO/AS.
- bb. Participate in an effort to finalize the integrated test flow and exchange hardware test for Flight Vehicle 6 and Flight Vehicle 7 approximately six months after initiation of Phase I. The PPC shall also participate in reviews to up-date the baseline flow and exchange hardware list.
- cc. Engage in a joint study with GE to define the installation of flight DRV's in the SM at Rochester. This study shall include procedures and test flow.
- dd. Determine need for SM thermal control subsystem for PPC test program. If a thermal control subsystem for PPC test programs is needed, a copy of the analysis which demonstrates the need will be sent to AF/AS,
- ee. PPC shall provide inputs to DAC to support studies directed toward achieving a two week pad cycle time goal.
- ff. PPC shall provide inputs to GE and DAC for the MOL Integration Plan.
- gg. PPC shall conduct reliability analysis of the MOL automatic configuration PPC equipment to identify critical items for a 60 day on-orbit mission. A report shall be prepared to identify the scope of necessary qualification/life testing. Preliminary results of this analysis to be available for, and presented at the 15 November 1967 Configuration Review.

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2. The PPC shall cease effort on those elements of the automatic mode baseline defined by [REDACTED] which are inapplicable to the revised LM and SM configurations. To accomplish this in an orderly manner, the PPC shall review [REDACTED] and shall prepare a list of all negotiated tasks that are concerned with automatic mode effort. The potential applicability of each task to the revised baseline, and the effort expended to date shall be ascertained. Delivery dates of Support Modules and LM components for flight models 4 & 5 and for development models of the automatic mode shall be removed from the delivery schedule of [REDACTED] and replaced with TBD. The PPC, however, shall use the launch dates of 11-15-71 and 2-15-72 for Flight Vehicle 6 and Flight Vehicle 7 as a basis for schedule planning, and shall advise the Air Force of any long-lead procurement or effort required to protect this schedule.
 - 2a. The PPC shall meet directly with the Associate Contractors when problems of mutual impact are identified.
3. The PPC shall prepare and deliver a proposed Work Specification for the Phase II Support Module and LM component development models and production models (for FM-4 and FM-5) and associate ASE, together with MPS automatic mode assembly and testing. This Work Specification shall include a CDRL list on Form DD 1423. This is a list of reports to be submitted during Phase II.
 - 3a. PPC shall provide inputs to DAC for the MOL/DORIAN security analysis and plan for the unmanned automatic mode.

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4. Progress on the foregoing tasks shall be reported in the monthly Program Status Reports. Formal briefings to AF/AS on progress will not be required more often than once a month.
5. Provide for additional effort required by the increase to the 60 day version - 8 DRV's and additional film.
 - a. Additional hardware.
 - b. Additional development, qualification and acceptance testing.
 - c. Design activities.

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