FUL-0089-64
Cy 1 of 4

9204-SHC64-157

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21 October 1964

Dear Jim:

The Work Statement and Schedule of Deliverable Items as contained in our proposal 9204-SHC64-141, dated 6 October 1964, has been revised as a result of technical discussions between your technical monitors and our project personnel.

In order to simplify the process of making the changes we are enclosing replacement pages to the proposal copies which have been assigned to your activity. These changes constitute Addendum No. 1 to the above noted proposal and is subject to the same terms, conditions and Contract considerations.

The referenced changes are as follows:

1. Page 7, Section 1.2, Paragraph E, Line 2 -Delete the words: S/I Camera.

2. Page 9, Section 1.3, 1st Paragraph, 2nd Sentence - Delete:

   The model will be operated in a vacuum chamber to ascertain the dynamic effects of the absence of air and to detect the possible presence of corona discharge.

   and substitute with: The model will be operated at both ambient atmospheres and in a vacuum chamber to ascertain the dynamic effects of the absence of air, detect the possible presence of corona discharge, and evaluate the reliability of the required forward and reverse motion of the film.

3. Page 17, Section 3.1.1, 6th Paragraph, Lines 3 & 4 - Delete the words: edge of the nearly concentric spherical shell of the corrector lens.

   and substitute with: of the aspheric corrector plate

4. Page 17, Section 3.1.2, 1st Paragraph, Lines 1 and 2 - Delete the words: The meniscus corrector, the folding mirror and the two plate ribbed primary mirror.

   and substitute with: The two plate ribbed primary mirror, the folding mirror and the aspheric plate.

5. Page 18, Section 3.2.2 - Delete in its entirety and substitute with: Since the optical fabrication problems associated with this camera design are essentially the same as in the optic bar design no element fabrication is necessary.

6. Page 24, Item #3 - Delete in its entirety and substitute with:

   Task 5 Summary Report giving a detailed report of the system analyses.

7. Page 24, Items #9 and #10 - Delete in their entirety and substitute with: Prototype elements of the optical bar system to include one each Schmidt plate, primary mirror, and folding mirror consistent with the requirements of the lens design.

8. Page 25 - Add item #19:

   (Quantity 1) Summary report comparing the rotating optical bar system and the 1/3 focal length system. This should compare the results of the individual feasibility studies, state Itek's opinion as to the manufacturing problems of each design, and recommend the design which is most likely to fulfill the total operational requirements without compromising the basic mission objectives. (Delivery Date 1/31/65).

Our records indicate that Copies #1 through #5 of proposal 9204-SHC64-141 are assigned to J. McMahon. We request that the obsoleted pages (Page 7, 9, 17, 18, 24 and 25) be returned to W. N. Snouffer, P.O. Box 115, Bedford, Massachusetts for destruction and that the revised pages enclosed be inserted.

Should you require further information, please contact the undersigned.

Very truly yours,

J. E. Lilley,
Contract Administrator

JEL/mm

Approved:
Frank J. Madden,
Project Manager

FUL-0089-64/2

film drive drum, true film path with all dancers, rollers, etc., incorporated in an optical bar structure shortened by the elimination of the optical system but complete with all optical bar drive components, bearings, slip rings, etc. The film drive subassembly shall be complete with all necessary IMC motions and counter balances, fiducial marking, and film coding subsystems. Compromises of the "ultimate" design may be made, where necessitated by component availability, if the resultant brassboard is compatible with the "ultimate" design.

1.2 Camera System Design

The following system design efforts will be accomplished:

a. Perform a detailed design study (including layouts) of the main camera, incorporating film transport and optics indicating size, location and configuration of all significant subassemblies.

b. Perform a design study of camera structure, system support structure, and structural mounts to vehicle.

c. Prepare main camera specifications, establishing detail design and performance requirements.

d. Establish and maintain camera block diagrams, and timing diagrams.

e. Perform a detailed design study (including layouts) of the other components of the camera system (i.e., recovery take-up).

n. Fabricate and maintain a full-scale non operating (wooden) mockup of the complete photo system establishing all component sizes and locations, film paths, windows, support structure, vehicle mounts, interface connections, cable runs, etc.

o. Devise a feasible plan for and establish a practical method of incorporating into the camera a fiducial system such that a definite relationship can be established between image points and the original object points.

p. Consider the parameters affecting the maintenance of a pressure at the film transport area such that corona discharge can be obviated. If air bearings are used the spillage from these bearings will be accounted for and calculations made for additional make up air.

1.3 Test

Itek will generate a test plan, develop test equipment, and perform tests to clearly demonstrate the capability of the film transport brassboard. The model will be operated at both ambient atmospheres and in a vacuum chamber to ascertain the dynamic effects of the absence of air, detect the possible presence of corona discharge, and evaluate the eligibility of the required forward and reverse motion of the film. No further environmental testing will be undertaken in conjunction with this effort. Vacuum tests will be conducted using existing facilities which are currently being utilized on other Government contracts. This effort is predicated upon the use of these facilities on a non-interference basis. All design, testing and evaluation shall conform to good comercial practice rather than to military specifications.

A technical summary will be prepared at the end of each month. A preliminary lens design and tolerancing analysis will be presented at the end of the third month. A final report will be supplied at the end of the sixth month covering all design and analysis carried out. Continuous system analysis and consulting services will be supplied to the project and to the optical manufacturing departments.

The preliminary design will be satisfactory for prototype fabrication of elements. The final design shall incorporate all features appropriate to production quantities.

We have studied the effects of thermal gradients and their optical effects on flat windows and these investigations will be extended to cover the heat transfer to and through the faces and of the aspheric corrector plate. Calculations will be made of the defocusing and aberration effects of uniform temperature excursions to determine the degree to which such effects can be tolerated in operation.

The thermal analysis capability of the Vidya Division of Itek will be utilized to predict the effect on the optical elements of albedo and other thermal disturbances.

3.1.2 Fabrication

The two plate ribbed primary mirror, the folding mirror, and the aspheric plate are of a sufficiently critical nature and present enough unique fabrication and mounting problems to warrant Itek proposing the fabrication of prototypes of these elements and the cells required to mount them to the optical bar proper.

Investigations into materials and structures, as well as fabrication, assembly and test techniques will be conducted to assure optimum selection of components and manufacturing methods conducive to as efficient a production schedule as is feasible for systems of this type. The use of cast-in-place epoxy loating shoulders, foamed-in-place resins and elastomeric mounting will be examined for suitability of application.

3.1.3 Optical Testing

Itek will generate a test plan and carry out such tests as are required to assure optical, mechanical, thermal and operational integrity of the individual element-mount combinations. Ritchie tests using laser interferometric techniques will be utilized in the testing of the folding mirror.

3.2 One Third Focal Length System

3.2.1 Design

Itek will design a Schmidt-corrected catadioptric 60-inch f/3.0 optical system suitable for use in a panoramic system which is to be rotated about an axis located 20-inches behind the node of emergence.

3.2.2 Fabrication

Since the optical fabrication problems associated with this camera design are essentially the same as in the optic bar design no element fabrication is necessary.

SUMMARY OF DELIVERABLE ITEMS

Contractual requirements of the Phase I Program are as summarized below:

Item	Quantity	Description	Delivery Date
1	1	Brassboard of constant velocity film transport system suitable for optical bar type panoramic system and incorporating optic bar bearing system	1/31/65
2	1	Evaluation report of the performance and operational feasibility of Item 1.	1/31/65
3	1	Task 5 Summary report giving a detailed report of the system analyses	1/31/65
4	1	Preliminary interface specification defining the optical bar camera system envelope, weights, power requirements, and other camera system spacecraft interface factors.	11/16/64
5	1	Full scale wooden design mockup of the complete optical bar camera system in a space frame representing the vehicle	1/31/65
6	1	Report summarizing the optical bar camera design	1/31/65
7	1	Engineering specifications for the fabrication of the optical elements	9/30/64
8	1	Interim report covering the design and expected performance of the optical systems	9/30/64
9 & 10	1	Prototype elements of the optical bar system to include one each Schmidt plate, primary mirror and folding mirror consistent with the requirements of the lens design.	1/31/65

(Revised)

Item	Quantity	Description	Delivery Date
11	1	Final optical design report covering all aspects of the optical design and fabrication studies and stating requirements for putting the designs into production.	12/31/64
12	1	Breadboard of a continuous film transport system for the 1/3 focal length, 120° scan, panoramic camera system.	1/31/65
13	1	Evaluation report of the performance and operational feasibility of Item 12.	1/31/65
14	1	Full scale wooden mockup of a single 1/3 focal length camera within a space frame representing the vehicle.	1/31/65
15	1	Preliminary interface specification defining 1/3 focal length camera system envelope, weights, power requirements, and other camera spacecraft interface factors.	11/21/64
16	1	Report summarizing the 1/3 focal length camera design.	1/31/65
17	1	Report of facility requirements, costs, schedules, and specifications for their construction.	12/31/64
18	1	Program plan for Phase II.	12/31/64
19	1	Summary report comparing the rotating optical bar system and the 1/3 focal length system. This should compare the results of the individual feasibility studies, state Itek's opinion as to the manufacturing problems of each design, and recommend the design which is most likely to fulfill the total operational requirements without compromising the basic mission objectives	1/31/65