

*Draft 6/9/69*

PROCUREMENT PLAN FOR THE DEVELOPMENT OF AN  
INTEGRATED MEDICAL AND BEHAVIORAL  
LABORATORY MEASUREMENT SYSTEM  
(IMBLMS)

Introduction

This procurement plan will update the original plan for IMBLMS approved by the Associate Administrator for Manned Space Flight on December 2, 1966, the addendum to the original plan approved by the Associate Administrator on October 24, 1967, and the revision to the original plan approved by the Associate Administrator on July 3, 1968. For purposes of clarity, in discussing this phase of IMBLMS, "Preliminary Project Design Phase," it is considered desirable to restate all aspects of the plan and indicate the contract phases already completed. There are no significant changes in the technical concept of IMBLMS or in the procurement approach as originally planned. The procurement plan will be updated by amendment prior to contracting for the next phase.

I. DESCRIPTION OF THE PROPOSED PROCUREMENT

A. Purpose and Description of Work, Supplies, or Services

1. Background

Medical experiments have been an integral part of the manned spaceflight program beginning with Projects Mercury and Gemini and into Project Apollo. Likewise, a series of medical experiments is currently programed for the Saturn I Workshop Project. For the past 16 years, NASA has conducted a study effort to identify the information required for the support of man for long duration missions and to provide basic data of interest to clinical medicine and allied biomedical disciplines. *OK. [initials]*

Up to the present time, manned spaceflight missions have conducted separate medical and behavioral experiments. IMBLMS applies a systems approach through utilization of common equipment and by enabling an entire comprehensive series of measurements to be conducted individually or in combinations onboard the spacecraft. The IMBLMS capability includes processing display and/or transmittal of the measurement data. Thus, the IMBLMS can accommodate any experiments through its comprehensive measurement capability. The IMBLMS will be flexible from flight to flight in both measurement capability and equipment integration. It will combine a practicality and suitability for use in spaceflight



experiments with a growth potential for accommodating new measurements stemming from the impact of new knowledge and the products of new technology to be provided in IMBLMS. Presently, the contractors are engaged in activities that will demonstrate a coordinated systems type measurements capability and respective operational techniques by means of an IMBLMS functional breadboard.

The proposed procurement will initiate the Phase C Project Design which shall be contracted for in two successive segments. The first segment (C.1) will include the Preliminary Design of the flight IMBLMS and program plan for follow-on phases. Both contractors will continue to compete through the first segment of Phase C. Phase C.2 will include final design, development, and qualification of the flight IMBLMS. *At the conclusion of* One contractor from the Phase C.1 *one of the two competing contractors* contract will be selected for Phase C.2. Phase D will include manufacture of flight IMBLMS and operational support for IMBLMS utilization. It is probable that Phase D will be negotiated on a noncompetitive basis with the Phase C.2 contractor, and be started prior to the completion of C.2.

## 2. Objective

The program objective is a flight Integrated Medical and Behavioral Laboratory Measurement System which will optimize commonality of equipment and flight crew tasks and which will be designed so that it can be utilized in full or in part aboard any manned space vehicle, such as Saturn Space Station, and Lunar Base. This system will be capable of accomplishing specified medical and behavioral measurements and accommodating additional measurements and experiments which are being submitted to NASA on a continuing basis. It will be designed in modular form to enable altering of medical experiment mission plans with a minimal lead time and maximum facility.

It is anticipated that IMBLMS will consist of a five functional elements, each containing a relatively discrete measurement capability. One element will encompass the physiological area; one, the biochemical area; one, the microbiological area; one the behavioral area; and one, the data management, control, and display area.

The objective of the proposed procurement is to initiate the first segment, Phase C, Preliminary Project Design. The contractors will complete tasks summarized as follows:

### Task 1, Design

This includes all the subtasks and related efforts dedicated to accomplishing the Preliminary Project Design for a flight



version of IMBLMS.

- I.1 Preliminary Design Requirements
- I.2 Preliminary Design Drawings, Analysis, and Supporting Activities

#### Task II, Program Planning

This task will determine the detailed planning needs for Phases C.2 and D and document the information in a series of Management, Technical, and Cost Plans.

#### Task III, Flight Design Mockup (nonfunctional)

This task is directed at assembling a nonfunctional mockup of the flight version IMBLMS and developing the plans and procedures for subsequently conducting a time line analysis.

#### Task IV, C.2 Proposal

The effort in this task is concerned with preparation of the contractor's Technical and Business Proposals for Phase C.2.

#### TASKS I THROUGH IV WILL BE COMPLETED PRIOR TO THE FIRST 6 MONTHS OF PHASE C.1.

Task V through Task VII permit the contractor to maintain his IMBLMS Project key management and technical personnel intact during the period anticipated for Phase C.2 contractor selection and produce useful productive results directly applicable to the continuing IMBLMS program.

#### Task V, Time Line Analysis

This task will conduct the time line analysis using the flight version IMBLMS mockup and procedures developed in Task III. Results and recommendations will be documented in a final report.

#### Task VI, Develop Vehicle Interfaces

This activity will be concerned with defining more specifically the requirements for interfacing the flight version IMBLMS with three specific vehicles (identified by NASA in the fifth month of this Phase C.1) and formulating the preliminary design concepts for the respective vehicle interfaces.

#### Task VII, Definition of IMBLMS Clinical Capability

This task will define the needs for developing the clinical capability of IMBLMS (Diagnostic and Therapeutic).



TASKS V, VI, AND VII ARE TO BE CONDUCTED AT A REDUCED LEVEL  
DURING THE SEVENTH AND EIGHTH MONTHS OF PHASE C.1.

3. Approach

Phase A, Advanced Study, was completed prior to the approval of the original procurement plan. The phased project planning procedure has been utilized beginning with the first procurement for Phase B, Project Definition. Under formal source evaluation procedures, the Administrator selected the General Electric Company and Lockheed Missiles and Space Company for performance of Phase B. Headquarters' Contract NAS W-1630 and NAS W-1631, respectively, were awarded to the contractors on June 27, 1967. The contracts were on a fixed price basis at \$50,000 each for a performance period of 4 months.

In accordance with the original plan, a RFP was issued to the contractors during the above period of performance covering Phase C, design. However, based upon funding constraints and the need for additional definition effort, a revised RFP was issued providing for indepth evaluation of measurements and techniques. Modifications number 1 to the above contracts were entered into at approximately \$100,000 each for a performance period of 2 months. The final segment of Phase B (B.3) was contracted for in December 1968 with a performance period of 13 months. These modifications number 2 were contracted for at \$1,100,000, each for the delivery of functional IMBLMS breadboards and preliminary engineering development unit specifications.

The proposed procurement will result in a new fixed price contract in the amount of approximately \$1,500,000 with a performance period of 8 months for Phase C.1. Both General Electric and Lockheed will continue in competition for Phase C.1. Proposals for Phases C.2 and D will be submitted by the contractors in the sixth month of Phase C.1 and during the time the contractors are completing the final tasks of Phase C.1, selection of one contractor will be recommended by the Source Evaluation Board. To the extent practicable, selection for the next phases will be based upon contractor performance to date, results of Breadboard Test Programs, C.2 and D Program Plans, pricing, and other contract considerations applicable to Phase C.2, Final Design, and Phase D, Development/Operations.

It is probable that the contract for Phase D will be negotiated with the Phase C.2 contractor on a noncompetitive basis. However, the possibility of introducing competition for the Phase D contract will be assessed during Phase C, and the analysis and recommendation will be discussed in subsequent amendments to this procurement plan.



#### 4. Scope

##### a. Phase C - Design

This Phase will be initiated following formal approval of procurement policies and will be accomplished in two segments.

##### (1) Phase C.1 - Preliminary Design

The proposed procurement, Phase C.1, will provide preliminary design of the flight IMBLMS, program plans, and cost schedules for Phases C.2 and D.

##### (2) Phase C.2 - Final Design

The Phase C.2 effort will include all the activities required to achieve the detailed design, fabrication, and qualification of the flight version IMBLMS and its readiness for flight unit manufacture and operational support. Earlier development model IMBLMS, as are necessary to establish and test the final design and to begin training, will be produced during the course of this phase. The end products of Phase C.2 include a flight qualified Integrated Medical and Behavioral Laboratory Measurement System, fabricated and installed in working order in a mockup or partial mockup of the selected spacecraft (as subsequently decided by NASA), design drawings, performance/design R&QA/safety and test specifications of NASA selected equipment, timeline testing results of specified measurements/experiments, all program documentation including end item specifications, manufacturing and acceptance specifications, and program and management plans for the Phase D effort.

##### b. Phase D - Development/Operations

The Phase D effort includes the manufacture of flight hardware and operational support for missions utilizing the Integrated Medical and Behavioral Laboratory Measurement System. Phase D will include the procurement of complete laboratory measurement systems for flight, flight backup, and checkout and training purposes plus such additional end products as may be required by the Manned Space Flight Program Office.

#### B. Program and Project

The proposed procurement falls within the Apollo Supporting Development Project No. 92-1, Change 6, approved by the Deputy Administrator on December 17, 1968.



C. Responsible Technical Office

1. Program Responsibility

The IMBLMS Program Office at NASA Headquarters will be responsible for overall coordination of IMBLMS with other NASA programs and for program direction of all places.

2. Technical Office

Technical direction of all program phases of the IMBLMS contract(s) will be the responsibility of the IMBLMS Project Office within the Biomedical Technology Division of the Medical Research and Operations Directorate at the Manned Spacecraft Center.

D. Plan for Technical Monitoring

Technical monitoring under the proposed procurement will be primarily based upon evaluation of contractor reports, briefings, and site visits. Results of test operations of the IMBLMS breadboards at Manned Spacecraft Center will be used for guidance and coordination needed in Phase C.1.

E. Relation to Other Procurements - Past, Present, and Future

1. Past

Past procurements relating to the Advanced Study Phase of this program are:

- a. NAS W-775 and NAS W-776 with Republic Aviation and North American Aviation, respectively. Subject: "Biomedical and Human Factors Requirements for a Manned Earth Orbiting Station."
- b. Contract NAS W-1071 with Lockheed Missiles and Space Company. Subject: "Conceptual Design and Optimization of Measurement Devices for Biomedical and Human Factors Testing for Orbital Research Laboratory Concepts," and "Feasibility Determination and Timeline Testing of the Apollo Extension System Biomedical Experiments Program."
- c. NAS W-1562 and NAS W-1556 with General Electric and Space-labs, respectively. Subject: "Collection and Preservation of Biological Specimens during Space Flight for Post-Flight Analysis."
- d. NAS W-1559 with Biosystems. Subject: "A Study to Determine the Feasibility of Noninvasive Methodologies for Determination of Venous Pressure during Space Missions."



- e. NAS W-1556 and NAS W-1560 with Spacelabs and Hayes International, respectively. Subject: "A Study to Determine the Feasibility of using Physical Methods of Biochemical Analysis in Space Flight."
- f. NAS W-1579 and NAS W-1575 with Space General and IBM, respectively. Subject: "Study to Define the Microbiological Test Requirements for Manned Space Flight."

## 2. Present

Procurement actions are now in process for studies leading toward the development of specific hardware items for AAP medical experiment development (budget classification 948-60), and for definition of new medical experiment techniques and equipment for later integration into the Integrated Medical and Behavioral Laboratory Measurement System. These procurement actions are as follows:

- a. NAS r-14-051-001 with Michael Reese Hospital and Medical Center for development of procedures for analysis of components in biological fluids in the absence of gravity as in an orbiting laboratory.
- b. NAS r-05-004-026 for a study of peripheral volume measurements as indices of peripheral circulatory factors in the cardiovascular orthostatic response to be performed by Davis School of Medicine, University of California.
- c. In-house and contractual efforts being carried out in support of currently approved Apollo and Apollo Applications Program in-flight medical experiments.
- d. Four medical experiments in the definition phase under Manned Spacecraft Center grants and contracts.
- e. One contract for development of the techniques and reagents required for quantitative and qualitative assessment of the viral ecology of the crew during inflight phases of an extended duration mission.

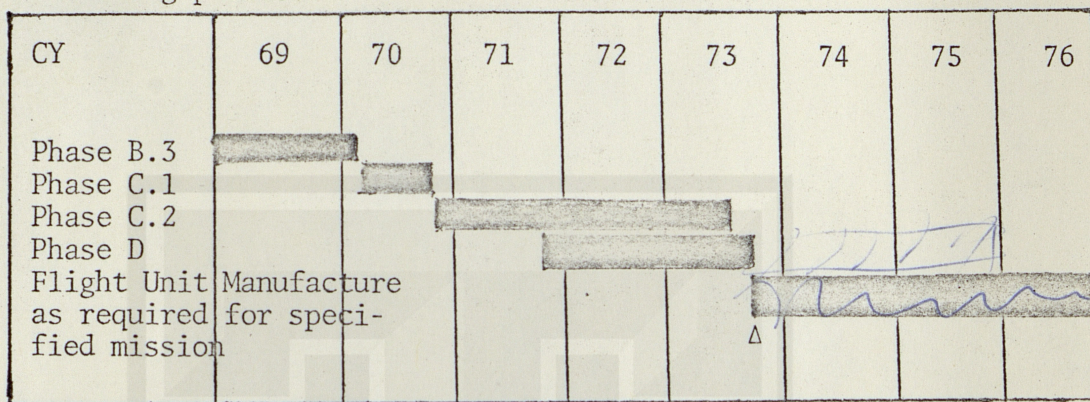
## 3. Future

For long duration flights of a year or more, after 1973, it is anticipated that complete flight laboratory systems in addition to the number specified in this procurement will be required. These systems will be required for experimental purposes and for crew medical surveillance and care on extended space and planetary missions of the future. Normal evolution of advanced designs will include Diagnostic, Therapeutic, and Surgical capabilities.



## F. Performance Milestones and Delivery Schedule

This project is directed toward the development of IMBLMS for possible flight operations beginning in 1973. The planned performance period for the first segment of Phase C will be 8 months. The planned performance period for the second segment of Phase C will be 30 months and Phase D performance period will be 18 months. The bar chart below illustrates the schedule interface among the remaining phases.



## G. Total Estimated Cost

Phase B, All segments	\$ 2,750,000
Phase C, First segment	3,800,000
Phase C, Second segment	31,600,000
Phase D	36,300,000
<b>TOTAL</b>	<b>\$74,450,000</b>

## II. FUNDING

### A. Approved Project Funding by Fiscal Year

Project funding in the amount of \$3,800,000 is anticipated for fiscal year 1970 under AMM Support Development and Supplemental Sources Funding for subsequent fiscal years has not yet been approved.

### B. Funding of Proposed Procurement by Fiscal Year

All work under the proposed procurement requires R&D funding. Funding requirements by fiscal year are as follows:

<u>1966-68</u>	<u>1969</u>	<u>1970</u>
\$400,000	\$2,350,000	\$3,800,000
<u>1971</u>	<u>1972</u>	<u>1973</u>
\$12,000,000	\$29,600,000	\$26,300,000



C. Funding of Follow-on Procurements by Fiscal Year

Funding requirements for follow-on procurements beyond Fiscal Year 1973, Phase D, are not known.

D. Contingencies or Reserves Required by Fiscal Year

Not applicable

III. SOURCES

A. Known Sources and Competitive Situation

The contract documentation for the procurement leading to award of Contracts NAS W-1630 and NAS W-1631 for Phase B contains the Source Evaluation Board proceedings and the source selection by the Administrator.

B. Sources to be Solicited

The initial procurement plan and related authorizing documents have been based upon the phased project planning procedure. An inherent feature of this approach is that contractors who are initially selected will continue in the program until final selection is made.

Only the "incumbent" contractors will be considered for performance of the proposed initial segment of the Project Design Phase (C.1). Authority for this selection exists in the documents which have been approved for this program and, therefore, a "justification for noncompetitive procurement" will not be processed.

C. Synopsizing

A preaward synopsis of this procurement will be forwarded for publication in the Commerce Business Daily as required by Section 1.1003 of the NASA Procurement Regulation.

IV. JUSTIFICATION AND AUTHORIZATION FOR NEGOTIATION

A. Determination and Findings

It is proposed that this procurement will be negotiated pursuant to the provisions of 10 U.S.C. 2304(a)(11). A proposed Class Determination and Findings authorizing negotiation of Phase C.1 has been prepared as Attachment I to this procurement plan.

B. Justification Relating to Class Determination and Findings

It is proposed under this procurement plan to negotiate two contracts incorporating identical Work Statements, Tasks I through VII, as described under I.A.2 above.



The contractors will perform preliminary design of flight IMBLMS and research and development work to prepare program plans for the final design, fabrication, and qualification of IMBLMS flight units.

The above requirements represent the initial segment of Design Phase for IMBLMS. The requirements can be stated only by general terms such as "preliminary design." The research and development effort is necessary to assure a functional, qualifiable flight system. In the absence of specific drawings and specifications, it is impossible to accomplish the proposed procurement by means of formal advertising.

Since identical task statements are to be included in the two proposed contract modifications, it is considered most expeditious to utilize a Class Determination and Findings. Such Determination and Findings is limited to the procurement for the first segment of Phase C.

## V. TYPE OF CONTRACT

### A. Recommended Type

#### 1. Project Definition Phase

Work under the Project Definition Phase, Contracts NAS W-1630 and NAS W-1631 has been performed on a fixed-price basis.

#### 2. Design Phase

##### a. Phase C.1 - Preliminary Design

It is anticipated that work under C.1 can be defined in sufficient detail and definiteness to permit the use of a fixed-price instrument.

##### b. Phase C.2 - Final Design

This phase will involve extensive design and development effort as outlined above. Because of the magnitude of the engineering effort and the uncertainties, a fixed-price contract would not be feasible. Therefore, it is probable that a cost reimbursable contract would be negotiated.

#### 3. Development Phase

Based upon satisfactory design effort under Phase C, it is likely that the definition of work under Phase D can be sufficiently well established to permit the use of a fixed-price incentive type contract.



B. Determination and Findings for Method of Contracting

A Determination and Findings for method of contracting is not required for the proposed procurement. D&F's will be processed as required for future phases.

C. Special Requirements

None known at this time

D. Incentive Considerations

As indicated above, the proposed procurement involves straight-forward engineering tasks which can be handled on a firm fixed-price basis. Incentive arrangements would be inappropriate.

The same considerations apply for Phase C.1. Under Phase C.2, Final Design, a cost reimbursable contract is indicated and there is no basis for introducing cost, delivery, or performance incentives at that point in the program. However, under Phase D, it may be desirable to consider a multiple incentive arrangement.

E. Letter Contract

Not applicable

VI. ORAL BRIEFING OF PROSPECTIVE CONTRACTORS

Continuing technical discussions have been held with the contractors throughout the program. No formal oral briefings will be utilized in connection with the proposed procurement.

VII. METHOD OF EVALUATION OF PROPOSALS

A. Recommended Method

A Source Evaluation Board appointed by the Associate Administrator for Manned Space Flight evaluated the proposals under the initial Phase B.2 and B.3 procurement in accordance with NPC 402, Source Evaluation Board Manual.

A restructured Source Evaluation Board, see VII.C below, will review the proposals for Phase C.1 prior to C.1.

B. Special Problems

No special problems are anticipated.



C. Source Evaluation Appointment Letter

The Source Evaluation Board appointment letter for the restructured SEB, prepared for the signature of the Administrator, is enclosed herewith.

VIII. GOVERNMENT PROPERTY - DESCRIPTION, MONETARY EVALUATION, AND BASIS FOR REQUIREMENT

A. Facilities

There have been no requirements for Government facilities in the program to date, and no facilities requirements are anticipated for Phase C.1.

B. Other Property - Government Furnished

No Government property has been furnished to the contractors to date, and no Government-furnished property is contemplated for Phase C.1.

IX. RELIABILITY AND QUALITY ASSURANCE

A. Reliability Assurance

Phase C.1 contractors, as a portion of their IMBLMS program plans, will be required to develop reliability program plans, preliminary mathematical model and reliability predictions, and analysis of feasible alternatives and factors which could be major problems in achieving goals using NPC 250-1, Reliability Program Provisions for Space Systems Contractors, and NHB 5200.5, Apollo Applications Reliability and Quality Assurance Program Plan, as guides. Additionally, Phase C contractors will be required to establish reliability and safety goals and other RQA requirements in preliminary specifications in accordance with NPC 500-1, Apollo Configuration Management Manual. These reliability plans will be refined during the course of Phase C for incorporation into Phase D contractual requirements.

B. Quality Assurance

Development of quality assurance program plans will be required of the Phase C.1 contractors as part of their IMBLMS program plan. The guide used for the development of the QA plans will be NPC 200-2, Quality Program Provisions for Space System Contractors, and NHB 5300-5, Apollo Applications Reliability and Quality Assurance Program Plan. These quality assurance plans will be refined during the course of Phase C for incorporation into Phase D contractual requirements.



## X. MANAGEMENT INFORMATION SYSTEMS

The utilization of a management information system is not contemplated for the Phase C.1 contracts. If a fixed-price contract is not appropriate for the design phase, the NASA Financial Management Reporting System (without PERT) will be required. The need for management information systems requirements for the development phase of this procurement is recognized. However, it is not possible at this time to determine which requirements such as PERT (with or without companion cost), line of balance, or other information should be required.

## XI. PRECONTRACT COSTS

Precontract costs are not contemplated for Phase C.1.

## XII. TECHNICAL DATA FOR REPROCUREMENT

It is conceivable that procurement of additional IMBLMS beyond those covered by this plan may be required. Consequently, technical data for reprocurement will be specified as a deliverable item under the development phase contract.

## XIII. OTHER PERTINENT DATA

### A. Test Requirements

Phase C.1 contractors, as a portion of their IMBLMS program plans, will be required to develop test requirements in preliminary specification and test plans covering test concept, approach, and long-lead items using NHB 8080.3, Apollo Applications Test Requirements Documents, as a guide. The Phase C contractor will be required to establish test requirements against performance and design requirements in contract end item (CEI) specifications (Part I) and associated test plan(s) in accordance with NHB 8080.3. These test requirements and plan(s) will be refined and completed during the course of Phase C for incorporation into Phase D contractual requirement.

## XIV. PROCUREMENT ACTION SCHEDULE

<u>Event</u>	<u>Estimated Time Interval</u>	<u>Milestone Target Date</u>
Submission of procurement plan		August 1, 1969
Procurement plan approved, SEB appointment letter, and D&F signed	1 month	Sept. 1, 1969
RFP issuance	1 month	October 1, 1969
Proposals due	1 month	Nov. 1, 1969
Proposals evaluated	1 month	Dec. 1, 1969
Negotiation and award of contracts	2 months	Feb. 1, 1969



XV. LEGAL REVIEW OF PROCUREMENT PLAN

This procurement plan has been reviewed by the MSC Legal Counsel.  
Their comments are enclosed.

