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Contract No. MB-1957
Amendment No. 1

Itek Corporation
Lexington, Massachusetts

Gentlemen:

1. This document constitutes Amendment No. 1 to Contract No. MB-1957 between the parties hereto, and said contract is amended as hereinafter set forth.

2. The parties hereto have negotiated and agreed upon additional work to be conducted under this contract. Said work is set forth in Appendix III attached hereto and made a part of this contract at an increase in estimated cost and fixed fee of $505,700.00 and $39,900.00, respectively.

3. In addition, the parties have agreed to certain changes in Appendix I and II of the basic contract at no change in estimated cost and fixed fee. Said changes are as follows:

a. Paragraph B, Delivery of Appendix I is revised as follows:

"(1) By deleting the words "one each Schmidt plates" appearing in Item i., line 3 and in lieu substitute the words 'two (2) aspheric connector plates.'

(2) By deleting Items n. and o. in their entirety and in lieu substitute n. and o. - Final Report - 1/3 Focal Length Displaced Node Camera System - 12/31/64."

b. Appendix II is amended by adding the following new paragraph 6 thereto:

"It is understood that the work described in Appendix I under Task II was concluded on 13 November 1964 with the exception of breadboard testing. Breadboard testing was continued so that results could be incorporated in the first report required under item n. and o. of Schedule B."

4. As a result of the foregoing, the PERIOD OF PERFORMANCE set forth in PART II is extended to 28 February 1965.

5. Further, PART III of the schedule is revised to read as follows:

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"PART III - ESTIMATED COST AND FIXED FEE

a. The total estimated cost for the performance of this contract is $3,356,806.00.

b. The fixed fee for the performance of this contract is $264,900.00."

6. All other terms, conditions and requirements of this contract remain unchanged.

7. Please indicate your receipt and acceptance of this Amendment No. 1 by executing the original and two copies hereof. Please return the fully executed original and one copy to the undersigned, and retain the remaining copy for your files.

Very truly yours,

Contracting Officer

ACKNOWLEDGED AND ACCEPTED
ITEK CORPORATION
LEXINGTON, MASSACHUSETTS

BY W J Lawson

TITLE VICE-PRESIDENT

DATE 3/15/1965

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APPENDIX III

Contract No. MB-1957

Amendment No. 1

STATEMENT OF WORK

A. Contractor shall furnish the necessary facilities, services, and materials to accomplish the work set forth herein below.

TASK 1

1.1 BRASSBOARD TESTING

The primary project effort will continue to be directed toward completion of brassboard tests and further development of the rotating optical bar camera concept. Particular emphasis will be placed upon the series of tests which establish the capability of synchronizing film velocity with optical bar rotational rate, which demonstrate how well film flatness can be maintained, and which establish to what extent and to what rates we can control lateral wander of the film. These tests will first be run at standard atmospheric pressure and without axial oscillation of the film drum. Subsequent testing will be done with the film drum oscillating. During this subsequent testing we will substantiate the validity of the proposed technique for frame sensing. At an appropriate time the move will be made to the vacuum chamber such that we can determine from the previous tests the variations caused by this environment and to determine if a corona discharge problem exists.

During these tests data will also be gathered which will allow evaluation of the heat dissipation from torque motors internal to the camera and provide "first cut" information about vibration levels.

As soon as test data becomes available we will initiate data reduction such that a running account can be kept of progress.

1.2 GAS BAR STEERING

An adjunct to the brassboard is the gas bar steering breadboard. The potential value of this item is two-fold, first, it provides a film steering system if mechanical alignment of rollers does not prove adequate for reliable film transport and, secondly, it can be utilized to control the film's lateral position at the focal plane to accomplish the required image motion compensation. It has been constructed such that it may be incorporated into the brassboard if need so dictates. We propose that development testing (which so far has been encouraging) be continued on this item.

1.3 INTERMITTENT FILM DRIVE

During Phase I a design concept for an intermittent film drive was conceived which is consistent with the requirements of the rotating optical bar camera. We propose to construct a breadboard of this drive utilizing the film drum which was used for film flatness tests and in addition fabricate the necessary parts unique to the intermittent drive. The fabricated parts would be made such that if the drive proved feasible it could be used in the brassboard for more complete testing.

TASK 2

2.1 CAMERA SYSTEM DESIGN

There are certain components of the camera which are critical items in terms of Phase II schedules. Uppermost among these are the optical bar structure and the film transport. We propose that the prototype design of these major sub-assemblies be prepared as completely as time permits. We also recommend a continued lower level effort be applied to establishing performance and reliability of such items as bearings, torquers, slip rings, etc. Included here would be the generation of camera system and major subassembly design specifications and component procurement specifications for long lead items. Continued effort is needed to control and minimize the weight of the camera system and to this end we wish to maintain on the staff personnel experienced in this task.

The camera design needs to be monitored from the thermal standpoint and we propose that Vidya assist us at a minimal level consistent with maintaining continuity.

2.2 CRITICAL COMPONENT PILOT PROCUREMENT

There are certain components such as torquers, bearings, and slip rings which must be specially developed and/or custom built for the camera. It would be most desirable to obtain for development and reliability testing pilot units of these items. This procurement would also pinpoint vendor technical problems and allow the vendors to consider ways of circumventing these problems.

The invar metering rods and beryllium skin needed for the optical bar also pose developmental and procurement problems. Here also it is advisable to conduct developmental tests and to make initial token procurements to probe the problems to be encountered.

TASK 3

3.1 OPTICAL DESIGN

The basic optical design is complete but we wish to optimize the design from the standpoint of tolerancing. This is desirable in order that the tolerances be apportioned in such a way as to permit the most easily manufacturable camera system possible within the constraints of acceptable quality.

It is further desirable during this period to devote some time to defining a workable optical system alignment technique. Considering both the goal of optical quality and the production rate it is imperative that we have well thought out techniques which are not excessively time consuming.

3.2 OPTICAL FABRICATION AND TESTING

The optical fabrication aspect of the feasibility study of the aspheric corrector plate of the primary and folding mirrors is continuing and we propose to bring this to its logical conclusion. We have already gained much experience and encountered problems which, although frustrating, have served to warn us of pitfalls to be avoided. The time gained in this way will be invaluable in a production program.

3.3 PROTOTYPE MOUNT DESIGN

As test results become available it will be necessary to adjust the optical mount designs such that they are consistent with the needs of the camera prototype design.

TASK 4

4.1 FACILITIES STUDY

A fairly comprehensive study of the needs for space and equipment for the development and production phases of the program has been done. There remains the need of writing detailed procurement specifications for such key requirements as clean rooms, thermo-vacuum chamber, vibration equipment, etc We also wish to prepare the specification sheets for the construction engineers to allow immediate action upon initiation of an A & E contract.

Recently the Government requested that we determine the requirements for a separate facility for the major assembly and test of the camera system. its integration with the orbiting control vehicle and recovery vehicle, and qualification of the complete system. Two alternate sites are to be considered for the new building, one at Itek, or secondly, at a Boston area site not on Itek property.

TASK 5

5.1 SYSTEM ANALYSIS

There will always be a continuing need to update and expand error budgets, system and sub-system performance predictions, and system and sub-system performance specifications. Some of this updating is due to refinement of calculations but as results become available from the brass-board testing and optics testing this information must be factored into the predictions.

A request has been received to make a study of the probability distribution of operational errors. This requires the services of a capable mathemetician with appropriate computer backup and these are costed into the work statement.

The system analysis group is often called upon to supply supporting material for customer presentations and we have taken this need into account in the estimates.

5.2 CORONA INVESTIGATION

We propose that the Ion Physics investigation continue. Up to this point they have been concerned with the theoretical aspects of charge generation and dissipation and with the definition of experiments and experimental techniques which would give results of a useful nature. They now feel that some laboratory experimentation is in order to check their premises. In addition to this work their help will be valuable as brassboard testing is initiated in the vacuum environment.

TASK 6

6.1 PROGRAM PLANNING

Using the completed Phase II Analysis report as a basis it is desirable to generate more detailed plans and schedules for critical subassemblies.

In this category we also wish to define procedures which will give strong control over engineering drawing release and change, define parts flow, and govern review and disposition of defective and failed parts. These areas tend to be overlooked until the resultant confusion necessitates that controls be imposed.

6.2 FIELD SERVICE PLANNING

It is important that some time be spent on planning what activities will take place and what support facilities will be required at the launch area. The level of testing achieved prior to equipment receipt at the launch area would dictate the extent of facility requirement at the launch area. Since there will undoubtedly be more than one system at this facility at one time it will be of significant size and will require considerable planning effort.

7.1 INTERFACE

Since the contractors responsible for SEAC, the orbiting control vehicle, and the recovery vehicle have been identified there has been a rapidly increasing number of queries relative to the various interface factors. To answer these queries and to inform the appropriate personnel of needed adjustments in design approach it is necessary to maintain personnel for this specific function.

In addition to the above duties we plan to have this group have a first look at the requirements for the stellar index camera needed for the establishment of cartographic reference.

B. Delivery

Contractor shall complete as much of the work set forth above as possible within the funding limitation and submit a report of the work completed and the results as of 28 February 1965.