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SCIENCE PARK, P.O. BOX 60 • STATE COLLEGE, PA. 16801 • PHONE 814 • 238-4311

February 7, 1967

Mr. R. D. Mayo
Code 5614
Naval Research Laboratory
Washington, D. C. 20390

Dear Sir:

Reference: HRB Proposal P-6791

HRB-Singer, Inc. is pleased to submit its proposal, P-6791, for continuation of the effort currently being performed under contract [redacted] Our enclosed technical proposal describes a research and development program to be performed at our State College facility with a liaison and logistic support effort to be performed at the Naval Research Laboratory. Our proposal is based upon HRB-Singer providing its unique background and experience for the U. S. Navy in solving its special electronic receiving, recording and analysis problems.

Because performance of research cannot be clearly defined, we feel that the type of contract applicable to our technical proposal is a cost reimbursement type with a fixed fee. Our estimated cost for a twelve-month effort is $876,004.00 with a fixed fee of $87,596.00. A breakdown of the cost proposal, notes appropriate thereto and a certificate of current cost and pricing are attached.

We would appreciate an opportunity to discuss this proposal at your earliest convenience. Please contact Mr. David Allison for any technical information. Mr. James E. Hess will be glad to answer questions of a contractual nature. Our telephone number in State College, Pennsylvania is 814, 238-4311.

Very truly yours,

GLM:RFW:im
Enclosures-
Technical Proposal, 3 cys
Cost Estimate, 3 cys
Notes, 1 cy
Certificate of Current Pricing, 1 cy

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I. INTRODUCTION

Since March 1964 HRB-Singer, Inc. has worked with the Naval Research Laboratory on research and development programs attempting to develop new equipment which will better satisfy the needs of NRL. We have also provided back-up engineering support by assigning HRB personnel at NRL. This support has taken various forms, some of which have been design engineering, field support, installation assistance and logistic support.

During the past three years HRB has been successful in demonstrating the feasibility and practicality of producing a generation of new VHF receivers for NRL. Since January 1966, at the direction of the Scientific Officer, HRB has been working on the development of a complete new special-purpose, electronic system. Two first generation, prototype models (System 913) of this System have been designed and fabricated.

In this proposal HRB-Singer presents a program for further development of System 913 and the associated software.

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C05025552
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II. PROGRAM DEFINITION

A. General

The progress made to date on the development of System 913 and in consideration of system requirements, several key areas of interest have been defined. Based on analysis of system requirements it is now evident that analysis efforts to develop techniques for fully exploiting collected data in a timely or tactical sense must be initiated. Encouraging results to date on current equipment evaluation have increased the likelihood of additional equipment requirements for the remaining field sites. Accordingly, prior to production of additional systems, a trade-off analysis must be undertaken to include technical improvements and determine the most economical approach.

B. System 913 -- Hardware

1. Receiving Subsystem

At the direction of the Scientific Officer a development effort to define a second generation receiving subsystem was initiated in December 1966. It is proposed that this investigation be continued. The objective of this effort is to develop an engineering model reflecting an integrated receiver and analog processing unit. Documentation required for possible production of the second generation receiving subsystem will be generated.

2. Pulse Sorter

The existing configuration of the Pulse Sorter requires technical improvements so that performance of the overall system will be enhanced. Typical improvements which are under consideration are: (1) an increased clock frequency to minimize current phasing difficulties with the asynchronous operation (2) all clocked logic and (3) better system interaction with the correlator function of the Digital Processing Unit.

The present physical configuration of the Pulse Sorter presents potential long-term reliability problems and does not permit economical production to fulfill total operational requirements. As such the development of an engineering model (pre-production prototype) is recommended. This model will reflect technical changes to improve performance and mechanical reconfiguration to enhance production requirements. Required documenta-

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C05025552
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tion for production will be produced.

3. Digital Processing Unit

With the objective of an optimized total system, technical changes in the DPU should encompass a higher clock frequency for greater analysis accuracy. In addition the current equipment configuration does not permit economical production in the operational quantities required. The addition of a digital computer to the collection system configuration for real time processing necessitates an effort to analyze and define the hardware/software interface.

In view of the above, the development of an engineering model (preproduction prototype) is recommended. This effort will (1) incorporate technical changes to enhance overall system accuracy, (2) define DPU-computer interface hardware and software requirements, (3) allow for mechanical reconfiguration so that production quantities can be built, if required, and (4) permit completion of the required documentation (drawings) for production.

C. System 913 -- Software

HRB-Singer recommends that an effort be expended in the definition of a complete system configuration; the successful integration of second generation equipment into an optimized system; and the extension of analysis and computer software efforts toward achieving immediate and future requirements.

Significant benefit has been derived in the past year by operating the total System 913 in the low-pressure environment of State College. Accordingly it is recommended that a total 913 System, integrated with a digital computer, be made available in State College for next year's effort. This would provide a vehicle for further analysis and evaluation of software and hardware technique. In addition, the availability of a total system in State College will enable us to react to a software problem posed by the overseas operation on a QRC basis with a high degree of assurance that the recommended solution is the correct solution.

1. System Analysis

The extension of existing software efforts toward the immediate goal of deploying one 913 System together with a computer (SEL Model 810A) to

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the overseas site by 1 April 1967 must be completed. The highest priority is being placed on the mechanization of these software techniques on the SEL 810A digital computer.

2. Total System Error Analysis

It is recommended that a total system error analysis and evaluation be initiated to provide analytical substance for system definition.

3. Special Techniques Development

It is recommended that an effort be initiated to define the exploitation potential of collected data toward meeting specific NRL objectives.

4. Mechanical Requirements

Substantial mechanical planning will be required to develop an engineering model (pre-production prototype) configured to permit production of operational systems as required. Extensive documentation is required to facilitate the production process. Interface planning between the design engineers and production engineers will be required to permit a smooth transition from development to production.

5. Computer Utilization Study

The addition of a computer to the 913 System permits real time processing of collected data. The availability of the computer greatly increases the flexibility of the system. As such, it is recommended that an effort be undertaken to define the possible use of the computer to perform automatic, continuous monitoring of system performance.

As an example of this automatic, continuous monitoring, consider a test function that provides computer program controlled test inputs to specific subsystems. When this data is inserted into the various components of System 913 on a periodic basis, subsystem through total system performance can be measured automatically and continuously. This action will release Navy technicians from this responsibility (thus making them available for other pressing equipment maintenance duties) and will provide, on a continuous basis, if desired, a measure of system performance.

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C05025552
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6. System Level Manual

The magnitude of the total system to date makes it necessary that a complete and coherent system level manual be written. This manual will be essentially an operation type document written to the best commercial standards. Such a manual is mandatory to permit satisfactory and efficient site operation. It is recommended that this task be started as soon as feasible.

7. Integrated Circuit Investigation

The planning necessary for production of a number of 913 Systems should take into consideration the economic benefits which could be realized by developing hybrid integrated circuit logic elements. This effort would be aimed at providing integrated circuits for use during the production cycle of System 913.

It is recommended that a feasibility investigation of hybrid integrated circuit fabrication techniques to meet production requirements be undertaken.

D. System 913 -- Technical Assistance and Project Coordination at NRL

In order to insure project coordination and obtain maximum benefit of the resources available at the Naval Research Laboratory it is recommended that the current level of resident support at NRL being provided under Contract [redacted] be continued. In addition, it is recommended that additional field support at NRL and/or overseas, be provided on an on-call basis during the period of performance. The desirability and availability of personnel for this additional field support would be coordinated with the resident HRB task director at NRL, the Program Manager and the Scientific Officer.

E. System 913 -- Training

Some consideration should be given at this time as to the desirability of providing a training course and instructors for teaching on System 913 equipment. In the event the integration of a digital computer into System 913 proves as valuable as hoped and a decision is made by NRL to produce additional systems, it will be necessary for Navy personnel to become familiar with the operation and maintenance of the equipment. HRB-Singer can be prepared to offer a training course on System 913 should this become desirable. It will take approximately four to six months to prepare the required documentation for teaching an operations and maintenance course. This

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effort could be undertaken in conjunction with any production effort which may be initiated.

F. System 913 -- Program Management

Due to the increased scope of HRB-Singer's support to the Naval Research Laboratory, as herein proposed, major consideration must be given to program management in State College. It is our intention that the task established in March 1966 by the Scientific Officer (designated Technical Director) be expanded in scope and that the individual previously designated as the technical director in State College be established as the overall Program Manager. The Program Manager and his staff will be responsible for overall management of the effort proposed in this document. He will coordinate his activities with the HRB resident task director at NRL and the Scientific Officer.

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III. PERIOD OF PERFORMANCE

HRB-Singer, Inc. recommends that the effort proposed herein be conducted over a twelve month period. Should the needs of this program shift by changes in the operational requirements during the contract period the emphasis of work on any resulting contract will be altered accordingly. All changes in emphasis will be coordinated with the Scientific Officer and will be initiated at his direction.

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IV. PERSONNEL

HRB-Singer recommends the assignment of Mr. J. Kevin Kelly as the Program Manager. Messers. Lee M. Hammarstrom, Mark J. Van de Walle, James N. O'Connor and Paul M. Oesterling are recommended as the resident HRB staff at NRL. The qualifications of these men are well known by NRL and therefore resumes of their experience will not be repeated herein.

Personnel to be assigned to the R & D effort at State College, together with personnel required for additional field support, will be chosen from the staff of over 700 professional personnel at HRB-Singer. The individuals to be chosen will depend on the assigned tasks and will be coordinated with the Scientific Officer at NRL. Qualified design engineers, mathematicians, computer programmers, etc. possessing specialties in the various disciplines required for this R & D effort will be selected.

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V. REPORTS

Reports, as required by the Scientific Officer at NRL, will be submitted. It is proposed that a monthly status report (letter) be submitted by the Program Manager covering all aspects of the program. In addition, quarterly reports will be submitted covering the activities and progress to date on the analysis effort, the total system error analysis and the special techniques analysis effort. A final report will be submitted at the conclusion of the analysis effort (in lieu of 4th quarterly report), special techniques analysis (in lieu of 4th quarterly report), computer utilization study and integrated circuit investigation. A final report covering the activities of the entire program will be submitted 60 days after termination of the contract. The operations manual will be submitted nine months after the task is initiated.

Upon completion of the engineering model (pre-production prototype) a technical manual containing circuit diagrams, an explanation of the operation of the equipment, accepted maintenance procedures and alignment procedures will be provided. In addition all documentation produced in anticipation of a production effort will be made available.

All reports, manuals, drawings and other documentation will be produced to accepted industry standards.

A bar graph showing anticipated start and completion dates for the various tasks is shown below.

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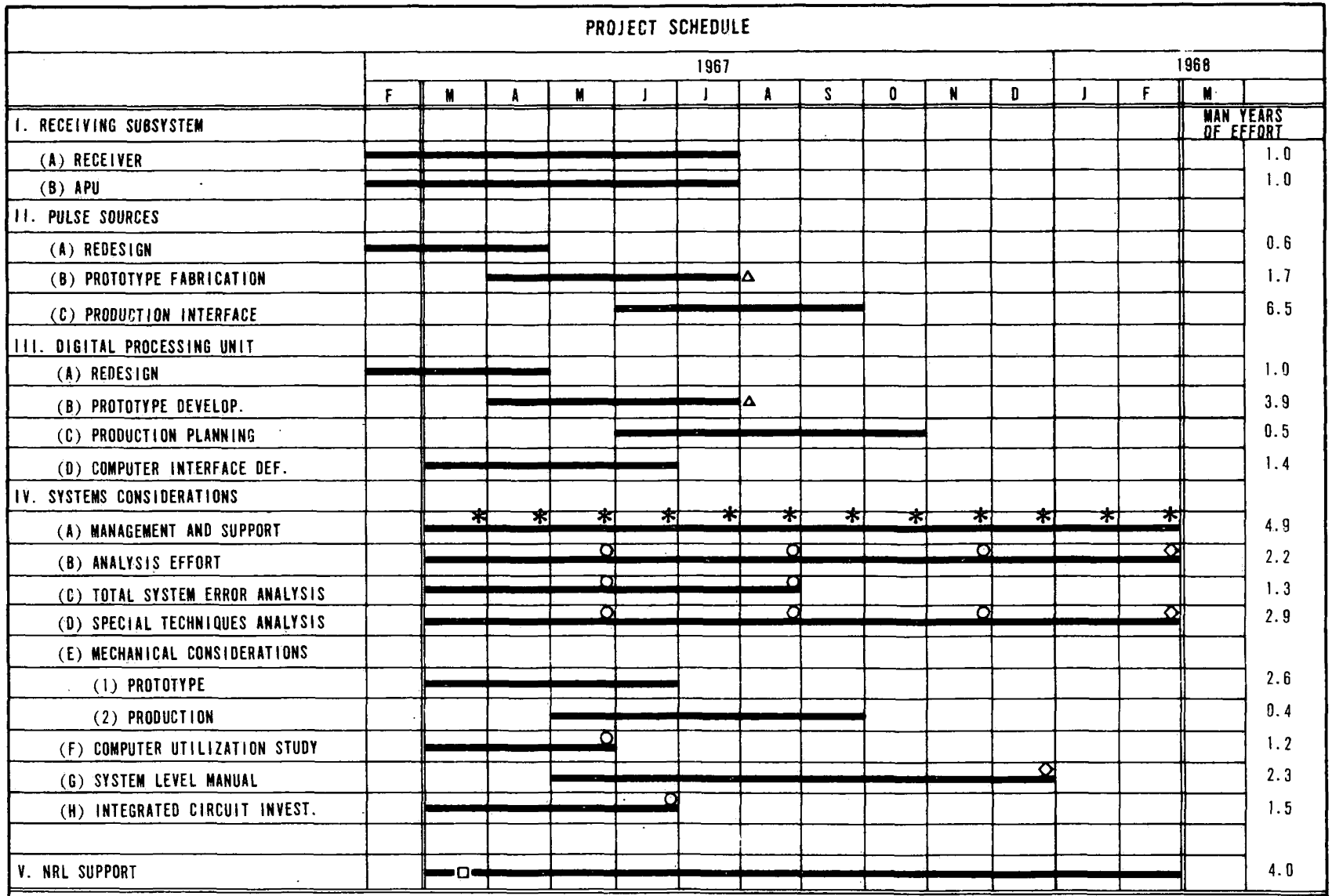
PROJECT SCHEDULE



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