

62-713

Chris Kraft



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON 1, TEXAS

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AUG 17 1962

Subject: Request for Proposal No. MSC-62-40 as Amended

Gentlemen:

The National Aeronautics and Space Administration, Manned Spacecraft Center, Houston 1, Texas, invites your organization to submit a proposal covering the work described in Exhibit "A" attached. Your proposal must comply with the instructions contained in Exhibits "C" and "D" attached. Instructions for Preparation of Technical Proposal, Section I, is contained in Exhibit "A".

Please notify this office within five (5) days of the date of this letter whether or not you plan to submit a proposal. If a proposal is to be submitted it must be submitted in fifty (50) copies. Said proposal must be mailed to reach this office not later than **SEP 1 1962** and should include the name and telephone number of the individual who will represent your organization in any negotiation that may be required on the procurement.

Your proposal must be signed by an individual authorized to bind the offeror, and will contain a statement to the effect that the proposal is firm for a period of not less than one-hundred and twenty (120) days from the date of its receipt by the Government.

Information will be disclosed to offerors in accordance with regulations applicable to negotiated procurements, subsequent to evaluation of all proposals received.

Inquiries regarding this procurement and proposal should be directed to the National Aeronautics and Space Administration, Manned Spacecraft Center, Houston 1, Texas, Attention: Apollo Procurement Office, James Stroup. The telephone number is WALnut 8-2811, Extension 6206, 6207, 6208, or 6209. Your proposal should be mailed to the above address.

Your cost proposal will be evaluated on the basis of Phase I as defined below. Phase II costs will be negotiated at a later date. Phase I includes:

A. Interim Computer Facility:

The program development computational facilities proposed to be provided and utilized from award of contract through demonstration of readiness of a computer operating in a mode simulating the final configuration. This task shall include but not be limited to the following:

1. Equipment design and implementation.
2. Equipment rental and purchase.
3. Operation and maintenance.
4. Any special programs required to permit the development of the real time programs to be carried out in these facilities.

Each of the above 1 through 4 should be priced out separately.

B. Computer Complex Mission Program Development:

Includes the tasks of developing the major mathematical processors to be used for the Gemini and/or Apollo projects such as, but not limited to the following:

1. Equation-of-motion integration.
2. Trajectory determination.
3. Tracking antenna acquisition data generation.
4. Tracking data input processors such as the data edit and smoothing techniques, if needed.
5. Coordinate transformations and output processors for display presentation.
6. Midcourse propulsion recommendation program.

The estimate for this section B shall reflect the programming costs (excluding computer costs) for the work carried out on this task from award of contract through demonstration of satisfactory performance of each of these major routines individually during sub-system testing.

The proposed effort in this area of program formulation shall be clearly specified since this particular task may not be the sole responsibility of the contractor.

C. Computer Complex Simulation Program Development:

The cost proposal for this section C shall include the costs directly associated with the preliminary development of an open-loop simulation program through demonstration of a non-real time

capability. This program shall be the compilation of the various processors (equation-of-motion integration, tracking antenna observation computation, random and systematic error generators, etc.) which utilize the inputs and produce the outputs asked in section 3.3.1 of the work statement. This program, which will form the nucleus of the overall closed-loop simulation program outlined in this section, shall exclude the phases of flight involving continuous complex guidance such as during launch and lifting reentry. It will have provision for controlled trajectory modification and error application defined in advance of each computer run.

D. Hardware System Study

This task will be completed when detailed systems specifications, upon which procurement and/or manufacture can be initiated, are approved by Manned Spacecraft Center.

E. Program Systems and Standards:

This item is completed when all of the following have been accepted and approved by Manned Spacecraft Center:

1. Detailed specification of the compiler or assembly system to be used.
2. Detailed specification of detailed programmer coding standards (Systematic nomenclature to be used, method to control allocation of common storage, method to control tables of constants, etc.)
3. Detailed specification of executive program.
4. Detailed specification of computer control and monitoring technique.

Your proposal for Phase I as outlined above should indicate total cost per hour for various personnel categories such as: programming, maintenance, operating, engineering and whatever other categories are involved. In cases where there are several sub-categories such as in programming and engineering the cost per hour for sub-categories should also be provided.

Your proposal should also break out clearly the lease or rental cost of the interim building and the associated charges directly related to the use and occupancy of the building.

Your proposal should provide cost data for all effort following Phase I in sufficient detail for budget and funding purposes only.

Your proposal should be prepared in two (2) sections, Technical Section and Cost and Management Section and should be contained in one binder.

The prospective contractor will consider the provisions of Circular No. A-54 dated 14 October 1961, issued by Executive Office of the President, Bureau of the Budget, Subject: Policies on selection and acquisition of automatic data (ADP) equipment. The contractor will indicate the basis for making his recommendation on whether to buy or lease a particular piece of equipment. This information will be contained in the Cost and Management section of the proposal.

All proposals will be evaluated by a NASA Source Evaluation Board. The Board will consider the scientific and technical merit of your proposal, your background and experience in related work, your Management Proposal and the reasonableness of your proposed costs and any other factors deemed significant by the Board.

The Contractor chosen as a result of this Request for Proposal will be required to work as an Associate Contractor to a Prime Contractor, who will have overall responsibility for system integration to insure compatibility of the sub-systems and equipment of the Integrated Mission Control Center, of which the Ground Computer Complex is a part.

Any resulting contract will contain the following clause:

PERSONNEL TRANSFER

The contractor recognizes: (1) that at some future time he may be replaced by a successor and (2) that retention of highly skilled Gemini/Apollo trained personnel in the Gemini/Apollo programs is of paramount importance for high order of performance and success of Gemini and Apollo missions. The contractor also recognizes that the ultimate retention of such employees who may desire to remain with the Gemini/Apollo program, and who may be acceptable both to any successor corporation and the Government, will be materially advanced if such employees can remain without appreciable loss of earned fringe benefits, or under circumstances which offer comparable benefits to that previously earned. The fringe benefits to be considered but not necessarily limited to are: retirement, vacation, sick leave, hospitalization, and seniority.

The contractor agrees to fully cooperate with the Government and any successor contractor to further the objectives stated above. In this regard, the contractor will make available any and all records, or other data which may be required to properly ascertain the earned benefits of the employee, and/or his relative position within the fringe benefit program of the contractor and to encourage selected employees to remain with the Gemini/Apollo program.

In addition, the contractor agrees to enter into negotiations with the Government to equitably credit to the contract all accrued

expenses for fringe benefits which have been accumulated to cover employees so transferred to any successor contractor.

Notwithstanding the above, it is realized that some employees may not desire to transfer, but they will be required to remain on the job for some period of time in order to provide for the orderly transition from the contractor to the successor corporation. In such event, the contractor agrees to use its best efforts to encourage selected employees to remain on the job and to subcontract the services of such employees to any successor at reasonable rates for a period not to exceed six (6) months.

Sincerely,


Dave W. Lang
Contracting Officer

Encls:

1. EXHIBIT "A"
2. EXHIBIT "B"
3. EXHIBIT "C"
4. EXHIBIT "D"
5. General Provisions
6. PERT Handbook
7. NASA Quality Publication NPC 200-1, 200-2 and 200-3

EXHIBIT "A"

REAL TIME COMPUTER COMPLEX

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Section 1.0

1.0 PRELIMINARY STATEMENT

The NASA-Manned Spacecraft Center (MSC) intends to award a contract for the design, implementation, maintenance, operation and general support of the MSC Ground Computer Complex, including both computer program and equipment development.

The Computer Complex will be an integral part of the Mission Control Center (MCC) and other elements of the Ground Operational Support System (GOSS) and will be used to support flight simulations and real time flight control of manned space flight programs.

This document presents the requirements upon which bidders shall base their proposals toward acquiring this contract.

Section 2.0

2.0 DESCRIPTION OF PROJECTS

2.1 Description of Mission.- The following summaries of the Project Gemini and Project Apollo mission profiles are given to aid the bidder in his appreciation of the scope of the contract and to supply information on which the bidder may base his discussion of the real time computing support of the missions.

2.1.1 Project Gemini.- Project Gemini is the NASA program for the development and operation of a spacecraft which will be capable of the following types of missions:

a. Earth orbital for extended periods.- Titan II insertion of a two-man spacecraft into low (150 n.m.), near circular orbits with flight duration up to two weeks. Return from orbit may involve aerodynamic lifting-reentry techniques and use of a para-glider to provide landing point selection.

b. Earth orbital with rendezvous.- Titan II insertion of a two-man spacecraft into low, near-circular orbit to be joined in space to an Atlas-assisted Agena target vehicle. Space rendezvous and docking techniques may be applicable to Project Apollo technology.

2.1.2 Project Apollo.- Project Apollo is the NASA program for the development and operation of a vehicle which will be capable of the following types of missions, with an abort capability from any point in these missions:

a. Orbital.- Saturn insertion of a three-man spacecraft into a low altitude earth orbit, with capability of practicing, in a near earth environment, lunar landing and rendezvous maneuvers.

b. Highly elliptical cislunar orbit.- Saturn insertion of a three-man spacecraft into a low altitude earth-parking orbit. Subsequent co-planar injection of the spacecraft by the last stage of the launch vehicle into a highly elliptical cislunar trajectory.

c. Circumlunar.- Saturn insertion of a three-man spacecraft into a low altitude earth-parking orbit. Subsequent co-planar injection of the spacecraft by the last stage of the launch vehicle into a circumlunar trajectory.

d. Lunar orbits.- Saturn insertion of a three-man spacecraft into a low altitude earth-parking orbit. Subsequent co-planar injection of the spacecraft by the last stage of the

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Launch vehicle into a translunar trajectory. It should be assumed that near the pericynthion of the translunar trajectory the main propulsion unit of the service module inserts the spacecraft into a local lunar orbit prior to earth return.

e. Lunar landing of two men (via lunar orbit rendezvous).- Launch vehicle insertion of a three-man spacecraft into a low altitude earth-parking orbit. Subsequent co-planar injection of the spacecraft by the last stage of the launch vehicle into a translunar trajectory. Near the pericynthion of the translunar trajectory the main propulsion unit of the service module inserts the spacecraft into a local lunar orbit. The Command Module-Service Module configuration will remain in lunar orbit while the lunar landing will be accomplished in the two-man Lunar Excursion Module. After a nominal duration on the lunar surface, the Lunar Excursion Module will be launched to rendezvous with the Command Module-Service Module configuration and, after rendezvous, will return to earth.

2.1.3 Crew Monitoring and Control.- Although the Apollo and Gemini spacecraft will be able to complete each phase of their missions independent of ground-based information, the Mission Control Center (acting as a redundant element), also must have all information necessary to control each mission phase.

2.2 Role of Computer Complex.- The ground-based flight controllers must always be in position to provide needed information to the spacecraft crew, especially in the event of abort, contingencies, or alternative missions. Thus the flight controllers will rely heavily on the real time computer complex to supply information and recommendations for the flight controllers to act upon for manned space flight projects.

Basically, it is the task of the computer complex at each instant during the mission to supply to the flight controllers the information required for completing the mission regardless of what has happened previously.

This requires monitoring of the present trajectory, through the use of network tracking data, and processing of data from the spacecraft systems to precisely determine and display the current situation to the flight controllers. The more complex task of the computer program will be as an assistant in mission management. This requires logical evaluation of the current

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mission situation (present trajectory and present status of the spacecraft systems) to determine, based on pre-selected criteria, if the primary mission can still be safely accomplished. If not, an alternative mission must be logically selected and recommended by the computer program. In addition, the computer program must have logic to recommend the most suitable abort trajectory to fly in the event an abort becomes necessary in any phase of any mission. The preselected mission control parameters necessary for successful completion of the mission selected (primary mission, alternate mission, or abort) must be computed and displayed.

The flight plans for primary and alternate missions, the planning of the action to follow in the event of contingencies, the selection of specific spacecraft systems data for processing, and the specification of the required mission control center displays will be largely the task of the mission planning personnel of the MSC (see Sec. 3.1.1). It is evident that the number of possible contingencies is almost boundless. However, it is only by pre-planning the computer program logic for the action to follow in each situation that the maximum probability of a successful mission will be achieved. An effective monitoring system is necessary to determine the logical actions taken by the computer program, especially in the case of contingencies or alternative missions. A manual control capability is also necessary to override or re-direct the logical actions of the computer program.

- 2.3 Definitions.- For the purposes of this RFP, the following definitions apply:
 - 2.3.1 Gemini Spacecraft.- A two-man spacecraft similar in configuration to the Mercury capsule.
 - 2.3.2 Gemini Target.- The vehicle with which the Gemini spacecraft will rendezvous.
 - 2.3.3 Apollo Spacecraft.- The spacecraft consists of separate modules.
 - a. Command module - a recoverable module housing the crew and all the controls needed by the crew except those contained within the LEM.

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b. Service module - unmanned non-recoverable module containing the various propulsion systems.

c. LEM - Lunar Excursion Module - the two-man module used for landing on the moon's surface from lunar orbit and return from moon's surface to lunar orbit.

- 2.3.4 Ground Operational Support System.- All ground-based equipment associated with mission flight support including the mission control center, ground computer complex, remote instrumentation sites, communications systems, and the over-all flight operations support systems.
- 2.3.5 Mission Control Center.- An operational control facility located within the MSC. This facility will be equipped and operated in a manner which will allow operational control of all manned space flight missions.
- 2.3.6 Simulation Control Center.- A facility within the MCC equipped in a manner to allow control and evaluation of the operational procedures and actions of ground-based elements involved in closed-loop mission simulations.

3.0 COMPUTER COMPLEX PROGRAM DEVELOPMENT

- 3.1 Scope of Work.-This section is a statement of the scope of work to be carried out by the contractor in the development of the specific computer programs defined in Section 3.3.
- 3.1.3 Formulation.-The real time computer program formulation is the responsibility of the Flight Operations Division (FOD) of the NASA-Manned Spacecraft Center. There are a large number of interested participants in this area, one of which is the bidder awarded this contract. This contractor shall be called upon:
- a. To participate in mission planning to the extent that the computer programs and equipment influence the conduct of the missions.
 - b. To recommend program logic and specific mathematical techniques.
 - c. To participate in the detailed development of the mathematical techniques selected for use in the programs.
 - d. To prepare the final detailed flow charts, or equivalent, which are the formal precise definition of the program formulation.
- 3.1.2 Coding and Debugging.-The task of translating the final detailed flow charts into working computer programs is the responsibility of the contractor alone.
- 3.1.3 Program testing.-The contractor shall be responsible for planning, testing, evaluating and documenting the performance of the various individual mathematical processors, such as the trajectory determination and equation-of-motion integration, input-output, editing, etc.

The contractor shall be responsible for overall computer program testing as the various components are assembled and combined together. This work involves exercising the programs in both non-real and real time modes, often with simulated inputs on computers compatible with those which will be used in the final computer complex.

3.1.4 System test.-The computer programs, the computers, the mission control center displays, and all of the associated hardware are the components of the overall system which is discussed in this section and again in Section 4.1.5. The contractor shall be responsible for planning, performing, evaluating, and documenting overall system checkout tests which are, in the main, closed-loop simulations involving the system defined above as well as the special simulation programs and equipment (see Section 3.3.1 and 4.1.5) and the flight controllers on their substitutes. Their purpose is to provide the integrated system check-out and confidence testing. They evolve into a continuing flight controller training program. The contractor shall ascertain that the tests employed are in accordance with such check-out criteria as may be provided by the Government.

3.2 Program Systems

3.2.1 Systems and Standards.-In the early stages of over-all computer program development, it will be necessary to specify certain programming techniques, systems, and standards. The contractor will be responsible to see that such standards are adhered to..

3.3 Program Definition

3.3.1 Simulation Programs.-Launch vehicles and spacecraft for both the Apollo and Gemini projects will be subject to continuous trajectory modification. As a result, realistic flight controller training and flight control complex testing is only possible through the development of a closed-loop simulation technique (see Fig. 1). A part of this is the special computer program discussed in this section.

The closed-loop simulation system contains a flight crew trainer, a spacecraft simulation computer, a Simulation Control Center, and a ground systems simulation computer. The flight crew trainer and the associated spacecraft simulation computer are not within the responsibility of the ground computer complex and will be implemented under separate contract. The Simulation Control Center will also be implemented under a separate contract.

The outputs of this program are simulated data (network tracking data, spacecraft telemetry data) to be used as input to the real-time operational computer in service of the Mission Control Center. The simulated data must be identical in format and timing to data received during actual missions.

The inputs to the ground systems simulation computer will be data from the spacecraft simulation computer, which defines the spacecraft trajectory, telemetry data from the flight crew trainer, and simulation control information from the Simulation Control Center.

3.3.2 Mission Programs.-The real time programs associated with ground operational support of all phases of the Gemini and Apollo missions fall into three main categories:

- a. Ground Monitoring Programs
- b. Mission Control Programs
- c. Computer Control Programs

3.3.2.1 Ground Monitoring Programs.-The output of these computer programs drive displays which allow the ground monitoring crew cognizance of the current status of all critical systems which are in operation during the mission. The subject matter of these programs will include, but is not limited to:

a. Data processing (smoothing, predicted trends) of information from critical spacecraft systems to determine current status and performance. Systems include, but are not limited to:

- (1) Electrical
- (2) Navigation and Attitude Control
- (3) Propulsion
- (4) Life Support

b. Data processing of information status and performance of the launch vehicle.

c. Data processing of aeromedical parameters.

d. Spacecraft illumination and temperature conditions.

e. Current position and velocity determination.

f. Data processing to determine status and performance of critical ground equipment supporting the missions such as tracking stations, remote site data processors and the ground computer complex.

g. Evaluation of time-to-go to next critical mission decisions.

3.3.2.2 Mission Control Programs.--These programs drive displays which assist the ground-based flight controllers to take proper action or to dispense to the spacecraft crew via ground support flight monitors, optimal advice regarding essential actions to be taken during the mission. In general, the subject matter of the Mission Control Programs include:

a. Time dependent total mission flight plans.

b. Real time logic and computation to assist selection of alternative mission plans.

c. Real time solutions to emergency abort situations.

d. Precise duplication of on-board computer functions.

e. Prediction of position and velocity in all phases of the mission.

f. Midcourse correction computation.

g. Rendezvous logic and computation.

h. Antenna pointing information.

i. Logic to permit remote control of certain remote site functions (i.e., RF carriers and receivers ON and OFF, designating priority data to be transmitted, etc.) under the direction of the Mission Control Center.

3.3.2.3 Computer Control Programs.-Recognizing that the computer complex shall be called upon to serve multiple demands, often simultaneously, it is likely that an Executive Program, which controls sequence of operations will be required.

Programs shall include features which give the capability of monitoring and controlling the progress and judgment of the computer.

3.3.3 Postflight Data Reduction.-The contractor shall prepare programs which will be capable of reducing all types of data (e.g., radar, telemetry) which are associated with real time computing. This data reduction shall include quantities derived from real time inputs in addition to those used directly in the real time computing. A program will be formulated to log and index significant events occurring during the missions.

3.3.4 Network Countdown Program.-Programs will be required to support tests of the operational readiness of the computer complex related data flow network within the ground operational support system during prelaunch countdown and during extended missions.

Section 4.0

4.0 COMPUTER COMPLEX EQUIPMENT DEVELOPMENT

- 4.1 Scope of Work.- This section provides a statement of the scope of the work for which the contractor awarded this contract will be responsible in the development of the MSC computer complex.
- 4.1.1 Studies.- Necessary equipment studies, resulting in complete, detailed equipment specifications upon which procurement and/or design and fabrication will be based, are the responsibility of the contractor. (The type and number of major components to be included shall be specified in the contract to be awarded. See Section 7.2, item B3.)
- 4.1.2 Design.- The restrictive flight schedule makes it probable that off-the-shelf equipment be selected for use in the assembly of this computer complex. However, it is apparent that modification of existing equipment and design and fabrication of entirely new components may be necessary. This task and the detailed documentation of it are responsibilities of the contractor.
- 4.1.3 Implementation.- The procurement, design, fabrication, and installation of all equipment within the computer complex is the responsibility of the contractor.
- 4.1.4 Sub-system testing.- All computer complex hardware testing is the continuing responsibility of the contractor. It may be necessary to develop special techniques, equipment and computer programs for this purpose. It will be required that the procedures, progress and evaluation of results be completely documented in accordance with checkout criteria as may be provided by the Government.
- 4.1.5 System testing.- As noted previously (Sections 3.1.4 and 3.3.1), it will be necessary for the contractor to carry out a continuing program of over-all computer complex system tests, principally involving closed-loop simulation techniques to be developed by the contractor.

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4.2 Computer complex interfaces.- The computer complex shall include equipment to accept raw data directly from the communications lines linking the computer complex to the Ground Operational Support System communication center. The functions of receiving, buffering, conversion, formating, and addressing are tasks of the computer complex. The computer complex shall also include equipment to accept information from the Mission Control Center (switch settings and other control functions) and from the Simulation Center (trajectory information, control switches, error generators, and other inputs necessary for effective closed-loop simulation.) The ground systems simulation computer, used in closed-loop simulation is the responsibility of the ground computer complex.

The computer complex also includes equipment to completely process (buffering, conversion, formating, addressing, etc.) and transmit (transmitters, error detection, etc.) output data to the Mission Control Center and Simulation Center. This includes all equipment up to but not including the final buffering register from which the displays are driven. The computer complex equipment shall perform all data processing functions (conversion, formating, etc.) such that data transmitted to the remote sites, via the communications center, is in a form compatible for transmission over communication lines.

A schematic diagram giving the responsibility of the computer complex within the over-all data flow is given in figure 2.

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5.0 MAINTENANCE AND OPERATION*

5.1 Program

- 5.1.1 Updating of programs.- The contractor will be responsible for incorporating all additions and changes into the operational and ground systems simulation program. The inclusion of these changes and additions in the program documentation will also be the responsibility of the contractor.
- 5.1.2 Computer operators.- The contractor will be responsible for providing a sufficient number of computer operators to support all computer operations required under the contract. This includes all phases of computer program development (debugging, testing, flight simulations), and flight operations.
- 5.1.3 Computer controllers.- The performance of the ground computers and computer programs must be monitored and controlled in real time by computer controllers. Personnel to perform these tasks during flight simulations and flight operations will be provided by the contractor.

5.2 Equipment

- 5.2.1 Modification - Design and Engineering.- System design and engineering modifications to the equipment of the computer complex will probably become necessary as experienced is gained through flight simulations and actual flight operations. The contractor should recognize this probability and be prepared to perform this work. Revision of system design documentation and equipment manuals to reflect these modifications will also be the responsibility of the contractor.
- 5.2.2 Maintenance.- The contractor will be required to formulate and carry out plans for periodic testing and maintenance of the complete computer complex as defined in Section 4.2 This includes all preventive maintenance and testing of the computer complex equipment, including that required during flight simulations and actual flights.

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5.2.3 Operators.- The contractor shall provide trained personnel to operate all equipment within the computer complex. These operators will furnish support to computer complex implementation, sub-system testing, program development, flight simulations, and actual flight operations.

*The government reserves the right to provide separately for the maintenance and/or operation of any or all of the purchase equipment and rental GFE within the computer complex.

6.0 GENERAL REQUIREMENTS

- 6.1 Location of Program Development Personnel.-Personnel involved in the development of the computer program will require extremely close liaison with the NASA mission planning personnel. Accordingly, it shall be a provision of this contract that the contractor will locate these people in the Houston area conveniently accessible to MSC. Accommodations for not less than eight NASA personnel within the contractors' temporary computing facility at Houston will be required. (Upon completion of the IMCC building, all personnel will occupy space therein).
- 6.2 Provision of Program Development Facilities.-Real time programs must finally be checked and confidence-tested on the computer-display complex that will be utilized during flight missions. Recognizing that this equipment will not be available until relatively late in the period of program development, the contractor shall be required to provide temporary facilities in the Houston area exclusively for this purpose.
- 6.3 Simultaneous Project Support.-It should be recognized that both the Gemini and Apollo computer systems must be designed for overlapping schedules. Although actual Gemini and Apollo flights need not be considered to be flown simultaneously, program check-out and testing will have to be accomplished simultaneously. In addition, the capability to support simulated missions for one of the projects (either Gemini or Apollo) while simultaneously supporting an actual flight for the other project is required.
- 6.4 Documentation and Reporting
- 6.4.1 Progress Reports.-Technical progress reports shall be prepared and presented bi-monthly at the MSC. These reports shall be in the form of a written report and an informal presentation.

Formal presentations shall be made at four-month intervals on the technical progress made on the contract. These presentations will include slides, charts, etc., and will reflect the

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contract activity for the preceding four months and the projected four months. The contractor will be prepared to demonstrate the programs and systems resulting from his work.

Informal discussions between the contractor personnel and the NASA MSC personnel shall be encouraged.

The contractor shall also provide individual reports at the conclusion of specific studies or projects.

- 6.5 Coordination with other contractors.-Responsibility for the design and implementation of other elements of the Ground Operational Support System (Mission Control Center, Simulation Center, etc.), of which the computer complex is an integral part, will be awarded under separate contracts. It will be necessary for the Ground Computer Complex contractor to work in conjunction with these contractors as interface, compatibility, reliability, and checkout problems arise. An organization of the NASA, or possibly a single contractor, will have the responsibility for coordination of the over-all Ground Operational Support System.
- 6.6 Coordination with organization other than MSC.-The contractor will coordinate through the MSC all meetings, discussions and correspondence with groups not within the contractor's organization if the subject matter is in any way related to this contract. External groups in the above category are other NASA centers, DOD, MIT Instrumentation Laboratory and MIT Lincoln Laboratory, etc.
- 6.7 Scheduling.-The following schedule requirements should be assumed by the bidder.

The temporary computing facility to be located in Houston will be operational within 90 days of the award of this contract.

Gemini and Apollo earth-orbit computing systems completed and a high level of confidence established through system tests and simulated missions -April 1, 1964.

Apollo lunar computing system completed and a high level of confidence established through system test and simulated missions - September 1, 1965.

6.8 Reliability and Quality Control.

- 6.8.1 System Reliability.-The overall system reliability shall be 0.9995 for 336 hours as demonstrated by a reliability acceptance test to be specified in the contract. The maximum duration of this test shall be thirty (30) continuous calendar days.
- 6.8.2 Reliability Program Plan, Apportionment and Prediction.-The contractor will prepare for MSC approval within 30 days after contract award a time-phased reliability program plan using procedure outlined in MIL-R-27542 as a general guide. At the same time he will submit an apportionment of the overall reliability requirement among the various subsystems and unit equipment. This apportionment shall consider operating times, failure consequences, redundancy, maintenance times, etc., and will be updated at least twice during the system development period. Also within 30 days after contract award, he will submit reliability predictions using MIL-STD-756 and MIL Handbook 217 as a general guide. This prediction shall be updated twice during the development period.
- 6.8.3 Design Reviews.-Within 30 days after contract award, the contractor shall submit proposed time-phased schedules and procedures for conducting formal design reviews, for system components requiring contractor development, using MIL-R-27542 as a general guide. The Government or designated representatives shall have the option of attending all such reviews.
- 6.8.4 Environmental Qualification Acceptance Tests.-Within 30 days after contract award, the contractor shall submit proposed schedules, general plans and estimated engineering, services, and materials to perform system or subsystem qualification tests using MIL-E-4158B as a general guide.
- 6.8.5 Parts, Materials and Processes.-Within 30 days after contract award, the contractor shall prepare a preliminary list of approved parts, materials, and processes for system components requiring contractor development. Final approved parts, materials and processes and related specifications and procedures shall be submitted upon completion of design and shall be updated based on qualification test results during the course of the contract.

- 6.8.6 Quality Control.-Within 30 days after contract award, the contractor shall submit time-phased quality control and inspection test program plans in accordance with NASA Quality Publications MPC 200.2 and 200.3 April, 1962, for those system components requiring contractor development.
- 6.8.7 Maintainability.-Within 30 days after contract award, the contractor shall submit a time-phased maintainability program plan, using the procedures outlined in MIL-N-26512B, as a general guide.

Section 7.0

7.0 TECHNICAL PROPOSAL FORMAT AND CONTENT

- 7.1 Physical size.- The technical proposal, including all diagrams and figures, shall not exceed one-hundred (100) pages of eight and one-half by eleven inches. Folded diagrams or figures will be appropriately assessed as multiples of the given page size. The reproduced letter height on all pages, including diagrams and figures, shall not be smaller than standard 12 pitch (pica).
- 7.2 Outline of Technical Proposal.- The bidder shall submit a discussion of each of the topics given in the following outline, in the order listed. He shall discuss his philosophy and the approach he intends to follow in each case, being sure to include the points indicated parenthetically.
- A. General discussion (Over-all approach and philosophy)
1. General Program Development (Section 3.0)
- a. Mathematical Formulation (Section 3.1.1) (The bidder should indicate his qualifications for this work, clearly showing the extent of his proposed participation in mission planning, development of mathematical techniques, and derivation of program logic.)
- b. Coding and Debugging (Section 3.1.2) (The bidder should discuss his plans for accomplishing these tasks efficiently and reliably.)
- c. Computer Program Testing (Section 3.1.3) (The bidder should show the techniques he plans to employ, discussing these with respect to both non-real and real time modes, the use of simulated inputs, and the testing of each of the several types of programs.)
- d. Computer System Testing (See Section 7,A,3,d)
- e. Systems and Standards (Section 3.2.1) (The bidder should discuss proposed standards or techniques to be employed in program development.)

2. Specific Program Development

a. Simulation Programs (Section 3.3.1) (Discuss aspects of the development of a simulation technique and the formulation and use of computer programs for program debugging, flight controller training, and systems tests.)

b. Ground Monitoring Programs (Section 3.3.2.1) (Discuss formulation and use of these programs; also indicate the extent to which the computer complex can prove of value in real-time analysis of the performance of the various ground systems.)

c. Mission Control Programs (Section 3.3.2.2) (Here the bidder may show his understanding of the use of computers in real-time flight control, discussing in turn each of the sub-sections of this section. He shall relate his discussion to the following basic mission phases:

(1) Common to Gemini and Apollo projects

Prelaunch (initiation of real time support until lift-off)

Booster powered flight (lift-off to insertion)

Insertion into earth orbit

Trajectory subsequent to insertion

Trajectory modifications by corrective impulse

Docking in the event of rendezvous

Reentry from nominal, alternative and aborted missions

Aborts in any mission phase

(2) Related to Apollo only

Injection into translunar trajectory

Translunar trajectory

Major orbit transfers including midcourse corrections and maneuvers in the vicinity of the moon

Lunar landing

Lunar launch

Trans-earth trajectory

d. Computer Control Programs (Section 3.3.2.3) (Show how the computers may be used to handle their own scheduling, self-checking, etc., or suggest an alternative method to accomplish these tasks.)

e. Postflight Data Reduction Programs (Section 3.3.3) (Discuss the problems of accomplishing reduction of inputs and outputs logged in the computer complex into a form such that detailed postflight analysis can be accomplished.)

f. Network Countdown Programs (Section 3.3.4) (Show how the bidder believes such a program could be employed to facilitate network checkout.)

3. Computer Complex Equipment (Section 4.0)

a. Equipment Definition.- (The bidder shall specify the type and number of computers and associated equipment required in the computer complex to satisfy computing capacity and redundancy requirements. Reasons for the above selections shall be given with consideration being given to computing speed, memory capacity, input/output speed, reliability, adaptability to real-time requirements, and availability. The bidder shall also specify (1) special input/output equipment which may be used by the computer controllers to monitor and control the computing program and (2) the type, adaptability, and availability of data receiving, data transmitting, and data processing equipment to be employed within the computer complex.)

b. Design (Section 4.1.2) (The bidder shall describe his capability and planned approach to the design of new components and modification of existing components.)

- c. Implementation (Section 4.1.3) (The bidder shall describe his capability and planned approach for accomplishing the full implementation of the computer complex on a rigid time schedule.)
 - d. System and Sub-system Testing. (The bidder shall describe his capability and planned approach to the task of testing the computer complex system. The bidder shall consider system tests independent of other elements of the G.O.S.S. and, in addition, tests which utilize the computer complex as an element of the G.O.S.S.)
4. Maintenance and Operation (Section 5.0) (The bidder shall discuss his approach to these tasks, including updating of programs and modification of equipment which may be required as the program develops. The qualifications of the personnel he plans to use in the various aspects of this work should be shown.)
5. Reliability and Quality Control (Section 6.8)
- a. The bidder shall discuss his philosophy concerning each of the following aspects of a modern, effective equipment reliability and quality control program:
 - (1) Reliability program plan (Ref. MIL-R-27542)
 - (2) Reliability apportionment
 - (3) Reliability prediction (Ref. MIL-STD-756 and MIL Handbook 217)
 - (4) *Design reviews (Ref. MIL-R-27542)
 - (5) Environmental qualification acceptance tests (Ref. MIL-E-4158B)
 - (6) *Quality control and inspection test programs (Ref. NASA Quality Publications MPC 200.2 and 200.3)
 - (7) Maintainability (Ref. MIL-N-26512B)
- *Apply only to those portions of the system requiring contractor development.

b. The bidder shall also discuss the problem of developing a practical test for assuring the reliability of the computer complex as stated in Section 6.8.1.

6. General Requirements

a. Location of Program Development Personnel and Facilities (Sections 6.1 and 6.2) The bidder shall provide in his proposal for a temporary computing facility where his personnel may accomplish real-time program development prior to availability of the computer complex in the IMCC.

b. Simultaneous Project Support (Section 6.3) The bidder shall show how simultaneous support of a simulated mission and an actual mission can be accomplished with the complex he specifies.

c. The bidder's proposal may specify manufacturer and model of major components of the complex. However, the NASA reserves the right to specify alternate equipment if it deems necessary. The contractor shall state if his acceptance of the contract is contingent on the use of the equipment which he specifies.

d. The bidder shall state any objection to the requirements of Section 6.5.

e. Contractor's Staff Control (See Section II, Paragraph III B)

B. Implementation Plans.- Section A is largely concerned with the bidder's overall approach and philosophy pertaining to the complete computer complex. In this section the bidders will provide detailed implementation plans for those activities and procurements requiring immediate implementation.

1. Programming

a. A detailed plan for the implementation of the programs required to support the Gemini rendezvous operations. (This set of computer programs must be operational and checked out by April 1, 1964.)

b. A detailed plan for the formulation of the programs required to support the Apollo earth orbital missions.

2. Interim Computing Facility

A detailed plan for the implementation of an interim computing facility to be located in Houston to support computing requirements prior to the completion of the IMCC. (This interim center will be operational within 90 days of the award of the contract.)

3. Computation System Studies

A detailed plan to assist NASA and other contractors in a comprehensive study of requirements for the complete computation system. The results of these studies will be used for the rapid procurement of equipment and as a basis for definitization of the work statement for the balance of the contract. These study efforts include

- a. The computation approach and numerical methods to be used in the final system.
- b. The numbers and configurations of the computers required to support the computational requirements.
- c. The data flow requirements to determine the numbers and configurations of real time equipments and other equipments to be supplied.
- d. Other peripheral studies requested by MSC.

These initial studies will be completed within 90 days of the award of the contract.

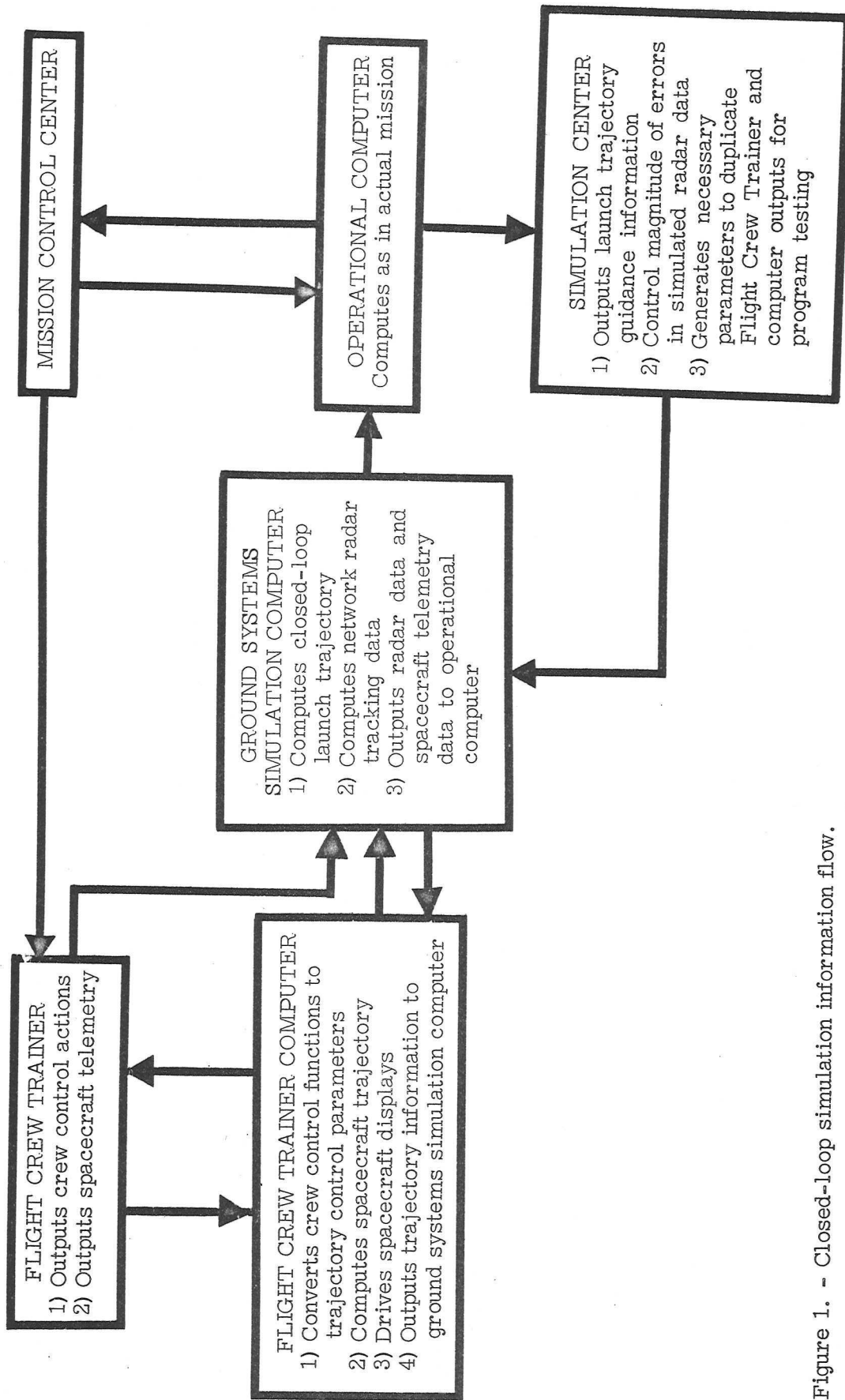


Figure 1. - Closed-loop simulation information flow.

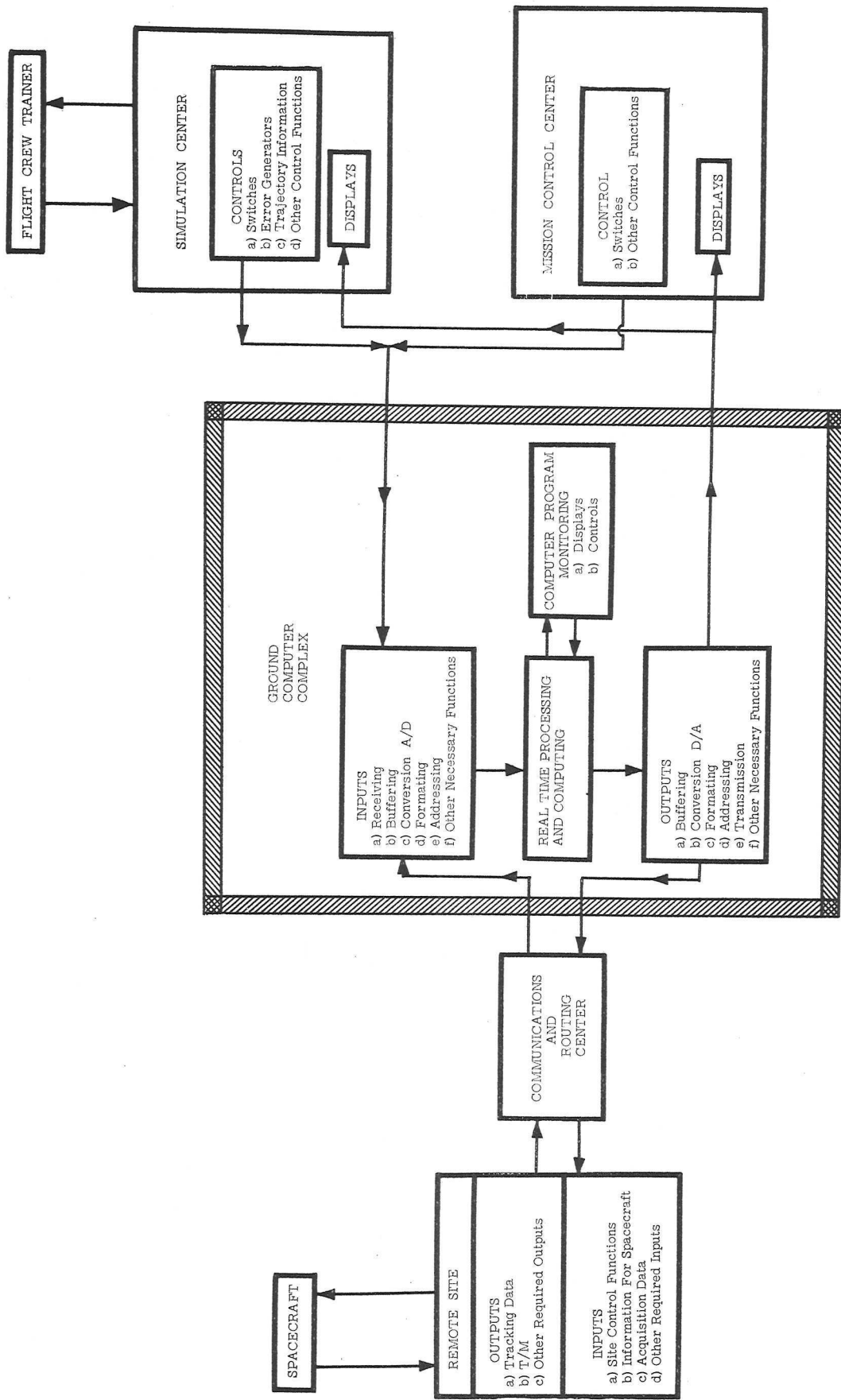


Figure 2. - Computer Complex functions within GCCS information flow.

EXHIBIT "B"

This part is to be completed, detached, signed, and returned with the proposal.

BIDDER REPRESENTS: (Check appropriate boxes)

1. That it is a () REGULAR DEALER IN, () MANUFACTURER OF, the supplies offered.

2. (a) That it () HAS, () HAS NOT employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) that it () HAS, () HAS NOT, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer. (For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 44, Part 150, Nov. 1958).

3. That it operates as, () AN INDIVIDUAL, () A PARTNERSHIP, () A CORPORATION, incorporated in the State of _____.

4. (a) That it () IS, () IS NOT a small business concern. Generally, a small business concern for the purpose of Government Procurement is a concern that (1) is not dominant in its field of operation and, with its affiliates, employs fewer than 500 employees, or (2) is certified as a small business concern by the Small Business Administration. (See Code of Federal Regulations, Title 13, Part 103, as amended, which contains the detailed definition and related procedures.)

(b) If bidder is a small business concern and is not the manufacturer of the supplies offered, it also represents that all supplies to be furnished hereunder () WILL, () WILL NOT, be manufactured or produced by a small business concern in the United States, its Territories, its Possessions, or the Commonwealth of Puerto Rico.

5. That each end product, except the end products excluded below, is a domestic source end product (as defined in the contract clause entitled BUY AMERICAN ACT); and that components of unknown origin have been considered to have been mined, produced, or manufactured outside the United States.

LIST EXCLUDED ITEMS:

By _____
Signature

Typed Name

Title

GENERAL INSTRUCTIONS FOR PREPARING
COST AND CONTRACTUAL PROPOSALS

1. General:

a. Your cost and contractual proposal, which will be an important consideration in the award of a contract, should be specific and complete. Proposals should be practical. Elaborate format, binders, and the like are neither necessary nor desired; legibility, clarity, and coherence being more important.

b. Proposals submitted in response to this Request for Proposal will not be returned but will be retained for official record.

c. The contingent fee certificate, EXHIBIT "B", must be completed and signed by an individual authorized to bind your organization contractually.

"If the bidder, by checking the appropriate box provided therefor in his bid, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the bidder-contractor) to solicit or secure this contract, or that he has paid or agreed to pay any fee, commission, percentage, or brokerage fee to any company or person contingent upon or resulting from the award of this contract, he may be requested by the Contracting Officer to furnish a complete Standard Form 119, Contractor's Statement of Contingent or Other Fees (December 1952 Ed.). If a bidder previously furnished a completed Standard Form 119 (December 1952 Ed.) to the office issuing this invitation for bids (request for quotations), he may accompany his bid with a signed statement (a) indicating when such completed form was previously furnished, (b) identifying by number the previous invitation for bids or contract, if any in connection with which such form was submitted, and (c) representing that the statement in such form is applicable to this bid."

d. If your proposal is accepted, the Government will award standard contracts embodying those clauses required by the Armed Services Procurement Regulations and NASA Procurement Regulations consistent with the type of contract entered into, including Nondiscrimination in Employment and standard labor clauses. The provisions of a Basic Agreement, if such an agreement is in effect between your organization and the Government, will be utilized if applicable to the proposed work upon specific and complete reference in the proposal. The NASA proposes to use standard Government or NASA clauses on Patent Right, Data, Notice and assistance Regarding Patent Infringement, Filing of Patent Applications, and Authorization and Consent as appropriate. NASA PERT SYSTEM CONTRACT CLAUSES attached will also be included.

e. In the event facilities under a Government facility contract are to be used in connection with the performance of an ensuing contract, the proposal will

include the Facility Contract number, the expiration date of the facility contract, and the name of the agency having cognizance over the facility contract. A statement will also be included in the proposal indicating the facilities will be available for timely completion of performance under an ensuing contract on a non-interference basis and whether or not your proposal is based on "No Charge for Use" and whether or not you could perform the work in the event use of such facilities is not authorized.

f. List facilities, including their cost, which must be purchased in addition to those presently available. State the accumulated total dollar amount of Government facilities on hand and contemplated as a result of a contract award which are not covered by Government facility contract.

g. Program Schedules. "NASA PERT SYSTEM." "A proposed time schedule for performance of the work should be set out by phases or parts of the project, and show interrelationships among phases. This proposed schedule should be supported by an accompanying PERT network, prepared in general conformity with the instructions of the NASA PERT Handbook." "Prospective contractors are advised that the successful contractor will be required to implement the NASA PERT System and report program progress biweekly."

2. Restrictions on Disclosure of Data in Proposals:

If you should consider it necessary to restrict disclosure of your data, submitted in response to this Request for Proposal, the following legend will apply:

This data furnished in response to subject RFP, shall not be disclosed outside the Government or be duplicated, used or disclosed in whole or in part for any purpose other than to evaluate the proposal; provided, that if a contract is awarded to this offeror as a result of or in connection with the submission of such data, the Government shall have the right to duplicate, use or disclose this data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in such data if it is obtained from another source.

Offerors shall mark each sheet of data which they so wish to restrict with the legend set forth above. Proposals received which require restriction of data, which include other than the above will not be acceptable and may be returned to the offeror.

3. Special Information:

a. If this procurement is classified, the bidder will return all classified information, including reproductions thereof, to the Contracting Officer concerned, or his duly authorized representative, unless specifically authorized in writing by the Contracting Officer to retain or destroy such classified matter in accordance with applicable security regulations:

(1) On or before the date for opening bids when a bid is not submitted.

(2) Within fifteen (15) days after notification that a bid or a negotiation proposal has been accepted.

(3) At such other times as the Contracting Officer concerned or his duly authorized representative may direct or agree. (Reference: Industrial Security Manual for Safeguarding Classified Information).

b. Because of the nature of the work called for in this procurement, it is not being formally advertised but will be negotiated. The Contracting Officer will select the best overall proposal, based on the technical merit, cost and other factors. The Government reserves the right to negotiate with any Contractor and to reject as the Government's interest may appear, any and all quotations and proposals received, or to waive any minor informality in connection therewith.

c. Late Proposals: The Government reserves the right to consider proposals or modification thereof received after the date indicated for such purpose, but before award is made, should such action be in the interest of the Government.

d. No costs incurred before receipt of a signed contract or specific written authorization from the Contracting Officer can be charged to the proposed contract. Your attention is invited to the fact that the Contracting Officer is the only individual who can legally commit the Government to the expenditure of public funds.

e. The term "negotiation" as used herein shall not be interpreted as meaning that offerors will be given the opportunity to revise or lower their original quotation or otherwise modify their original proposal. Offerors are cautioned to carefully review all terms and conditions and specifications of this Request for Proposal prior to submission of bids. The Contracting Officer may consider offeror's original proposal as final without extending privilege to modify or revise quotation or conduct further negotiations.

f. A properly authenticated Certificate of Current Pricing Data will be required for each procurement action exceeding \$100,000.00, and may be required at the Contracting Officer's discretion when lesser amounts are involved. This certificate will be required from the Prime Contractor immediately prior to agreement on negotiated prices, targets, or price revisions.

NASA PERT SYSTEM CONTRACT CLAUSE

"NASA PERT SYSTEM (Mar., 1962)

"(a) The NASA PERT system shall be implemented and maintained in accordance with the NASA PERT Handbook as in effect on the date of this contract and as it may be amended from time to time.

"(b) In the event of an amendment to the NASA PERT Handbook which changes substantially the amount of detail required to be reported or the system of reporting, such amendment shall be treated as a change under the clause of this contract entitled "Changes."

"(c) The system shall be implemented by a PERT team consisting of representatives of the Contractor and the NASA. Implementation by the PERT team will commence within 30 days after the date of this contract. The number of networks required and the scope of each network will be established by NASA, after giving due consideration to recommendations of the PERT team. The Contractor's participation, as a member of this team, shall include but not be limited to the following:

Formulation of recommendations as to the number and scope of networks required, development of the networks required, identification of events and activities comprising each of the networks required, and initial estimates of activity times supported by initial estimates of direct labor (in manhours) associated with each activity time. Implementation of NASA PERT will be complete within 90 days after the date of this contract. Reporting against and updating of individual networks shall commence as soon as individual networks are developed and not await completion of all networks.

"(d) Reporting against networks established shall be as described in the NASA PERT Handbook. These reports shall be submitted on alternate Fridays (the reporting date) specified by NASA via mail, TWX, phone, or such other manner as necessary to reach the NASA Project Manager by the Monday (A.M.) following the report date. The computer input data reported shall be current as of the reporting date."

NASA FINANCIAL MANAGEMENT REPORTING (with PERT)

"(a) Financial Management Reports shall be submitted by the Contractor on NASA Form 533 in accordance with the instructions on the reverse of the form. The line entries for subdivisions of work and elements of cost to be reported within the total contract shall be determined by NASA, after giving due consideration to the recommendations of a combined PERT/Financial Report implementation team consisting of Contractor and NASA Representatives. Subsequent changes and/or additions in the line entries to be reported will be similarly determined. The Contracting Officer will notify the Contractor of each change and addition and the reporting period to which each will apply.

"(b) The line entries for subdivisions of work selected for reporting shall be compatible with NASA PERT networks in order to permit integrated time/cost management control and reporting. Establishment of these subdivisions of work shall proceed simultaneously with the development of NASA PERT networks.

"(c) Financial Management reporting shall commence with a report for the first calendar month following the date of this contract. Until completion of the implementation of PERT, the line entries of the report shall reflect a summarized breakdown which is anticipated will approximate the more detailed entries based on PERT networks. Beginning with the first calendar month following completion of the implementation of PERT, the report shall be submitted with line entries fully compatible with PERT networks."

EXHIBIT "D"

SPECIAL INSTRUCTIONS FOR PREPARATION OF PROPOSALS

MANAGEMENT AND COST PROPOSAL

MANAGEMENT AND SUBCONTRACT ADMINISTRATION

I. PURPOSE

This section of the Management and Cost Proposal is required to determine the extent to which the offeror can manage a program of this magnitude. It is intended that a narrative description should include, but not be limited to, a brief description of the following considerations under the broad categories of both Program Management and Subcontract Administration. This section must not exceed fifty (50) pages, including all diagrams and figures on standard 8 1/2 by 11 in. paper. Folded diagrams and papers will be properly assessed as multiples of given page size.

II. PROGRAM MANAGEMENT

A. Organization

1. State which division or plant of the company would handle this work and what organizational arrangements would be used to accomplish over-all management, design, development, production, quality assurance, and use of supporting services. Discuss why this organizational arrangement was chosen.
2. Discuss the authority to be given the company official in charge of this work including: to whom he reports, what decision-making authority he has, and how he obtains the support of other elements of the division or company.

B. Experience on Similar Work

1. Describe briefly the experience of the division or plant which would do this work in handling work of a similar character. Discuss how that experience is useful or advantageous with respect to the work set forth in the RFP. If pertinent experience is not in the division or plant which would be assigned this work, describe how that experience would be brought to bear.
2. On all experience cited as pertinent, state for whom the work was done, the types of functions you performed (i.e., design, manufacture, installation and checkout, etc.), and the relationship of your work to the total project (i.e., supplier only, associated contractor, project supervision, etc.).

C. Program Control

1. State the previous experience of the division to which this work would be assigned in the use of the PERT system and the PERT-Cost system. If a centralized company office would handle PERT processing, discuss its experience and how it would coordinate with the division assigned this work.
2. Discuss techniques to be used in assuring close coordination between the division of your company assigned this work and MSC and other contractors participating in the preparation of operation of the Mission Control Center.

III. MANPOWER AND KEY PERSONNEL

A. Manpower Utilization

The amount of manpower estimated to be required for this work will be obtained from Exhibit 2 of the cost proposal and control procedures.

B. Key Personnel

Furnish resumes of key personnel assigned full-time or part-time to this work, using the attached Resume Form. The list should include, but not necessarily be limited to, the following.

1. Top management of the division or plant assigned this work.
2. Senior company official assigned responsibility for directing the work.
3. Top man in charge of design, manufacture, logic development, program development, program testing, computer operations, and maintenance.

Where less than full-time assignment is contemplated, so state and indicate what other commitments the individual will have.

IV. SUBCONTRACT ADMINISTRATION

A. Organization

1. Organizational level for operational policy and direction.

2. Degree of participation by your technical staff in the subcontract function.
3. Pricing policies and techniques which insure current, complete and accurate cost and pricing data.
4. Method of implementation of the small business program and labor surplus area policies.
5. Procedure for insuring that your subcontractors apply sound pricing procedures in dealing with lower tier subcontractors.
6. Description of vendor assistance program.
7. Procedure for arriving at a Make-or-Buy decision, and composition of committee.
8. Higher level review of Make-or-Buy decision.
9. Method to insure small business has opportunities to compete for subcontracts.

B. Source Selection

1. Procedure to insure proposals are solicited from all qualified sources.
2. Method of plant survey team investigation including members of team, and criteria utilized.
3. Method utilized to insure that the subcontract is to the best advantage of the contractor, price and other factors considered.
4. Occasions when source selection boards are employed.
5. Criteria for determining subcontracts to be reviewed by management for compliance with subcontract policy, selection of source, degree of competition, and use of price analysis and current pricing data.

C. Control

1. Description of change control procedures which will insure coordination, evaluation of subcontractor recommendations, and implementation to insure changes are incorporated into proper items.

2. Procedure to insure specification compliance control.
3. Criteria dictating establishment of residencies.
4. Intention to establish residencies at major subcontractors.
5. Description of technical and management assistance offered to subcontractors.
6. Procedure for cost and performance control of subcontractors.
7. Subcontract provisions, if any, which provide for control by you.

KEY PERSONNEL - RESUME SUMMARY

NAME	PRESENT ASSIGNMENT	PROPOSED ASSIGNMENT	RELATED YEARS	EXPERIENCE NATURE	TOTAL YEARS EXPERIENCE	EDUCATION	REMARKS
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NOTE: If less than full time assignment indicate by asterisk and footnote to designate percent of time contemplated and what will be the other assignments.

COST AND COST CONTROL PROCEDURES

I. PURPOSE

This section of the Management and Cost Proposal will determine the extent to which the offeror has utilized sound estimating, costing, and controls in preparation of his bid. Brevity and clarity are desired and excess verbiage should be avoided. The Contractor should cover his proposal in two broad categories: (a) Cost experience and (b) Detailed cost estimate.

II. COST EXPERIENCE

- A. Discuss briefly specific experiences which have demonstrated your ability to estimate and control costs on a program of this magnitude. Explain the cost history of major subcontractors you are considering for this program and the reasons for your selection.
- B. Describe briefly other programs performed by your company where your controls have resulted in significant cost reductions and methods of accomplishment.

III. COST ESTIMATE

- A. Prepare a total expenditure by Government Fiscal Year (July 1 - June 30), in accordance with Exhibit 1 attached hereto. Assume 1 October 1962 to be starting date.
- B. Prepare a man-loading analysis in accordance with Exhibit 2 attached hereto.
- C. Prepare MSC Form 207 (original and 3 copies) which will be the summary sheet covering Phase I of the contract.
- D. In support of the summary estimate (MSC Form 207) furnish the following detail:
 1. Material - Furnish priced bill of materials for all items (other than subcontract) which exceed \$10,000 either on a unit or cumulative basis.
 2. Purchased parts - Same as D1 above.
 3. Subcontracts - Furnish list of subcontracts, by vendors' name, description of item, quantities, total price delineating non-recurring development costs and total hardware costs. Indicate percentage of subcontracting to total costs. Indicate inter-company affiliation, in apropos. (Exclude consultant services)
 4. If costs for consultants are included, state names of consultants, rate of compensation, firm employed by and estimated time to be employed. No profit or fee should be applied to consultant costs.

5. Special tooling and test equipment - Costs of capital facilities, which term includes standard tools and standard test equipment available in the open market, are not considered acceptable as direct costs; but the allocable portion of normal depreciation thereon is properly chargeable to overhead. Any special tooling or special test equipment -- defined as property of such specialized nature that its use, without substantial modification or alteration, is limited to the production of the particular supplies or the performance of the particular services for which acquired or furnished (cf. ASPR 13-101.5) -- which is required to perform the proposed contract should be listed in detail including item description, proposed use, quantity, and unit price. Information on any costs of this type in any contemplated sub-contracts should also be furnished.
6. Royalties - If any royalty costs are included in your proposal, state the amount, the basis of computation, the name and address of the payee, the feature on which paid, and the name, number, and date of any patents or patent applications pertinent thereto. No profit, fixed fee, or indirect expense would be applied to royalty costs.
7. Taxes - The prices or estimated costs quoted should include all applicable Federal Taxes currently in effect, but should not include any State or Local direct tax. If your proposal contains any amount for State or local direct taxes, specify amount and explain why it is included and how it has been computed.
8. Insurance - List type, coverage, and premium of insurance policies, if any, applicable to this project and state whether or not costs thereof are included in your quoted overhead rates.
9. Travel expenses - If any travel expenses are included as a direct charge in your quotation, give reason and explain method of computation including per diem rate for each type of traveler. This cost should be below the profit-fee line.

10. Direct labor -
 - a. Contractors are encouraged to delineate and break-out major areas of efforts by labor hours and types in such detail as will clearly present his approach to man-power utilization.
 - b. Labor rates - Include schedules showing categories of labor and how quoted rates are forecast and derived. All rates are to be basic exclusive of any overtime contingency.
 - c. Overhead - Indicate whether overhead rates are based on direct labor dollars or direct labor hours. State whether rates quoted represent actual historical rates or forecast rates. If the overhead rates quoted have been approved recently by any Government agency for a specific period, state the period involved and by whom and when approved. If the overhead rates quoted differ from rates approved by the Government, explain in detail. If your overhead rates have not been approved by the Government and the rates quoted are not your current rates, explain in detail the factors considered in arriving at the quoted rates.
 - d. Overtime - Overtime costs included in your quotation shall be specifically identified by labor function and quoted as a direct charge. Any overtime included as an overhead or indirect charge shall be specifically identified as to area and cost.
 - e. Outside labor procured by the prime shall be specifically identified as to hours and cost.
11. Indirect loading factors - Explain any material and labor loading factors applied and not included in overhead or as direct costs. Specify rates and applicable dollars.
12. Other direct costs - Furnish supporting, explanatory information on each item of Other Direct Costs to the extent warranted by the amount of the cost or its unusual nature.

13. G & A - Indicate basis and rate of application.
14. Fixed fee or profit - Explain method of computation.
15. Financial information - A current balance sheet and a profit and loss statement for the most recent fiscal period of months or more, including detailed schedules of overhead and G & A expenses and of cost of goods sold, segregated according to material, labor and overhead costs, should be submitted with your proposal. This information should be for the specific division quoting on the job as differentiated from corporate entity. Furnish plant-wide budget forecast as currently utilized by management for estimating purposes. Should cover performance period contemplated in this proposal.

EXHIBIT #1

FISCAL YEAR FUNDING REQUIREMENTS

(1 July - 30 June)

(First Year Fy 1963 - 1 October 1962 - 30 June 1963)

	FY-1963	FY-1964	FY-1965	FY-1966	*	TOTAL
(1) Funding Requirements**						
By FY quarters (for Fy 63 only)						
1st quarter						
2nd quarter						
3rd quarter						
4th quarter						
TOTAL \$						
(2) Facilities Requirements**						
By FY quarters						
1st quarter						
2nd quarter						
3rd quarter						
4th quarter						
TOTAL FACILITIES						
(3) Total Fund Requirements**						
By FY quarters						
1st quarter						
2nd quarter						
3rd quarter						
4th quarter						

*Other FY's as applicable
 **See definitions attached

GRAND TOTAL

EXHIBIT #1 - Definitions

1. Defined as those funds required to fund anticipated accrued costs, both inhouse and at subcontractor level plus the unexpended dollar value of subcontractor material and inhouse orders outstanding.

2. Facilities requirements are defined as the funds required to be furnished to the contractor and/or his subcontractors to alter, or modify, or to construct or obtain additional facilities in order to fulfill the requirements of the statement of work.

3. Defined as sum of funding requirements and facilities requirements.

EXHIBIT #2

MAN-LOADING REQUIREMENTS

	FY62	FY63	FY64	FY65	**	TOTAL
Engineering						
Direct						
1st qtr						
2nd qtr						
3rd qtr						
4th qtr						
Indirect						
1st qtr						
2nd qtr						
3rd qtr						
4th qtr						
Tooling						
Direct						
(Same as above)						
Indirect						
(Same as above)						
Fabrication						
Direct						
(Same as above)						
Indirect						
(Same as above)						
Quality Control						
(Same as above)						
Others						
Direct						
(Same as above)						
Indirect						
(Same as above)						

**And other fiscal years as applicable.

EXHIBIT #2 - Definitions

Man-loading requirements for the proposals submitted will be by fiscal year and by quarters within the fiscal years. The requirements will be in tabular form in the following format:

1. Engineering

Direct

Indirect

2. Tooling

Direct

Indirect

3. Fabrication

Direct

Indirect

4. Quality Control

Direct

Indirect

5. Others

Direct

Indirect

Any people which cannot clearly fall within any one functional of 1 thru 4 above will be shown in group 5. Additionally the contractor will submit a definition of what people have been included in group 5.