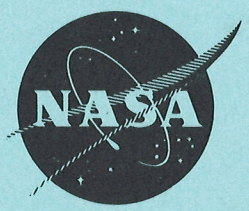
NHB 7121.2
AUGUST 1968
EDITION

PHASED PROJECT PLANNING GUIDELINES



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PREFACE

August 1968

NHB 7121.2 is the initial publication of the guidelines for implementation of the Phased Project Planning (PPP) concept prescribed by NPD 7121.1A.

These guidelines are applicable to the planning and approval activities which lead to the implementation of major new research and development projects as defined in NPD 7121.1A as well as to major modifications or extensions of approved projects. They should, therefore, be reflected in the Project Approval Documents which serve as the basic documentation for project definition, guidance and control throughout NASA.

The purpose of PPP is to provide, through defined phases, an adequate basis for management decisions on the extent to which project activities can be properly undertaken and commitments made. However, these guidelines do not prescribe detailed format and content of plans and other documents and reports used to apply the PPP concept. Similarly, the work content of phases and the information requirements described herein are not checklists. They are included to assist in understanding the intent of the PPP concept and should not be viewed as rigid or inflexible.

PPP, as a concept for orderly planning and definition of new major R&D undertakings, must be adapted to the peculiarities of each individual case. However, the flexibility permitted for adaptation should not be considered as a license for major variation which would compromise the objectives that underlie the concept.

Cognizant NASA officials are expected to pursue their project planning and definition activities in reasonable conformance with these guidelines and to request only those exceptions or deviations which are clearly necessary and justified.

These guidelines will be modified as determined necessary on the basis of experience. Comments or suggestions for changes should be directed to the Office of Organization and Management.

Harold B. Finger

Associate Administrator for
Organization and Management

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CHAPTER 1: INTRODUCTION

1.1 PURPOSE AND SCOPE

a. The purpose of this Issuance is to describe the Phased Project Planning (PPP) concept prescribed by NPD 7121.1A and to provide guidance and information to assist in implementing it.

b. These guidelines apply to the planning and approval activities which lead to the implementation of major new research and development projects as defined in NPD 7121.1A as well as to major modifications or extensions of approved projects. They do not apply to the Agency's level-of-effort Supporting Research and Technology activity, or to Advanced Mission Studies.

c. These guidelines do not prescribe detailed format and content of plans and documents used to apply the PPP concept. Implementing guidelines consistent with and utilizing to the extent practicable existing agency systems and procedures, but suited to their unique management needs, shall be developed and published by the individual Program Offices with their field installations.

d. The work content of phases and the information requirements described herein are not check lists, but merely illustrations of the general nature of the work since each project will have its own unique requirements. While the guidelines describe activity at the project level, the concept of PPP may be utilized at subordinate levels, when deemed appropriate.

e. Provision has been made in the guidelines for flexibility in the project planning process. However, the approval processes which are described are mandatory.

1.2 ORGANIZATION

The body of these guidelines is organized as follows:

a. Chapter 2 contains a summary description of PPP, philosophical background, procurement considerations, and the relationship of PPP to the agency-wide Supporting Research and Technology (SRT) and Advanced Mission Study activity.

b. Chapters 3 through 6 describe the division of responsibilites, the content and the approval process for Phases A, B, C and D.

c. Appendix A covers considerations important to PPP procurement activity.

CHAPTER 2: SUMMARY DESCRIPTION OF PHASED PROJECT PLANNING (PPP)

2.1 BACKGROUND

a. Phased Project Planning (PPP) is a phased approach to the planning, approval and conduct of major research and development activity. This approach was selected because the development of advanced aeronautical and space hardware systems involves considerable risk and uncertainty--and the greater the degree of technological advance involved, the greater are the risks and uncertainties. Uncertainty with respect to schedules and resource requirements of on-going projects seriously limits the Agency's ability to plan follow-on programs. PPP is directed at increasing the probability of achieving specified system performance within original resource and schedule estimates.

b. Regardless of the excellence of the planning there will be unforeseen problems and the necessity for changes which could not have been predicted. However, the better the planning, the fewer should be the number of unforeseen serious problems and required changes to the original plan. Accordingly, PPP is focused on the planning and definition phases of activity that precede full scale development and operations, and provides a disciplined basis for management to (1) evaluate project planning effort at critical points, (2) be cognizant of and thereby in a position to preserve significant future options, and (3) optimize the pay-off of the effort in relation to other activites and their combined contributions to overall agency objectives.

c. PPP has been structured to provide a progressive build-up of knowledge on all aspects of a proposed project (technical, manpower, funding, operational support, scheduling, facilities, management, procurement, relationship to the total agency program, etc.). Thus, the final implementation can be undertaken with the confidence that comes from a fuller understanding of project objectives and requirements.

d. The Administrator has selected four major management decision points within the evolution of a project which are of special significance and importance in the management of the Agency's program and resources. At these points, consideration and action by the Administrator and other senior officials is required. PPP is designed to provide information so that these decisions can be made in the context of the requirements and implications of a total project and its relationships to other agency program activities and overall objectives. These decision points are at those times when the sponsoring Program Office wishes to:

(1) initiate the analytical work, on a total-project basis, which is required to establish the overall (not just technical) feasibility of accomplishing a specific project with any of the approaches or concepts which have been identified by the Advanced Mission Study program or other effort, or

(2) engage in an effort of study, preliminary breadboarding and engineering analysis which will select from the feasible approaches, the single project approach to be followed for the conduct of the proposed project, or

(3) start detailed definition of the project, including preliminary design, develop all the required supporting data and prepare a firm plan for project development and operation, or

(4) initiate final design and hardware development, and carry out operations for the achievement of project objectives.

e. These decision points divide the planning and definition process into three phases followed by an implementation phase. Under the PPP concept the phases are termed: Phase A - Preliminary Analysis, Phase B - Definition, Phase C - Design, and Phase D - Development/Operations. The four phases are fundamental to the PPP concept and clearly evidence the intention and desire of management to expend the necessary time and resources to fully define the work to be done and to carefully assess its programmatic and managerial implications prior to committing the Agency to implementation of research and development projects.

2.2 DESCRIPTION OF PHASES

a. PHASE A - PRELIMINARY ANALYSIS

Phase A is primarily an in-house effort which involves the analysis of alternate overall project approaches or concepts for accomplishing a proposed agency technical objective or mission. It will identify, from the more promising concepts which have been examined in the Advanced Mission Study effort or elsewhere, those project approaches which are worthy of further refinement. It will identify such project elements as major facilities, operational and logistical support, advanced research and advanced technology effort required to support the proposed project and assist in determining whether the proposed technical objective or mission is feasible and worthy of further definition. Contracted effort is limited to auxiliary studies in support of the in-house activity.

b. PHASE B - DEFINITION

Phase B effort involves detailed study, comparative analysis and preliminary system design directed toward facilitating the choice of a single project approach from among the alternate approaches selected through Phase A activity. Also included is the identification of facilities, logistics, operations, and additional advanced technology, and advance development tasks required to support the specific approach selected. The major effort is normally accomplished by contracting for studies. These studies provide data for NASA in-house analysis which will determine the nature of the next recommendation to management.

c. PHASE C - DESIGN

Phase C effort includes the detailed definition of the final objectives and project concept. System design with mockups and test articles of critical systems and subsystems is undertaken if necessary to help assure that the hardware is within the state-of-the-art, that the technical milestone schedules and resource estimates for the next phase are realistic, and that definitive contracts can be negotiated for Phase D. Also included is the identification of alternate or back-up system/subsystem development requirements, facilities, logistics and operational support requirements. A unique feature of this phase is the provision for additional work by contractors during the period between submittal of their reports and Agency action on Phase D. The Phase C contractors are in competition for the award of the Phase D contract. They perform all the work in this phase except for NASA supporting studies and the in-house effort required to monitor the contractors and analyze the results.

d. PHASE D - DEVELOPMENT/OPERATIONS

Phase D effort covers final hardware design and development (including alternate and back-up systems/subsystems), fabrication, test, and project operations. This phase has the normal balance and composition of contractor/NASA work associated with a development/operations activity.

Figure 2-1, "Phased Project Planning Phase Relationships," in a condensed form relates the phases and their outputs.

2.3 APPLICATION

a. The work content of each of the first three phases is directed toward developing information needed to support the next major decision. PPP is not a rigid process in which projects will always proceed from a specifically authorized Phase A through Phases B, C and D. In certain circumstances a proposed new project, or an extension of an existing project, could begin at the Phase B, Phase C or Phase D level if the required level of information has been developed through other effort. Management approval to initiate any phase will depend on the demonstration to management that the level of information and planning is commensurate with the phase of effort being proposed.

b. It is the responsibility of the Program Office proposing project effort in any phase to demonstrate to the Administrator and other senior officials that the prerequisite work has been done, that the decision (or authorization) being requested is clearly and logically supported by the information in hand, that the objectives are sound and properly supplement the Agency's program, and that coordination with other Program and Functional Offices and field installations has been accomplished to ensure that operational and managerial aspects of the effort have been adequately assessed.

c. The PPP concept applies to Agency planning, study and design activities (both in-house and contractual) which have as their end objective, the approval and execution of major (significant) research or development projects. These need not be new projects. The PPP concept applies equally to major modifications or extensions of approved projects. When an experiment is of sufficient magnitude that it has several of the characteristics given in subparagraph d, it should be handled in the same manner as a project.

d. A major research or development project cannot be defined in specific terms. Therefore, a judgment must be made by the responsible Program Office and Center operating officials as to whether a particular R&D effort should be classified as major and therefore subject to specific approval by the Administrator or his delegate. Where there is uncertainty on whether a project should be considered as "major" the matter should be resolved with the Administrator or his delegate. A major project normally would have several of the following characteristics:

(1) Require significant Agency resources, through run-out, in terms of manpower/funding/facilities.

(2) Involve important relationships with external organizations, the public, or foreign governments.

(3) Usually encompass design, development, fabrication, test and operations.

(4) Require the identification or formation of a special organizational element which would devote full time to the execution of the effort.

e. Specifically excluded from PPP is the general study of possible future missions and technical or engineering concepts for their execution, which is conducted under the Advanced Mission Study program. Also excluded is the level-of-effort Supporting Research and Technology activity. These areas are discussed in paragraphs 2.5 and 2.6.

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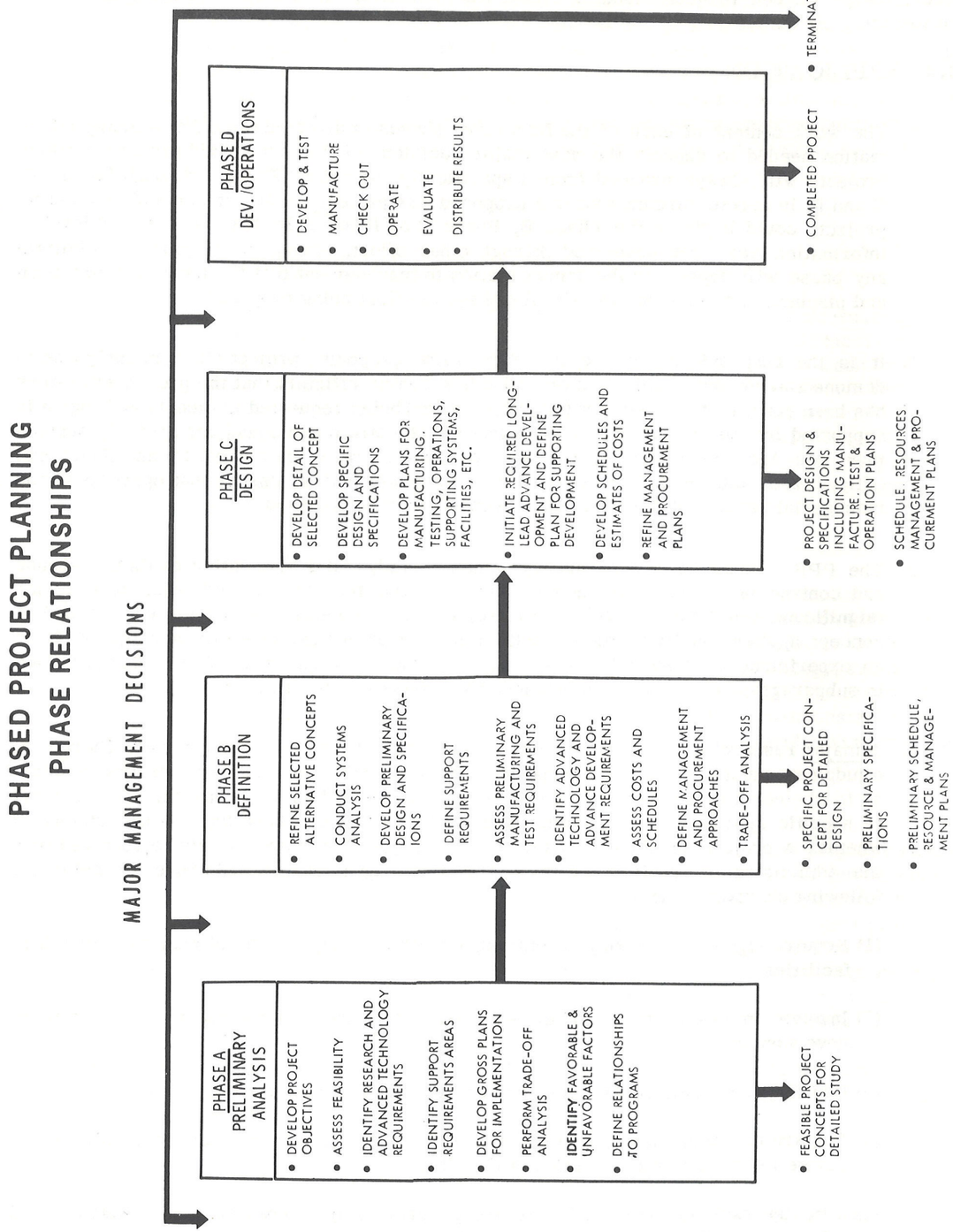


Figure 2-1

2.4 PROCUREMENT ASPECTS

The basic objective of PPP is to improve planning, decision making and implementation of new major projects with a view toward developing and staying within original technical, schedule and cost estimates. Improved project definition tends to assure qualified contractor response, clarifies contractor responsibilities, and increases the possibility of employing types of contracts best suited to achieving this objective. Guidance on procurement planning, including selection of contract types and distribution of risk is set forth in Appendix A.

2.5 RELATIONSHIP BETWEEN PHASED PROJECT PLANNING (PPP) AND ADVANCED MISSION STUDIES

a. The Advanced Mission Study effort is largely a contracted activity devoted to the examination of possible future objectives, activities and/or missions and the development of technical concepts by which those missions could be accomplished. The output of this effort, and/or similar information from other sources, provides a base for selection of projects to be considered for Phased Project Planning.

b. PPP progresses from that point by examining, on a total-project basis (technical, resources, timing, contracting, management consideration, etc.) the various concepts for accomplishing the objectives of a probable future mission. The initial phase of the PPP process (Phase A) is primarily a NASA in-house effort. Contractor participation in Phase A is specifically limited to supporting studies required for the in-house activity. The output of Phase A then serves as a base for the contracted activity which largely composes the subsequent PPP phases.

2.6 RELATIONSHIP BETWEEN PPP AND SUPPORTING RESEARCH AND TECHNOLOGY (SRT)

a. A major objective of PPP is to utilize the latest advances from the SRT effort and, in turn, to give direction to that effort. Specifically:

(1) The technology derived from the SRT effort provides a substantial part of the technical base which permits the Agency to consider new aeronautical or space objectives for Phase A implementation.

(2) Phase A will include identification of additional SRT requirements in areas pertinent to the mission under study.

(3) As PPP effort moves into Phases B and C, and the definition of mission hardware and operations becomes better known, the SRT requirements become more specific and time critical in order to assure that Phase D can be undertaken within the state-of-the-art.

b. It is Agency policy to maintain the closest relationship between PPP and the SRT program. It is intended that Phase D activity be undertaken within the technological state-of-the-art. To ensure this, as has been noted, each Phase will identify and help define the related SRT activity required to support the proposed project, and present a plan for the activity.

c. SRT tasks which are identified in Phases A, B and C are those which are important to the success of Phase D activity. Accordingly, it is vital that the Project Manager take all necessary actions required to assure that the SRT tasks are undertaken on a timely basis. Recognition must also be given to the responsiblities which have been assigned to the Office of Advanced Research and Technology and the Office of Space Science and Applications for the conduct of SRT in specific engineering and scientific desciplines. Therefore, it will be incumbent on the Project Manager both to identify his SRT requirements to the appropriate organization and to assure himself that the requirements will be satisfied. If appropriate, after coordinating his planning with the offices involved, he may plan to fund specific direct support SRT activity as part of his project. If the SRT activity does not provide him with confidence that the state-of-technology will support his project he should change his technical approach and plan accordingly.

CHAPTER 3: PHASE A--PRELIMINARY ANALYSIS

3.1 OBJECTIVES

Phase A is to identify, from the more promising concepts which have been examined in the Advanced Mission Study effort or elsewhere, those project approaches for accomplishing a specific NASA objective which are considered worthy of further refinement. Further, it is to provide management with a basis for action on recommendations for follow-on project activity.

3.2 PREPARATION AND APPROVAL OF A PHASE A PROJECT PLAN

a. GENERAL

A plan describing a specific Phase A project and how it will be accomplished is a prerequiste for approval to proceed with the Phase A activity. The preparation of this plan is an in-house function using all available data including those that may have been developed in Advanced Mission Studies or SRT activity.

b. RESPONSIBILITY

The Program Office which would have cognizance over the project during subsequent phases normally will initiate or sponsor a Phase A project and have the responsibility for having the plan prepared. However, other Program Offices are not precluded from Phase A project initiation or sponsorship, and in such cases, will have the responsibility for preparation of the plan. In this latter case, an information copy of the plan must be forwarded to the Program Office which would have cognizance over later phases. Except for unusual cases, the preparation of the plan will be assigned to the Field Center selected for project management where the work of preparation will be subject to the normal Field Center/Program Office management relationship.

c. STRUCTURE AND CONTENT OF PLAN

The plan will vary with the nature, size and complexity of the project, but it is expected to have the following general content:

(1) Project Objectives. The objectives of the ultimate project should be stated in terms of its scientific, technological or operational contribution to overall agency objectives as well as to the basic NASA program which it supports.

(2) Description. The scope of the activity should be outlined, including a list of the project approaches to be examined, prior related studies and the nature of the information to be developed.

(3) Work Plan. The plan should include an outline of the work statements for supporting study contracts (if required) with schedules, funding levels and anticipated type of contract. The plan for in-house activity is expected to cover identification of additional SRT tasks, centers involved, task schedules and manpower levels. Further, on-going SRT tasks pertinent to the Phase A project should be identified. There should also be an analysis of possible Phase B procurements to identify the contracted effort envisioned for Phase B.

(4) Schedules and Resource Requirements. The schedules, resource requirements, funding level and funding source will be given for the total Phase A project.

(5) Management. The Headquarters and Field Center management structure for the Phase A project should be outlined, including the Phase A project group with identification of key personnel, and the reporting and review plans.

d. REVIEW AND APPROVAL PROCESS

(1) An annual presentation of the planned Phase A program (in-house and contract) will be made to the Administrator or his delegate. Additions to or changes in the Phase A program (in-house and contract) between the annual reviews will be included as an agenda item in the monthly program reviews for the Administrator.

(2) A blanket Project Approval Document (PAD) for the total Phase A program (in-house and contract effort) of a Program Office will be approved by the Administrator or his delegate, with specific Phase A projects identified, for information, by attachments to the blanket PAD. Approval of a specific Phase A project which is totally in-house rests with the Program, Institutional and/or Field Installation Directors as agreed upon by these officials. Approval for procurement of supporting contractor effort is obtained, on the basis of a Phase A project plan, from the sponsoring Program Director or the Administrator if required because of the funding level involved. Information copies of all approved Phase A project plans will be distributed to all Program Directors and appropriate Functional Offices.

(3) Figure 3-1, "Key Procedures for Phase A," outlines the sequence in which the review, approval and subsequent activities take place. The detail of the review and approval functions of the Program, Institutional and Field Installation Directors has been omitted. These matters are within the operating jurisdiction of the individual Directors. For the same reason, no intermediate levels of review and/or approval are indicated between Directors and the Project Managers.

3.3 CONDUCT OF A PHASE A PROJECT

a. GENERAL

Phase A work normally will be in-house at a Field Center. Contractor effort, if any, is to be solely in support of the in-house activity. Contracts should cover selected well-defined portions of the project. Contractors need not be capable of Phases B, C and D effort.

b. STUDY EFFORT

Regardless of whether the activity is totally in-house or a combination of in-house and supporting contractor work, the aim and general content of the effort is the same. The following (not a check list) illustrates elements normally expected to be covered for each concept under study:

-- Development of project objectives in detail.
-- Assessment of the feasibility of achieving project objectives.
-- Identification of research, advanced technology and other project support requirements.
-- Gross hardware requirements and plans for project implementation including manufacturing, test, logistic support, operations, etc.
-- Determination of gross schedule for implementation.
-- Estimates of gross resource requirements (funds, manpower and facilities).

-- Identification of the favorable and unfavorable technical, resource, and policy factors.
-- Trade-off analyses to provide a basis for recommendations for follow-on action.
-- Application to, or interface with, on-going or proposed projects.

c. MANAGEMENT

A Phase A project will be under the overall direction of the Program Office which had the responsibility for preparation of the Phase A plan, utilizing the project group established for this purpose.

d. CONTRACT MONITORING

Technical guidance and monitoring of contractor effort must be of sufficient continuity and depth to provide a full understanding of the data and conclusions. This will assist in assuring effective contractor effort as well as expediting analysis of contractor reports and formulation of the final in-house analytical report.

e. ANALYTICAL REPORT

(1) The in-house analytical report is the document on which the decision for follow-on activity will be based. It should present the results of the analytical effort in a form which supports the conclusions and recommendations (technical, management, resource, schedule, and policy) which are derived from that effort. The conclusions must form a logical base for the recommendations. In general, the report is expected to contain data of the type illustrated by the following list:

- How the project objectives would contribute to agency and program objectives.
- Complete information on each approach studied.
- Preliminary specifications for use in Phase B.
- Comprehensive comparative analysis of alternatives and trade-offs (including resource and schedule estimates for the project through completion).
- Identification of Phase B study contracts required.
- Statement of impact on Agency program and resources.
- Identification and plan for implementing research and technology tasks critical to the project.
- Relationship to on-going or proposed projects.
- Conclusions.
- Recommendations.

(2) Recomendations must fall into one of the following categories; termination or deferment of the project, initiation of further study, initiation of Phase B, or initiation of Phase C or D if all prerequisite work has been accomplished.

(3) In the case of a recommendation for termination or deferment, the actions required and their implications will be noted. In the case of further study (Advanced Mission or Phase A) the appropriate planning will be included. A recommendation to skip to Phase C or D must be fully supported by showing that all prerequisite work has been completed. A specific recommendation should be accompanied by the appropriate plan.

(4) In the case of a recommendation to initiate Phase B activity, the plan for Phase B should be prepared in accordance with paragraphs 4.2a and b.

(5) Study results will be disseminated to directly interested Program and Field Center Directors. Important comments from these elements will be appended to the report and clearly keyed to the pertinent sections of the report for easy reference. For example, all statements of SRT requirements should include the comments of the cognizant discipline or technology group and all statements of operations requirements should include the comments of the group which would provide the support.

3.4 PROCUREMENT ASPECTS

Procurement considerations are covered in Appendix A.

KEY PROCEDURE

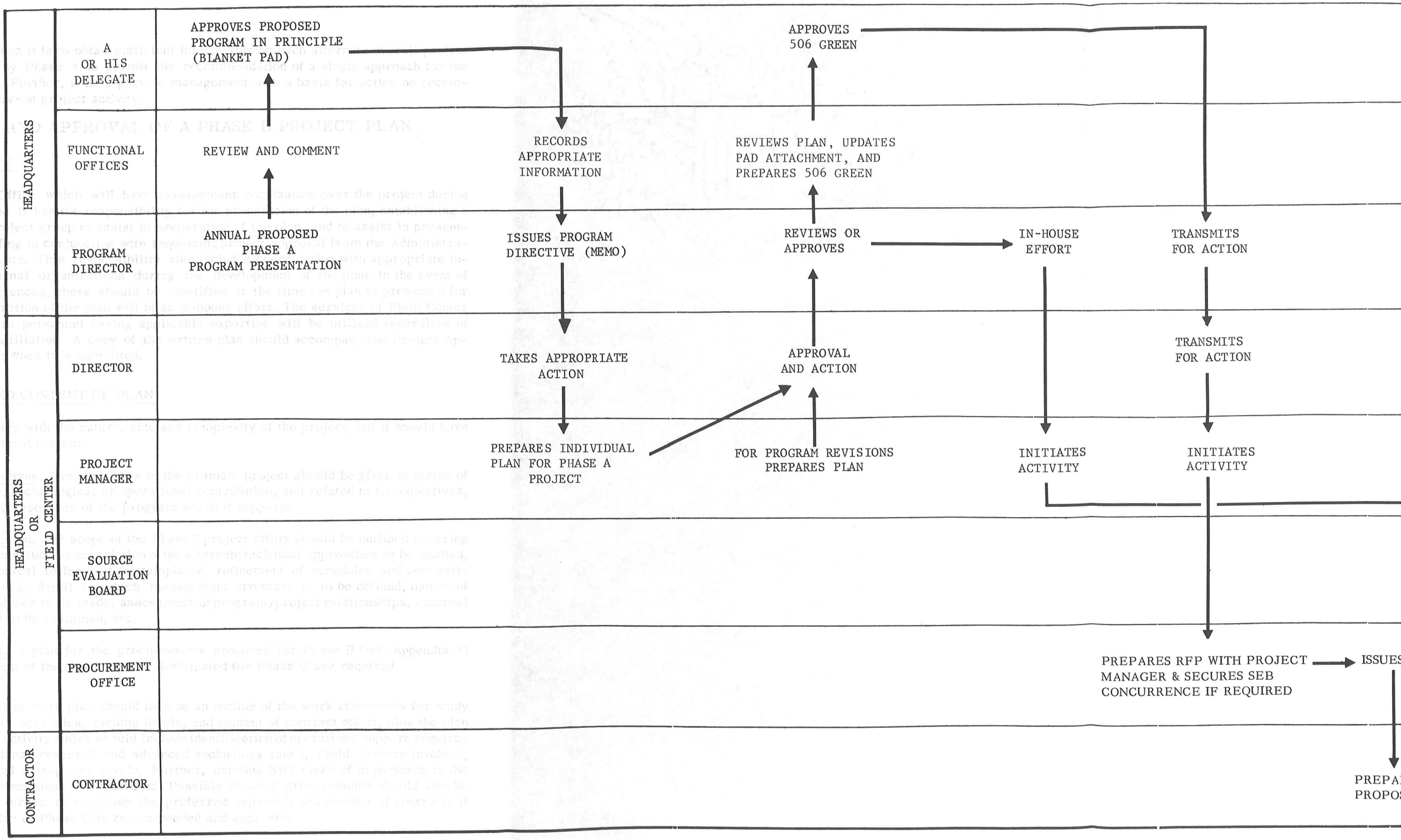


Figure 3-1

KEY PROCEDURES FOR PHASE A

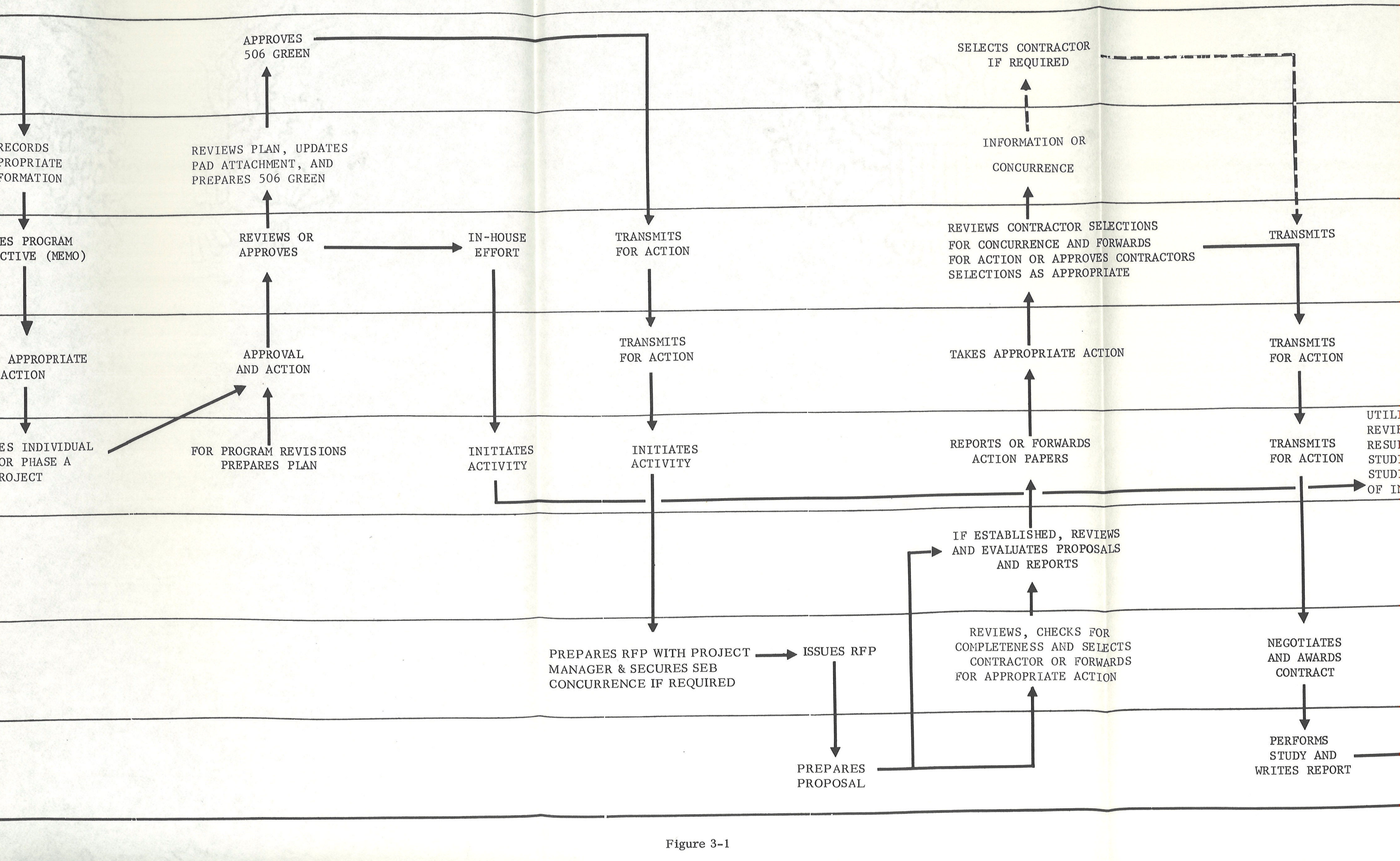
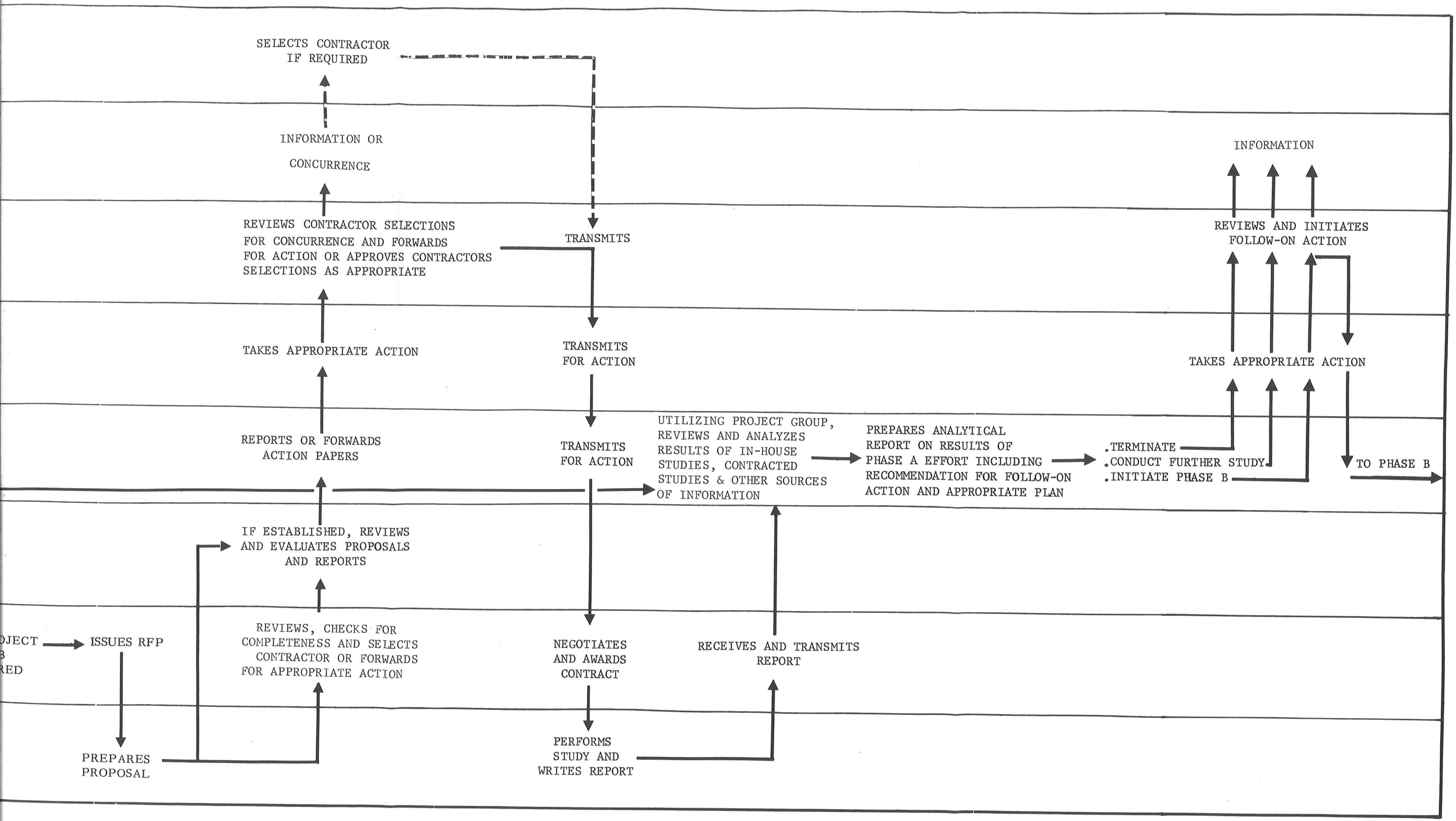


Figure 3-1

OCEDURES FOR PHASE A



CHAPTER 4: PHASE B--DEFINITION

4.1 OBJECTIVES

The objective of Phase B is to obtain sufficient information on each alternate overall project approach selected by Phase A to permit the recommendation of a single approach for the prospective project. Further, it is to provide management with a basis for action on recommendations for follow-on project activity.

4.2 PREPARATION AND APPROVAL OF A PHASE B PROJECT PLAN

a. RESPONSIBILITY

The Program Office which will have management cognizance over the project during Phases B, C and D has the responsibility for the preparation of the plan, establishing a Field Center project group to assist in preparation of the plan, and to assist in presenting an oral briefing in conjunction with requesting project approval from the Administrator or his delegate. This responsibility also includes coordination with appropriate internal and external organizations during the development of the plan. In the event of unresolved differences, these should be identified at the time the plan is presented for approval. Preparation of the plan will be an in-house effort. The services of Field Center and Headquarters personnel having applicable expertise will be utilized regardless of administrative affiliation. A copy of the written plan should accompany the Project Approval Document when it is submitted.

b. STRUCTURE AND CONTENT OF PLAN

The plan will vary with the nature, size and complexity of the project, but it should have the following general content:

(1) Project Objectives. The objectives of the ultimate project should be given in terms of the scientific, technological or operational contribution, and related to the objectives, schedules and resources of the program which it supports.

(2) Study Description. The scope of the Phase B project effort should be outlined covering major elements such as description of the alternate technical approaches to be studied, level of technical refinement contemplated, refinement of schedules and cost estimates proposed, detail to which management structure is to be defined, nature of trade-off analyses to be made, assessment of program/project relationships, external relationships to be examined, etc.

(3) Procurement. A plan for the procurements proposed for Phase B (ref. Appendix A) and a statement of the procurements anticipated for Phase C are required.

(4) Work Plan. The work plan should include an outline of the work statements for study contracts with schedules, funding levels, and content of contract effort, plus the plan for in-house activity which should include identification of operations support requirements, additional research and advanced technology tasks, Field Centers involved, schedules, and man-power levels. Further, existing SRT tasks of importance to the proposed project should be identified. Possible Phase C procurements should also be examined in order to establish the preferred approach and number of contracts if implementation of Phase C is recommended and approved.

(5) Schedules and Resources. Detailed schedule and resource information should be identified for Phase B, including the source of funding as well as summary schedules and gross resource requirements for the total project.

(6) Management. The management structure for Phase B effort should be outlined, including the required expansion of the Phase B project group with identification of key personnel and arrangements for management, reporting and review. If it appears probable that Phase C will be started essentially contiguous to Phase B, consideration should be given to the formation of a project group which could be expanded to handle Phases C and D.

c. REVIEW AND APPROVAL PROCESS

Figure 4-1 "Key Procedures for Phase B", outlines the sequence in which the review and approval activities are to be accomplished. Shown in the chart are the major reviews and the initial specific project approval (PAD) which are needed to proceed with the effort. A separate PAD signed by the Administrator or his delegate will be issued for each Phase B project. When the proposed project is complex it may be necessary to prepare separate PAD's for discrete elements of the project (spacecraft, launch vehicles, payloads, operations support, etc.) to promote management of the project and provide adequate visibility for review, assessment and approval. Detail of the review and approval functions of the Program, Institutional and Field Center Directors has been omitted. These are matters within the operating jurisdiction of the individual Directors. For the same reason no intermediate levels of review and/or approval are indicated between Directors and the Project Managers.

4.3 CONDUCT OF A PHASE B PROJECT

a. GENERAL

The major portion of the Phase B project effort generally will be contracted by the appropriate Field Center. Since the intent of that contractor effort is solely to develop information for in-house analysis, emphasis must be placed on selecting contractors having demonstrated study capability in the applicable disciplines. It must also be emphasized that contractor participation in this phase is not part of the competition for a Phase D contract. The in-house Field Center effort is to supplement contractor activity and will include analysis of all data developed and the preparation of a report covering the results of that analysis. Every approach selected through the Phase A effort should be studied unless data developed since completing Phase A, or other considerations, dictate otherwise. The in-house project group will monitor and coordinate the contractor and in-house effort, analyze the results of the total Phase B effort, and prepare the final analytical report which will include their recommendations.

b. PRIME CONTRACTOR EFFORT

(1) The specific study requirements placed on the contractors can vary with the size and complexity of the proposed project. These factors also determine the nature and amount of bread-boarding required to support this activity. The following illustrative list (not a check list) indicates elements normally expected to be covered:

- Refinement of selected alternative concepts.
- Preliminary system design data (including preliminary systems specifications).
- Preliminary assessment of manufacturing and testing facilities and techniques.
- Identification of requirements for operational support.

- System and subsystem design-margins/safety-factor goals.
- Preliminary reliability assessment, requirements and plan.
- Preliminary quality assurance requirements and plan.
- Preliminary test plan.
- Identification of Advanced Research and Technology, and Advance Development requirements.
- Configuration management plan.
- Contractor management plan.
- Data management plan.
- Preliminary logistics plan.
- Estimated schedule for total project implementation supported by PERT.
- Contractor procurement planning for Phases C and D.
- Estimates of resource requirements (funds, manpower, facilities).

(2) The results of contractor studies of the individual approaches will be used for trade-off analyses to identify the most desirable approach for further project implementation. This comparative analysis activity is an in-house responsibility and will, to the extent feasible, rely on in-house effort. Contractor assistance will require advance approval by the Administrator or his delegate. Contractor selection should then be made so as not to develop a conflict-of-interest situation without his prior knowledge. (See discussion of Conflict of Interest, Appendix A, paragraph A.2b(2).)

(3) Each contractor will submit a report giving the results and conclusions on each approach studied and on trade-off analyses made.

(4) The specific format for the contractor's report will be prescribed by the Field Center responsible for Phase B. Use of a uniform format for the reporting of study efforts would assist in utilization of the reported data.

a. IN-HOUSE EFFORT

(1) General. The in-house effort will be under the overall direction of the Program Office having the management responsibility for the project. Project responsibility will generally be assigned to a Field Center by the appropriate Program Director. Where appropriate, arrangements should be made to utilize the capabilities of other Field Centers. The in-house analysis effort may be supplemented by supporting contracts for the study of special aspects of the project.

(2) Contract Monitoring. Technical direction and monitoring of the contractor effort must be of sufficient continuity and depth to provide a full understanding of the data and conclusions. This assists in guiding the contractor effort as well as expediting analysis of contractor reports and the formulation of the final in-house analytical report.

(3) Technical Effort. This activity includes such things as selecting preliminary specifications developed by Phase B activity to assure that they can be met within the state-of-the-art, mockups and test articles as required, and trade-off analyses of important segments of the approaches under study.

(4) Analysis and Recommendations

(a) General. The final, and major, technical endeavor is the analysis of the results of the contractor and in-house work, the writing of the analytical report and development of recommendations. The importance of this effort cannot be overemphasized because the success of succeeding phases is dependent on the correctness of the analysis and the accuracy of the report.

(b) Analysis and Review. Under the direction of the responsible Program Office, and utilizing the applicable resources of Field Centers, a detailed analysis of the contractor and in-house Phase B effort is required. This analytical effort will culminate in an in-house report which analyzes the pertinent data and develops conclusions and recommendations for management consideration. The results of the total Phase B study efforts should be analyzed to define the project. Included should be such elements as; available options, how to achieve the project objectives within the constraints of current technology, available resources, and realistic schedules. Consideration must be given to the impact on on-going approved projects and, to the extent possible, on related interagency and international activity.

(c) Analytical Report

(i) The in-house analytical report is the document on which the decision for follow-on activity will be based. It should present the results of the analytical effort in a form which supports the conclusions and recommendations (technical, management, resource, schedule, procurement, political, etc.) which are derived from that effort. The conclusions must logically form the basis for the recommendations. In general, the report should contain:

- Complete information and preliminary specifications on each approach studied.
- Comprehensive comparative analysis of the alternative approaches and of the trade-offs studied (including resource and schedule estimates for the project through completion).
- Impact of project on Agency and contractor resources.
- If applicable, identification of advanced technology and advance development tasks critical to the project, with a plan for their accomplishment.
- Conclusions.
- Recommendations.

(ii) Recommendations must fall into one of the following categories; termination or deferment of the project, initiation of further study, initiation of Phase C, or initiation of Phase D if prerequisite work has been accomplished.

(iii) In the case of a recommendation for termination or deferment, the actions required and their implications will be noted. In the case of further study (Phase B or prior level of activity) the appropriate planning will be included.

(iv) In the case of recommendation to initiate Phase C activity, a plan for Phase C--prepared in accordance with paragraphs 5.2a, b and c--will accompany the analytical report and recommendations.

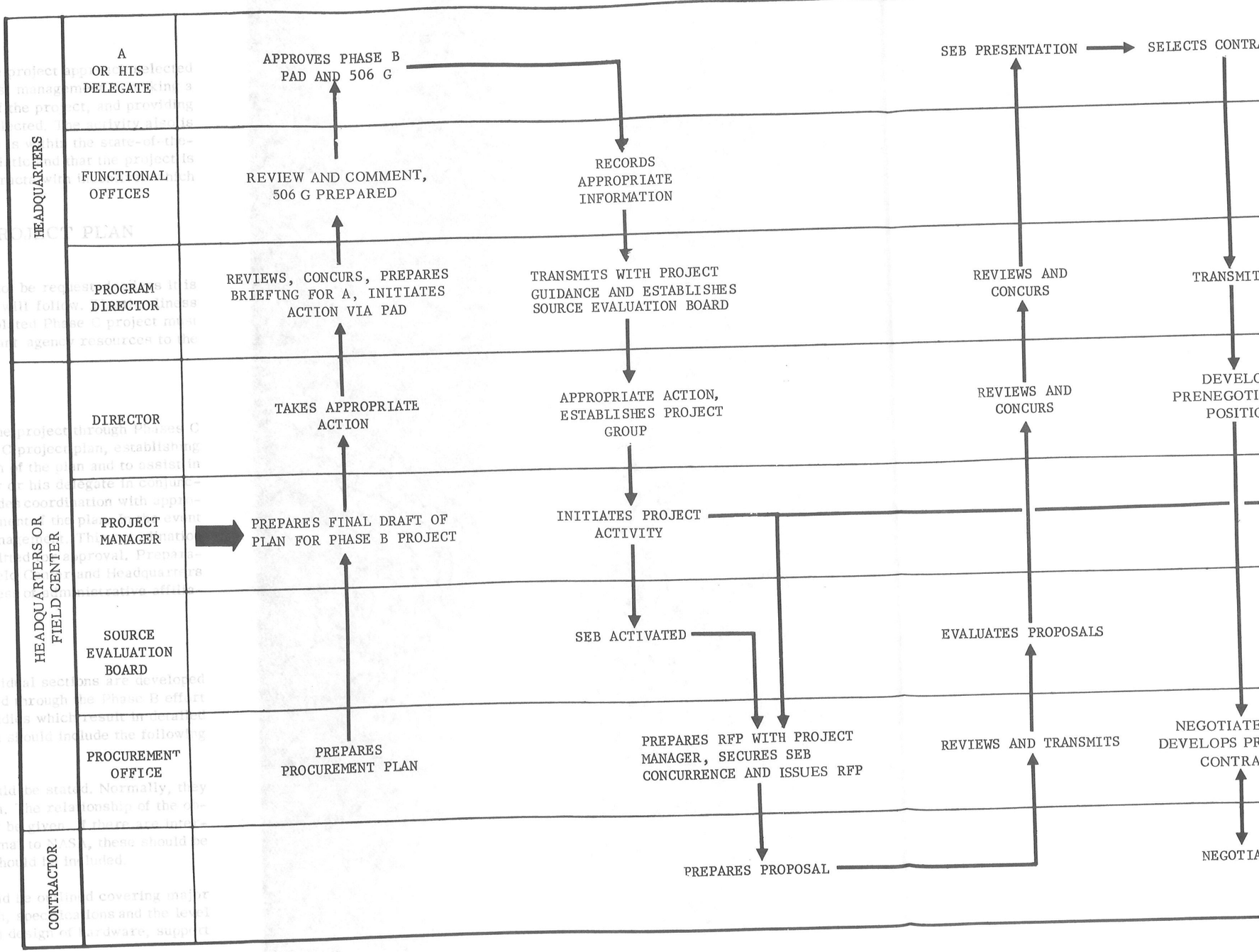
(v) A recommendation to skip to Phase D must be supported by showing that prerequisite work has been completed. In addition, the approach to be implemented should be identified, and the analytical report written so as to fully replace the Phase C analytical report described in paragraph 5.3c. A plan for Phase D will accompany the recommendation.

(vi) Study results will be disseminated to cognizant Program and Center Directors of NASA. Important comments from these other elements will be appended to the report and clearly keyed to the pertinent sections of the report for easy reference.

4.4 PROCUREMENT ASPECTS

Special provisions applicable to Phase B contracting are covered in Appendix A.

KEY PROC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REVIEWS, CONCURS, PREPARES BRIEFING FOR A, INITIATES ACTION VIA PAD
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KEY PROCEDURES FOR PHASE B

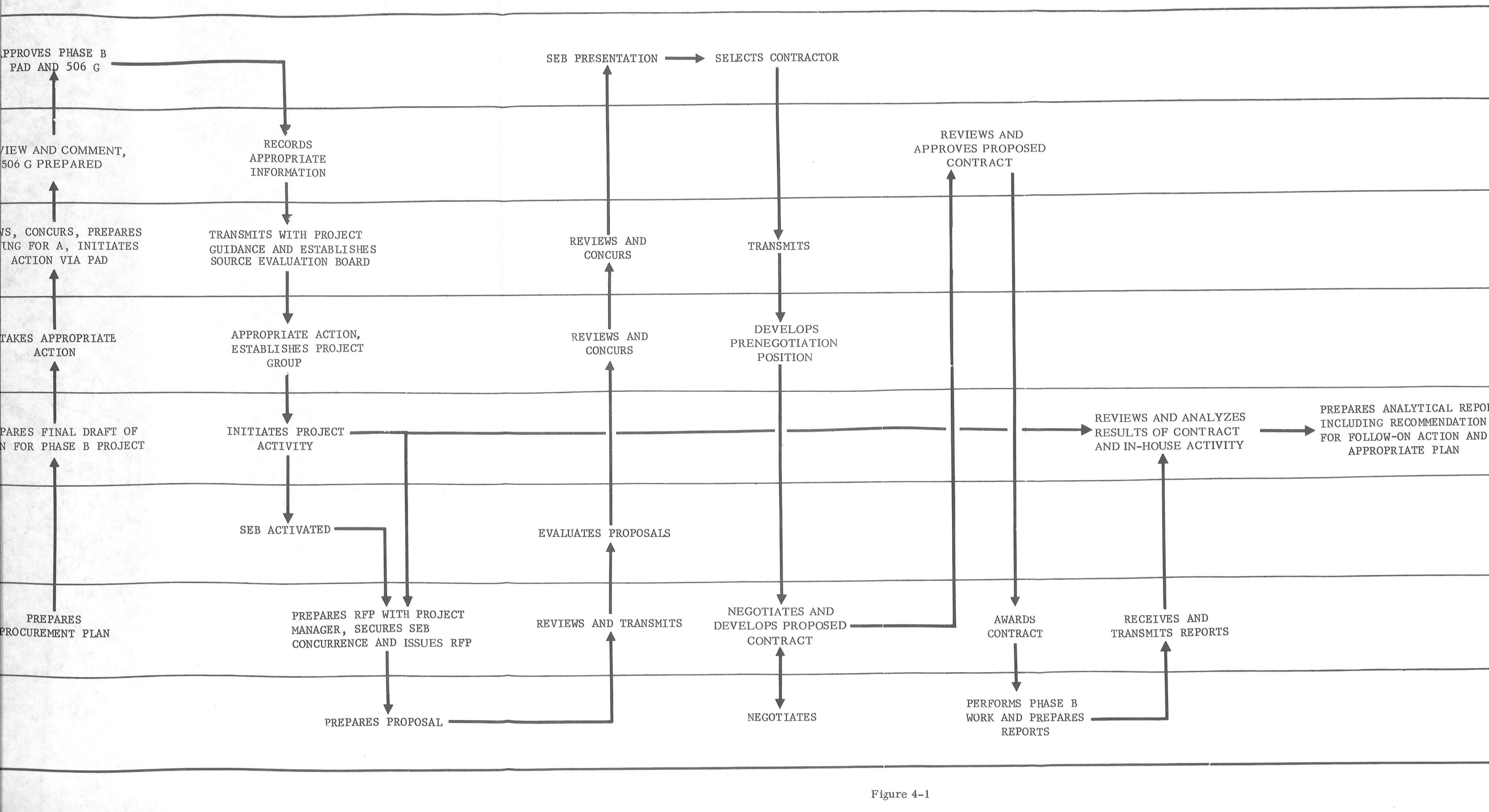


Figure 4-1

KEY PROCEDURES FOR PHASE B

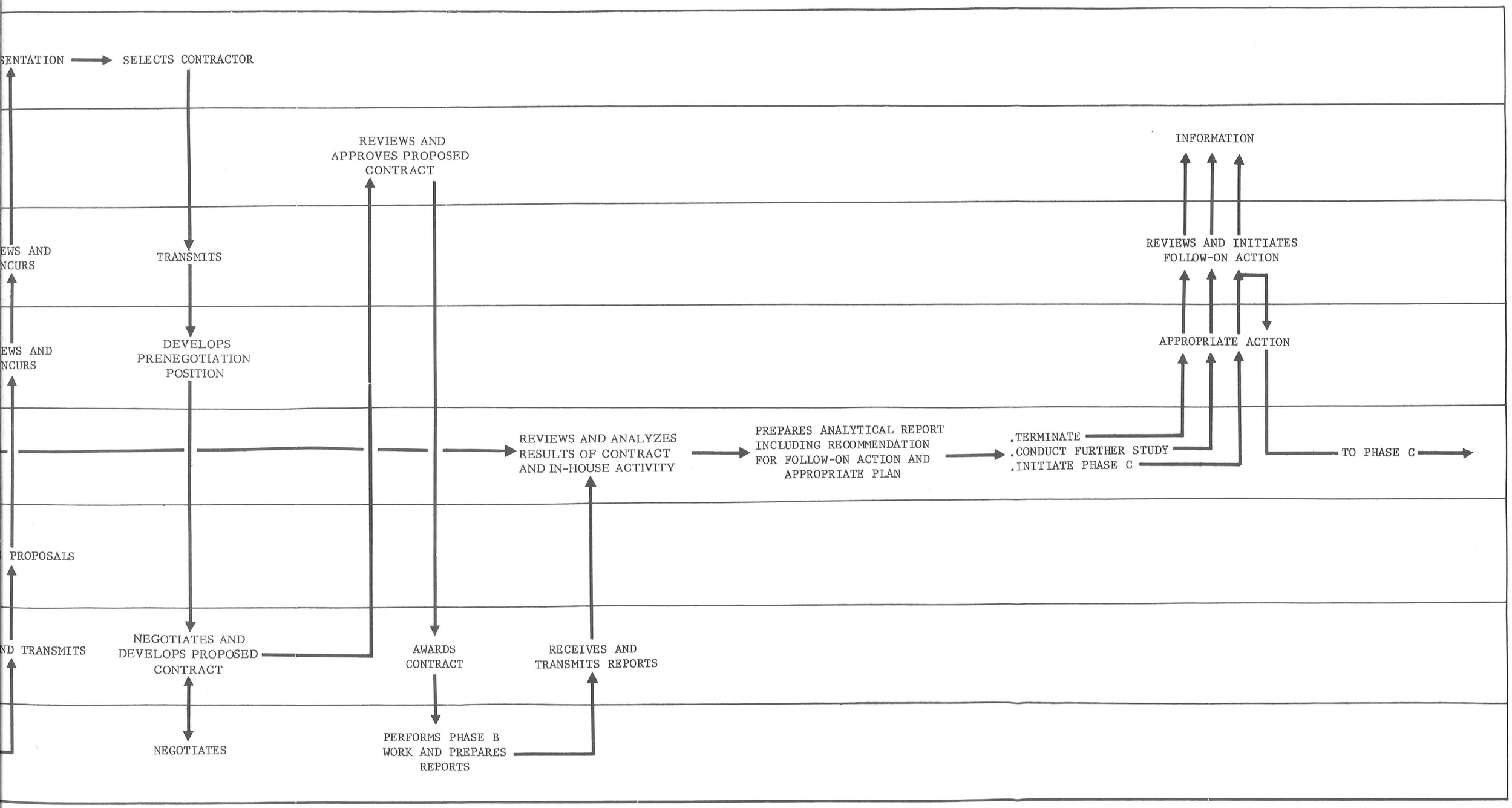


Figure 4-1

CHAPTER 5: PHASE C--DESIGN

5.1 OBJECTIVES

The Phase C project effort is directed toward defining in detail the project approach selected through the Phase B activity, developing information to assist management in making a decision with respect to proceeding into the hardware phase of the project, and providing the competition through which the Phase D contractor will be selected. The activity also is directed toward providing assurance that the technical approach is within the state-of-the-art, that schedule and resource estimates for Phase D are realistic and that the project is sufficiently defined to allow the negotiation and award of contracts with incentives which are as highly motivating as risk and other factors permit.

5.2 PREPARATION AND APPROVAL OF A PHASE C PROJECT PLAN

a. REQUEST FOR APPROVAL

As a general rule, approval for initiation of Phase C will not be requested unless it is reasonably certain that Phase D, project implementation, will follow. The timeliness (in terms of budget and Congressional processes) of a contemplated Phase C project must be explored with management prior to committing significant agency resources to the preparation of the Phase C project plan.

b. RESPONSIBILITY

The Program Office which will have the responsibility for the project through Phases C and D has the responsibility for the preparation of the Phase C project plan, establishing a Field Center project group to assist in the preparation of the plan and to assist in presenting an oral briefing, if required, to the Administrator or his delegate in conjunction with requesting project approval. The responsibility includes coordination with appropriate internal and external organizations during the development of the plan. In the event of unresolved differences, these should be reported to management. This coordination activity must be undertaken prior to the time the plan is submitted for approval. Preparation of the plan will be an in-house effort. The services of Field Center and Headquarters personnel having applicable expertise will be utilized regardless of administrative affiliation.

c. STRUCTURE AND CONTENT OF PLAN

The form of the plan follows that of Phase B, but the individual sections are developed in greater detail. However, only the project approach selected through the Phase B effort will be treated and the treatment consists of in-depth studies which result in detailed definition of all aspects of the project. Specifically, the plan should include the following elements:

(1) Project Objectives. The objectives of the project should be stated. Normally, they will be refinements of those stated in the Phase B plan. The relationship of the objectives to basic NASA programs, missions and goals will be given. If there are interfaces with other projects or programs internal or external to NASA, these should be stated. Significant schedule and resource relationships should be included.

(2) Study Description. The scope of the Phase C activity should be outlined covering major elements such as: descriptions of the technical approach, specifications and the level of refinement planned; level of detail to be developed on design of hardware, support

activity, manpower and costs; expansion of the management and reporting structure; trade-off analysis planned; assessment to be made of program/project relationships (internal and external); etc.

(3) Procurement. A plan for the procurements proposed for Phase C is required (ref. Appendix A).

(4) Work Plan. The work plan should include: an outline of the work statements for the two increments of contractor effort, if both are appropriate, (ref. paragraph 5.3) including level of mockups and test articles authorized; funding levels and type of contract; an outline of the work plan for in-house activity including identification of advance development and additional advanced technology tasks; Field Center responsibilities; and schedules and manpower levels. Further, existing SRT tasks important to the proposed project should be identified. As is more fully outlined in Appendix A, procurement aspects of the projected Phase D effort should be studied in order to anticipate the contractual arrangements best suited for project implementation.

(5) Schedules and Resources. Detailed information on Phase C schedules and resource requirements and summary level data for the total project should be presented. The funding source for Phase C will be identified.

(6) Management Structure. The management structure planned for Phase C, proposed expansion of the project group including identification of key personnel, and reporting and review plans will be outlined.

d. REVIEW AND APPROVAL PROCESS

The sequence of review and approval activities pertinent to Phase C is outlined in Figure 5-1 "Key Procedures - Phase C". The process is essentially the same as that for Phase B. Each Phase C project will be covered by a separate PAD. In the event it is a complex project it may be necessary to cover individual elements of the project by separate PAD's to facilitate management of the project and provide adequate visibility for review, assessment and approval. The details of the review and approval process between Program, Institutional, and Field Center Directors are not treated. These relationships are the responsibilities of the individual Directors concerned.

5.3 CONDUCT OF A PHASE C PROJECT

a. GENERAL

The major portion of the Phase C activity is to be conducted by contractors. The in-house effort supplements the prime contractor activity and can include supporting contracts on special aspects of the proposed project. The in-house effort is directed toward validating the contractor data, integrating all data into a set of final design specifications, support requirements and plans for implementing the project, and the preparation of a summary report of the results of the study with an analysis of the data and recommendations for follow-on action. When appropriate, each prime contractor will develop a work plan for the period between submission of their primary report and proposal package, and the Agency action regarding follow-on effort (see Appendix A). The project group should maintain a reasonable level of review and analysis of the contractor effort, in order to prepare a timely analytical report and set of recommendations.

b. PRIME CONTRACTOR EFFORT

(1) Study Activity. The scope of work and the objectives are the same for each of the prime contractors. The specific information required depends upon the project itself,

and schedule and management factors. The following is a representative list (not a check list) of the type of information to be generated by the prime contractors:

- Detailed description of total system.
- Engineering analysis of the integrated system to assure compatibility, establish interface requirements, redundancy, etc.
- Identification of significant end items, hardware, data, facilities and services.
- Preliminary engineering design, including prototypes of selected long-lead hardware.
- Preliminary engineering design for supporting systems and identification of facilities for test and evaluation, transportation, checkout, operations, etc.
- Identification and plan for back-up subsystems development.
- Preparation of final contractor end-item specifications.
- Preparation of hardware end-item specifications.
- Plans for development, management, facilities, manpower, manufacturing, test, procurement, configuration management, logistics, reliability analysis and testing, quality assurance, etc.

(2) Primary Report and Proposal

(a) Report. Each prime contractor will submit a primary report covering his investigations and pertinent results. This will be a comprehensive analytical report (comparative analysis) upon which he bases his recommendations and proposal for Phase D. It should include:

- Complete information on the study effort, including negative results.
- Comprehensive comparative analysis of trade-offs considered.
- Firm recommendations on system and subsystem specifications.
- Preliminary test plans.
- Preliminary operations and support plan.
- Plan for back-up and alternate subsystems development.
- Equipment lists.

(b) Proposal. As part of his primary report, each contractor will submit a proposal for implementing Phase D. In addition to the basic technical plan and its direct support this would include:

- Logistics, reliability, quality, facility, data management, contractor manpower, and other appropriate plans.
- Schedules and project milestones supported by PERT or other appropriate management plan for analysis of planning and scheduling.
- Year-by-year and run-out cost projections.
- Contractor management structure.
- Plan for monitoring and control.
- Reporting structure (technical, schedule, resources).
- Detailed cost proposal, including recommended incentive structures.

(3) Supplementary Report. If appropriate, the prime contractors in Phase C will have two increments of work. The first is that just described. The second increment involves supplemental studies important to the project, but not critical to the decision to undertake Phase D. This activity takes place during the period between submittal of the primary report by the prime contractors and the termination of Phase C effort. The results of this additional study effort should be covered by supplementary reports.

c. IN-HOUSE EFFORT

The in-house Phase C effort parallels that of Phase B with respect to supplemental contracts, contract monitoring, technical activity, and preparation of the analytical report. In-house activity includes the initiation of the advance development effort by the Project Manager, development of the work statement for Phase D and the provision of pertinent Phase C technical information to the contractors. The analytical report for management consideration should contain:

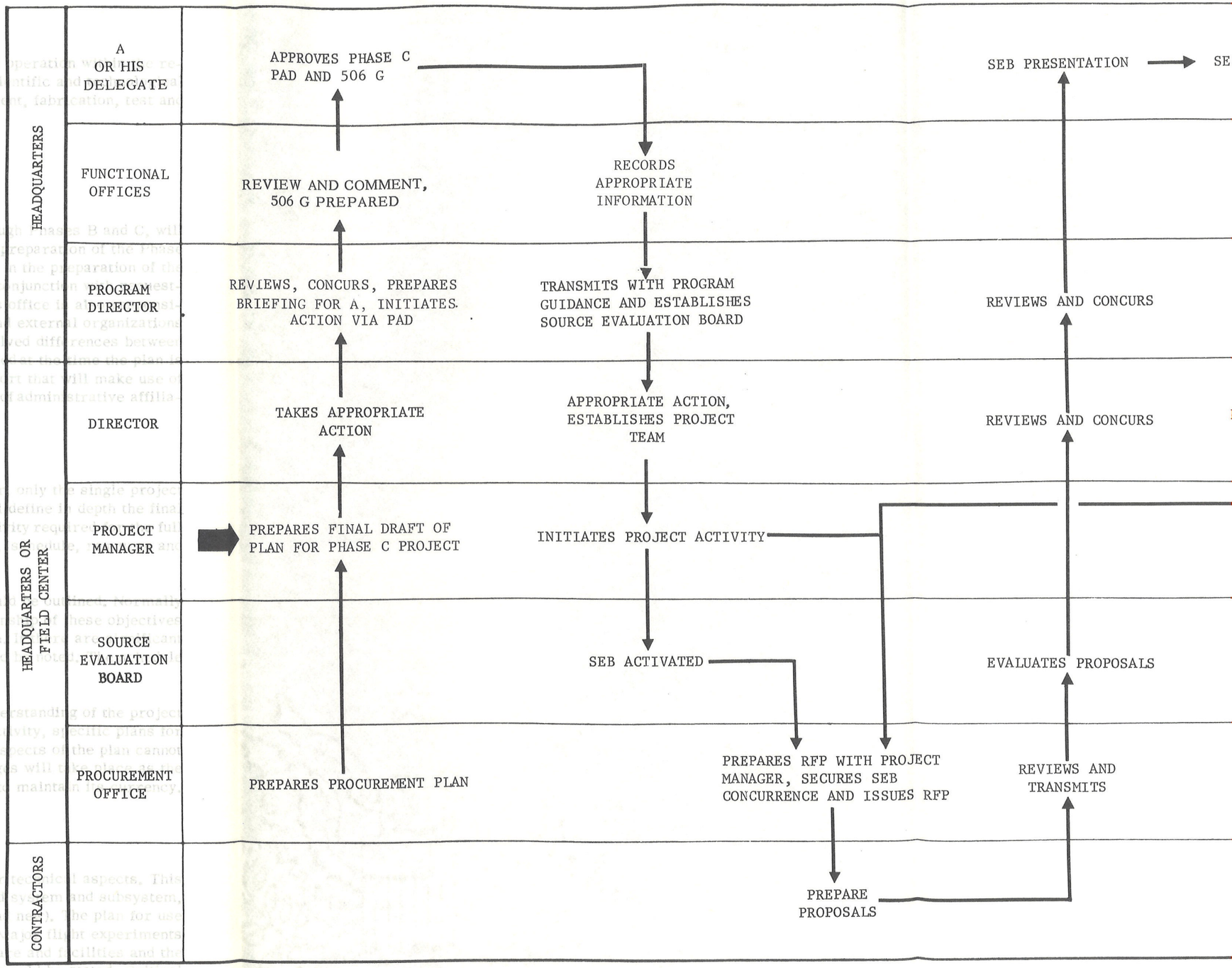
- Complete information on the studies made.
- A comprehensive comparison of study results and contractor recommendations.
- Conclusions covering whether the project has, in every respect, reached the state of definition required to start Phase D.
- Recommendations for the follow-on program--technical, resource, management and procurement. If the recommendation is for continued study or project termination, the rationale for this judgment will be given.
- Plans for termination or further implementation of the advanced technology and advance development effort, if applicable.
- The impact of the recommendations on the resources of the Agency and industry (manpower, facilities).
- The impact of the project on related programs of NASA and other agencies.
- An appropriate plan for the project with the nature of the plan depending on whether the report recommends initiation of Phase D, further study, or termination.

As in the case of Phases A and B, study results will be disseminated to cognizant Program and Field Center Directors of NASA. Important comments from these elements should be attached to the report and keyed to the pertinent sections for easy reference. A summary report will be prepared for General Management by the responsible Program Office. In general, an oral report would be presented.

5.4 PROCUREMENT ASPECTS

Special procurement aspects are presented in Appendix A.

KEY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PROCUREMENT OFFICE
APPROVES PHASE C PAD AND 506 G
REVIEW AND COMMENT, 506 G PREPARED
REVIEWS, CONCURS, PREPARES BRIEFING FOR A, INITIATES ACTION VIA PAD
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PREPARES PROCUREMENT PLAN
RECORDS APPROPRIATE INFORMATION
TRANSMITS WITH PROGRAM GUIDANCE AND ESTABLISHES SOURCE EVALUATION BOARD
APPROPRIATE ACTION, ESTABLISHES PROJECT TEAM
INITIATES PROJECT ACTIVITY
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KEY PROCEDURES FOR PHASE C

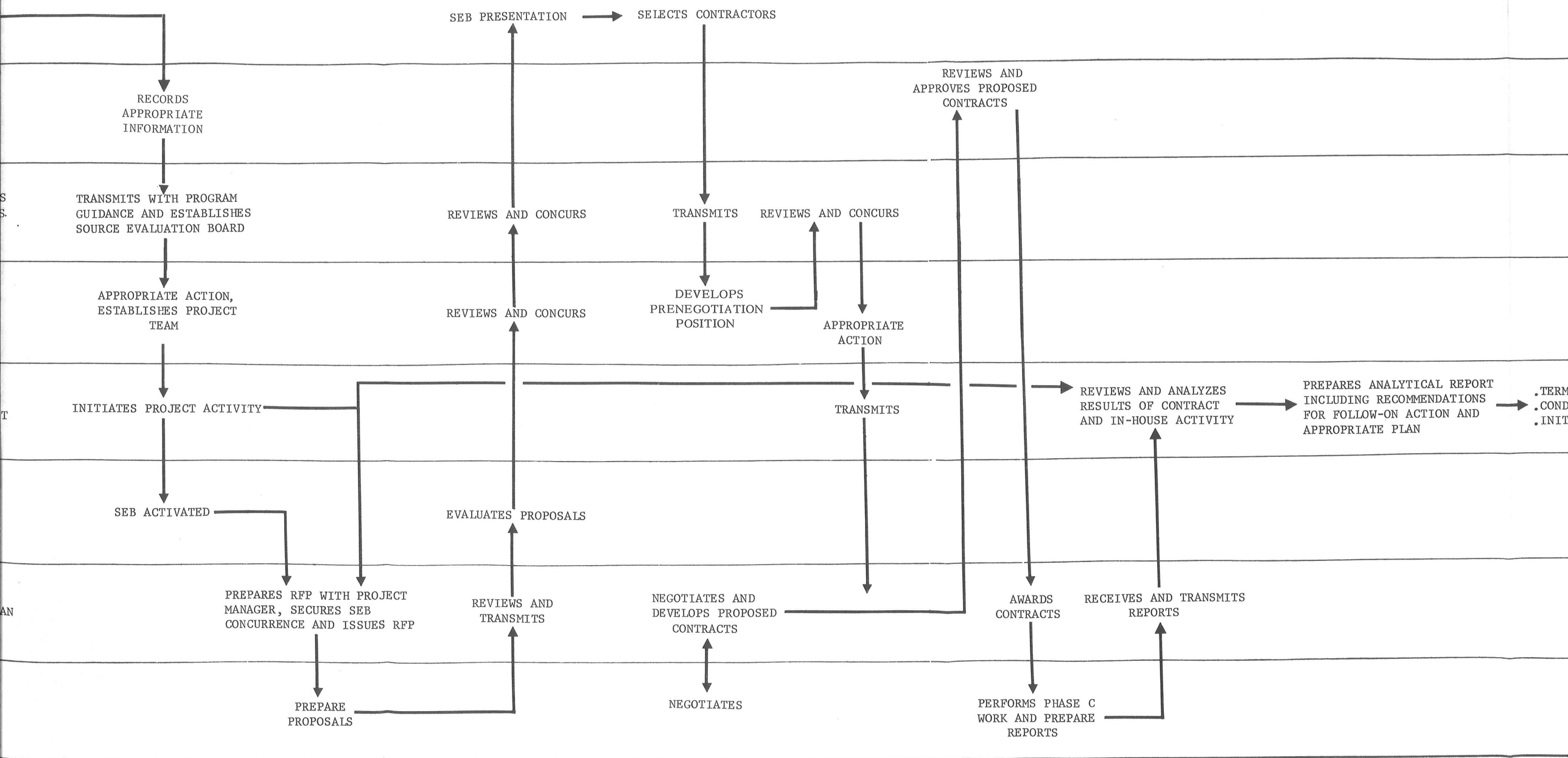


Figure 5-1

KEY PROCEDURES FOR PHASE C

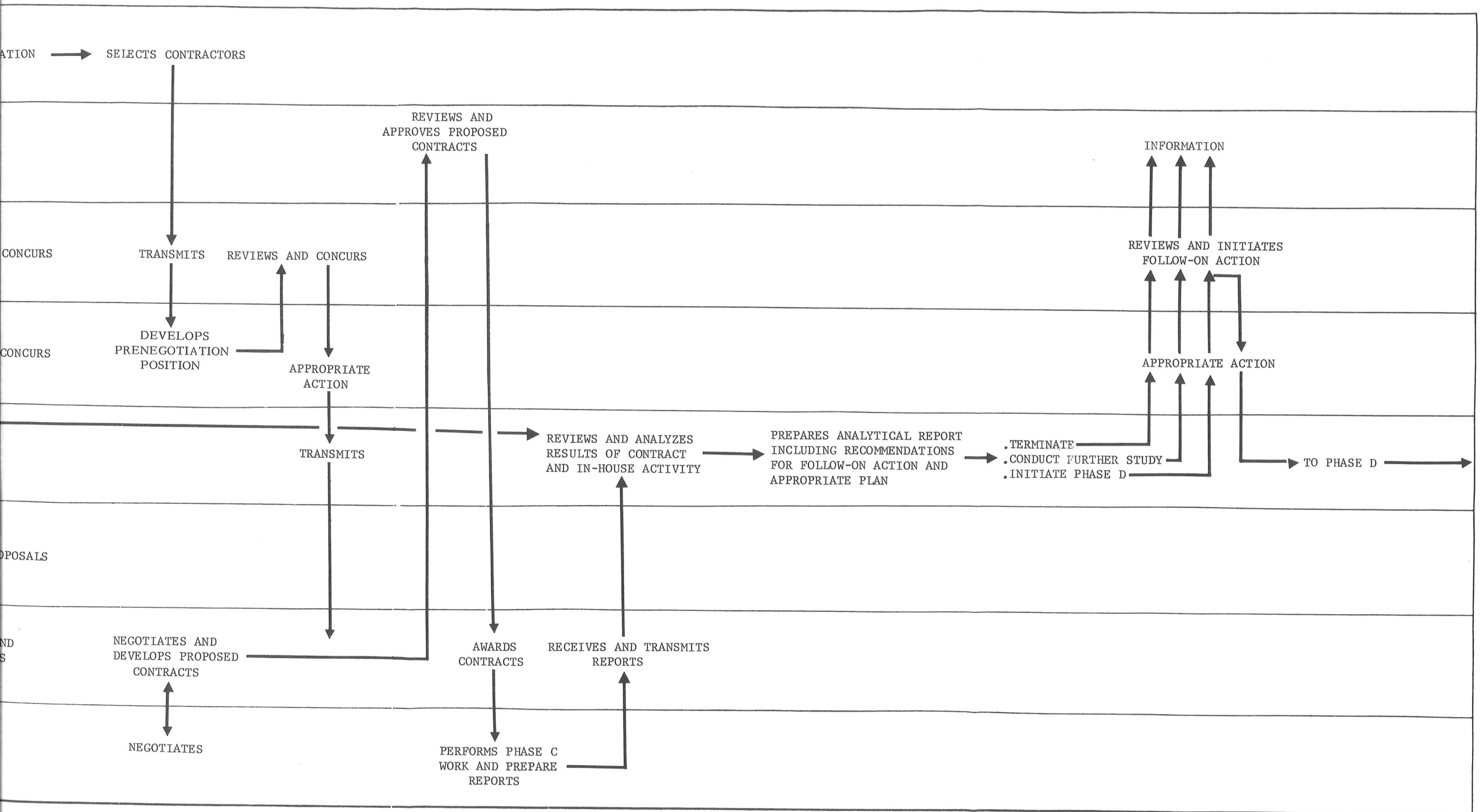


Figure 5-1

CHAPTER 6: PHASE D--DEVELOPMENT/OPERATIONS

6.1 OBJECTIVES

The Phase D effort is directed toward project implementation and operation within the resource and schedule estimates, and without degradation of the scientific and technological objectives. Included in the effort is final hardware design, development, fabrication, test and operation.

6.2 PREPARATION AND APPROVAL OF PHASE D PLAN

a. RESPONSIBILITY

The Program Office that had responsibility for the project through Phases B and C, will conduct the Phase D effort. This office has the responsibility for preparation of the Phase D project plan, using the Field Center project group to assist in the preparation of the plan, and to assist in presenting an oral briefing, if required, in conjunction with requesting project approval from the Administrator or his delegate. This office is also responsible for the coordination of the plan with appropriate internal and external organizations prior to requesting approval. In the event of significant unresolved differences between cooperating program groups, these differences should be identified at the time the plan is presented for approval. Preparation of the plan is an in-house effort that will make use of appropriate Field Center and Headquarters personnel regardless of administrative affiliation.

b. STRUCTURE AND CONTENT OF PLAN

The form of the plan follows that of Phases B and C. However, only the single project defined through the Phase C activity will be treated. The plan will define in depth the final design, development, fabrication, test, operation and support activity required for the full implementation of the project. Included will be procurement, schedule, resource and management plans. The plan will include these elements:

(1) Project Objectives. The specific objectives of the project should be outlined. Normally they will be a refinement of the Phase C statement. The relationship of these objectives to the basic NASA programs, missions and goals will be given. If there are significant interfaces with programs external to the agency these should be noted. The schedule and resource requirements of the project should be included.

(2) Summary Description of Project Plan. To provide a basic understanding of the project implementation effort and guidance to the implementation activity, specific plans for each major area of work should be outlined. Because some aspects of the plan cannot be finalized until the project is under contract and changes will take place as the project progresses, each segment of the plan will be updated to maintain its currency. Representative segments of the plan are:

(a) Technical Plan

(i) The project should be described in terms of its major technical aspects. This would include a description of each major hardward system and subsystem, ground support equipment, and facilities (existing and new). The plan for use of in-house and contractor teams would be presented. Major flight experiments would be described. The planned use of major hardware and facilities and the sequence of events during the life of the project would be stated. Critical

design and performance parameters should be noted as well as system interfaces and special mission constraints affecting systems design and operation. Detailed technical descriptions and specifications should be incorporated by reference. The plan for supporting development activity would also be included.

(ii) A description of the configuration management system for the project would be included, noting organizational responsibilities; levels of control; and procedures for approving, communicating, and documenting changes.

(iii) Reliability and quality assurance procedures, and related documentation required to ensure adherence to reliability and quality assurance standards would be identified and described.

(iv) Special systems, procedures and related documentation applicable to the planning, approval and implementation of the logistic support requirements of the project would be identified and described.

(v) Special systems, procedures and related documentation applicable to the planning, approval and implementation of training, ground and flight test and operations requirements would be covered.

(b) Management Plan

(i) The total organization (NASA, other government agencies, contractors, etc.) for conduct and management of the project should be described in terms of major responsibilities and authorities and operating and reporting relationships. Responsibilities and authorities should be described in relation to specific end-items of hardware (including experiments), categories of development, test and operational support, facilities, logistic support and training.

(ii) Special boards, committees, panels and working groups will be identified and described. Membership need not be described in detail. However, key NASA officials serving as permanent members should be listed as well as the organization affiliations of other participants. Key management systems and procedures would be outlined, and reference and use would be made of applicable agency-wide systems and procedures where practicable. Unique systems and procedures would be identified and described.

(iii) The structure of major planning documents below the level of the Phase D Plan would be specified. Each document would be described in terms of its scope and content, responsibility for preparation, review and approval, and relationship to other planning documents.

(iv) The structure of regular progress reviews of project activity would be described in terms of the name or title of the review meeting, specific purpose of the review, attendance and frequency.

(v) Recurring project status reports reflecting status and problems would be identified and described in terms of report title, scope and content, responsibility for preparation, required distribution and frequency.

(vi) Hardware inspection, review and certification requirements would be identified and described for key items. Noted would be such factors as: purpose and scope, timing/sequence, and the responsible groups for conducting and certifying the tests.

(vii) The project scheduling systems and related documentation would be described in terms of levels of schedule control, key milestones, reporting requirements and procedures, and responsibilities for reporting and approval.

(viii) The system for fund and manpower management would be described in terms of key documents, procedures, responsibilities and authorities.

(ix) The facility needs of the project would be identified including the plan for acquisition, activation, etc.

(x) The data management system to be used will be described in terms of scope, responsibilities and authorities of the various organizations concerned and related policies and procedures. The project-wide index of documents, magnetic tapes, films and other data will be incorporated by reference.

(c) Procurement Plan. An outline of the planned mode, segments, and schedule for the major procurements would be presented. In addition any special policies or procedures would be identified and described.

c. REVIEW AND APPROVAL PROCESS

The sequence of review and approval activities pertinent to Phase D is outlined in Figure 6-1 "Key Procedures--Phase D." The process is essentially the same as that for Phase C. A PAD will be prepared for each Phase D project.

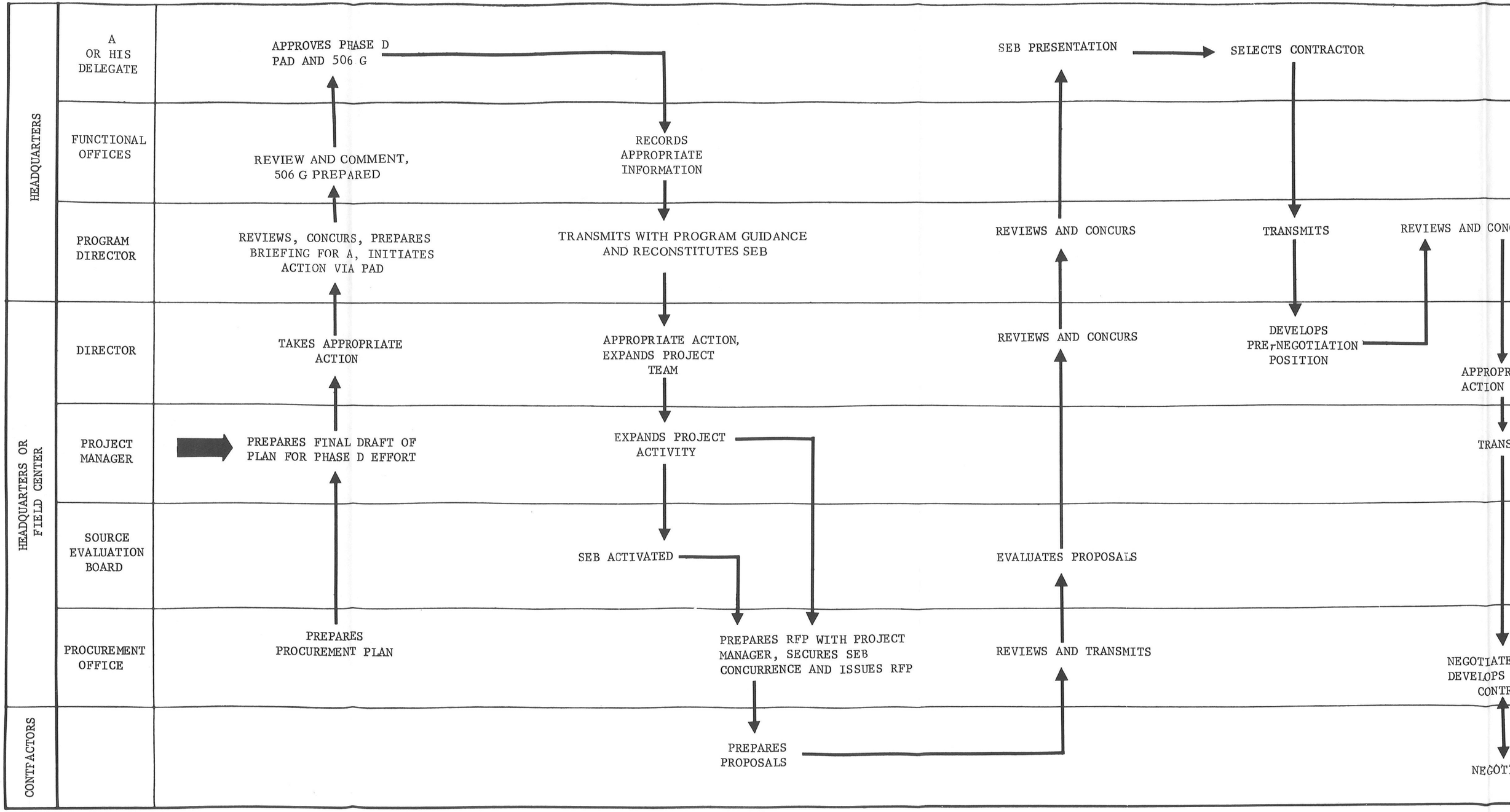
6.3 CONDUCT OF PHASE D ACTIVITY

Phase D will be conducted in accordance with the Phase D plan within the scope of the PAD approval. Normal administrative processes will be followed.

6.4 PROCUREMENT ASPECTS

The special procurement aspects of Phase D activity are covered in Appendix A.

KEY PROCEDURES FOR PHASE D



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KEY PROCEDURES FOR PHASE D

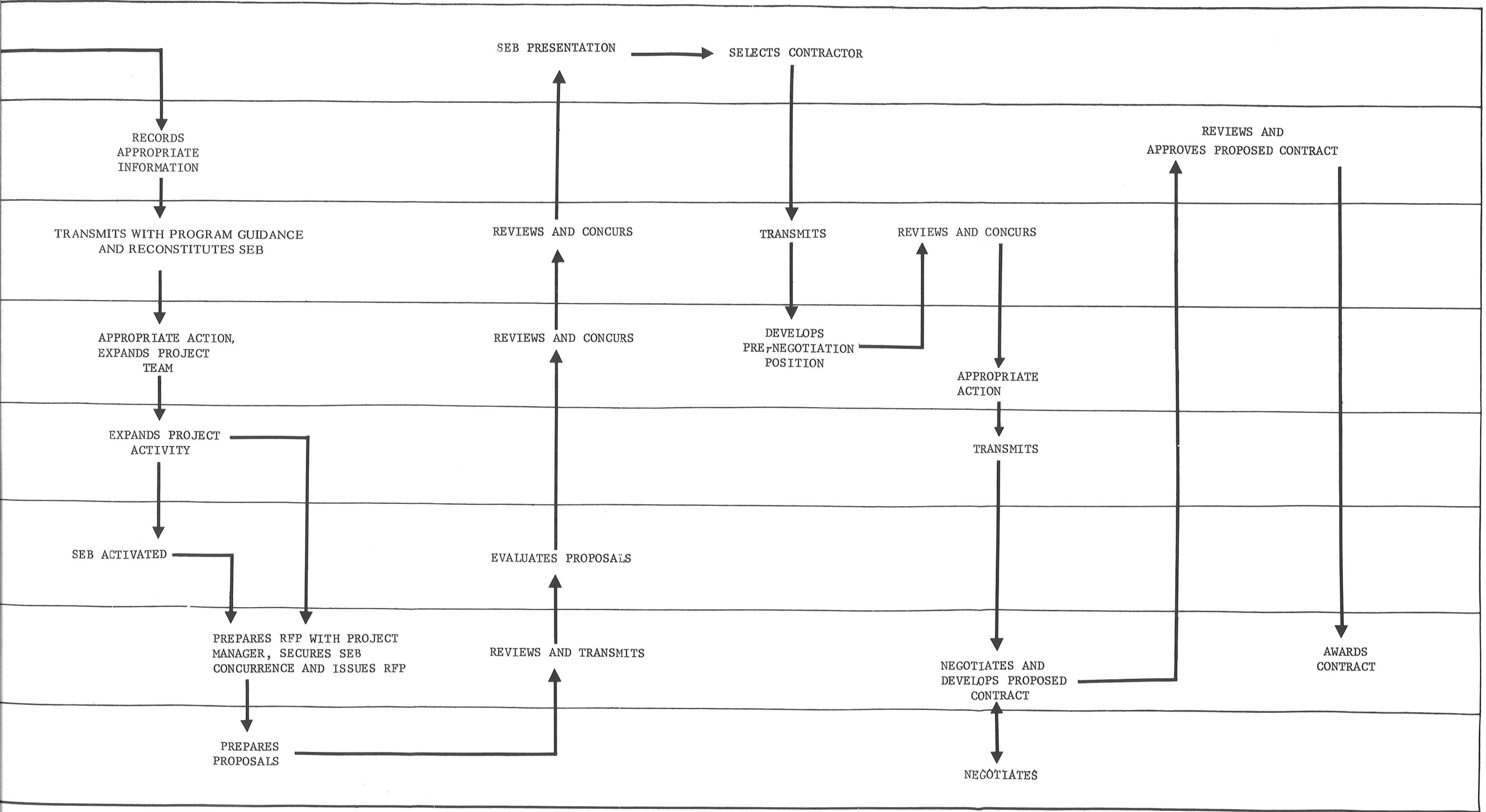

Figure 6-1

APPENDIX A: PROCUREMENT CONSIDERATIONS

A.1 INTRODUCTORY COMMENTS

a. One of the objectives of Phased Project Planning (PPP) is to progressively refine requirements during the evolution of a project to produce a detailed work statement for Phase D that will permit use of contracts containing appropriate forms of incentive. Effective contracting is indispensable to achieving the desired results of PPP.

b. This Appendix deals with the application of certain aspects of the procurement process to PPP. Figure A-1 summarizes certain procurement aspects of PPP.

A.2 GENERAL POLICY

a. APPLICABILITY OF NASA PROCUREMENT REGULATIONS

Procurements made under PPP are subject to NPC 400, "NASA Procurement Regulations" (NASA PR). Application of NPC 400 to procurements conducted under PPP should present no special problems. Deviations may be authorized as provided for in accordance with NASA PR 1.109 to deal with special situations.

b. COMPETITION

(1) Competitive concepts apply to all phases of PPP. In Phase A procurement, competition is based primarily on scientific and technical qualifications for specialized areas of R&D. In Phase B the more normal competition process applies, as more fully described in paragraph A.4b(1). Phases C and D represent the full competitive process except that Phase C selections require a Phase D capability. Phase D selections are generally limited to successful Phase C participants. Phase C RFP's and synopsis should specifically state the Phase D capability requirement and that the Phase D competition will normally be limited to Phase C participants.

(2) Care should be taken to ensure that contractors participating in the various phases will be fairly treated from the standpoint of their competitive positions and will not be placed in a favored position by way of information provided or by the amount and type of awards made in earlier phases. PPP awards should not be made in a manner that will preclude participation in later phases because of organizational conflict exclusion from such later phases. Contractors will be advised where any PPP or related contracting will result in exclusion from later phases.

(3) It is desirable to make contractor selections in each phase at the earliest feasible time in order to release unsuccessful contractors and key scientific and technical manpower for other work.

c. PROCUREMENT PLANNING

(1) Procurement planning is an integral element of PPP. This planning requires consideration of costs, risk elements, competitive aspects, and budgetary and other constraints. Program and procurement personnel will coordinate their activities through all stages of PPP in order to assure orderly procurement planning. This team approach will facilitate the consideration and handling of procurement problems, and the processing of necessary documents.

(2) Subject to the special instructions below on use of a single plan to cover more than one phase, procurement plans in accordance with NASA PR 3.852-3 will be prepared for all Phases. Where more than one major system is involved, multiple plans (single plan for each system) will be required. The Phase B procurement plan will include known planning for Phases C and D. When feasible a description of the contemplated phasing arrangements, monetary levels and other appropriate data important to Phase B and follow-on Phases will be included. The relationship of Phase B contracts to the total planned phasing arrangements should be identified.

(3) The procurement plan for Phase C will contain detailed planning for the Phase C contracts along with known plans for effecting the Phase D contract. This procurement plan will be revised and updated at the completion of Phase C to describe properly the Phase D procurement.

d. PROPOSAL EVALUATION

Proposals will be evaluated in consonance with NASA PR 3.804. Phase A proposals will generally be governed by NASA PR 3.804-2. Phase B proposals will normally be evaluated in accordance with applicable Source Evaluation Board (SEB) procedure (PR 3.804-3). For determining the applicability of NPC 402, "Source Evaluation Board Manual," to Phase B procurements, the combined estimated cost for Phases B, C and D will be utilized. For continuity and efficiency, the Phase B SEB personnel will, to the extent feasible, be used for Phase C and Phase D SEB's. Where contractor effort is utilized to assist NASA in developing information needed to supplement in-house analysis of Phase contract effort, it will require advance approval by the Administrator or his delegate, and compliance with requirements of NASA PR., Appendix G, on organizational conflicts.

e. CONTRACTOR ACTIVITY DURING PHASE C EVALUATION PERIOD

Primary reports including costs and technical proposals for Phase D will be required as a part of Phase C. During the period between the submission of the primary Phase C reports and the decision regarding Phase D, it normally will be in the Government's interest to provide the Phase C contractors with continuing work in order that important technical capability will not be lost. This work activity should be covered by tasks outlined, if feasible, in the Phase C Statement of Work and will include, among other things, provision for revision and updating of the proposals for Phase D if determined necessary by NASA. Additionally, by task orders provided for in the Phase C contract or other contractual technique, the Phase C contractors may be given specific directions to solve technical problems outstanding or identified during the evaluation process. Consideration should be given to provision in Phase C contracts for options to unilaterally extend the evaluation period by short term (for example, 30-day) increments for some reasonable and specified maximum time period. Reports covering the continuing work activity will be known as supplementary reports. This statement is not intended to mandatorily require provision for standby work. This will be determined on the basis of careful analysis of the need for the work, type and size of the project, cost versus benefits, and other relevant factors.

f. TYPES OF CONTRACTS

(1) One of the important objectives of PPP is to provide Phase D with a definitive work statement conducive to use of incentive type contracts. The exact type of contract for each prospective phase is a judgment decision based upon all the relevant facts and current circumstances.

(2) In determining which contract type is in NASA's best interest, consideration should be given to cost uncertainties and reasonable risk assumption and allocation; the competitive posture or position of each of the concerns involved; the trade-offs between preserving competition throughout the phasing and cost incurrence required; avoiding creation of a noncompetitive situation; the policy of not encouraging cost sharing and at the same time recognizing a contractor's freedom to determine his optimum investment to qualify for award; the inherent tendency of the particular contract type to promote cost sharing; policies which promote Independent Research and Development (IR&D) and Bidding and Proposal (B&P) cost growth.

(3) More detailed considerations on selection of contract type are set forth in discussion of procurement aspects of each phase.

g. CONTRACT APPROVAL

Contracts will be approved in accordance with NASA PR 50.105.

h. APPLICATION TO SUBCONTRACTS

Prime contractors seeking or holding PPP definition contracts should take into account the planning and funding needs of major subcontract effort and other aspects of PPP that have reasonable application to the subcontract level.

A.3 PHASE A--PRELIMINARY ANALYSIS

a. GENERAL

The purpose of Phase A is to identify the most promising approaches to accomplish a specific NASA objective.

b. SPECIAL CONSIDERATIONS

Special policies applicable to Phase A contracting are:

(1) Phase A contracts should be fixed price or cost plus fixed fee (CPFF). When Phase A costs can be reasonably estimated, a fixed price contract is appropriate. Otherwise, a CPFF contract may be more appropriate. In this connection, the parties should understand at least the general scope of the effort contemplated. If Phase A contracts are awarded to more than one contractor for identical work, the funding levels should be related to the amounts reasonably needed for the study by each contractor. Awards in unequal amounts may result because of the varying approaches, differing competitive cost positions, or amount of work needed to be performed by each contractor. NASA's general policy against cost sharing should be applied. Where the expected costs and experience positions of the companies warrant, equally funded contracts may be proper.

(2) The Request for Proposals (RFP) should advise contractors that: In accordance with contractual provisions to be included in a contract based on the proposal, data developed as well as data specifically used in performing the work under the contract will be made available to NASA with unlimited rights in the Government to reproduce, use and disclose the data; except that specific considerations may be given in the contract to the identification and delivery of proprietary data subject to special use restrictions agreed to by the parties. In Phase A studies, data developed as well as that specifically used, as required to be delivered, shall be reported on a timely basis in order that it

can be utilized in the preparation of in-house analytical reports and, if appropriate, furnished to other firms for follow-on efforts and published for general distribution subject to the use restrictions, if any, as to proprietary data.

A.4 PHASE B--DEFINITION

a. GENERAL

The purpose of Phase B is to select one of several project approaches for further definition and eventual development should conditions favor this action.

b. SPECIAL CONSIDERATIONS

(1) The RFP for Phase B may allow the potential contractors to propose on the total work package or any portion thereof. Specifically, contractors may be allowed to propose on:

(a) One or more, but less than all, approaches; or
(b) All approaches to be studied; or
(c) Both (a) and (b).

The NASA decision on alternative approaches to be permitted the potential contractors will depend upon the particular circumstances and desired results. For example, if requiring an all-approach study would prejudicially curtail competition or deprive NASA of the needed capability of contractors who do not have the capability on all approaches, then alternative (a) is indicated. On the other hand, if we expect an unwarranted reluctance to propose on a particular approach, it may be necessary to employ alternative (b) to get studies on all approaches. If the alternative (a) approach is used, the contractors selected will not be in a position to perform specific trade-off analysis of all the various approaches, and this effort, or some of it, may have to be accomplished by or under the auspices of NASA.

(2) Phase B contracts should be CPFF or fixed price, whichever is better suited. If the cost, including major subcontract effort, may not be realistically estimated, and this will frequently be the case, a CPFF contract is appropriate. If, as will be possible in some circumstances, the cost may be reasonably estimated, a fixed price contract may be appropriate because of the simplicity in administration but this factor should not be overriding. If Phase B contracts are awarded to more than one contractor for identical work, the funding levels should be related to the amounts reasonably needed for the study by each contractor. Awards in differing amounts may result because of the varying approaches, costs, or amount of work needed to be performed by each contractor. Where the expected costs and experience positions of the companies warrant, equally funded contracts may be proper. NASA's general policy against cost sharing should be applied.

(3) The Request for Proposal (RFP) will:

(a) Identify the alternative/alternatives to be studied.

(b) Contain a statement that the data developed as well as that specifically used in performing the work under the contract will be made available to NASA with unlimited rights in the Government to reproduce, use, and disclose the data; except that specific considerations may be given to the identification and delivery of proprietary data involved, subject to special use restrictions agreed to by the parties; that the data required shall be reported on a timely basis in order that it can be utilized in the preparation of in-house reports and, as needed, made available to other firms for follow-on efforts, and published for general distribution subject to the use restrictions, if any, as to proprietary data.

(c) Explain the relationship of the Phase B effort to possible Phases C and D so that the inter-relationship is clearly understood by the potential contractors.

A.5 PHASE C--DESIGN

a. GENERAL

The purpose of Phase C is to define in detail the project approach selected following or in connection with the Phase B study effort. Phase C generally will not be undertaken unless there is reasonable certainty that the Agency will be in a position to move directly into Phase D. The Phase C activity represents the initiation of the competition for project implementation (Phase D) and is extremely important to the Agency and the contractor community.

b. SPECIAL FACTORS

(1) Generally, two and , where warranted, more than two prime contractors will be selected for Phase C contract award. However, special situations may dictate selection of a single contractor. Specific justification should be submitted. Factors which might lead to a single Phase C contractor are described as follows:

- More than one major system is involved and practical limitations restrict ability to handle multiple interfaces.
- Funding limitations may preclude more than one contract.
- Definition in Phase B may realistically have been adequate to develop sound cost estimates and incentive parameters to preclude a loss of bargaining leverage for Phase D. Also, some additional Phase B effort may permit sufficient definition and identification of cost and incentive parameters to consider a reduction in or elimination of Phase C and/or selection of a single contractor for Phase C.
- Phases A and B work and possible supplemental Phase B work may indicate that multiple contracts for Phase C would be duplicative and that more sustained effort by a single Phase C contractor would produce better definition.

Thus, flexibility in approach for selection of multiple Phase C contractors and the work scope in Phase C versus extended Phase B needs to be given careful consideration.

(2) SEB procedures will be utilized for contractor selection.

(3) Only one work statement will be prepared in connection with the Request for Proposal (RFP). The RFP will contain all of the factors reasonably pertinent to the procurement under consideration. Technical and cost proposals and proposed make or buy plans for Phase D will be an integral part of the contractual requirements for Phase C. The RFP will also include the following:

- A statement that only those firms capable of performing through Phase D will be eligible for a Phase C contract award.

- A statement that data developed as well as that specifically used in performing the work under the contract will be made available to NASA with unlimited rights in the Government to use, reproduce, and disclose the data; except that specific considerations may be given to the identification and delivery of proprietary data involved subject to special use restrictions agreed to by the parties.
- A statement describing contractor activity during the period between the Phase C primary report and the Phase D decision. Included in this activity will be the revision or updating of their Phase D proposals if this is necessitated by Government revision of the Phase D work statement.
- The contractual arrangement for the activity described immediately above.
- A statement to the effect that the basis for award of a Phase D contract will include consideration of the primary reports and the proposals for Phase D as they may have been revised.
- A statement that the Phase D contract normally will be awarded to one of the Phase C contractors, but that the Agency reserves the right to bring new contractors into the project at any time in the Government's best interest.
- A "back-up" package of pertinent technical information will accompany the work statement.

(4) Contractors will be advised that: (a) If Phase D is initiated, the Phase D work statement will be developed by the Government based largely upon Phase C effort, and (b) In Phase C effort, data developed as well as specifically used may be included in the revised Phase C work statement and, as needed, made available to the Phase C incumbent contractors for consideration in preparation of their final Phase D proposals, subject to special use restrictions for proprietary data, if any.

(5) The motivation for Phase D award will normally be the overriding incentive for achieving the performance and cost objectives under a Phase C award. Incentive dollars for keeping costs down may be largely offset by desire to achieve performance objectives combined with a willingness to cost share through use of IR&D and B&P, etc. If this is the case, then a CPFF contract would be appropriate. However, where a single Phase C contractor is to be selected or the PPP process in Phase B has brought contractors into the same relative competitive posture, and an incentive contract apperars feasible as a truly motivating device, use of a Cost Plus Award Fee (CPAF) contract may be considered. If an incentive type contract is selected and it has performance degradation potential, then structuring should be addressed to minimizing this possibility. If, as will be possible in some circumstances, the cost may be reasonably estimated, a fixed price contract may be appropriate because of the simplicity in administration, but this factor should not be overriding.

(6) Since Phase C is critical in the selection process leading to Phase D, action taken by the Government to provide adequate guidance during this Phase and in preparation for Phase D must be carefully weighed to avoid favoring the competitive position of any contractor. Technical transfusion in Phase C is thus accomplished primarily through the Phase C work statement, and for Phase D, through the updated Phase C work statement.

(7) Particular emphasis should be placed in Phase C on the development of contractual agreements for the structuring of an appropriate form of contract for Phase D.

(8) Preferably the same SEB personnel will be used for Phase C and Phase D evaluations. This is especially desirable since continuity between Phase C and Phase D evaluations is particularly critical. The in-house project group personnel may be used as consultants to the Board. It is anticipated that selected members of the project group will also be voting members of the Board.

(9) Synopsis for competition and subcontract opportunity will be accomplished in accordance with NASA PR 1.1003-1 and 1.1003-6. Additionally, the synopsis will state that only proposals representing contractors with a capability of carrying the project to completion (through Phase D) will be considered for a prime Phase C award.

(10) A preproposal conference should be held to explain in detail all aspects of the Phase C solicitation and the phasing technique to be employed. It should be made clear to interested contractors, for example, that:

- the Government may decide not to proceed to Phase D, and
- if required to serve the Government's best interest, new contractors may be brought into the competiton for Phase D.

A.6 PHASE D--DEVELOPMENT/OPERATIONS

a. GENERAL

The purpose of Phase D is to implement the Agency decision to proceed with the project, defined by the Phase C effort, through final design, development, fabrication, test and operation within the technical, resource, and management plans developed for the project which served as the basis for management approval of the project.

b. SPECIAL FACTORS

(1) Generally one of the prime contractors engaged in the Phase C activity will be selected for implementation of Phase D.

(2) A synopsis should be prepared to advise of subcontracting opportunities (NASA PR 1.1003-6).

(3) In the unusual event that it is found necessary to include new contractors in the competition for Phase D, synopsizing in accordance with applicable procurement regulations would be required.

(4) Preferably the same SEB personnel will be used for Phase C and Phase D evaluations. This is especially desirable since continuity between Phase C and Phase D evaluations is particularly critical. The in-house project group personnel may be used as consultants to the Board. It is anticipated that selected members of the project group will also be voting members of the Board.

(5) Having applied PPP, the Phase D effort should theoretically permit a relatively high degree of risk to be assumed by the contractor on performance, delivery and cost. Accordingly, an appropriate form of contract reflecting this assumption of risk should be employed. Various types of incentive contracts should be examined to determine which type and which structuring technique best achieves the Government's objectives. In many of the R&D projects of the type NASA has undertaken, some form of Cost Plus Incentive Fee (CPIF) contract has proven most suitable for the Phase D work. As our experience with PPP grows, the objective should be to strive realistically for higher risk but realistic contract types. Projects of less complexity and size may permit realistic use of Fixed Price Incentive (FPI) or even fixed price contracts. However, care should be exercised to avoid performance degradation by unwarranted use of high risk contract types.

(6) The work statement to be included in the finally negotiated contract will be developed from the results of the contractor and in-house effort during Phase C, including, to the extent available, information developed during the holding period between the major Phase C effort and the Agency's decision to proceed to Phase D.

SUMMARY OF PROCUREMENT ASPECTS OF PHASED PROJECT PLANNING[1]

	PHASE A Preliminary Analysis	PHASE B Definition	PHASE C Design	PHASE D Development/Operations
1. Number of Contracts	Individual study contracts (separate Work Statements).	Individual study contracts (normally separate Work Statements).	Two or more Contracts[2] (single Work Statement).	One contract (single Work Statement).
2. Competition	Competitive, in the broad sense, based on scientific and technical competence in the particular study area (or noncompetitive, where appropriate, including unsolicited proposals).	Open competition (unless noncompetitive justified).	Open competition except restricted to contractors with capability to perform Phase D.	Restricted to Phase C contractors (except for unusual cases).
3. Type of Contract	Fixed Price: Where costs can be realistically estimated. Cost Plus Fixed Fee: Where costs cannot be estimated realistically. Funding Levels: a. Amounts depending upon contractor's needs. b. Equally funded contracts where expected costs and experience warrant.	Cost Plus Fixed Fee: Where costs, including subcontract effort, cannot be estimated realistically. Fixed Price: Where costs can be realistically estimated. Funding Levels: a. Amounts depending upon contractor's needs; or b. Equally funded contracts where expected costs and experience warrant.	Cost Plus Fixed Fee: For large contracts where costs, including subcontract effort, cannot be estimated realistically. Incentive: Phase D contract is motivating factor. Where single contractor, or other special cases, award fee contract may be feasible. Funding Levels: a. Amounts depending upon contractors' needs; or b. Equally funded contracts where expected costs and experience warrant.	Incentive type which best reflects achieved definition, highest reasonable risk assumption, and Government's objectives. Large NASA R&D projects have shown CPIF most suitable. More experience and better definition may permit FPI or FP. Smaller or less complex projects may permit FPI or FP.
4. Procurement Plan	Individual procurement plans	Single procurement plan[3]	Single procurement plan[3]	Single procurement plan.[3] (Where applicable, Phase C plan can be updated.)
5. Synopsis	Subcontract opportunity. Prime contract (unless noncompetitive).	Synopsize.	Synopsize.	Synopsize (subcontract opportunity only) unless new contractors introduced.
6. Request for Proposal (RFP)	RFP issued where appropriate (may be noncompetitive, including unsolicited proposals).	RFP issued.	RFP issued.	Issue revised Work Statement and request revised contractor proposal.
7. Contractor Selection	Contracting officer selection (unless SEB required or determined desirable).	Source Evaluation Board (SEB).	Utilization of Phase B SEB desirable.	Utilize Phase C SEB to maximum possible extent.

[1] This phasing is not a rigid process. If necessary information has been otherwise developed, phasing may begin at any phase and intermediate phases may be eliminated or combined.

[2] Factors of funding, ability to develop sound cost estimates and incentive parameters, significance of time element, and limitations on ability to handle multiple interfaces may dictate selection of single contractors.

[3] Where more than one major system is involved, multiple plans (Single plan for each system) may be required.

Figure A-1

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