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29 JAN 1965

MEMORANDUM FOR: [redacted] Comptroller
National Reconnaissance Office

SUBJECT : FULCRUM Funding

REFERENCE : BYE-36029-65, dated 4 January 1965

1. The following funding summary should provide the updating and costs by individual contractor as you requested. At this period in time, virtually all the milestones which had been established for each contract have been satisfied or are nearing completion. The following explicative information sets forth each appropriate contract with a general synopsis of the tasks and activities conducted by each together with corresponding obligations and estimated final cost to the NRO.

	NRO Obligations	Est. NRO Cost
A. CAMERA	2.501	2.538

Under the Itek Contract, seven specific tasks were conducted which included the design and fabrication of a high-speed film transport system for use in an optical bar type panoramic system.

(1) The principal features of this transport included a full-scale true configuration brassboard model including supply and take-up spools, film drive drum and true filming path with all dancers, rollers, etc. The film drive sub-assembly was completed with necessary IMC motion and counter balances, etc.

(2) A detailed design study, including the main camera and optics, structure and structural mounts, was also accomplished under this initial task, as well as

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analysis of thermal requirements, electrical controls and equipment, and estimates of weights, balances and inertia.

(3) Additional tasks included the design of an optical system which provided a 60" focal length F 3 system with a 6" field.

(4) A facilities study to survey the development and production requirements for environmental testing, project administration and engineering, fabrication, assembly, field services and mission support of an entire program was also specified.

(5) Task 5 was a determination of the magnitudes and frequencies of the disturbing forces and torques and their effect on camera structural distortion to ascertain the resulting focal shift and/or synchronization errors and craft reaction.

Task (6) and (7) provided a program analysis relative to schedules and identification of critical long lead time items as well as the fabrication and material handling of a special nature. The interface liaison was also considered with particular reference to SEAC and associate contractors to ensure proper coordination of the camera system with other major components.

B. ALTERNATE CAMERA STUDY 455 469

A back-up camera study of some $60,000 was initiated with the Perkin-Elmer Corporation to explore an independent approach to the FULCRUM Concept. The outgrowth of this study was attractive enough to warrant authorizing Perkin-Elmer to pursue their camera design in greater depth and, as a result, additional funds up to $400K were provided. This effort produced a detailed optical design to include Class "A" drawings of the optical elements, determination of critical long lead time items and the necessary manufacturing, tooling, and testing procedures required to support such an optical study. Additionally, a film transport sub-system was breadboarded in sufficient detail to enable production of drawings suitable for the fabrication of an

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engineering model and the construction of mock-ups of said design. Necessary theoretical analysis was also conducted to define the thermal stress and other environmental parameters critical to the system, design, and performance.

C. FAST FILM TRANSPORT 230 230

As a back-up to the fast-film transport efforts underway at both Itek and Perkin-Elmer, a study to investigate alternate approaches to the design and construction of the film handling system was undertaken with the Space Technology Laboratories. Under this STL contract, both continuous and intermittent film motion is being studied and the film handling system fabricated in a brassboard form. A test fixture for evaluating the film handling system is presently under construction.

D. ALTERNATE FAST FILM TRANSPORT STUDY
30 30

In view of their experience in handling high-speed TV tape, we sought an additional fast film back-up by funding a small effort with RCA. The purpose of this contract was to undertake an analytical study of the mechanical configuration and motion control servos necessary for obtaining the performance required by the FULCRUM system. The study included super-imposed motion study, determination of mechanical tolerances and identification of a servo system for the motion profile control.

E. SPACECRAFT COMPETITIONS - RFPs
185 185

Spacecraft competitions were conducted under RFPs with GE, LMSC, and STL, each costing in the neighborhood of $60,000. The terms of the funded competition sought specific design studies with appropriate tradeoffs, manufacturing techniques, and management to produce a spacecraft system capable of satisfying FULCRUM requirements. Certain specifications were provided specifically whenever possible;

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however, certain assumptions as to requirements and performance were estimated.

F. SPACECRAFT 200 200

As a result of the spacecraft competition, the GE Corporation was selected to proceed with additional design effort at a cost of $200,000. The task for their additional design work centered about definition of a program implementation plan, a master program schedule, an engineering plan, and other appropriate plans regarding reliability, manufacturing, quality control, field service, facilities, etc.

G. RECOVERY VEHICLE COMPETITIONS 123 123

Funded competition was also conducted for the Recovery Vehicle design with GE and AVCO at a cost in the neighborhood of $60,000 each.

H. RECOVERY VEHICLE 150 150

As a result of the design competition, AVCO was selected and given an additional $150,000 to proceed with engineering studies to demonstrate the feasibility of the R/V system and conduct various design and tradeoff analysis. These studies included considerations of accuracy, reliability, weight, cost factors, together with the conceptual designs for the various interface possibilities.

I. FILM 75 100

Procurement of film necessary to conduct the various experiments and performance tests associated with each film transport system at Itek, Perkin-Elmer, and STL will cost in the neighborhood of $100,000.

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	NRO Obligations	Est. NRO Cost
J. SYSTEM ENGINEERING, ASSEMBLY, AND CHECKOUT	475	475

Under this contract STL was contracted to perform various system engineering functions to include determination of system requirements and establish performance specifications for the assigned programs through studies and analysis; to recommend experimental programs necessary to assure achievement of program objectives; and to conduct the other evaluation and analysis normally associated with system engineering and interface functions.

TOTAL	$4.424	$4.500

(Signed) John M. Clarke

John M. Clarke
Director
Budget, Program Analysis
and Manpower

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