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**THE PLAN FOR THE ECONOMIC EVALUATION
OF THE PUBLIC SERVICE COMMUNICATION
SATELLITE SYSTEM**

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THE PLAN FOR THE ECONOMIC EVALUATION
OF THE PUBLIC SERVICE COMMUNICATION
SATELLITE SYSTEM

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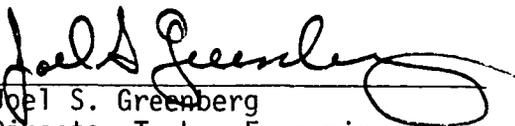
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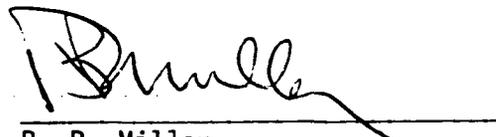
Revision No. 1
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Joel S. Greenberg
Director Techno-Economic
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F O R E W O R D

The object of this document is to lay out a comprehensive schedule for the economic evaluation and resource allocation of an experimental communications satellite developed for delivery of public services. The schedule covers the stages from the definition of an R&D program, to the collection of economic data from the experiments and the economic criteria for selection of users and their experiments. To assist the technology transfer from R&D to operational use the plan includes tasks on the assessment of the private sector opportunity in a public service communications satellite system.

NASA experience with applications programs show the need at an early stage in the R&D program definition to include the studies necessary to develop the economic data base. ECON Inc., having been involved in the economic assessment of several NASA applications programs, was tasked to develop a corresponding plan for the Public Service Communications Satellite (PSCS).

The main purpose of this document is to serve as a guide to NASA for planning and budgeting of a rigorous investment and cost-benefit analysis. A second purpose of this document is to identify early in the program the relationship between NASA and the users for cost-benefit determination, application planning, operational program implementation and who will pay for what.

NASA's involvement with a variety of users of the Applications Technology Satellites (ATS) and the Communications Technology Satellite (CTS) has resulted in considerable national discussion on the unique capability of satellites for the delivery of public services. In consequence NASA initiated in 1976 a series of studies and workshops to determine user requirements and to define a baseline system concept. These investigations have shown that a new generation of satellites, which can be used with low-cost ground terminals offers a promising solution to a host of problems and responsibilities of government agencies and various public organizations. The salient characteristics of this new generation of satellites is that low-cost terminals (\$2,000 - \$5,000 each) such as walkie-talkies for use by the police or emergency medicine can directly access the satellite. In comparison the current commercial communications satellites are designed for terminals, which are tied in with terrestrial communications networks, and are an order of magnitude higher in cost (\$50,000 - \$300,000 each).

The object of the proposed PSCS program is to develop, demonstrate and evaluate the operation of a communications satellite for the efficient delivery of services in all applicable sectors of the economy such as education, health, law enforcement, public safety, public broadcasting, etc. The economic evaluation of PSCS is to include both the delivery of current services cost-effectively and new services that can only be delivered by a "large antenna" satellite. The larger the satellite antenna the smaller the user terminal and cost.

Preliminary economic assessment indicates that the demand for a PSCS system is closely tied to the need for increased productivity of the public services in the United States. The major trend for increasing productivity is the replacement of transportation by telecommunications. The benefits of PSCS are a part of this growing telecommunications demand, which can best be met by a communications satellite developed for large numbers of very low-cost users.

The aggregation of a large number of public users for PSCS will clearly be a slower process than a market of private users. This is agreed to be the main reason for the lack of a commercial initiative in the development of the new generation of satellites. The NASA opportunity in PSCS development is to significantly reduce the risks of delay in early availability of such services. This plan is to rigorously address such issues.

A handwritten signature in black ink, appearing to read 'S. Ahmed Meer'. The signature is fluid and cursive, with a large initial 'S' and a long, sweeping underline.

S. Ahmed Meer
Applications Systems Analysis Office
Applications Directorate

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SECTION I - ELEMENTS OF THE PLAN

INTRODUCTION

This plan consists of two major sections. The first section describes the nature of the work to be performed in the economic evaluation of the PSCS program, the schedule and the estimated cost of performing the economic evaluation. The second section consists of task statements for each of the major elements of work to be performed in the economic evaluation.

The reader should note that this plan has not been approved by NASA and that the plan is subject to change as the PSCS program is defined.

This document describes the plan for the economic evaluation of the PSCS program. In order to estimate the economic and social benefits of the PSCS program, it is necessary to look beyond the planned NASA program and into the era when the services resulting from the PSCS program are delivered by operational systems. The benefits that result from the NASA program come from the operational systems that provide a continuity of services to users for many years. The economic and social benefits derive from increased productivity achieved through the use of improved communications, from ability to provide new services not possible with existing technology and from the delivery of these services to segments of the population not reached by existing services. The costs to achieve these benefits are the costs of the NASA PSCS program and the costs of the operational systems, including users costs. Thus, the economic evaluation of the PSCS program requires not only an understanding of users requirements and operations, but also the trade-offs between costs and benefits resulting from the technology used in the PSCS and follow-on operational systems.

A significant body of experience exists in the economic analysis of new space applications ventures. During the past four years, the tools of economic analysis have been used in support of the LANDSAT, SEASAT and the weather and climate programs in the NASA Office of Applications. While there are many similarities between the PSCS program and these other programs, there are also important differences, particularly in the areas of users, institutions and public regulatory policies. In the formulation of this plan, we have drawn upon those tools and techniques that have proven successful, and have adopted, extended and applied them to the unique requirements of the PSCS program.

The plan presented in this document is a total plan for the economic evaluation of the PSCS program within domestic markets. It extends from the present through the planning, performance and evaluation of economic experiments following the launch of the PSCS in 1982, and includes the consideration of how the results of these experiments impact the transfer from demonstration to operations. The implementation of this plan will provide NASA with information needed to understand and manage the economic and social impacts of the PSCS program.

OBJECTIVES OF ECONOMIC EVALUATION

Should the federal government invest in an R&D program aimed at understanding the market, developing the technology, and creating the environment which will lead to commercial systems capable of providing public communications services on a continuing basis?

Government is often required to help develop and to provide goods and services when, because of undue perceived risk and magnitude of investment, the private sector deems it undesirable to provide goods and services which would, if offered, confer benefits to members of society. Government participation is also often required when the production or consumption of goods or services provides to individuals benefits other than those normally provided to the parties of a market transaction. The benefits thus provided to members of a society in total are larger than the benefits received by the individual parties to the market transaction. Government is also required to see that services are provided in the most efficient and economical fashion.

A necessary condition for public sector funding of an R&D program is that the benefits which are the direct result of the R&D program exceed the cost of the R&D program. Thus the initial objective of the economic analysis is to determine if the benefits which may result from the achievement and utilization of operational PSCS systems resulting from the PSCS program will exceed the present value of the cost of initiating and maintaining the operational systems plus the present value of the cost of the R&D program which is required in order to make the operational systems a reality.

Given that the benefits exceed the costs, then a sufficient condition for public sector funding of an R&D program is the anticipated lack of adequate private sector participation required to achieve the indicated benefits. Thus, a second objective is to establish the likelihood and level of private sector participation in the absence of public sector participation and the desired form and level of public and private sector participation from the R&D stage through operations.

The economic analysis should also have as an objective the determination of those R&D and experimental program initiatives which will be most useful in promoting the anticipated benefits. To achieve this it is necessary to understand the obstacles and constraints which deter private sector investment (in particular the impact of perceived uncertainty and resulting risk in combination with large investments and long payback period) so that a program can be formulated specifically aimed at "buying" information which will lead to the reduction or elimination of the obstacles and constraints to operational system implementation.

Finally, the economic analysis should establish benefits and costs in terms of system capability so that technical and economic tradeoffs associated with satellite configuration and capability are possible for PSCS and follow-on systems.

OBJECTIVES OF ECONOMIC EVALUATION

- Do the potential economic benefits exceed the expected costs?
Determine if there will be net economic and other benefits from the achievement of operational PSCS systems and the services that they allow.
- What are the public and private sector roles?
Establish the level of participation of the public and private sectors from the R&D stage through operations.
- Which applications are economically important?
Select, implement and evaluate economic and technical verification experiments, and institutionally related experiments to determine those remaining actions required for achieving operational system implementation.
- What technical and economic tradeoffs should be made?
Determine the technical and economic tradeoffs associated with satellite configuration and capability for PSCS and follow-on systems.

LEVELS OF ECONOMIC EVALUATION PROGRAM

Three levels of economic evaluation will be used to estimate the economic and social benefits of the PSCS program and to facilitate the transfer of the services provided by the PSCS from demonstrations to operations. The levels of economic analysis to be used are program specific analysis, macro or sector analysis, and the analysis of societal issues.

Program specific analysis consists of the evaluation of the benefits and the costs of specific services that may result directly from the PSCS program. The economics of the specific services will be evaluated by the performance of user case studies. The user case studies will involve the examination of the costs and benefits of specific services such as the delivery of secondary education programming materials to students with and without the communications services which result from the PSCS program. A necessary part of the case study is the examination of the operations of a specific set of users with and without the new communications services, and the generalization of the results obtained in the study of a specific set of users to the larger community of users. In many previous economic evaluations, case studies have been performed using empirical estimates of performance changes obtained from interaction with users. In the PSCS program case studies, the opportunity exists to supplement empirical information with experiments that could be performed using the ATS-6, CTS, commercial satellites or nonspace systems. With the launch of PSCS in 1982 it will be possible to perform economic verification experiments using the PSCS. The purposes of these economic verification experiments are to assist in the evaluation of those services delivered by the PSCS that are of economic or social importance to users, to help validate earlier estimates of benefits and costs, and to begin the process of the transfer of the delivery of services from the PSCS demonstrations to operational systems. The economic verification experiments are an important factor in reducing the uncertainty and economic risk of future operational systems.

Whereas program specific analysis deals with user case studies and economic experiments, macro and sector analysis deals with the broader issues of efficiency and productivity within the communications sector, and the economic relationships of improved communications to other sectors of the economy. In the macro and sector level of analysis, econometric and input/output models will be used to evaluate the contribution of R&D in the communications sector of the economy, especially the contribution of government-sponsored R&D, and to examine how improved communications technology may effect the behavior of communications and other sectors of the economy. The program specific and macro levels of analysis are interrelated in that the measures of improvement determined in case studies will be used in estimating the effects of improved communications on productivity in other sectors of the economy.

The PSCS, and operational systems that may follow the PSCS, will directly interact with and deliver services to a large part of the population. The scope of the PSCS and follow-on operational systems raises societal, legal, and institutional issues that must be considered as boundary conditions and constraints to the economic evaluation. Various options and alternatives for ownership, access, programming content and regulation of the operational systems can have significant impacts upon the benefits and costs. Although the eventual outcome of many of these issues will largely be determined within the political process, the economic and social effects of options and alternatives must be considered. Within the design of the PSCS program, specific consideration must be given in both the formulation of the program and in the selection of the scope and nature of the experiments to be performed using the PSCS.

LEVELS OF ECONOMIC EVALUATION PROGRAM

- Program Specific Analysis
 - User Case Studies
 - Benefit/Cost Analysis
 - Economic Verification Experiments

- Macro and Sector Level Analysis
 - Econometric Analysis
 - Input/Output Analysis

- Societal and Institutional Issues
 - User Participation
 - Scope and Nature of Experiments

CONTEXT WITHIN WHICH ECONOMIC EVALUATION IS PERFORMED (INFORMATION FLOW)

The economic evaluation of the PSCS program requires extensive interaction between the user community, the system designers and the economic analysis team.

The requirements of the system will be defined by the needs of the end users of the system. These user requirements represent the forcing function for the definition of the PSCS and follow-on operational systems, as well as the economic analysis and modeling. User requirements and investment community uncertainties determine the level of capability needed in the system, as well as the important areas that are the candidates for case studies and experiments.

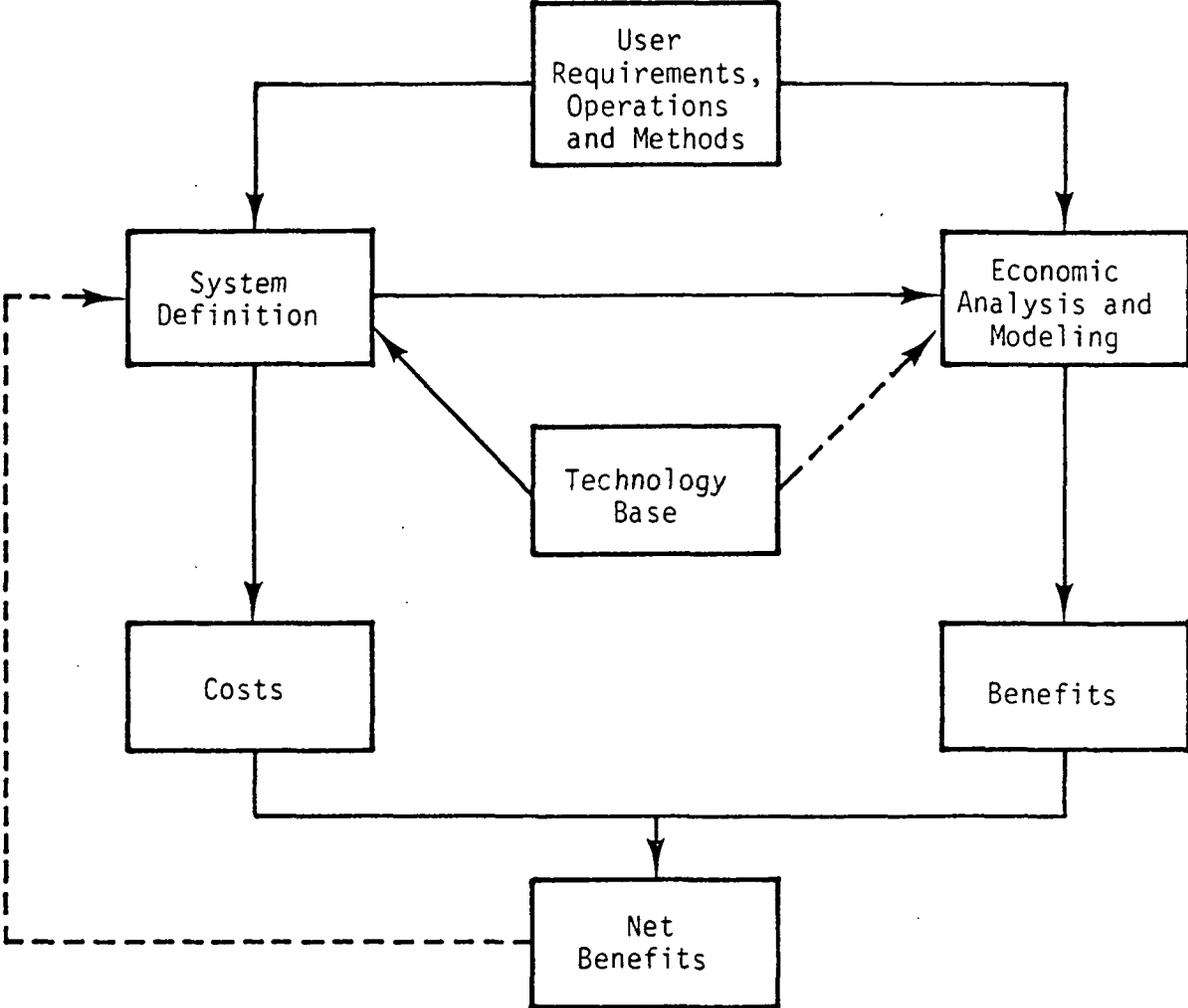
The system definition is determined by the user needs, as well the existing and forecasted technology base.

The system characteristics and level of technology embodied in the system in turn determine the system costs. The benefits are determined by the capability of the system to meet expected user requirements for the delivery of services. Along with the system design, the technology base represents an area of tradeoff in the consideration of costs and benefits. System capabilities become the primary driver of the costs, while system capabilities and their impacts on user operations are the primary factor in the development of benefits.

The net benefits of the system are the present value of the benefits less the present value of the costs which are incurred to achieve the benefits.

It is important to recognize the interactive potential of the economic evaluation, in that it is possible to affect both costs and benefits by changing the system capabilities. Thus, by the use of economic analysis and modeling, it is possible to achieve a system configuration that will maximize the economic benefits for a particular set of users, or across all users.

INFORMATION CONTEXT OF ECONOMIC EVALUATION



ECONOMIC EVALUATION - BENEFIT/COST ANALYSIS

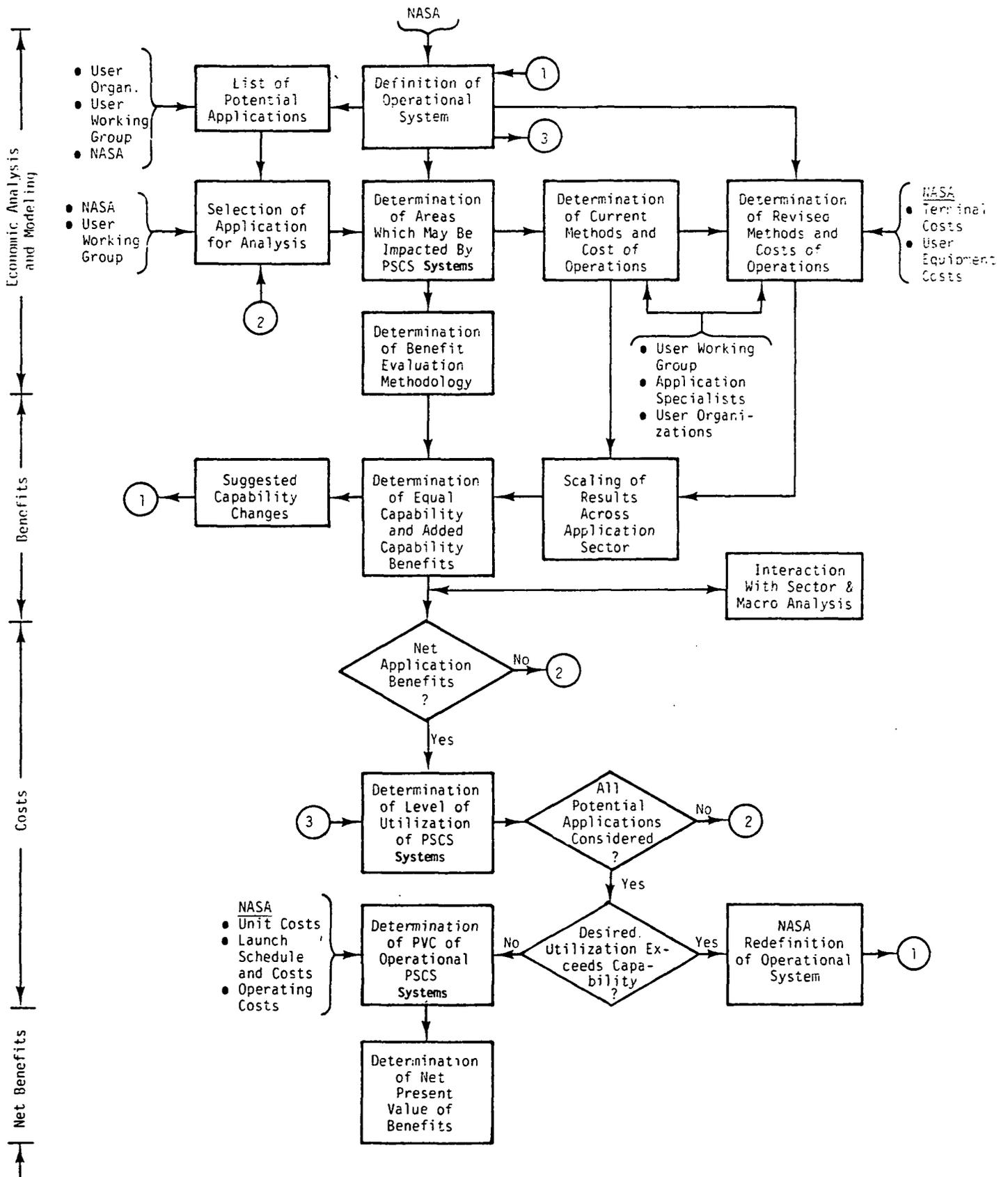
Benefit-cost analysis is concerned with evaluating the benefits and the costs which may result from the public sector investment in an R&D program aimed at providing new and/or improved communications services on a continuing basis. The benefits and costs are those that would be realized by society and include the benefits received and costs incurred by members of society who are direct parties to resulting market transactions (the provider and user of a communications service) as well as to those who are not direct parties to the market transaction but are indirectly affected. A standard method of analysis in benefit-cost studies involves a principle that may be called "with and without" analysis. This approach,* outlined on the facing page, compares the existing methods and costs of operations with revised (based upon utilization of new and/or improved communication services) methods and costs of operations and the resulting benefits.

The general approach illustrates the various tasks which comprise the benefit-cost analysis, the feedback paths and the data sources. In order to start the analysis it is necessary to have a definition of the capability of an operational system and a list of potential applications which may be impacted by the new and/or improved services. It is necessary to consider operational systems since the benefits of an R&D program are the result of its effect (timing and level of capability) on achieving operational systems. Through the combined efforts of NASA, User Working Groups and user organizations, specific application areas need to be selected which may be impacted by the results of the PSCS program. The "with and without" analysis can then be performed for each application area and results scaled across each application sector. Since diverse applications are to be considered, it is anticipated that different benefit evaluation methods will be established and used to determine equal capability and added capability benefits. Equal capability implies cost savings whereas added capability benefits may be achieved only if increased budgets are possible. Since multiple agencies and organizations are involved, it is important to identify those benefits which may be achieved only if budgets are increased. Based upon insights gained from the benefit-cost studies, desirable capability changes may become apparent.

Since operational systems may not be appropriately matched to application needs (for example, desired utilization may exceed capability), system redefinition may be necessary. Once the system definition is deemed adequate the present value of total system costs can be determined, compared with the present value of benefits and the net present value of benefits (i.e., benefits less costs) determined.

* To be used at different levels of detail for the preliminary economic analysis, case study and benefit-cost analysis tasks described in the following pages.

ECONOMIC EVALUATION - BENEFIT/COST ANALYSIS



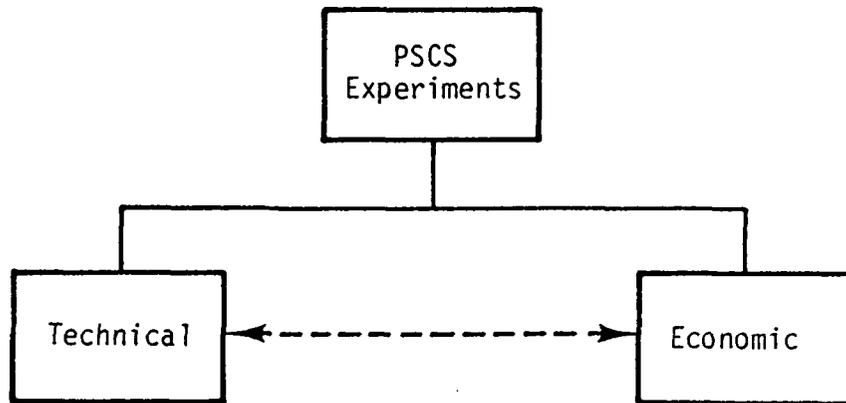
ECONOMIC VERIFICATION EXPERIMENTS

The purpose of the PSCS program is to demonstrate the technical capability for the improved delivery of existing services and new services that cannot be provided by existing systems, and the economic and social impacts of these improved and new services. The demonstration of the technical capability and its economic and social impact will be accomplished by the performance of experiments with the PSCS after it is launched in 1982. Since there is a history of prior experimentation with the ATS series, CTS, and commercial satellites, some of the possible uses of the PSCS will be relatively mature while others will be in a very early stage of development. For this reason, the experiments to be performed using the PSCS will range from demonstrations of technical performance in areas of new or high technology to the use of the PSCS in a pre-operational mode to demonstrate the economic integration of users into a viable market.

Since an objective of the PSCS program is to identify and develop services that can be transferred to operational systems, it is important that the experiments to be performed with the PSCS be designed to yield data on the operational and economic impacts of PSCS capabilities on users' operations. Thus, while some experiments will be designed to reduce the cost and technical risk of using PSCS technology in follow-on operational systems, the economic verification experiments will be designed to demonstrate the economic potential of operational systems and to reduce the market uncertainty. Moreover, some experiments may combine features of technical and economic demonstration.

The economic verification experiments are ground-based experiments using the PSCS, fixed and mobile earth terminals and the user infrastructure for the delivery services and information. A specific objective of the economic verification experiments is to provide quantitative data on the economic and social impacts of improved communications on users and their operations.

ECONOMIC VERIFICATION EXPERIMENTS



- Demonstrate High Technology
- Prove Technical Performance
- Reduce Cost and Technical Risk and Uncertainty
- Obtain Information on System Characteristics of Economic Importance to Users
- Demonstrate Economic Impacts
- Identify Operational Possibilities
- Provide Data Useful in Design of Follow-on Systems
- Reduce Market Uncertainty

Launch of PSCS in 1982 will provide opportunity to obtain experimental evidence on effects of improved communications on economic performance of public services

PRE-PSCS EXPERIMENT POSSIBILITIES

The economic evaluations that have been performed on other space applications programs have had to rely to a great extent upon empirical estimates of the impacts of proposed new systems on users operations. The use of empirical data has been necessary in most cases as the capability to obtain experimental data does not exist until the new space applications system is launched. While specific experiments involving improved communications or large-scale pre-operational demonstrations cannot be performed until the PSCS is launched, considerable capability exists with which meaningful experiments can be performed as an integral part of the economic evaluation prior to the launch of the PSCS in 1982. These experiments can make use of capabilities of the ATS-6, CTS, commercial communications satellites, and possibly nonspace systems, to perform experiments as a part of the user case studies. Using this approach it will be possible to obtain more direct participation of users in the formulation of the PSCS program, to obtain experimental evidence to support estimates of the benefits and costs of operational systems, and to obtain information useful in setting criteria for selection of the PSCS economic verification experiments.

PRE-PSCS EXPERIMENT POSSIBILITIES

- Opportunity to obtain data on impact of communication on public services before launch of PSCS.
- Use ATS-6, CTS, commercial communications satellites and nonspace systems in experiments to support economic evaluation case studies.

ECONOMIC EVALUATION - ECONOMETRIC MODELING AND SIMULATION

The major objectives of econometric analyses are to examine the contribution of R&D in the communication sector, especially the contribution made by federal R&D; and to examine how improved communications technology may affect the behavior of the communication and other sectors of the economy. These issues are important in evaluating whether investment in communications R&D can be expected to yield a reasonable rate of return from public and private points of view. They are also important in determining an appropriate role for the Federal Government.

Recent studies by Chase Econometrics,¹ ECON,² Zvi Griliches³ and Mathematica⁴ on the contribution of R&D have provided some evidence on the returns to R&D in agriculture, manufacturing and nonmanufacturing sectors. Although there are a number of economic studies on the communications industry, most of them have failed to adequately examine the issues related to R&D and technological progress.⁵ In particular, most studies have failed to examine the effects of communications R&D on technological progress and its impacts on the various sectors of the economy.

A recent study of the U.S. telecommunications industry conducted by ECON, Inc.⁶ attempted to evaluate the contribution of communications R&D through the use of an econometric model which incorporates major supply and demand relationships in a coherent framework. To examine the important issues related to communications R&D, further development and modification of this telecommunications model into a more inclusive and more detailed communications model is necessary.

Unlike most existing studies of R&D which attempt to evaluate R&D at either the national or company level, it is necessary to examine R&D at the industry or sector level and then link this communications model to a macro econometric model or an input-output model. This will result in the development of an expanded communications econometric model useful for simulation of the behavior of the communications sector. In addition, the impacts of the communications sector on the other sectors of the economy can be examined by linking the communications econometric model with a macro econometric model or an input-output model.

Outputs of the econometric model will include estimates of the supply and demand functions for communications services. The estimates will be disaggregated by functional area such as education, environmental data, health services and public safety. The model will yield elasticities for supply and demand which can be used to estimate the sensitivity of the market. Other parameters that will be estimated will include the return on R&D investment, capital needs, price and employment.

¹The Economic Impact of NASA R&D Spending, Chase Econometric Associates, Inc., August 1975.

²The Effects of Research and Development Activities on Technological Change and Economic Welfare: A Review of Analytical Approaches and Empirical Evidence, ECON, Inc., March 1976.

³Griliches, Zvi, Returns to Research and Development Expenditures in the Private Sector, Discussion Paper No. 434, Harvard University, September 1975.

⁴Quantifying the Benefits to the National Economy from Secondary Applications of NASA Technology, Mathematica, April 1975.

⁵Dobell, A., et al, Telephone Communications in Canada: Demand, Production and Investment Decisions, Bell Journal of Economics and Management Sciences, Spring, 1972.

⁶Abram, Philip and Kan Hua Young, The Effects of R&D on the U.S. Telecommunications Industry, Astronautics & Aeronautics, May 1977.

ECONOMIC EVALUATION - ECONOMETRIC MODELING AND SIMULATION

Issues to be addressed by econometric modeling and simulation:

- What is the contribution of R&D to technological progress or productive efficiency in the communications sector?
- What is the role of Federal Government R&D in promoting advancement of communications technology?
- How is the behavior of the communications sector (in terms of price and services) affected by R&D?
- How is the communications sector interrelated with the other sectors of the economy?

ANALYTICAL FRAMEWORK FOR COMMUNICATIONS SECTOR ECONOMETRIC MODEL

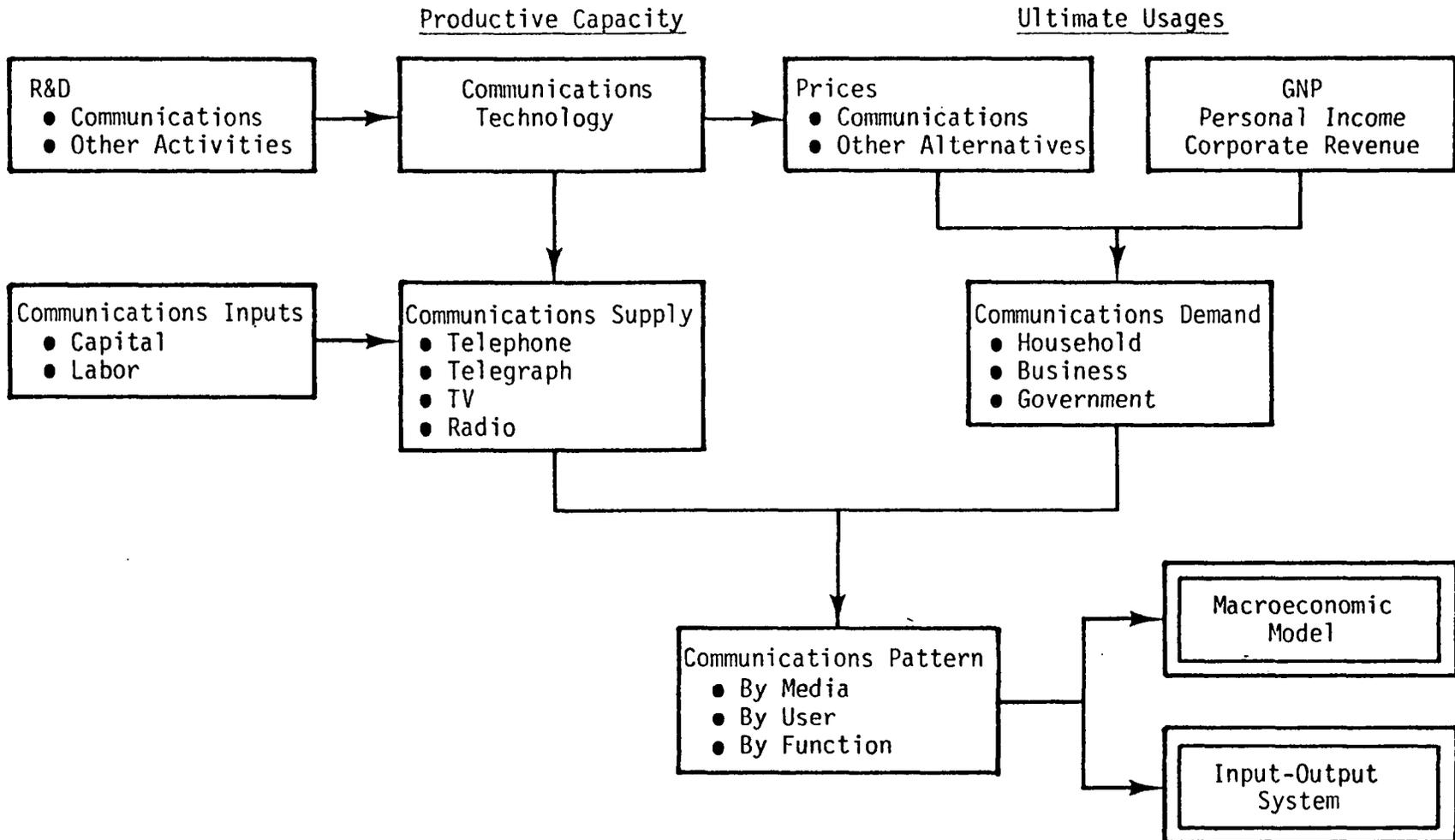
As the analytical framework indicates, R&D in communications and other activities affects the level of communications technology and productivity, which in turn determines the volume and the price of communications services. The supply of communications services, including telephone, telegraph, TV and radio, is the result of an application of communications inputs and communications technology. With an advance in communications technology, the same level of inputs is expected to produce more or better communications services.

On the demand side, the pattern of communications demand is largely affected by the prices of communications services and other alternatives as well as the level of economic activities in general as reflected by personal income or corporate revenue. The communications services are required by household, business and government agencies. Therefore, their behavior must be studied to determine how prices and other factors affect their communications usage.

Finally, both the supply and the demand conditions determine the communications patterns, which can be studied by media, by user or by function. Of immediate concern are public service communications services which may result from federal government investment in R&D. However, to evaluate these particular types of communications services appropriately, a broader picture must be examined and includes not only the communications sector but also the entire economy.

There are two major tasks to be performed in connection with the communications sector econometric model. These include modification of an existing telecommunication model (see paper by Abram and Young in Astronautics & Aeronautics, May 1977) and a formulation of linkages between the resulting communications econometric model and a macro econometric model or input-output model of the U.S. economy. The existing model includes only telephone and telegraph services and will be expanded to also include radio and television. In addition, more detailed or disaggregated analyses are required to provide information useful for design of public service communications services. For example, the demands for communications from the health and education sectors will be closely examined. Finally, the relationship between the communications sector and the rest of the economy will be analyzed by linking the resulting communications econometric model to an existing macro econometric model or an input-output system of the economy so that the full extent of the impact of communications R&D can be evaluated.

ANALYTICAL FRAMEWORK FOR COMMUNICATIONS SECTOR ECONOMETRIC MODEL



ROLE OF USERS AND PARTICIPANTS IN ECONOMIC EVALUATION

The two PSCS workshops (Easton, Maryland, October 1976^{*} and Alexandria, Virginia, March 1977^{**}) have served to demonstrate the large number of potential participants in the PSCS program and the wide range of the interests. In economic terms, the end users of the system essentially represent the demand for services. The end user needs are an important factor in establishing the design requirements of the PSCS, the design of experiments using the PSCS and other systems, as well as the economic viability of operational systems. The end users jointly determine the demand for the communications services, or the quantity of communications services that they are willing to purchase in a specified period, at a specified price and under a given set of conditions. Federal and state agencies play a multiplicity of roles. In addition to being users, some federal and state agencies also perform the important function of coordinating and aggregating the requirements of the constituency that they serve. Other government agencies establish regulatory policies that can accelerate or inhibit the successful transfer of PSCS capabilities or operational systems. Just as the end users and user agencies determine the demand function for the communications services by their willingness to purchase, the systems suppliers and designers, and the carriers and communications industry determine the supply or production function by their willingness to supply the services in a specified time, at a specified price, and under a given set of conditions. Technology, costs, market and financial considerations, and policy, legal and institutional factors all enter into the determination of the supply function. All of the foregoing factors must be considered in evaluating the economic and social impact of the capabilities and services provided by the PSCS and derivative operational systems.

^{*} Public Service Communications Satellite User Requirements Workshop, Final Report, January 14, 1977, NASA.

^{**} Public Service Communications Satellite System Review and Experiment Definition Workshop, Draft Report, March 29, 1977, NASA.

ROLE OF USERS AND PARTICIPANTS IN ECONOMIC EVALUATION

Type	Examples	Role
End Users	<ul style="list-style-type: none"> ● Regional Education Services ● National Federation of Community Broadcasters ● Hershey Medical Center ● Public Service Consortium 	<ul style="list-style-type: none"> ● User Needs ● Demand for Service ● Experiment Requirements ● Experiment Formulation
Federal Agencies	<ul style="list-style-type: none"> ● GSA ● DEA ● NWS ● LEAA ● FCC 	<ul style="list-style-type: none"> ● Agency Needs ● Coordinate Special User Requirements ● Experiment Requirements ● Regulatory Constraints
Systems Designers and Suppliers	<ul style="list-style-type: none"> ● NASA ● Spacecraft and Ground Station Suppliers 	<ul style="list-style-type: none"> ● Technical Capabilities ● Performance Determination ● Costs
Carriers and Communications Industry	<ul style="list-style-type: none"> ● Carriers ● Financial Community ● OTP ● FCC 	<ul style="list-style-type: none"> ● Market Development Concepts ● Financial and Business Considerations ● Policy, Institutional and Legal Issues

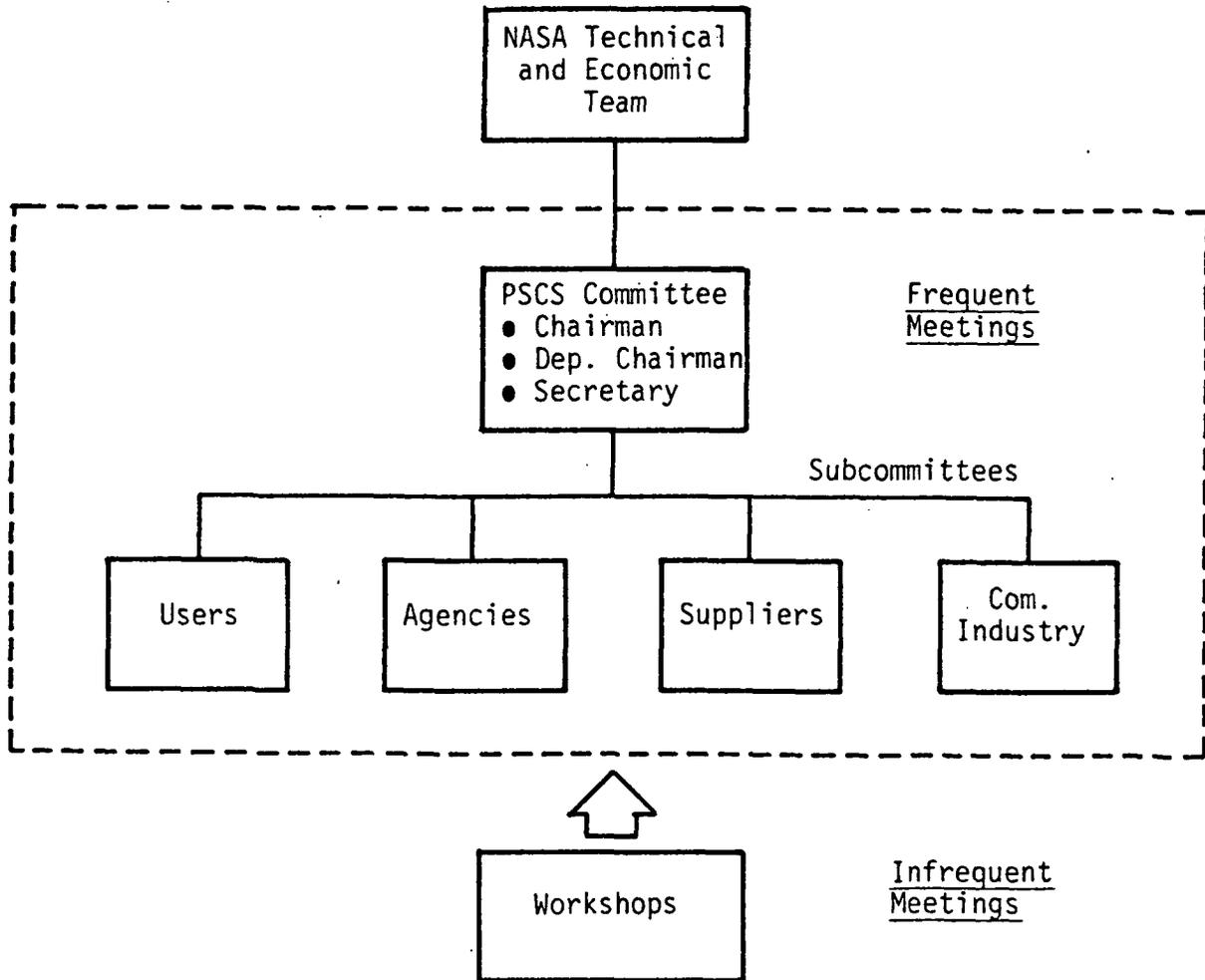
ORGANIZATION OF USERS AND PARTICIPANTS

The goal of the PSCS program is to provide to a large sector of the public existing services in a more cost effective manner, and new services that cannot be provided by existing technology and systems. With this goal in mind, it is important that the broad range of participants in the PSCS program be provided with a mechanism to interact with NASA in the establishment of the requirements for the PSCS and its applications. In recognition of the need, NASA has held two users workshops and has established an Interagency Coordinating Committee. The users workshops, involving several hundred participants, provide an excellent forum for the broad range of program participants to make their needs known to NASA and to review NASA plans. For these reasons, NASA will continue to sponsor these workshops periodically during the program. However, because of its size, the workshop does not represent an effective body for frequent interaction with the NASA program team. On the other hand, the Interagency Coordinating Committee represents only the interested federal agencies, and does not represent the other categories of program participants such as end users, carriers and the communications industry. In order to provide an effective body that is more representative of the participating community for NASA to interact with on a frequent basis, NASA will establish a PSCS advisory committee.

During the formative period of the PSCS program, the PSCS committee will be maintained as an informal working group under the cognizance of a NASA contractor. Upon receipt of program approval, the working group will be constituted as a formal advisory committee to the PSCS program.

It is anticipated that the PSCS working group, and at a later date the PSCS advisory committee, will play an important role in the review of technical and economic studies, in the establishment of systems requirements, and the selection of the experiments to be performed with the PSCS.

ORGANIZATION OF USERS AND PARTICIPANTS



PHASES OF ECONOMIC EVALUATION

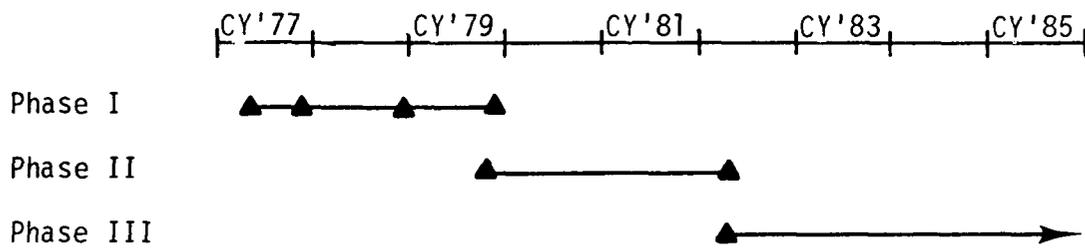
The overall economic evaluation may be considered as consisting of the three (3) indicated phases. These phases are the result of the general time schedule of events (for example, 1982 launch date for the PSCS and budgetary cycles and constraints) and the concomitant emphasis of required results. Thus, the first phase of the economic evaluation is concerned with a series of economic assessments and analyses aimed specifically at supporting NASA's new start information requirements. It is anticipated that economic evaluation results, at increasing levels of detail and thoroughness, will be required in the October-November time frame of calendar years 1977, 1978 and 1979.

Since major funding commitments will have been made and the PSCS will not have been launched, the second phase of the economic evaluation is concerned with experiment planning, selection and scheduling. Emphasis is placed on the development of criteria and techniques for experiment proposal evaluation and on the analysis, evaluation and selection of experiments to be performed with the PSCS. These experiments will be conducted after the launch of the PSCS. Other experiments may be conducted as part of the Phase I activities in support of the NASA's new start information requirements.

Experimental results will be forthcoming after successful PSCS launch. Therefore, the third phase of the economic evaluation is concerned with the evaluation of experiment results and future program planning in light of results received to date. The third phase efforts are also concerned with coordination with, and technology transfer to, the private sector.

PHASES OF ECONOMIC EVALUATION

- Phase I Economic Assessment of New Start
- Phase II Experiment Planning, Selection and Scheduling
- Phase III Evaluation of Experiment Results and Future Program Planning



MAJOR MILESTONE COMPLETION SCHEDULE - PHASE I

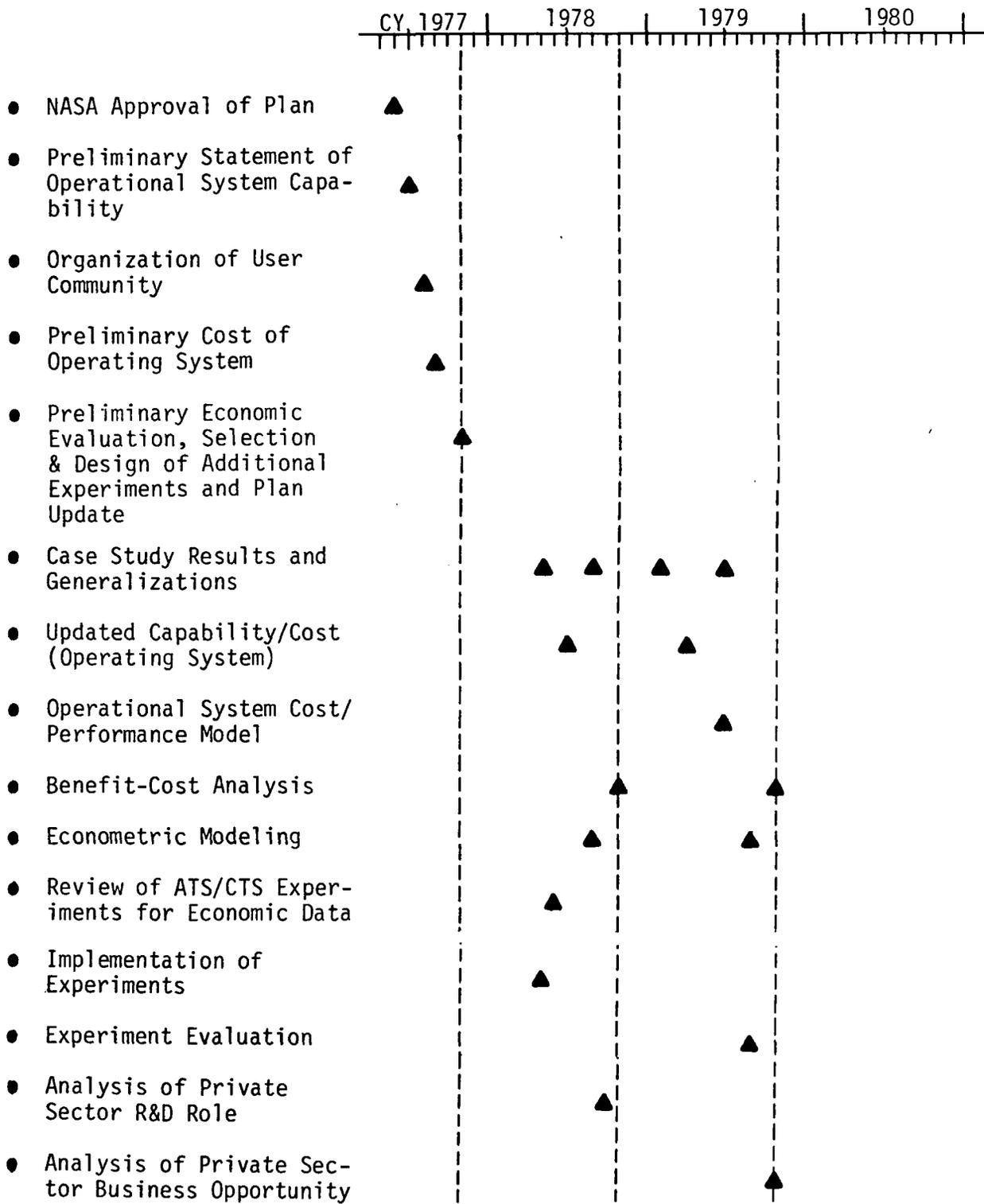
The facing milestone completion schedule indicates the sequence of events associated with the Phase I economic assessment to support the new start. The sequence of events is constrained primarily by the starting date (assumed NASA approval of the economic evaluation plan) and the need to provide successively more comprehensive results in the October-November time frame of 1977, 1978 and 1979. The specific schedules for performing the identified economic tasks are indicated in the following pages. Brief task descriptions are provided for each of the economic tasks in the Task Description section.

The principal FY'77 efforts are to be devoted toward performing and completing a preliminary evaluation of the benefits which may result from the implementation of an operational PSCS system which is the outgrowth of the PSCS R&D and experimental program. In order to accomplish this, it is necessary that (a) the user community be organized to provide an efficient flow of information to the economic analysis, (b) a preliminary operational PSCS system be described in terms of its performance capabilities as might affect user methods, operations and costs, and (c) a preliminary cost estimate be developed for the operational PSCS system. The FY'77 efforts will also be devoted to determining case studies (including economic oriented experiments which can utilize existing satellite or other communication systems) which can be performed during FY'78 and FY'79 and can lead to improved understanding of the economic benefits and increasingly refined benefit estimates. As a result of FY'77 efforts the economics evaluation plan will be reviewed and, if necessary, updated.

During FY'78 it is necessary to initiate and complete a number of case studies, generalize the results across the application sectors and perform benefit-cost analyses based upon the results obtained and economic data which may be obtained from ATS/CTS experiments currently underway or previously completed. The benefit-cost analysis requires that updated capability and cost estimates be available for an operational PSCS-type system. Econometric and other models will be developed and preliminary estimates made of the benefits which may result from communications R&D expenditures. Benefits will be evaluated at the macro level as well as by an aggregation of benefit evaluations at the micro level. Also during FY'78 an analysis will be completed of the likelihood of private sector participation in the absence of public sector investment and it is necessary to complete the implementation of experiments to be performed in conjunction with case studies.

The FY'79 efforts are concerned with completing the benefit-cost analyses and requires the completion of additional case studies, generalization of results, evaluation of experiment results, the use of econometric and sector models, and updated system capability and cost estimates. During FY'79 operational system cost/performance models will be developed and used to establish system costs in terms of required capability (as determined from the case studies and benefit analysis). The private sector business opportunities will be analyzed to establish a detailed understanding of the obstacles and constraints to commercialization.

PHASE I - SUPPORT OF NEW START: MAJOR MILESTONE COMPLETION SCHEDULE

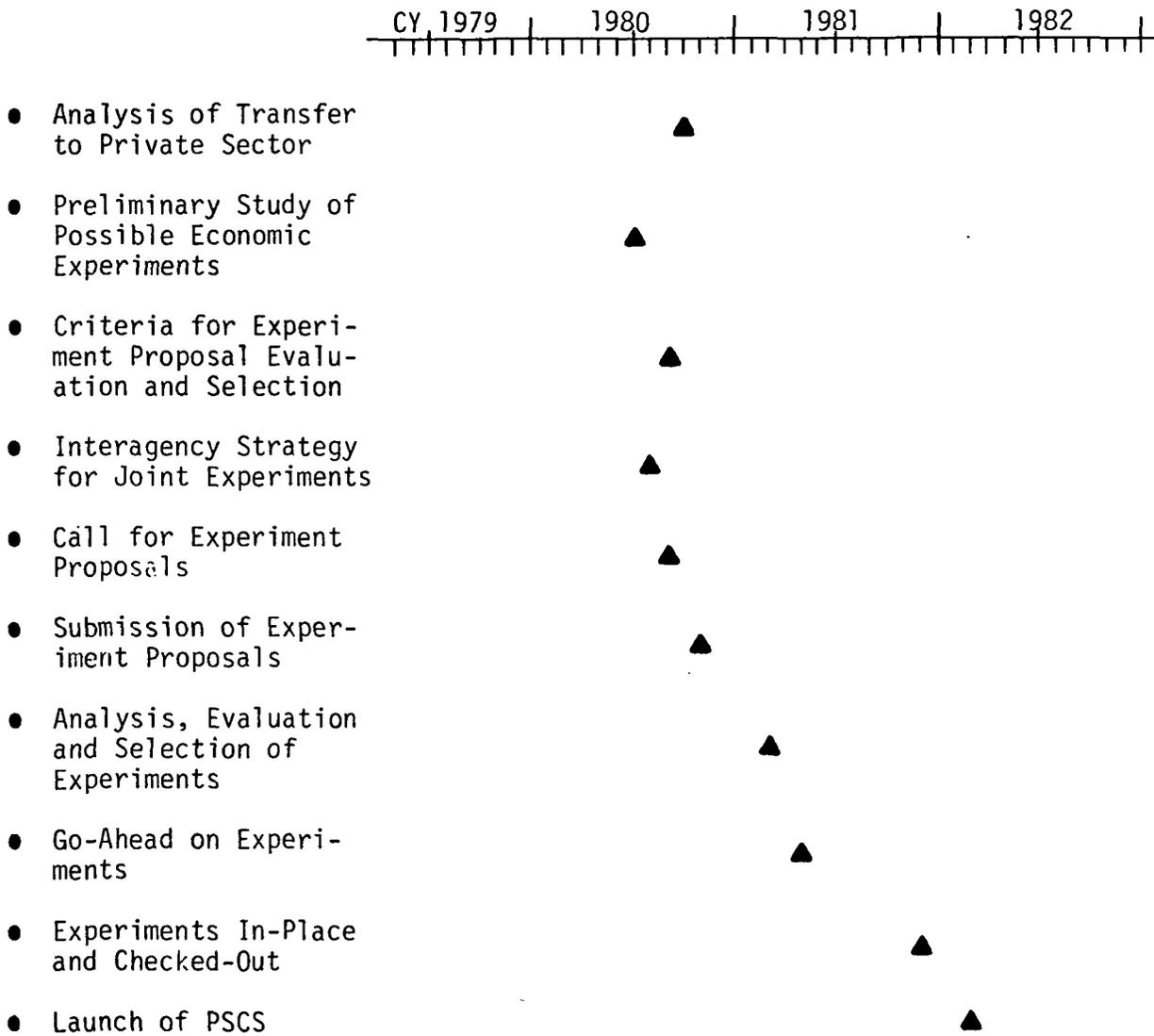


MAJOR MILESTONE COMPLETION SCHEDULE - PHASE II

The facing milestone completion schedule indicates the sequence of events associated with the Phase II experiment planning, selection and scheduling efforts. The specific tasks encompassed by this phase include an analysis of the transfer of technology to the private sector (i.e., determining the ways and means of eliminating the obstacles and constraints to private sector commercialization of PSCS demonstrated services), the development of criteria, procedures and techniques which will lead to the selection of those R&D and experimental program initiatives which will be most useful in promoting (i.e., eliminating obstacles and constraints) the benefits which are likely to develop as a result of operational implementation of PSCS demonstrated services, and finally the analysis, evaluation and selection of experiments to be conducted with the PSCS.

In order to insure the timely flow of experimental results after the PSCS launch in early 1982 it is desirable to complete a preliminary study of possible economic experiments by mid-1980, coordinate and establish an interagency strategy for joint experiments by mid-1980, call for experiment proposals by third-quarter of 1980 so that experiment proposals will be received during the latter part of 1980, analyze, evaluate and select experiments for implementation early in 1981 and shortly thereafter give the go-ahead on experimentation. This sequence of events will lead to experiments in-place and checked-out at the time of PSCS launch.

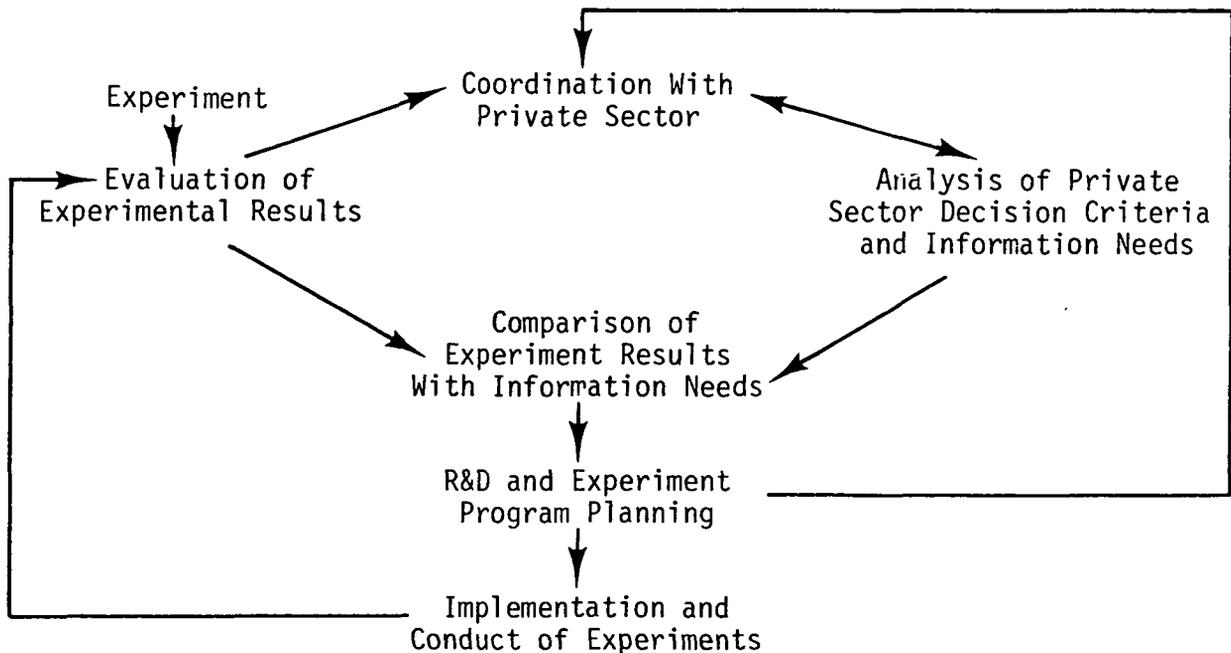
PHASE II - EXPERIMENT PLANNING, SELECTION AND SCHEDULING: MAJOR MILESTONE COMPLETION SCHEDULE



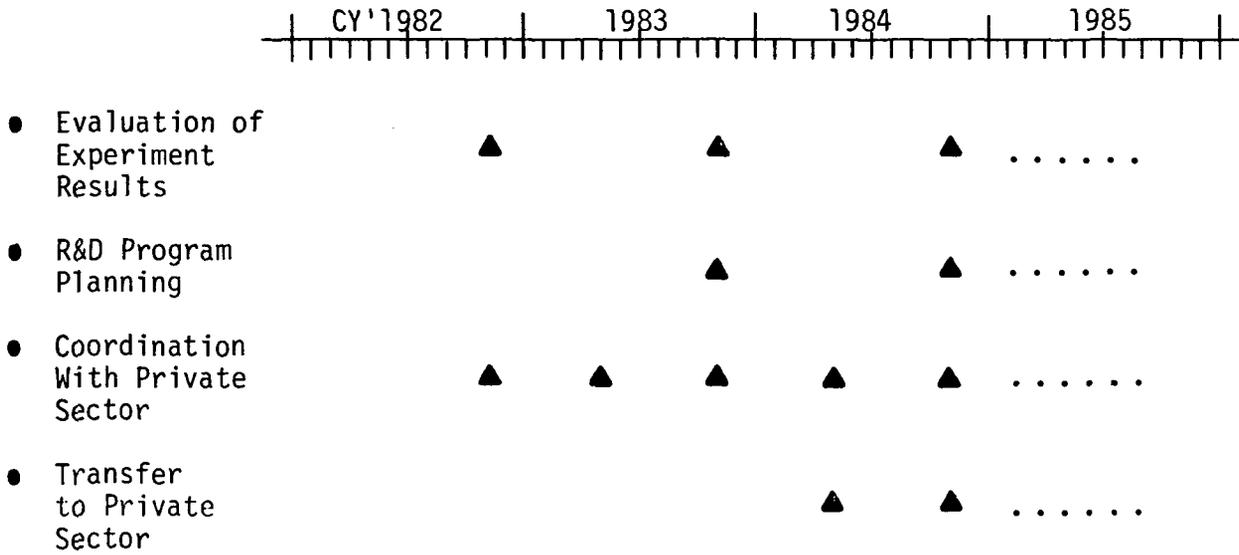
MAJOR MILESTONE COMPLETION SCHEDULE - PHASE III

The milestone completion schedule on the facing page indicates the sequence of events associated with the Phase III evaluation of experiment results and future program planning efforts. This phase is concerned with the continuing evaluation of experiment results and the planning of future efforts in light of the experimental results and continuing analysis of obstacles and constraints to private sector commercialization of demonstrated services. Since the activities and results are inherently continuous in nature, the indicated milestones represent annual reporting of obtained results, findings and decisions.

The basic flow of the Phase III efforts is illustrated below and indicates the comparison of experimental results with information needed by the private sector in order to bring about commercial services which have been found to be beneficial to society. Also indicated is the need for continued coordination with the private sector in order to apprise it of results obtained, future experiment and R&D plans, and to keep informed as to the private sector obstacles and constraints to implementation of services and plans for initiating new and/or improved services.



PHASE III - EVALUATION OF EXPERIMENT RESULTS AND FUTURE PROGRAM PLANNING:
 MAJOR MILESTONE COMPLETION SCHEDULE

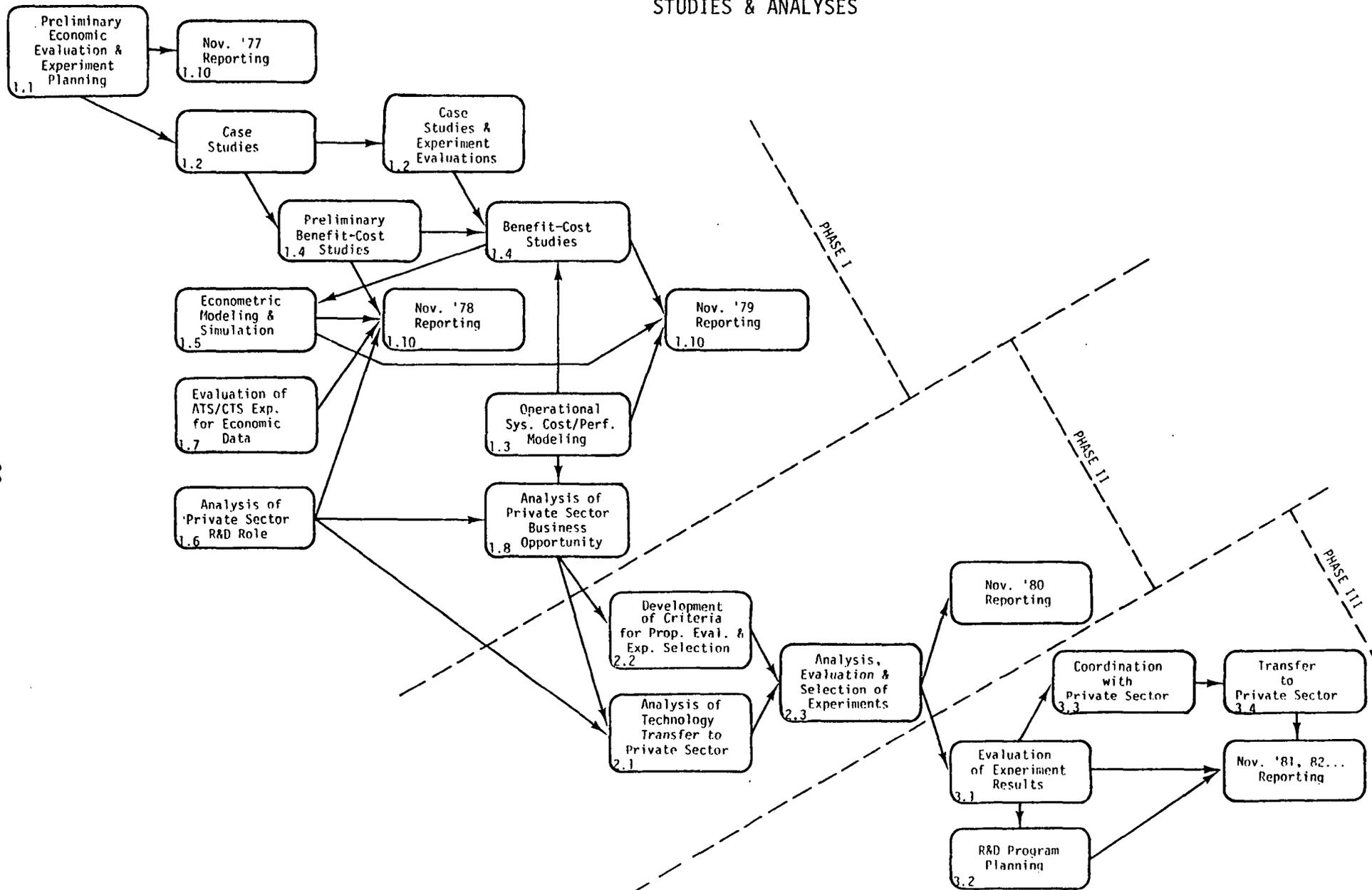


FLOW OF ECONOMIC EVALUATION STUDIES AND ANALYSES

The flow of the economic evaluation studies and analyses is indicated with specific tasks being identified by number. The specific task statements are presented in the section entitled, "Task Descriptions" and for Phase I and II tasks indicate the purpose of the task and the general approach to be taken to achieve the desired results.

As can be seen most tasks will draw heavily on the results of previous tasks. For example, it is envisioned that Task 2.2, Development of Criteria for Proposal Evaluation and Experiment Selection, will bring together and augment the simulation models developed in Tasks 1.3 and 1.8, Operational System Cost/Performance Modeling, and Analysis of Private Sector Business Opportunity, respectively.

FLOW OF ECONOMIC EVALUATION STUDIES & ANALYSES



ECONOMIC EVALUATION - TASK SCHEDULE

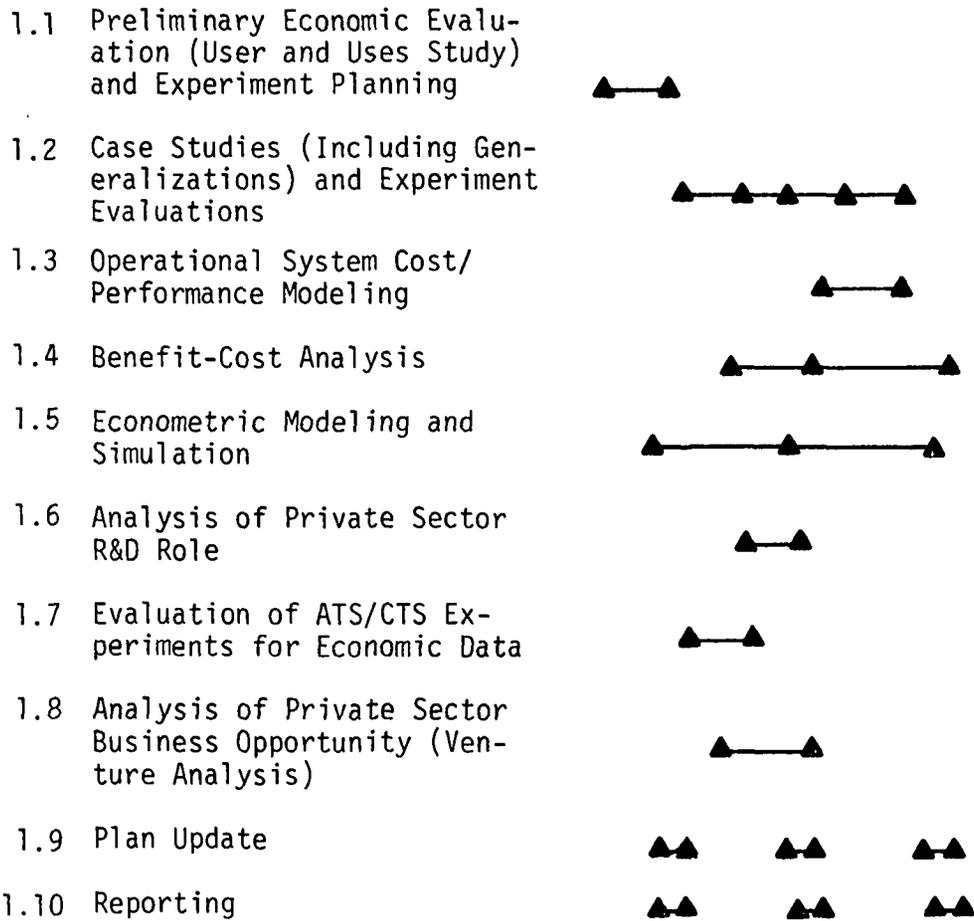
The accompanying Task Schedule indicates the specific sequencing of the economic evaluation tasks associated with the three phases of the economic evaluation. The specific timing of the Phase I tasks is influenced significantly by the desire to have results available in the October-November time frame in 1977, 1978 and 1979. It should be noted that several of the tasks (for example, Task 1.2) have intermediate milestones and are the result of natural division of efforts (for example, Task 1.2 consists of a series of case studies) or need for reporting results (for example, Tasks 1.5 and 3.1).

ECONOMIC EVALUATION
TASK SCHEDULE

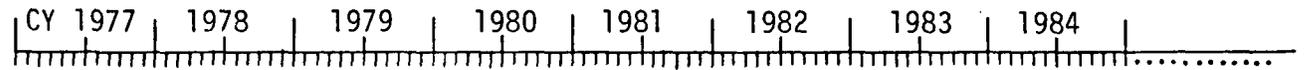


● NASA Submission to OMB

Phase I - Support of New Start



ECONOMIC EVALUATION
TASK SCHEDULE (continued)



Phase II - Experiment Planning,
Selection and Scheduling



Phase III - Evaluation of Experiment Results and Future Program Planning



BUDGETARY ESTIMATES

Budgetary estimates are presented in the accompanying table in terms of manpower (professional man-months) and thousands of dollars (K\$). These estimates are presented by task, phase and total economic evaluation program by year from FY'77 through FY'82. The budgetary estimates for FY'83 through FY'85 are given for this total period (not year by year).

Several points should be noted. All dollars are current dollars and take into account an estimated 7 percent per year average increase in labor and related costs. The case study budgetary estimates are based upon the performance of eight (8) case studies at an average of six (6) man-months per study.

The economic evaluation plan which has been developed requires an additional expenditure of approximately \$120K during FY'77. The rate of expenditure increases to approximately \$425K in FY'78 and FY'79. From FY'80 through FY'85 it appears that annual expenditures will be on the order of \$200K.

BUDGETARY ESTIMATES

	FY '77		FY '78		FY '79		FY '80		FY '81		FY '82		FY '83 Through FY '85		Total	
	MM	K\$	MM	K\$*	MM	K\$*	MM	K\$*								
Phase I - Support of New Start																
1.1 Preliminary Economic Evaluation (User and Uses Study) and Experiment Planning	16	95	--	--	--	--	--	--	--	--	--	--	--	--	16	95
1.2 Case Studies (Including Generalizations)* and Experiment Evaluations	--	--	30	187	15	100	--	--	--	--	--	--	--	--	45	287
1.3 Operational System Cost/Performance Modeling	--	--	--	--	6	46	--	--	--	--	--	--	--	--	6	46
1.4 Benefit-Cost Analysis	--	--	8	50	12	80	--	--	--	--	--	--	--	--	20	130
1.5 Econometric Modeling	3	15	21	125	36	220	--	--	--	--	--	--	--	--	60	360
1.6 Analysis of Private Sector R&D Role	--	--	4	25	--	--	--	--	--	--	--	--	--	--	4	25
1.7 Review ATS/CTS Experiment for Economic Data	--	--	6	37	--	--	--	--	--	--	--	--	--	--	6	37
1.8 Analysis of Private Sector Business Opportunity	--	--	--	--	8	55	--	--	--	--	--	--	--	--	8	55
1.9 Plan Update	1	6	1	6	1	7	--	--	--	--	--	--	--	--	3	19
Subtotal	20	116	70	430	78	508	--	--	--	--	--	--	--	--	168	1054
Phase II - Experiment Planning, Selection and Scheduling																
2.1 Analysis of Technology Transfer to Private Sector	--	--	--	--	--	--	12	100	--	--	--	--	--	--	12	100
2.2 Development of Criteria for Proposal Evaluation and Selection	--	--	--	--	--	--	8	58	--	--	--	--	--	--	8	58
2.3 Analysis, Evaluation and Selection of Experiments	--	--	--	--	--	--	2	15	12	95	12	90	12	100	36	290
Subtotal	--	--	--	--	--	--	22	173	12	85	12	90	12	100	58	418
Phase III - Evaluation of Experiment Results and Future Program Planning																
3.1 Evaluation of Experiment Results	--	--	--	--	--	--	--	--	--	--	6	45	18	150	24	195
3.2 R&D Program Planning	--	--	--	--	--	--	--	--	--	--	--	--	18	150	18	150
3.3 Coordination With Private Sector	--	--	--	--	--	--	--	--	--	--	6	45	18	150	24	195
3.4 Transfer to Private Sector	--	--	--	--	--	--	--	--	--	--	3	23	18	150	21	173
Subtotal	--	--	--	--	--	--	--	--	--	--	15	113	72	600	87	713
Annual Total	20	116	70	430	78	508	22	173	12	85	27	203	84	700	313	2215
Cumulative Total	20	116	90	546	168	1054	190	1227	202	1312	229	1515	313	2215		

* Assuming eight (8) case studies @ 6 mm/study.

* Based upon 7 percent/year average increase in labor cost.

FUNDING OF ECONOMIC STUDIES--COMPARISON WITH OTHER MAJOR APPLICATIONS PROGRAMS

In order to place the plan for the economic evaluation of the PSCS in perspective, a comparison has been made with two other major space applications programs. Two factors are compared, the starting date of the economic evaluation with respect to the launch date of the system that the economic evaluation is intended to support, and the sum of the actual and estimated expenditures through launch. While each element of the PSCS plan must be justified on its own merit, the comparison does suggest that both the timing and the level of effort of the PSCS economic evaluation is not disparate with previous experience.

FUNDING OF ECONOMIC STUDIES - COMPARISON WITH OTHER MAJOR APPLICATIONS PROGRAMS

		Years from Start of Economic Evaluation to Launch								Spent to Date (K\$)	Total (K\$) Through Launch
		1	2	3	4	5	6	7	8		
SEASAT	Begin Economic Evaluation Δ (1973)					Launch	\square SEASAT-A (1978)			725*	1300**
LANDSAT	Δ (1974)							\square LANDSAT-D (1981)		NASA- 1600 Other Agencies-1500 <u>3100</u>	> 3100
41 PSCS	Δ (1977)						\square PSCS			125	1700

* Battelle, ECON, JPL through fiscal year 1978 (Economic Studies).

** Assumes approval of three to five Economic Verification Experiments.

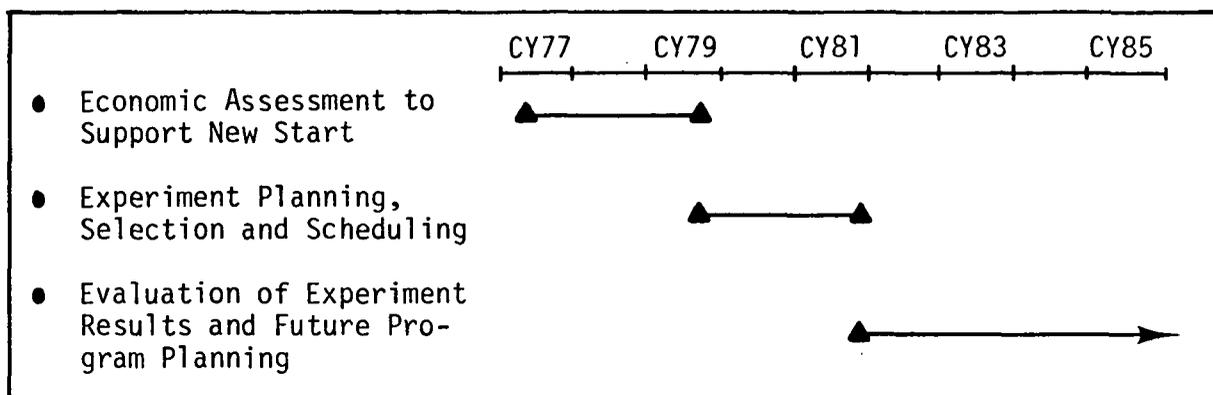
SUMMARY

This document presents a total plan for the economic evaluation of the PSCS program. The plan begins during FY 1977 with a preliminary economic evaluation that is intended to support internal NASA planning for a new start, and continues for the duration of the PSCS program through the evaluation of the economic aspects of experiments performed with the PSCS after it is launched in 1982.

The formulation of this plan has drawn upon more than four years of experience in the economic evaluation of other successful space applications programs. While there are many similarities between this plan and the use of economic evaluations in other space applications programs such as LANDSAT and SEASAT, the plan also recognizes the fact that there are significant institutional, legal, political, regulatory and user differences between PSCS and other space applications programs. The SEASAT program has shown the desirability of the early and continued participation of the users in the formulation and the implementation of the program. Both LANDSAT and SEASAT have shown the usefulness of rigorous economic analysis to NASA management, users and the other organizations involved in the program approval cycle. In addition, both of these programs have shown the desirability of a structured users community to interact with the NASA program team, as well as the desirability of interaction between the economics and technical study teams and the users in the formulation of system requirements and applications. This experience has been incorporated in the preparation of the PSCS plan.

The plan describes three major phases of the PSCS economic evaluation. The first phase, consisting of the economic assessment to support the new start has begun and will continue through 1979. The first phase consists of an analysis of the uses and users of the PSCS, and an economic assessment involving user case studies and econometric modeling. A significant feature of the first phase is the possibility of using experiments that could be performed before the launch of the PSCS as a central part of the user case studies. Beginning in 1979 and continuing through 1981, the second phase of the economic evaluation involves the planning, selection and pre-launch implementation of economic verification experiments to be performed using the PSCS. The third phase of the economic evaluation begins with launch in 1982 and consists of the evaluation of the economic experiments, and the interaction with users and systems operators to facilitate transfer of PSCS demonstrated capabilities and services to an operational status.

SUMMARY



- Comprehensive Plan covers program from inception through evaluation of experiments and transfer to private sector.
- Economic assessment requires inputs from broad range of activities for evaluating costs and benefits.
- Need to formally structure participants to interact with study team.

SECTION II - TASK DESCRIPTIONS

The following pages contain a compilation of brief task statements for each of the tasks contained in the economic evaluation program plan. For the Phase I and II tasks, the task statements include a statement of the purpose of the task and an outline of the approach to be taken. For Phase III tasks, only a statement of the purpose of the task is given. Each task is identified by a task number so that the task statements can be easily cross-referenced to the tasks discussed on the previous pages.

PHASE I
TASK STATEMENTS

TASK STATEMENT

1.1 PRELIMINARY ECONOMIC EVALUATION (USER AND USES STUDY) AND EXPERIMENT PLANNING

Purpose: Establish a preliminary estimate of economic benefits which may result from operational PSCS systems.

Approach:^{*} For a selected group of applications, determine in a preliminary fashion:

- Areas which may be impacted by PSCS operational systems
- Current methods and costs of operations
- Revised (based upon PSCS services) methods and costs of operations
- Generalization across application sector
- Benefit evaluation methodology
- Benefits per application sector
- Net benefits across all sectors
- Analyze and participate in planning of experiments which may be conducted to assist with new start definition.

^{*} Basic approach is as illustrated in chart entitled "Economic Analysis - Benefit/Cost Approach".

TASK STATEMENT

1.2 CASE STUDIES (INCLUDING GENERALIZATIONS) AND EXPERIMENT EVALUATIONS

Purpose: Establish a detailed understanding of user requirements, current methods and costs of operations, and revised (based upon use of PSCS services) methods and costs of operations, using this detailed knowledge generalize requirements and costs across application sector.

Approach: ^{*} For a selected group of applications, work with a selected group of potential users to determine in depth:

- Areas which may be impacted by PSCS operational systems
- Current methods and costs of operations
- Revised (based upon PSCS services) methods and costs of operations
- Generalization across users within each application sector
- Benefit evaluation methodology
- Benefits per application sector
- Participate in the evaluation of results of experiments conducted to assist with new start definition.

* Basic approach is as illustrated in chart entitled "Economic Analysis - Benefit/Cost Approach".

TASK STATEMENT

1.3 OPERATIONAL SYSTEM COST/PERFORMANCE MODELING

Purpose: To establish the operational PSCS system annual costs, and present value of costs, in terms of performance as determined by user requirements.

Approach: Develop an operational system simulation model which considers:^{*}

- Space and ground segment costs
- Nominal S/C configuration, capability and cost
- Sensitivity coefficients (scaling factors)
- Cost uncertainties
- Subsystem reliability
- User demand characteristics

and develops, using unit cost and other data provided by NASA and demand data from generalized case studies:

- Launch schedules
- Probability distribution of annual cost
- Probability distribution of present value of cost.

^{*} See, for example, Greenberg, J. S. and R. Nichols, Economic Impact of New Technology on Domestic Satellite Communications, AMS Report No. 1285, Princeton University, 31 March 1976 and Greenberg, J. S., SEASAT Economic Assessment: The SATIL 2 Program (A Program for the Evaluation of the Costs of an Operational SEASAT System as a Function of Operational Requirements and Reliability), ECON, Inc., Report No. 75-125-10B, 31 August 1975.

TASK STATEMENT

1.4 BENEFIT-COST ANALYSIS

Purpose: Establish the net benefits which may result from an operational PSCS system.

Approach: For applications considered in case studies and using operational system cost/performance model:

- Develop benefit models^{*} in terms of level and price of service
- Evaluate equal and added capability benefits
- Determine level of utilization (per application) of PSCS operational system
- Determine operational system cost in terms of capability
- Iteratively determine price and level of service
- Determine net benefits (benefits less costs).

^{*}Taking into account all user costs.

TASK STATEMENT

1.5 ECONOMETRIC MODELING AND SIMULATION

Purpose: To develop an econometric model of the communication sector and to establish its links with a macroeconomic model and/or an input-output system so that the full extent of the contribution of communication R&D can be evaluated.

Approach: Construct an econometric model of the communication sector, incorporating both supply and demand relationships.* The econometric model will consider:

- Telephone, telegraph, TV and radio
- Demand for communication services by various users
- Supply of communication services and its relation to technological progress and R&D
- Revenue and cost relationships
- Investment and employment requirements.

The contribution of R&D to the communication sector will be examined by the econometric model of the communication sector, and its effects on other sectors of the economy will be evaluated by linking the communication model to an existing macroeconomic model, e.g., the OBE model used by the Department of Commerce and/or an input-output analysis.

* Abram, P. and K. Young, The Effects of R&D on the U.S. Telecommunications Industry, Astronautics & Aeronautics, May 1977.

TASK STATEMENT

1.6 ANALYSIS OF PRIVATE SECTOR R&D ROLE

Purpose: To assess the likelihood and degree of private sector participation in the absence of public sector investment.

Approach: Using NASA preliminary cost estimates and data obtained from corporate business planners and investment analysts:

- Establish preliminary pro forma business plans (income, cash flow, and other projections) based upon an operational PSCS system
- Review private sector investment criteria and recent large scale business opportunities
- Review other factors which affect private sector investment decisions
- Compare preliminary pro forma plans with investment criteria, other factors and recent opportunity/decision experiences
- Assess likelihood and degree of private sector participation in absence of public sector investment.

TASK STATEMENT

1.7 EVALUATION OF ATS/CTS EXPERIMENTS FOR ECONOMIC DATA

Purpose: Review ATS/CTS experiments to establish and evaluate economic data base which may be useful by providing a systematically organized source of data to support claims that might be made in the new start justification process.

Approach: Review pertinent ATS/CTS experiments and establish the following by reviewing experiment documentation and interviewing experimenters:

- Experiment goals
- Experiment technical results
- Experiment demonstrated (measured and/or inferred) economic results
- Evaluate what has been learned to date about user economics as impacted by improved and/or new communication services.

TASK STATEMENT

1.8 ANALYSIS OF PRIVATE SECTOR BUSINESS OPPORTUNITY

Purpose: To establish a detailed understanding of the possible private sector PSCS system business opportunities and to establish the obstacles and constraints to commercialization.

Approach: Using NASA refined cost estimates and data obtained from corporate business planners and investment analysts:

- Develop possible business scenarios
- Develop simulation models for private sector business ventures
- Consider impact of uncertain demand and costs and impact of unreliability
- For possible business scenarios develop probability distributions of net profit, cash flow, cumulative cash flow, payback, etc., based upon cost data provided by NASA, common carriers, etc., and demand estimates resulting from case studies and other sources
- Assess the attractiveness of the private sector business opportunities (explicit consideration of risk, exposure and payback)
- Assess the implications of input data uncertainty reduction on the attractiveness of the private sector business opportunity.

TASK STATEMENT

1.9 PLAN UPDATE

Purpose: Periodically update the plan for the economic evaluation of the PSCS system in order to reassess necessary tasks, schedules and costs in terms of what has been learned to date.

Approach: Using most recent plan as starting point:

- Review results of studies and analysis since formulation of plan
- Review ultimate goals and objectives
- Reformulate plan so as to achieve goals and objectives.

PHASE II
TASK STATEMENTS

TASK STATEMENT

2.1 ANALYSIS OF TECHNOLOGY TRANSFER TO PRIVATE SECTOR

Purpose: Determination of the ways and means of eliminating the obstacles and constraints to private sector commercialization of PSCS demonstrated services.

Approach: Using business simulation models and guidance from corporate business planners and investment analysts:

- Determine financial, institutional and other obstacles and constraints to private sector commercialization of PSCS demonstrated services
- Investigate ways of reducing uncertainty, risk and exposure
- Analyze alternative private sector participation scenarios such as buying or leasing PSCS
- Analyze impact on other carriers
- Analyze role of regulatory policies
- Analyze pricing policy and impact on rate of commercialization.

TASK STATEMENT

2.2 DEVELOPMENT OF CRITERIA FOR PROJECT EVALUATION AND SELECTION

Purpose: Develop models procedures and criteria which will lead to the selection of those R&D and experimental program initiatives which will be most useful in promoting the net economic benefits which are likely to develop as a result of operational implementation of PSCS demonstrated services.

Approach: Formulate models, procedures and criteria aimed at "buying" information through R&D and experimental programs which will lead to the reduction or elimination of the obstacles and constraints to operational system implementation. This will require:

- Development of simulation models* which will allow service price to be estimated in terms of level of service and regulatory constraints
- Development of procedures for assessing impact of an R&D project or experiment on uncertainty
- Development of procedures (using simulation models) for assessing impact of reduction of uncertainty on risk and/or exposure reduction and effect on implementation decisions
- Development of models leading to the evaluation of consumer surplus and producer surplus benefits in terms of price of communications service
- Development of data requirements and procedures for data collection
- Development of pricing policies for experiments.

* It is anticipated that models developed in previous tasks will be utilized and modified.

TASK STATEMENT

2.3 ANALYSIS, EVALUATION AND SELECTION OF EXPERIMENTS

Purpose: Analyze, evaluate and assist in the selection of proposed experiments.

Approach: Utilizing models, procedures and criteria previously developed (Task 2.2), combinations of different proposed experiments will be analyzed and evaluated to determine that combination which will be most useful in promoting the achievable net economic benefits. Close coordination will be maintained with proposed experimenters so as to insure the availability of data for the analyses and evaluations.

PHASE III
TASK STATEMENTS

TASK STATEMENT

3.1 EVALUATION OF EXPERIMENT RESULTS

Purpose: On a continuing basis, review the experiment results to ensure that desired economic data is forthcoming and then when data is available, re-evaluate the application economic benefits (and costs) as indicated by experiment results, reassess user requirements and impact on system capability in light of experiment results.

TASK STATEMENT

3.2 R&D PROGRAM PLANNING

Purpose: On a continuing basis, analyze, evaluate and assist in the selection of proposed experiments and the continuation of experiments already underway. The evaluation of experiments already underway will consider the information obtained to date and the economic value of continuing the experiment to obtain additional information.

TASK STATEMENT

3.3 COORDINATION WITH PRIVATE SECTOR

Purpose: Maintain continuing contact and liaison with the private sector (carriers, business planners and financial analysts) in order to keep current with their decision criteria regarding commercialization of services and inform them of experiment results obtained to date and future plans.

TASK STATEMENT

3.4 TRANSFER TO PRIVATE SECTOR

Purpose: Continually review the private sector decision criteria, and perceived obstacles and constraints, and reassess, in light of experiment results and regulatory and other changes, the scenarios for transferring the communications technology to the private sector.