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Part IV

The Current Status of the Planning-Programing-Budgeting System

THE STATUS AND NEXT STEPS FOR PLANNING, PROGRAMING, AND BUDGETING

BY JACK W. CARLSON*

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In this paper, Dr. Carlson discusses the purpose and character, progress, and prospects of the Planning-Programing-Budgeting System (PPBS). Since 1965, PPBS has been initiated in 26 agencies in the Federal Government. Its purpose is to help decisionmakers allocate limited public resources more effectively, reduce the portion of the budget that is "uncontrollable," understand the actual impact of public programs, assure the orderly presentation of relevant analysis for decisionmaking, identify programs that no longer serve national objectives, integrate long-range objectives with current-year budgets, and connect planning and budgeting with actual performance.

PPBS was designed as a process that would encourage the analysis of major policy issues and provide a method of making explicit tradeoffs among programs aimed at similar objectives. It was tied into the budget cycle to assure relevance and was organized flexibly to allow adaptation to the unique characteristics of each agency.

The component parts of PPBS are: (1) Program structures which display each agency's physical and financial activities according to objectives or common outputs; (2) issue letters which summarize the agency's and Budget Bureau's list of major policy issues in need of analysis and evaluation during each planning and budgeting cycle; (3) special analytic studies which reflect intensive analysis of particular problems; (4) program memoranda which register agency choices between alternatives and summarize relevant analysis affecting the decisions; (5) program and financial plans which display for the past 2 and next 5 years data on the financial inputs and physical outputs resulting from proposed and past commitments.

Based on criteria of an ideal system, the success of the PPB system has been limited. However, based on the criteria of improvements to the existing decisionmaking process, Dr. Carlson asserts that PPB has been and continues to be moderately successful, and that it has been and will continue to be an important contribution to public policy decisionmaking. He discusses some of the specific limitations and achievements of PPB during the last 4 years.

The objectives of the PPB system have been endorsed by both Democratic and Republican administrations. PPBS will be improved during 1969, the fiscal year 1971 planning and budget cycle, with more changes contemplated for 1970, the fiscal year 1972 planning and budgeting cycle. Their specific nature will depend upon the experience of this year. Dr. Carlson discusses some of the new directions for the PPB system now being adopted.

In a set of 13 attachments to the paper, a number of displays pertinent to the structure and functioning of the PPB system are presented.

I. PURPOSE AND CHARACTER OF THE PPB SYSTEM

The Planning, Programing, Budgeting System (PPBS) is an approach to decisionmaking designed to help make as explicit as possible

*This paper was prepared with the assistance of James V. DeLong of the Office of Program Evaluation.

the costs and consequences of major choices and to encourage the use of this information systematically in the making of public policy. It is an evolutionary change that grows logically out of 50 years of improvement in the techniques of budgeting, accounting, and analysis, in both the Government and the private sectors.[1] Normally, such changes work their way into practice slowly, as the logical nature of the development becomes clear. In contrast, with respect to PPBS, starting in 1961 in the Defense Department and in 1965 in 20 other agencies, a deliberate and major effort was started to effect reforms more rapidly. This effort was accompanied by some fanfare and—in retrospect—exaggerated expectations.

The attention focused upon the methods used to implement PPB has obscured somewhat the pressing problems of Government decisionmaking and resource allocation that provided the basic rationale for its introduction and, more particularly, for the attempt to achieve change quickly. But, in evaluating PPB, it is important to keep it in the context of these difficulties of decisionmaking in a highly complex governmental apparatus that now oversees the spending of nearly $200 billion through a multitude of large and small decisions made at many levels of authority in an intensely political environment.

These basic problems are:*

1. The resources available to the Government are obviously limited, and demand for their use always exceeds supply. This dilemma has been exacerbated as more and more people in the society have come to see Government financing as not only justifiable but necessary in one area after another. Since few demands for Government funds are clearly and completely without merit, the President and his subordinates need techniques for defining objectives and priorities and insuring that public funds are used most effectively in achieving them.

2. The portion of the budget over which the President, the Cabinet, or the Congress has effective control in any given year is small because the legal and moral commitments made by past decisions are great.** Effective Government requires that some technique exist to ensure that

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[1] Prior to 1921, an executive budget did not exist, except for the term of the first two Presidents, Washington and Adams; rather, each department submitted budget requests and received authorizations directly from the Congress. In 1911, the New York Bureau of Municipal Research recommended budgetary classification by function and objects of expenditure and recommended the three functions of budgeting that are embodied in PPBS: Control, management efficiency, and planning. President Taft in 1912, as the result of the Report of the Commission on Economy and Efficiency, submitted to the Congress a model budget based on expenditures by function, by organization, by type of activity, by capital and current expenditures, and by cross classification among each category. The Budget and Accounting Act of 1921 created the Bureau of the Budget in the Treasury Department and created a central executive budget, but the emphasis was on operational control until the budget was taken out of the Treasury Department and placed in the newly established Executive Office of the President in 1939; then the budgetary emphasis shifted to managerial efficiency. This was enhanced by the call for performance budgeting found in the 1949 Hoover Commission. The 1950 Budget and Accounting Act directed improvements in accounting and cost data. Finally, in the 1960's, the third function of the budget was slowly developed: Executive planning. The development of methodology for evaluating public programs has occurred over a long period of time. Some of the more notable sources were in the water resources area during this century and particularly through the 1950's and in the defense area with the long gestation period provided by the RAND Corporation and others since World War II.
See Schick, "The Road to PPB: The Stages of Budget Reform," *Public Administration Review*, 26:4 (December 1966), p. 243; and Schultze, *The Politics and Economics of Public Spending*, pp. 1–17 (Brookings, 1968).

*Further discussion of this issue is found in the paper by Hoffman in vol. 3 of this collection.

**Further discussion of this issue is found in the paper by Weidenbaum in vol. 1 of this collection.

the small portion of the budget subject to discretion is foreclosed only through deliberate policy choice, not by inadvertence. This requires recognition of the extent to which present decisions, possibly minor at first glance, commit the Government to future expenditures.

3. The problems of evaluation and coordination of Federal programs are large and intractable. It is easy to overestimate the extent to which we know the results of programs, even in terms of the simplest output measures. Readily available measurement techniques of statistics, social science, or commonsense can often supply this information, but it is important that Federal agencies have incentives to use these techniques and that a method exist for incorporating their results into the Government decisionmaking processes. Without such a link, in an organization as large as the Federal Government, it is possible to have evaluation occurring that has no impact on existing or potential programs.

4. Because of the size of the Government and the uncertainties inherent in the problems with which it deals, the Government tends to be sluggish in implementing new ideas. A large number of agencies and persons are involved in any given policy area, and the difficulties of communicating, agreeing to, and implementing policy changes are immense.

5. There are some programs in the Federal Government which do not pay off because their costs exceed their calculated benefits, or because they do not really assist the intended target groups. The existence of moral or political claims upon society may cause such programs to continue indefinitely. No one would deny that such claims should receive careful consideration, but the Government still needs a method of identifying such programs, calculating the cost of meeting the claims, and developing less costly or more effective alternatives.

6. Planning methods devised to meet these difficulties have not been adequate. Too often, there is no link between long-range plans and either the resources which will realistically be available or the likely effect of past decisions on future resource claims. Better links between plans and probable resource availability need to be developed and more extensively applied.

7. Once money is committed in a budget, there are only limited attempts to hold program managers to any predetermined plan to use this money on a time-phased basis with performance tied to resource use. This shortcoming is ameliorated by general or selective oversight techniques used by the Budget Bureau, the Congress, the General Accounting Office, the press, and the public, but there is still a need to develop time-cost-performance measures and to use them.

PPBS helps deal with these problems in a comprehensive way through two closely related changes in the process of making Government resource allocation decisions. The first of these is premised on the belief that the expansion of our knowledge in the social and physical sciences and of the sophistication and quantity of data holds great promise for improving specific decisions of the Government if, and only if, this knowledge can be brought to bear on problems at the right time and in the right place. Therefore, one thrust of PPBS is to develop and apply this type of knowledge in a meaningful way to *major issues* as they arise—such as the development and deployment of a major new weapons system, the implementation of a project for

exploiting mineral resources, or the creation of a new manpower training program.

In many areas, however, major decision points are not obvious. Resources are committed by accretion over time, with no occasion on which the relationship between limited resources, the universe of need, and the effectveness of the program receive specific attention. This can result in either overinvestment or underinvestment in a particular area. For example, Federal transportation policy decisions might not consider explicitly the possible intermodal tradeoffs available; we have a series of programs to which we add resources independently. Therefore, the second purpose of PPB has been to improve the *normal decision process* so that questions of comparative costs, benefits, resource inputs, outputs, and effectiveness are routinely raised and comprehensively considered. Even if data or conceptual knowledge are scarce with respect to a particular area of Government activity, improvements can be made by developing a decision process that ensures that these crucial questions are not simply ignored. The purpose is to achieve explicitness about objectives and outputs; to aggregate costs and programs according to objectives; to develop alternative methods of accomplishing objectives; to analyze benefits, outputs, and costs at whatever level of sophistication is possible; and to project the extent to which future options are mortgaged by past or present decisions. A key part of this is the development of overviews of program areas that display, insofar as possible, comparative data on related programs.

The two objectives—applying knowledge to specific issues and improving the decision process—are very much intertwined. Nonetheless, they are separable to some extent in both concept and practice, and it is worthwhile to point out the difference. Many debates over PPBS are conducted with one party talking major issues and the other discussing the decisionmaking process and the need for program overviews. In evaluating PPB both must be taken into account.

If these objectives are to be achieved, a formal system is necessary. New methods of approaching problems may evolve slowly without such a system, but a deliberate attempt to increase the rate of change requires one.

The formal system developed for PPB was based on several premises: First, PPBS would be tied into the budget cycle, partly because this is the only recurring administrative process through which almost all major decisions must pass and partly because it is the Government's formal resource allocation process and decision forcing mechanism.[2] Second, the major responsibility for developing PPBS would belong to the agencies. It seemed obvious that no improvement in the decision processes or increase in the quality of information and analysis brought to bear on major issues could be made unless the decisionmakers were interested in the improvement; thus, 98 percent of the staff increasees went to the agencies, not the Bureau of the Budget,[3]

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[2] This in effect was building on 2 previous functions of the budget: (1) Operational control of subordinate units to insure that public funds are spent for only those program objectives specified by law; (2) managerial control to assure efficient use of resources—although stressed timidly. Planning was the additional function tied to the budget. See Arthur Smithies. *The Budgeting Process in the United States* (New York, 1955) for the development of these functions to the 1950's.

[3] Of the 825 professionals assigned specifically to "PPB jobs" within 17 of the agencies with PPB systems, less than 20 are now within the Bureau of the Budget. See Attachment 1 for total staff increases according to basic function.

and, for research in support of PPBS, reliance was placed on agency funds and capabilities. The Budget Bureau did not attempt to create a capacity to do independent research of its own. Third, since many diverse agencies were to be covered, the system established had to be somewhat flexible so as to allow scope for adaptation.*

Pursuant to these premises, 26 agencies have established analytic staffs reporting to the agency head or his deputy and some or all of the component parts of the PPB system; a few of these agencies have initiated the development of a PPB system since January 1969.[4] Five formal parts of the PPB system were identified and their use incorporated into the budget process.[5] These were and are program structures, issue letters, program memoranda, special analytic studies, and program and financial plans.[6]

Each of these is intended to fulfill a particular role within the process. To summarize this conception briefly, the functions of these diverse elements are as follows.

Program structures.—This is a grouping of agency activities into objective-oriented classifications so that programs with common objectives or common outputs are considered together, along with the cost of each. Programs whose outputs are closely related and are, therefore, substitutes or complements are grouped together in broad categories such as "education." Each category is further subdivided into, for example, "development of basic skills," "development of vocational and occupational skills," etc. These subcategories are further subdivided into more detailed elements.[7]

The major purpose of the program structure is to make possible better analysis of agency programs by organizing cost and output information so as to include all areas relevant to a problem. It should also produce a number of other benefits, however. The exercise of putting together a program structure is often very useful in that it forces agency personnel to devote explicit attention to the objectives of different agency programs and to their differences and similarities. In itself, this exercise can produce useful insights. In addition, the program structure, if well done, highlights possible tradeoffs and alternatives that might not be considered if an agency examined its programs only in terms of organizational alinements or appropriations categories. Finally, the structure can reveal gaps in agency programs or new alternatives which have not been considered before.

The use of program structures brings to three the main ways of displaying the budget: Appropriations categories for insuring that obligations and expenditures stay within limits (for control); activity categories—by type of activity—for improving the efficient use of each component (for management); and program categories for relating

[4] Attachment 2 lists the agencies subject to PPBS as of May 1969.

[5] See attachment 3 for the time sequence of the process during a typical budget and planning cycle.

[6] See Bureau of the Budget Bulletin No. 68–9 (Apr. 12, 1968), reproduced in attachment 4. There have been changes in PPB over time as experience accumulated. This paper concentrates on the structure as of the fiscal year 1970 budget cycle and does not attempt to recapitulate the history, although a few changes are mentioned.

[7] See attachment 5, which contains a comparison of program structures and appropriations structures for one program subcategory. Attachment 10 shows the Federal fiscal year 1970 budget according to program structure.

*Further discussion of this issue is found in the papers by Schick and Wildavsky in vol. 3 of this collection.

program objectives and the evaluation of outputs in terms of these objectives (for strategic planning).[8]

Issue letters.—These are letters from the Budget Director to the agency heads defining the major program issues that should receive attention during the current planning and budgeting cycle.[9] They are the product of negotiations between the Budget Bureau and each agency. The rationale behind the identification of major issues is the need to focus the limited analytic resources on the more important problems, the importance of reaching agreement upon the nature of the problems involved, and the value of analysis which can broaden the range of policy alternatives considered by the agency and the President.

Program memoranda.—The program memorandum (PM) for a selected major program category is intended to be a brief document summarizing the decisions made by an agency on major issues in the program category and articulating the reasons for them. It should incorporate the results of any analysis bearing on the issue, identify the alternatives considered and state explicitly the assumptions made in the evaluation.[10]

The requirement of a PM helps insure that decisions are in fact made on the basis of evidence and after consideration of alternatives, that the choices made are deliberate rather than accidental, and that they do in fact represent the decisions of the agency head. Further, PM's are intended to serve as bases of discussion by identifying similarities and differences in the judgments of the bureaus, agencies, and subsequently the Budget Bureau, thus promoting focused, relevant discussion of major problems. PM's also should show not only current year costs, both direct and indirect, of new projects or programs but also costs in the future as well. Finally, they may serve as a means of policy guidance within an agency.

It has taken some evolution for the concept of the PM to reach this form. Originally, the PM's were envisioned as papers which would, for each major program category, set out objectives of an agency, discuss alternative ways of getting there, and choose the best. The PM's during the first year consisted, for the most part, of objectives stated at a very high level of abstraction, a description of the agency's present programs, and no clear link between them. Since then, in successive bulletins, PM's have been more firmly tied to the actual decisions that must be made on the major issues which an agency faces, and not on the entire group of interrelated programs. PM's are now required to include only highly selective issues—just the major issues in each program category. To give an adequate explanation of its decisions on these issues, of course, an agency must still have a realistic idea of its objectives.

Special analytic studies.—This category of document is extremely broad; it means any piece of work analyzing a particular problem with the object of coming to conclusions that can be used in the policy-making process. Such studies could be economic analyses, sociological evaluations, data collection efforts, development of useful techniques, mathematical models, or almost anything else that is appropriate to

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[8] This tripartite division is discussed in Schick, "The Road to PPB: The Stages of Budget Reform," *Public Administration Review*, 26: 4 (December 1966), p. 243.

[9] See attachment 6 for an example.

[10] See attachment 7 for an example.

the particular issue. Ideally, special studies are done in advance on the major issues that should be covered in the PM's. In practice, of course, the process is seldom that tidy. As a result, there are two basic types of studies: those that analyze—in terms of whatever theory and data are immediately available—questions which must be decided in the course of the current planning and budgeting cycle, and those that develop concepts or information for decisions which must be made in the future.[11]

Program and financial plans (PFP's).—This document lays out, by program category, and for the next 5 years, the funds committed to various program areas by past decisions and, wherever feasible, projected program outputs for the same period. (It also includes 2 preceding years and thus includes a total of 7 years; for example, the current program and financial plan includes budgetary commitments for fiscal year 1968 through fiscal year 1974 budgets.)

Since the President must recommend his budget to the Congress in terms of the congressionally established appropriations structure, the plan also provides a "crosswalk" which translates program costs classified by objective-oriented category into individual appropriation requests.

The PFP is intended as a bridge to relate annual budget allocations more closely to longer-term plans and priorities, and thus provides a tool for department heads to gain more discretion over future budgets.

The concept of commitment used for the PFP is necessarily rather amorphous. It includes expenditures or appropriations to which the Government is committed by law or contract, but it also includes obligations that are logically or morally compelled by past decisions. There is some looseness in defining the concept because of the wide divergence in the areas covered and lack of experience in using it carefully. The basic purpose behind the PFP is to identify the extent to which future budget choices are already foreclosed so that remaining options are identified, and so that future consequences of present decisions are routinely identified and considered during the decision process.[12]

In the case of defense, the 5-year defense program displays the defense forces for 8 future years and estimated costs and manpower by force, type, and major mission for 5 future years.* These are total program costs through each of 5 future years as compared to the lower budget levels based on the concept of commitments which are now used by other agencies which develop PFP's. The Defense Department also has a formal planning document prepared by the Joint Chiefs of Staff titled the "Joint Strategic Objective Plan" (JSOP). It arrays a single force over a longer horizon than the 5-year plan but without close ties with resource costs.

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[11] See attachment 8 for an example.
[12] See attachment 9 for an example.

*Further discussion of this issue is found in the papers by Enthoven, and Enthoven & Smith in vol. 3 of this collection.

II. Criteria and Evaluation

From this summary of the objectives of PPBS and the strategy of implementation chosen, a number of criteria of evaluation can be derived. They fall into three general categories of questions.

The first category compares the actual operation of the formal structure with the preconceived ideal. Does it work as envisioned? Do the documents and the process of preparing them have the benefits envisioned? What is the quality of the program structures, issue letters, program memoranda, special analytic studies, and program and financial plans? What basis has been laid for future improvement? What have been the patterns of staffing and education programs?

The second category of questions requires a different review of the same general area of the nature of the process of decisionmaking in the Government. Whereas the evaluation of the formal structure necessarily compares what now exists with a preconceived ideal, it is also important to compare what now exists with previous conditions. That is, even if PPB has not done all that was envisioned, what improvements in the decisionmaking process have occurred? Have the objectives of Government programs been made more precise? Has there been improvement in the structure, quality, and relevance of information on which resource allocation decisions are based? Is the information and analysis generated in the PPB system actually used by the people making decisions? Have tradeoffs between programs been recognized so that the scope of decisions is better suited to the dimensions of the problems? Have realistic alternative programs been developed and considered during the process?

The third and final category of questions concerns the degree to which analysis has been applied to specific problem areas. What specific decisions of the Federal Government on important issues during the last 3 years have been influenced by analysis? Would the analysis have been done without the innovation of PPBS?

A. The Effectiveness of the Formal Structure*

Although many benefits are attributable to PPB, the formal structure has been only partially successful.

While the bulk of this subsection is devoted to appraisal of the individual elements of the system, one basic, general difficulty deserves separate mention at the start. This is that PPB has become in large part a different, competitive method of decisionmaking, appended to the traditional channels of budgeting supported by the appropriation accounts and budgeting through the legislative development and clearance process. The intent was to make the budget and legislative channels broader and more effective, but the result in several cases has been otherwise. Each of these processes has data requirements, time schedules, and semi-independent players with only partial overlap and communication.

These three channels exist in varying forms at the bureau level, the agency level, and in the Bureau of the Budget. While some effort

*Further discussion of this issue is found in the papers by Marvin & Rouse, Schick, Wildavsky, Feldman, and Greenhouse in vol. 3 of this collection.

has been made to merge them and provide adequate analysis at the key decision points of each, progress is gradual.

Program structure.—Twenty-six agencies have developed program structures. These differ widely in quality and utility. Generally, they do represent helpful ways of looking at agency activities for analytic purposes, involvement in their preparation has been educational, and they do tend to highlight programs which should be considered together. In some cases, they have had impact on officials who had not realized the breadth or triviality of agency efforts in particular fields and in pursuit of particular objectives.

Because they have not been the central focus for decisionmaking, they have not always resulted in generation of alternatives and new ideas from the agencies. Final budgets are still resolved primarily by reference to the appropriations structure, although, increasingly, budget reviews are being conducted on the basis of the program structures with the use of a crosswalk to obtain the appropriations structure for submission to the Congress.[13]

There are obvious improvements to be made on many of the structures. Some of them reflect primarily the present organization of an agency and do not represent a serious attempt to think through objectives; others set objectives at too low a level, thus, automatically cutting off major alternatives. Nonetheless, the concept is useful.

For the first time, the fiscal year 1970 budget includes a tabulation of expenditures by agency according to the program structure.[14] Despite the limitations imposed by its level of aggregation and lack of output or benefit measures, the utility of this sort of tabulation seems clear: It raises many questions about the rationale for this particular configuration of Federal expenditures and opens productive lines of inquiry.

Issue letters.—The second element, the issues definition process, has presented greater problems. The Bureau has had difficulty in sending the letters to the agencies early enough in the planning and bungeting cycle, in defining the issues with sufficient specificity, and in limiting the number of issues posed in relationship to scarce analytic capability. In the letters for the fiscal year 1970 planning and budget cycle (January through December 1968), for example, about 380 issues were posed to 17 agencies and were sent as late as the end of April.[15] A few of these issues were already under study through earlier informal agreements between agency and BOB staffs.

About one-half of all issues were analyzed. The reasons for unresponsiveness range from insufficient time or analytic capability to reluctance to deal formally with sensitive problems. When analysis has been done, the proportion of analyses that have proven useful ranges from 16 percent in the human resource programs to nearly 90 percent in the community and economic development programs. In part, this reflects the greater difficulty in analyzing human resource problems than physical resource problems. It also reflects the shorter history of

[13] Attachment 5 shows the relationship of the program structure for part of one agency, HEW, as compared with the appropriation structure. This gives some idea of the scope of the changes involved.

[14] See attachment 10.

[15] Issues in a few agencies are developed without the use of a formal issue letter.

serious analysis or interest in analysis in the human resource agencies.[16]

The process of explicit identification of major issues has utility independent of the follow-up, of course. It sharpens and focuses the general quality of discussion and debate between the various levels of management within each agency and between the Executive Office of the President and the agencies.[17] It also aids the Budget Bureau in performing its functions during the planning and budgeting cycle.

Program memoranda.—The program memoranda (PM's) have been of uneven quality. Most of them have contained useful information, but only about 25 percent could be judged as adequate to excellent. Most of the others have not identified major alternatives, have not concentrated on policy decisions, or have not presented a multiyear strategy directed toward specific objectives and outputs. Many of the PM's tend to be descriptive, verbose, nonanalytic accounts of existing and proposed programs, together with an impassioned plea for funding at the full request. This is not very helpful in making resource allocation decisions, since it is difficult to know if an "urgent necessity" is more important than a "dire national need," a "must expenditure," or a "vital responsibility."

However, PM's have become important sources of program information at all levels in the executive branch because they do give a summary of information related to specific issues within an objective-oriented program category, something that seldom existed before. Where there has been a wide involvement of agency staff in preparing each PM, the broad educational gains for executives and subordinates in itself may have made the exercise worthwhile.

Special analytic studies.—This has been a successful part of the PPB innovation. There is no complete census of the number and results of analysis of studies,[18] but good ones have been done and have been inputs into major policy decisions. In some cases, public policy bargaining has been sharpened and needless friction avoided because of revealing analysis. The preferences and judgments of the decision-maker have been applied more knowingly than would otherwise have been the case.

However, there are great difficulties involved in doing usable public policy analysis. First, analyses aimed at identifying ways to achieve national objectives are greatly constrained by the fact that several tiers of Government, often with many agencies in each tier, are involved in Federal grant-in-aid programs to State and local governments. Seemingly obvious improvements can be thwarted by the multiplicity of agencies and program managers, each with a de facto veto over change. Analysis concerned with improving institutions for serving the public may have higher payoff than that which merely measures returns from public investment or who benefits or who pays.

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[16] See attachment 11 for a summary of the major program issues identified and analyzed during 1968.

[17] Charles L. Schultze, former Director of the Budget Bureau, has commented:

"The most frustrating aspect of public life is not the inability to convince others of the merits of a cherished project or policy. Rather, it is the endless hours spent on policy discussions in which the irrelevant issues have not been separated from the relevant, in which ascertainable facts and relationships have not been investigated but are the subject of heated debate, in which consideration of alternatives is impossible because only one proposal has been developed, and, above all, discussions in which nobility of aim is presumed to determine effectiveness of program."

Schultze, *op. cit.* n. 1, at 75.

[18] For a partial summary tabulation, see attachment 11.

Second, some agencies tend to concentrate their limited analytical people upon fairly minor issues involving a few million dollars or a minor social impact. Sometimes the major issues involving hundreds of millions or billions of dollars are left to rather superficial treatment. There is inadequate incentive for program managers or agency heads to analyze their programs because the result may mean the phasing down of their programs. Therefore, it is not surprising that many Federal executives prefer less or no analysis to more analysis.

Third, individual agency studies do not usually encompass the full breadth of program problems when these are related to the activities of several different agencies. For example, additional manpower training objectives can be partly or completely satisfied by programs in the Labor Department, the Office of Economic Opportunity, the Department of Health, Education, and Welfare, the Veterans' Administration, and the Department of Defense. This has been a major shortcoming of the planning and budgeting process to date.

In the author's judgment the quantity of adequate-to-excellent and useful analysis has increased by about 200 percent during the last 4 years. This may mean only that it has gone from five to 15 on a scale that has 100 as maximum, but it still represents considerable progress. Obviously the agency heads who have been slow in building capable analytic and planning staffs suffer most from a paucity of analysis or mediocre analysis.

*Program and financial plans.**—There have been difficulties with the program and financial plans (PFP's). In the beginning, the agencies were asked for planning figures on how much and in what way they would spend money in the future; the result was a series of lengthy wishlists of what the agencies would like to spend on their programs if no fiscal constraints were imposed. Some agencies showed program increases in all areas of more than 25 percent per year while other agencies showed small increases reflecting a level they thought politically feasible. The lack of consistent constraints on the future availability of public resources made this exercise almost useless.

The definition of the PFP was then changed to include only those future appropriations to which the Government is committed by legal or moral obligations resulting from past decisions or required by present decisions. The definition of "commitment" used has to be somewhat amorphous, but this has restricted the utility of the modified PFP's. Each agency used a somewhat different definition of commitment and then imposed an individual standard of resource limitations. Further improvement is necessary in the definition of commitments and uncontrollable expenditures. Much more precision is possible. Currently, many agencies develop the PFP in haste and guess the measure of program output.

The PFP has been useful to a few agencies and to the Budget Bureau. It has helped to provide some perspective on the level of committed public funds in the future, and even a modest improvement in this area represents progress. By knowing this, public executives can exercise more discretion over future budgeting than they

*Further discussion of this issue is found in the paper by Rivlin in vol. 3 of this collection.

would otherwise. It has also been useful for identifying unforeseen growth of seemingly uncontrollable expenditures.

Staffing and education.—The directions on PPB issued by the Bureau of the Budget instructed the agencies to provide an analytic staff reporting to the Secretary or his immediate subordinate and, in addition, encouraged the creation of analytic staffs located in key bureaus. During 1966 and 1967, the greatest growth in these staffs was at the agency level; between fiscal year 1968 and fiscal year 1969, the greatest growth was in the subordinate organizations.[19]

As of the fiscal 1969 budget year, total new positions for PPBS in the Federal Government was about 825 professionals. Of these, approximately one-third were net additions to agency staffs; the rest came from revision or rechristening of other jobs. There has been no substantial change for fiscal year 1970. However, there are many other personnel who are and should be involved with the PPB process and therefore the equivalent in man years is much higher.* The yearly expenditure for personnel connected with PPBS is roughly $40 million or about 0.0002 of total Federal expenditures. Perhaps the total of in-house and contract services for policy analysis would bring this total to $60 million or 0.0003 of Federal expenditures. The Congress has enacted legislation in several program areas which provides that one-half to 1 percent of the program funds should be earmarked for program evaluation.[20] If this were applied to all Federal programs, program evaluation funds would climb from about $60 million to $1–2 billion or 17–33 times as high as they are now.

At the same time that agencies created analytic staffs, several educational and training programs were started. These were intended to provide both analysts and analytically-oriented program managers for the future. All of these are now supervised by the Civil Service Commission (CSC) with Bureau participation on policy matters. The most extensive of these has been a 9-month course, the Educational Program in Systematic Analysis, given at several major universities. Currently, these universities are Harvard, Massachusetts Institute of Technology, Stanford, University of California at Irvine, and University of Maryland. So far, 246 career Federal employees have attended the program. The CSC also gives a 3-week course in analysis that has been attended by 1,055 people, 2-day orientation sessions that have had an enrollment of 3,350, and a number of other courses in areas relevant to analysis, such as data processing, statistics, mathematics, and cost/benefit and cost/effectiveness workshops.

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[19] See attachment 1.

[20] The following pieces of legislation have such provisions:

1. Public Health Service Act
   a. Sec 309(c)(2), grants to schools of public health.
   b. Sec. 314(d)(1), formula grants for public health services.
   c. Sec. 314(e), project grants for public health services.
   d. Sec. 797, allied health profession.
   e. Sec. 901(a), regional medical programs.
2. Community Mutual Health Centers Act, sec. 262 [sec. 303(a) of Public Law 90–574].
3. Social Security Act, sec. 513(b), maternal and child health.
4. Juvenile delinquency, sec. 404 of Public Law 90–445.
5. Vocational Rehabilitation Act, sec. 7(e).
6. Education programs, blanket authorization in sec. 402 of Public Law 90–247.
7. Work incentive programs, sec. 441 of the Social Security Act.

The executive branch continues to support the designation of funds for program evaluation.

***Further discussion of this issue is found in the paper by Marvin & Rouse in vol. 3 of this collection.**

In addition to the CSC's efforts, the graduate school of the Department of Agriculture and individual agencies have conducted courses in PPB or related subjects, or have developed special orientation or on-the-job training programs. These educational efforts have furnished a large number of the staff members with new skills or valuable orientation. Also, there have been continuing efforts to recruit more qualified personnel from the Nation's graduate schools.

B. IMPROVEMENTS

The above discussion gives a somewhat negative picture of progress to date under PPBS when comparing the actual with the ideal. And, compared with the high hopes and expectations during 1961 in Defense and during 1965 in 20 other agencies, the system has not done as much as anticipated.

Viewed more realistically, from the standpoint of improvements in the process over the pre-PPB situation and the addition of some useful analysis, progress has been significant. Some of these improvements have been discussed in the preceding section on the formal structure. In general, within the agencies and the Executive Office of the President—and also in State and local governments—benefits are observable in several areas.

1. *Definition of objectives.*—During the last 4 years, many agencies have undergone at least a partial reappraisal of their functions and missions. The general result has been an increase in the understanding of programs and in the awareness of possible alternatives and limitations that would not have occurred otherwise.

2. *Information.*—The quality, relevance, and structure of information being developed by the agencies have improved substantially. There is more solid information on program inputs and outputs, related to objectives, than was true a few years ago. The progress in this area includes the all-important element of structuring information into useful form.

The additional information has been shared with the Congress and the public in various ways and especially through improvements in budget and economic documents and budget justifications. This year, *Part 3* and *Special Analysis R* of the budget are products of the PPB system, and several other special analyses include PPB materials; also, some of the data in the latest *Economic Report* was obtained through the PPB system. Several special reports provide additional information, such as the report on oil shale development, evaluation of the Job Corps, and economic impact of air and water pollution abatement.[21] The justifications of appropriation requests submitted by the agencies have reflected the increase in program information.[22]

3. *Use of analysis in decisionmaking.*—As studies are made, they are used increasingly to assist decisionmakers. Some of these are identified below.[23] As indicated above, useful analysis in the domestic agencies has increased by about 200 percent during the last 4 years, and in the Defense Department by a higher percent during the last 8 years.

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[21] For a partial list of studies completed during 1966 and 1967, see attachment 12.

[22] For an example, see attachment 13, which contains excerpts from the fiscal year 1967 and fiscal year 1970 budget submissions to Congress made on behalf of a particular program; most of the improvement is due to PPB.

[23] See p. 628.

4. *Evaluation of programs.*—The Federal Government traditionally has not obtained sufficient feedback on the results of its programs. But there is now general agreement that it is important to measure the accomplishments of programs and to obtain information on whether the concepts that underlie each program prove to be useful. PPB has placed emphasis on this, and during the last 4 years the amount and caliber of program evaluation has increased. As more work is done to make the review and evaluation function a routine part of program administration, progress should be faster. It is still true, though, that the evaluation of existing programs is far from complete and receives less emphasis than evaluation of new programs or the redirection of experimental programs.

5. *Management efficiency.*—During the last 4 years in a few agencies and 8 years in parts of the Defense Department, some attempts have been made to trace the use of resources and measure them against predetermined program plans. These steps have been useful in indentifying the complexities and difficulties of doing this and also in whetting the appetite to try it on a wider scale.

6. *Wider involvement of officials in the budget process.*—One of the standard jokes among BoB officials is that high executives only make policy—they do not worry about budgets. The point, of course, is that no one can hope to make many important policy decisions without concerning himself with the actual allocation of resources, information reflected almost exclusively in the budget. An official who tries to do so will find that he is making policy statements, but, since plans that exclude resource constraints are usually irrelevant, someone else is making the real decisions.[24] Of course, the opposite extreme of annual budgets without plans and priorities to insure more balanced perspective and foresight is also unfortunate.[25] One impact of PPB has been to increase the awareness of agency officials that in many areas the allocation of the agency's resources *is* the policy, and that this does not automatically follow the officials' preferences unless they work at it. The result has been an increasing involvement of top officials in the planning and budgeting process. This is a healthy trend.

7. *Recognition of the legitimacy and necessity of analytic arguments.*—When PPBS was initiated, many of the analysts who joined the Government were familiar with quantitative analysis of different types. They were aware of its value and also of its possible abuses and limitations, so many of the problems involved were not entirely unexpected. But they were surprised to find that large numbers of people would deny the relevance of analysis to Government activities.

This perhaps requires a little explanation. No one was surprised to have it said that analytic treatment of Government problems does not tell one everything, or that political factors are important, or that distribution of benefits is often as important as amount, or that analysis in many areas is difficult. All of this could be readily agreed upon. But the idea that anyone would *deny* any utility to rigorous thought, quantitative where possible, about the gains, losses, and resource expenditures involved in a particular course of action was not expected.[26]

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[24] The usefulness of some planning by the military services reflected in the Joint Strategic Operations Plan suffers from such a lack of resource constraints.

[25] This was one of the reasons for broadening the traditional budgetary process from operational control and management efficiency to include strategic planning.

[26] This is a paraphrase of the definition of systems analysis contained in "Systems Analysis and the Political Process," by James Schlesinger, *Journal of Law and Economics*, Vol. XI, p. 281, 1968.

There have been many reasons for this type of resistance. Partly, it results from the way in which PPB was sprung rather suddenly upon the entire Government. There was also the problem that examples used tended to be drawn from defense, water resources, or other areas where work had been going on for some years; such examples had a degree of real or apparent sophistication that was neither readily attainable nor expected in other agencies. Unfortunately, some analysts overstressed the importance of their own effort relative to that of others, and thereby caused friction with operating officials. Also, there was a fear of replacing a generalist's judgment with the narrower view of an "expert." And there was an element of inertia inherent in large bureaucracies which reduced responsiveness to innovations of any kind.

Over time, some progress has been made in alleviating these difficulties. Instead of resistance to the whole idea of analysis, some recognition is now given that where bargaining is a vital part of any political process, it operates to the benefit of the participants when there exists a better understanding of the costs, benefits, outputs, and beneficiaries of alternative courses of action. That is, there has been a realization that PPB is not a substitute for the bargaining process but an important part of it, and a necessary element in making it work more effectively. There is also a recognition that good judgment is made even better when it can operate with good analysis. The framework of PPB and the systems analysis approach necessary for its use have, to a large extent, achieved legitimacy.

It should be reemphasized that the type of analysis that can be done on most Federal programs is a very long way from the sophistication that is the dream of each new graduate student. Government personnel must use whatever tools are available. Sometimes this means very accurate measures are feasible and needed. Other times the analyst must use very rough methods and only partially reliable data to deal with the complex realities which public policies seek to affect, and this may be all that is necessary anyway. The margins of error may be plus 200 percent and minus 50 percent—as in the case of a very useful recent study on air pollution abatement—and still be adequate. One cannot, and should not, attempt to make fine distinctions when only crude data is available; however, at present public officials are often faced with trying to find good, realistic ways of making even crude distinctions. Improvement can and should be emphasized as the use of program evaluation increases.

8. *Comparisons of related programs in several agencies.*—Some improvement in ways of displaying related programs in several agencies has occurred. These promise to further the establishment of general priorities by measuring the impact of complementary programs irrespective of organizational lines. For example, the 24 manpower programs found in six agencies, the 21 education programs found in five agencies, and the 16 health programs found in three agencies can be reviewed with related programs irrespective of agency identification.

When the manner and assumptions with which one approaches problems are improved, one insures that the conclusions will be better as well. Recognizing the tradeoffs one can make is only a start, of course; the next step is to devise ways to make them more rationally.

9. *State and local interest.*—State and local government officials have shown interest in planning and programing to complement their

budgeting process. The Federal Government has responded by including several projects to assist State and local governments develop their own budget and planning processes and increase the application of systems analysis.[27] Since many Federal programs depend heavily on effective State and local action, this is a very important development.

C. MAJOR ISSUES

The third question in evaluating PPB is whether one can identify major policy issues where analysis assisted the decisionmakers. The answer is clearly "Yes." There are a number of examples in which the amount of resources and/or the manner of their allocation has been influenced, at least in part, by systematic analysis. Such is the case for the following illustrative list of topics:[28]

Electricity for gaseous diffusion plants
Enforcement of civil rights laws
Allocation of legal resources for antitrust purposes
Structure and program of the Institute of Criminal Justice
Internal Revenue Service audit program
Oil shale development
Post Office organization and efficiency
Atomic Energy Commission cascade improvement program
Single class priority mail
Highway safety programs
Supersonic transport
USIA media use
Peace Corps volunteer priorities
Collection of customs duties
Fast breeder reactor program
Coast Guard aviation program
GSA motor pools
FAA air traffic control facilities
Infant mortality
Nursing manpower
Disease control
Medical care prices
Vocational rehabilitation
Nuclear rocket R. & D.
Demand for park recreation facilities
Manpower Development Training Act program
Helium supply
Heavy metals supply
Timber management
Forest roads
Topographic mapping
Work experience program
Saturn V rocket production
High energy physics
Water resources
Air pollution abatement strategies
Water pollution abatement strategies
Earth resources technology satellite
Job Corps program
Distribution of National Archives materials
Distribution of Federal visual aid materials
Coast Guard merchant marine safety program
Optimum modes for supplying Federal agencies with equipment, services and supplies
Building space acquisition
Off-shore mineral leasing policies
Veterans' pension rates
Area economic development

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[27] See the reports from the experimental project directed by Selma J. Mushkin: "PPB Pilot Project Reports from the Participating 5 States, 5 Counties and 5 Cities," State-Local Finances Project, George Washington University, February 1969.

[28] Some of this analysis has been completed and released in various reports. Other analysis is incomplete but will be completed and released in the future; some analysis will likely remain incomplete because the issue has changed.

This is only a partial list. No attempt was made to canvass the Government in an effort to find all possible examples. Other analyses that were useful are not included because of classification problems and other identification problems. In addition, some analyses now underway or newly completed will probably be useful in the future, but the policy decisions have not yet been made.

The role of analysis should not be overstated. In many policy decisions analysis played only a minor role; in other cases not included in the list, analysis was done that played no role at all. This occurred where the relevant decisionmakers were unaware of the analysis; found the analysis was misdirected and did not provide useful information; thought the analysis was more misleading than helpful; were uncomfortable with anything other than their own experienced judgments; or thought the analysis did not include measurements of factors that were most important.

The relationship between the examples above and PPB as a system is unclear. Some of these studies were done strictly within the channel created by the PPB system, others were parallel to it but stimulated by PPBS, and some analytic efforts antedated it. So it is difficult to say which of this work would have been done anyway, which would not have been done, which would have been done more poorly, and which would have been done sometime in the future.

However, the important purpose in initiating PPB was not to initiate a separate system but to improve the quality of public policy decisions. PPB cannot be judged solely by what is accomplished under its formalized mechanisms but by its total impact on the present and future quality of decisions. It has, undeniably, been important in creating a climate more receptive to the use of analysis and more demanding of analysis than existed in the past. If some, or even all, of the response to PPB occurs outside the formula structure necessary to initiate and develop PPB, it should be of little concern.

One of the most difficult questions to answer is whether PPB should have concentrated completely on analysis of individual issues and ignored the concept of PPB as a system of decisionmaking. The argument in favor of this approach is that the requirements of the system may have drained off valuable effort that could have been devoted to actual analysis and evaluation. This issue is especially acute in the light of the comments made here about the value of the documents produced in the system. There is no ready answer.

On balance, though, one is faced with the fact that to increase the use of analysis in Government decisionmaking one needs both a supply of relevant analytic work and a demand for it. One of the objectives of PPB as a system is to create this demand. If one were to rely totally upon the supply to create the demand, several problems would arise:

- Under traditional Government decision methods, even good analysis might lie fallow if its relevance at a specific decision point is unclear;
- Analyses designed without participation by those who must use the results are much less likely to be relevant to actual decisions;
- The Government, not to mention the private sector, already turns out thousands of analyses, evaluations, and studies every

year, some of them quite good. Their influence on policy is often negligible. This seems to indicate that more than supply is needed;

• There is no reason to think that the effort that produced poor PM's would have produced good studies. The PM is largely an exercise in asking the right questions; this is only one step—albeit the most important one—in doing good analysis.

For all these reasons, work to increase demand is as important as the attempt to increase the quantity and quality of the supply of analysis.

III. The Future of PPB

At the beginning of this paper, several pressing problems of modern government were mentioned. These problems remain and the PPBS approach represents the best foundation for making substantial improvements. Therefore, it is not surprising that the executive branch still affirms the objectives of the PPB System and wishes to pursue them with vigor.

Improvements are obviously possible and necessary if decisionmakers and the decisionmaking process are to respond to public needs efficiently and effectively. As experience indicates, care should be exercised so as to not oversell the innovations that will be tried this year and next before they are adequately tested. Improvements to the budget and planning process are planned to proceed as follows.

A. MINIMIZE CHANGES FOR THE FISCAL YEAR 1971 PLANNING AND BUDGETING CYCLE

Until major directions for changes in PPB are identified, changes in general form and substance will be minimized while changes in emphasis will receive attention. This means that the existing directions for the budget and planning cycle, Bulletin No. 68–9, will apply for the fiscal year 1971 cycle. But the emphasis on, for example, the spring preview (June 1969) as the main planning and program evaluation session within the Executive Offices of the President will be increased. The spring preview will include a review of commitments or "uncontrollable" expenditures from past decisions projected for 5 years ahead, of proposed new commitments, of results of major policy analyses, and of program evaluation efforts.

The major components of the PPB system will be used with the following changes in emphasis:

Program structure.—While it is important that the program structure reflect objectives and lend itself to analysis of tradeoffs and choices, there is no need to split accounting or appropriation structures or lowest level decisionmaking unit accounts unnecessarily. Beyond this generality, program structure should be designed according to the nature of each agency.

Issue letters.—Some changes in emphasis are occurring with the issue letters. First, the issue letters are being sent earlier in the cycle; most of the letters were sent before the end of March this year. Second, the number of Major Policy Issues has been reduced from a number of nearly 400 last year to 75 this year and include primarily, although not exclusively, those that have a budgetary impact of $50 million or more in fiscal year 1971 and/or $500 million during the next 5 years or an equivalent social impact. Third, each issue requiring

analysis is developed in full consultation with each agency along with consideration of the resources and time necessary to complete the analyses early enough to be useful in the decisionmaking process. Fourth, before the major policy issue analysis is requested, greater care is given to specifying each issue in a meaningful and rigorous way so as to assure more useful analysis. Fifth, each issue will receive the continuing attention and assistance if necessary of a BOB representative during its analytical phase. Sixth, issues requiring analysis spanning several future years are being developed also. Seventh, issues identification is intended to occur during all phases of the planning cycle; second issue letters have already been sent to some agencies this year. However, the completion of analysis is best accomplished by summer in order to help each agency head decide his fall budget request and for the President to establish his priorities.

Program memoranda.—PM's should be used in reporting the results of major program issues—one PM for each program category in which there is at least one issue. The emphasis should be conciseness, precision, and inclusion of only a minimum of descriptive material.

Special analytic studies.—No modifications are anticipated other than better timing of the effort to enhance relevance to the decision process and improvement in quality.

Program and financial plans.—The PFP's should be improved and used more extensively.

B. EMPHASIZE AGENCY ROLE IN PLANNING, PROGRAMING, AND BUDGETING

Realistically, the relationship between the President's Budget Bureau and any Government agency must be somewhat schizophrenic. In part, the Bureau appears as the adversary who consistently refuses to give an agency all the resources it would like. At other times, it appears to offer assistance to agencies too burdened with day-to-day problems to develop long-range innovations. There is little prospect that this conflict of roles can or should be completely resolved. Its mere existence, however, reduces the extent to which the Bureau can assure marked improvement in the quality of public policy decisions until each agency's capability is increased. It is only realistic to state that the responsibility for improvement in the planning and budgeting processes must be primarily within the agency.

At present, there is a tendency to think of PPB as a tool primarily for the Budget Bureau. This is not the intention, and should not be the result. Each agency head is responsible to the President and he to the Congress for national policy in his area of public responsibility; PPB should be a tool for the agencies to use in meeting this responsibility. It should be made clear that the Cabinet officers and other agency heads are primarily responsible for its implementation and use.

This emphasis on the role of the agencies will be reflected in several ways during the coming year.

1. As stated, fewer major issues will be requested by the Budget Bureau. Only 75 Major Policy Issues have been specified for analysis so far this year in contrast to about 380 last year. In turn, the agencies are being encouraged to develop additional issue analyses for their own use, and for possible future budget justification.

2. Consultation is occurring between agencies and the executive offices before the limited number of major issues are identified for evaluation and analysis.

3. Some additional agencies are developing components of the PPB system to fit their needs. Three agencies have already started since January 1969.

4. Each agency has been requested to survey the adequacy of their planning and analytic staffs at the agency level and within each major suborganization. Even in tight budget years, it is a good investment to expand each agency's capability to evaluate how best to achieve their priorities with very limited funds. To assist, the results of the Budget Bureau's 16-agency study of PPB staffs has been shared with each agency that participated.

5. Educational programs and training programs are being continued and expanded to help upgrade skills in analysis and planning. The Educational Program in Systematic Analysis is being further developed to serve the needs of preparing career personnel for evaluating public programs. Universities are being encouraged to design programs to serve the public need for graduates equipped with both the traditional skills of the professions (e.g., law and medicine) and the additional skills useful for evaluating public resource alternatives; Harvard University has initiated such a program leading to masters' and doctors' degrees in public policy, which is one useful approach for satisfying this need. The Civil Service Commission and other organizations are being encouraged to continue upgrading their courses to assist further in planning, analysis, and budgeting.

6. Agencies are being encouraged to hire additional capable analysts when vacancies occur. Even with the current limitations on personnel ceilings, some vacancies occur and qualified people must be recruited. To assist, the Budget Bureau, in cooperation with the agencies, has contacted deans and department heads of most universities with graduate schools requesting them to call to the attention of their graduate students and faculty members the many opportunities for analyzing public resource use; university people have been supplied with the names of the chief planning officer and the personnel officer in each agency.

7. Improved methods for evaluating public policy are being sought and shared with all agencies. This includes development of improved discounting procedures, sensitivity tests for investment risk, better definitions of direct and indirect benefits and reasonable assumptions of socioeconomic variables (e.g., future changes in GNP, population, labor force, etc.).

8. Techniques for increasing agency awareness of the interrelationship of its own programs to similar ones in other agencies are being further developed, and analysis of major policy issues which affect more than one agency are being accomplished.

9. Improvements to the planning and budgeting process are being implemented in a more flexible way so as to recognize each agency's unique characteristics and capability for innovation.

10. Agencies are being encouraged to review their procedures for analyzing legislation to insure that adequate analysis is done before it is recommended to the President and the Congress. The discipline inherent in the planning and budgeting cycle could help provide badly needed analysis in this area.

11. Agencies working to develop social indicators of the need (or lack of need) for particular public programs are being assisted in their efforts.* Some agencies have been helpful in laying some groundwork, but what is needed is a cooperative effort among all affected agencies. To assist, a conceptual format for showing data that measures social conditions in conjunction with data that measures the impact of public and private expenditures aimed at improving those social conditions is being developed. For example, data on the current stock of housing, quality measures, and measures showing changes over time are contrasted with expenditures on housing and projections of the time period needed to achieve specified levels of numbers and quality at current rates of improvement.

12. Agencies are being helped to develop a conceptual framework for comparing and evaluating all their programs. With the proper format, the existing data and informed judgments could provide a useful summary of the social impact of Federal programs and/or the limits of our knowledge. These Program Overviews are attempting to provide the following information:

a. The physical goods or services each Federal program produces. For example, the Manpower Development Training Act Institutional Training Program is estimated to provide 57,000 man-years of training in fiscal year 1969: the Hill-Burton hospital construction program is estimated to provide 18,618 new hospital beds or the rough equivalent of 2,000 additional patient-years of hospital care; a water project provides acre-feet of water and kilowatt hours of electricity; etc.

b. The cost of each unit of goods or service, both on the average and for small additions. For examples, the average Federal cost, based on an average of 18 weeks of training, for MDTA institutional training is about $1,400;

c. The dollar value of the good or service in the economy, where possible. For example, an estimate has been made from limited data that MDTA institutional trainees can be expected to receive $700 additional yearly income for each of the next 10 years or about $4,700 in present value terms (10-percent discount rate). However, in many cases it is not possible to find suitable market prices, such as for military aircraft.

d. The characteristics of the beneficiaries. For example, the trainee beneficiaries of MDTA institutional training are estimated to be 50 percent Negro, 65 percent from households below the poverty threshold, 40 percent below 21 years of age, 45 percent from central cities of cities over 250,000 people.[29]

C. IMPROVEMENTS TO PLANNING AND BUDGETING FOR THE FISCAL YEAR 1972 CYCLE

Between now and September, an evaluation of the present process will be completed. Such an evaluation will benefit from—

The papers submitted to the Joint Economic Committee's Compendium on the PPB system and the subsequent hearings;

[29] For further explanation see statement of Jack W. Carlson before the Subcommittee on Economy in Government of the Joint Economic Committee, on "Guidelines for Estimating the Benefits of Public Expenditures," U.S. Congress, May 12, 1969.

*Further discussion of this issue is found in the paper by Sawhill in vol. 1 of this collection.

Other papers and hearings of the Congress;

The studies of the General Accounting Office concerning staffing in the agencies;

Studies by the Budget Bureau concerning the operation of the PPB process in several agencies and an assessment of the output of the system in terms of improved decisions, documents with useful analytical and descriptive material, and the improved capability to analyze public policy issues in the future;

A major study of potential informational improvements by an outside contractor to the Budget Bureau;

Evaluations of the system by the planning and budgeting officers who have participated in it; and

Evaluations of knowledgeable people in the academic community and other parts of the private sector.

The major changes for the next cycle should be identified by September 1969 and will be implemented shortly thereafter. It is already obvious, for example, that the analysis of policy issues could be greatly improved if policy issues are identified even earlier than was the case for the fiscal year 1971 cycle.

D. ASSIST STATE AND LOCAL GOVERNMENTS IMPROVE THEIR OWN ANALYSIS AND PLANNING PROCESSES

In many program areas, Federal expenditures are, for all practical purposes, administered by State and local governments. If these funds—$26 billion in fiscal year 1970—are to be used with maximum effectiveness, the capability to analyze and evaluate programs must exist at these levels. Therefore, several projects have been initiated to further this goal. Some of the present projects include—

An experimental program has just been completed under which five city, five county, and five State governments were given grants to implement PPBS:*

An experimental BOB–HUD project has been initiated to survey areas of greatest potential improvement in State government planning, programing, and budgeting functions. Two States have been surveyed and HUD has provided some funds to augment State funds to implement the recommendations in areas of greatest possible improvement. Six other States are scheduled for fiscal year 1970.

The development of data showing Federal expenditures and socioeconomic data on a geographic basis and analyzing social impact of programs is going forward.

These efforts will continue and be of increasing utility to State and local governments. In return, the Federal Government will be assured of more effective use of the federally collected funds it passes on to these governments.

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*Further discussion of this issue is found in the paper by Mushkin & Cotton in vol. 1 of this collection.

LIST OF ATTACHMENTS

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ATTACHMENT 1

STAFF INCREASES FOR PPBS

Number of PPB Positions Shown in the Fiscal Year 1969 Budget [1]

	Added 1966–68	Added 1968–69	Total, 1969
Central staff; analytic:			
Professional	177	21	198
Support	82	6	88
Program monitoring and data handling:			
Professional	105	9	114
Support	46	5	51
Other (including subordinate agencies):			
Professional	428	85	513
Support	159	22	181
Recapitulation:			
Total professional	710	115	825
Total support	287	33	320
Total	997	148	1, 145

[1] Represents only 21 agencies. Department of Defense (military), Central Intelligence Agency, Small Business Administration, Civil Service Commission, and Tennessee Valley Authority are excluded.

ATTACHMENT 2

AGENCIES WITH PLANNING-PROGRAMING-BUDGETING-SYSTEMS AS OF MAY 1969*

Department of Agriculture
Department of Commerce
Department of Defense—Military functions (including civil defense and military assistance)
Department of Defense—Corps of Engineers, civil functions
Department of Health, Education, and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Justice
Department of Labor
Post Office Department
Department of State (cultural affairs only)
Department of Transportation
Department of the Treasury
Agency for International Development
Atomic Energy Commission
Central Intelligence Agency
Civil Service Commission
General Services Administration
National Aeronautics and Space Administration
National Science Foundation
Office of Economic Opportunity
Peace Corps
Small Business Administration
Tennessee Valley Authority
U.S. Information Agency
Veterans' Administration

*Some other agencies are considering adopting components of the PPB System during 1969.

ATTACHMENT 3

THE PPBS PROCESS IN A TYPICAL BUDGET YEAR

Planning and Budgeting Cycle for Fiscal Year 1971 (July 1970–June 1971)

1968	
November–February 1969	Identification of major policy issues affecting the fiscal year 1971 budget and/or subsequent budgets, or having major social impact. Issue letters sent by the Director of the Bureau of the Budget to each agency head.
May–June	Results of issue analysis reported to agency heads and then to the Budget Director. Commitments or uncontrollable budget expenditures based on past decisions are identified and projected 5 years ahead along with the identification of proposed additional or new expenditures and the identification of low priority expenditures for the fiscal year 1971 budget.
June–July	Bureau of the Budget holds spring preview of major policy issues and plans for the reorientation of existing programs and/or identification of new low priority programs. The implications of changes in policy and spending levels are projected ahead for 5 years.
August	The Budget Bureau releases tentative guidance by agency and selected programs for each agency to develop final budget requests.
September–October	Final budget and program and financial plan are submitted by each agency to the Bureau of the Budget.
October–November	Budget holds final agency hearings and budget review.
November–December	President decides on the major budget issues.
1970	
January	Presidential budget message transmitted to the Congress.
February–June	Hearings on the budget by various committees of the Congress.
March–July	Congressional approval of the major items in the fiscal year 1971 budget.
July–June 1971	Fiscal year 1971.

ATTACHMENT 4

GUIDANCE FOR PPBS

(Bureau of the Budget Bulletin No. 68–9)

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., April 12, 1968.

BULLETIN No. 68–9

TO THE HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS
SUBJECT: Planning-Programing-Budgeting (PPB) System

1. *Purpose and scope.*—This bulletin contains guidelines for continued development of integrated planning-programing-budgeting (PPB) systems and outlines requirements for PPB submissions to the Bureau. This bulletin supersedes Bulletin No. 68–2, dated July 18, 1967. Bureau of the Budget Circular No. A–11 is being revised to be consistent with these instructions.

This bulletin applies to the agencies listed in section 1 of attachment A. Other agencies (listed in section 2) will be contacted by the Bureau with respect to the extent of required compliance to the guidance provided in this bulletin.

Attachment B provides guidance on the preparation of program and financial plans (PFP's). This guidance has been developed as a step toward making the PFP a more useful tool for planning. The use of this guidance is not required of all agencies this year. It will be used this year with a few selected agencies which agree to make a pilot application to test and refine the concepts involved. While only a few agencies are involved in the pilot effort, other agencies are encouraged to use attachment B guidance this year. (See paragraph 7a). Bureau staff will be available to advise on application of this guidance.

The principal objective of PPB is to improve the basis for major program decisions in the operating agencies and in the Executive Office of the President. This requires clear statements of alternatives and of the reasons for decisions. Program objectives are to be identified and alternative methods of meeting them are to be subjected to systematic comparison. Data are to be organized on the basis of programs, and are to reflect the future as well as current implications of decisions. As in the case of budgeting, planning and programing apply not only to current programs but to proposals involving new legislation.

The budget is the financial expression of the underlying program plan. Review by the Bureau is conducted primarily in program terms. It is essential that the products of the PPB system—the program memoranda, special analytic studies, and program and financial plans

(each defined in paragraph 2)—provide adequate bases for program decisions. Since the budget is transmitted to the Congress in terms of individual appropriations, there must be a clear relationship of program decisions to appropriation requests.

2. *Elements of the system.*—The PPB system provides for identification of program issues and consideration of such issues in the framework of a program structure. The system has three basic elements: Program memoranda, special analytic studies, and program and financial plans.

a. *Program memoranda (PM's).*—A PM presents a statement of the program issues, a comparison of the cost and effectiveness of alternatives for resolving those issues in relation to objectives, the agency head's recommendations on programs to be carried out, and the reasons for those decisions. PM's, therefore, provide the documentation for the strategic decisions recommended for the budget year.

b. *Special analytic studies (SAS's).*—The special analytic studies provide the analytic groundwork for the decisions reflected in the PM's. Studies are of two types, both of which are essential to effective operation of an agency PPB system and to annual budget review.

Some SAS's will be performed in order to better resolve an issue in the budget year. These studies will be initiated and completed during the year and their results will be shown in the PM submitted in support of the budget request.

The second type involves studies which continue beyond the budget year. A continuing study will develop on a longer run basis the conceptual understanding necessary to improve the data available, to evaluate the implications of agency objectives, and to provide an analytic basis for deciding future major program issues (see paragraph 3).

c. *Program and financial plans (PFP's).*—The PFP is a comprehensive multiyear summary of agency programs in terms of their outputs, costs, and financing needs over a planning period covering the budget year and 4 future years, or a longer period if this is appropriate to agency programs. While PM's deal primarily with the resolution of specified program issues, PFP's provide a continuing record from year to year of the outputs, costs, and financing of all agency programs. Thus the PFP is the basic planning document of the agency PPB system.

To meet Bureau needs, agency PFP submissions are to present specified data on outputs, costs, and financing over a 7-year period: the past, current, and budget years, and 4 future years. Since PM's submitted to the Bureau of the Budget present agency recommendations only on major program issues, the PFP serves as the vehicle for summarizing all program recommendations for budget review.

In addition to the material outlined above, the Bureau will continue to request, at staff level, such additional information as is necessary to better understand agency programs, PM's, special analytic studies, PFP's, and budget submissions.

3. *Major program issues (MPI's).*—A major program issue is a question requiring decision in the current budget cycle, with major implications in terms of either present or future costs, the direction of a program or group of programs, or a policy choice. The most im-

portant feature of the statement of a major program issue is the identification of specific alternative courses of action, and the costs and benefits of each. Pertinent legislative as well as budgetary considerations should be highlighted.

4. *Program structure.*—The program structure should group agency activities in a way that facilitates comparisons of the cost and effectiveness of alternative approaches to agency objectives. To serve this purpose, program classifications should be objective oriented, grouping activities with common objectives or common outputs. Each agency is responsible for its own program structure, subject to Bureau review. Continuing agency review of the program structure is required, with modification as necessary to meet changing conditions. The Bureau should be consulted on structural problems and proposed changes.

Normally, an agency program structure will include three levels of classifications: program categories, program subcategories and program elements. These should be established in accordance with the following general criteria.

a. *Program categories.*—The categories in a program structure should provide a suitable framework for considering and resolving major questions of mission and scale of operations which are a proper subject for decision at the higher levels of management—within the agency and within the Executive Office of the President. An agency generally should have between five and 10 program categories.

b. *Program subcategories.*—Subcategories should provide a meaningful substantive breakdown of program categories, and should group program elements producing outputs which have a high degree of similarity.

c. *Program elements.*—A program element covers agency activities related directly to the production of a discrete agency output, or group of related outputs. Agency activities which contribute directly to the output should be included in the program element, even though they may be conducted within different organizations, or financed from different appropriations. Thus, program elements are the basic units of the program structure.

Program elements have these characteristics: (1) They should produce clearly definable outputs, which are quantified wherever possible; (2) wherever feasible, the output of a program element should be an agency end product—not an intermediate product that supports another element; and (3) the inputs of a program element should vary with changes in the level of output, but not necessarily proportionally.

d. *Treatment of support and indirect activities.*—In dealing with the costs of support and indirect activities, arbitrary allocations which are made solely for the purpose of distributing all costs should be avoided. Allocations should be made only where they contribute to better decisions.

When supervisory and support operations (such as comptroller, personnel, and administrative service operations) are completely involved in a single program element, they should be reflected in that element.

In many situations, however, such operations may support two or more program elements. In such cases, the costs of the supervisory or support activities should be distributed to each supported program element—if there is a reasonable basis for doing so, and if those costs

may be expected to vary reasonably in line with trends in each of the program elements involved.

Where there is no reasonable basis for allocating such activities, or where allocation would not contribute to more effective decisionmaking in budget review, these activities should be reflected in appropriate separate classifications within the program structure.

e. *Adaptation of program structure to decisionmaking needs.*—There are many instances where the program structure, if it is to facilitate decisionmaking, must cut across organization lines, appropriations, and other classifications. Pursuit of absolute uniformity and consistency in development of a program structure will, however, be counterproductive in some instances in terms of the major objective of PPB: The improvement of the basis for decisionmaking.

For example, there are cases where a specific target group is an important focus of decisionmaking, while the services provided to the group would normally fall within several different classifications of the program structure. This would apply, for example, to a group of refugees who are furnished health, education, and other services, but where decisions in the executive branch are in fact made in terms of this group of refugees as a whole. In such a case, all activities concerning the group should be reflected in one unique program element within the subcategory and category predominantly involved, unless this would produce significant distortions in the basis for decisionmaking in the other parts of the program structure.

A second example involves certain overhead and support activities or administrative expense items, which may be technically allocable among various program elements under guidelines furnished above. In some instances, these costs are large collectively but, distributed among many program elements, are not a significant factor in decisions regarding those program elements. Where this is true, and where decisionmakers in the executive branch must focus at some point upon the costs in total, it is better to segregate them within the program structure, rather than allocating them.

As a third example, excessive fragmentation of appropriations and organizations should be avoided. For example, if about 80 percent of an appropriation or the costs of an organization would fall within one part of the program structure, the entire amount should be so allocated unless this would cause significant distortions in the basis for analysis and decisionmaking. Further, there is usually little to be gained by spreading very small appropriations or small parts of an appropriation within the program structure. Normally, they should be allocated in total to that element into which the costs predominantly fall.

Agencies should review their structure in light of these criteria. In addition, Bureau representatives will advise individual agencies of a number of specific instances where the program structure should be modified in accordance with the foregoing.

f. *Relationship to other classifications.*—As part of its effort in the review of program structures in individual agencies, the Bureau will continue to work toward development of a Government-wide program structure. As this effort progresses, agencies will be asked to adjust their structures to produce a comprehensive and compatible pattern across agency lines.

To facilitate the translation of program decisions and related data into the classifications used in the budget, it is desirable to bring program and appropriation structures into as close a relationship as possible. In refinement of the PPB system, the aim is to interrelate, to the maximum extent, the functional classification employed in the budget, the agency program structures, and the appropriation activity classifications in the budget. Attention should be given to changes in structures which will contribute to this objective.

5. *The program memoranda (PM's).*—PM's are oriented to major program issues. They may cover all or only a part of a program category, or cut across several program categories. Where a category is not involved in a major program issue, the category will not be covered by a PM. Thus, PM's will not necessarily cover the agency's entire program.

For internal purposes, and to provide for the September 30 budget submission to the Bureau, agencies should develop and maintain narrative and tabular material outlining the strategy and assumptions underlying the projections in the PFP for each program category. These category summaries will make reference to PM's as appropriate. Specific instructions regarding Bureau requirements are included in Circular No. A–11.

(*a*) *Content of the PM.*—The PM shows what choices the agency head has made, includes the major program recommendations of the agency for the upcoming budget, and defines authoritatively the strategy underlying those program recommendations. In addition to identifying the strategy upon which agency plans are built, the PM should show how the resolution of major program issues fits into or modifies the program strategy. This integration of the objectives of the agency program with specific decisions made on program issues for the budget year is one of the principal functions of the PM.

The PM also shows why particular choices have been made, by identifying agency objectives in a measurable way, and comparing alternative programs in terms of their costs and who pays them, and their benefits and the group benefited. The PM should deal explicitly with the legislative implications of the alternatives presented and should summarize the analytic basis for choice among those alternatives. The supporting analyses may be contained in separate appendixes to the PM. Where special analytic studies cover the detailed analysis, and have been made available, a PM need only summarize the findings and make reference to the studies.

The PM's provide internal guidance for preparation of the agency budget submissions, and a basis for major program decisions in budget review. Therefore it is essential that the choices among alternatives be recorded in the PM's and that the reasons for the choices be stated. Where special analytic studies have not been made, the PM will indicate whatever basis exists for choice among the alternatives.

A PM should be no longer than 20 pages, and should be so prepared that it can readily be used by the agency head and the Director of the Bureau of the Budget.

(*b*) *Submission requirements.*—Each agency will receive from the Bureau an issue letter requesting special analytic studies and identifying the major program issues to be covered by PM's for the upcoming budget cycle. Agencies may suggest additional issues and submit re-

lated PM's if they will contribute to more effective review of budget requests.

In response to the issue letter, draft PM's will be submitted in accordance with a schedule developed with the Bureau. The draft PM's will permit review by the Bureau of the statements of the major program issues which the agency will address, and the analytical material and methods being employed. Draft PM's are not commitments on the part of the agency to program decisions.

Final versions of each PM (and special analytic studies addressed to budget year problems) are to be submitted on September 30 with the agency's budget submission. These final PM's should indicate the recommendation of the agency head on all identified major program issues.

PM's are required to be submitted to the Bureau only in connection with major program issues, as outlined above. Agencies are encouraged to develop PM's in connection with other issues; submission of these additional PM's to the Bureau will be welcomed.

6. *Special analytic studies (SAS's).*—Special analytic studies provide agency heads and the Bureau with information for making decisions among alternative ways of achieving program objectives. There is no established format nor length for these studies—these will vary with the subject matter involved. Normally, a special analytic study should be conducted for each major program issue. However, staff shortages, the lack of data or of conceptual bases for analysis, and other circumstances may in some cases make it impossible to provide a special analytic study for each PM.

Usually a study is not coextensive with a program category. Dealing with a specific major program issue, a study may cover a specific aspect of a program category, or may cut across program category lines. As soon as practicable after receipt of the issue letter, agencies should notify the Bureau of studies underway and planned. If these plans change significantly, the Bureau should be advised.

7. *Program and financial plans (PFP's).*—The PFP covers data relating to the outputs, costs, and financing of all agency programs. The PFP should reflect the future implications of current and past program decisions of the agency head and, subsequently, of the President. The outputs, costs, and financing of agency programs are to be shown in the PFP for each program element, grouped in terms of the program structure by category and subcategory, and for each of the 7 years covered by the PFP.

The years beyond the budget year are included to show the future implications of past and current decisions. This projection, therefore, is not intended to be a justification of the future budget totals for the agency or for major programs. It is intended to be a reflection of the level to which existing decisions have committed the Federal Government.

The PFP shows, on the output side, the expected benefits of multiyear projections and, on the cost side, the future financial requirements that are the result of the accumulation of program decisions made for the budget year or in past years.

Agency systems will include procedures for preparing and updating PFP's in a way which is suited to the agency's programs and which satisfy requirements of this bulletin.

(*a*) *Scope and content of PFP.*—The PFP covers the total operations of the agency. Data should not be excluded because certain opera-

tions are not specifically covered by the existing program structure, or because the PPB system has not yet been extended to those operations. Data for such operations should be shown on a separate line of the PFP.

As a general rule, agencies will prepare PFP's on the same basis as for the 1969 budget. However, attachment B provides new guidance with respect to the preparation of PFP's. For the 1970 budget, this guidance will be used on a pilot or test basis by selected agencies, for which separate arrangements will be made by the Bureau. It is planned to make this guidance mandatory for all agencies next year, subject to whatever modifications are suggested by experience with the pilot applications this year. Other agencies are encouraged to review the guidance carefully; apply it for the 1970 budget to the extent they find it practicable; advise the Bureau of any problems; and make plans for application of the guidance next year.

(*b*) *Submission requirements.*—Specific tabulations to be used within an agency should be developed as appropriate for the programs of the agency. For submission to the Bureau, the following are required:

(1) Table I—Outputs and costs by program element (agency formats are acceptable).

(2) Table II—Costs by program category and subcategory, and, for the budget year, budget authority by program category and subcategory.

(3) Table III—A translation of financial requirements from the program structure to agency appropriations. (See Circular No. A–11 for format and instructions.)

A PFP will be submitted to the Bureau twice each year: on September 30, with the agency's budget submission to the Bureau, and not later than February 15, updated for all years to reflect the decisions reached in the budget. The initial submission will reflect the agency request for the budget year and, for the 4 future years, the cost of carrying out the programs to which the Government would be committed under those recommendations. The February 15 submission will reflect for the budget and future years the costs of carrying out the programs to which the Government is committed by decisions reflected in the budget. The PFP required for submission to the Bureau is not intended as a projection of requirements as foreseen by the agency over the planning period.

c. *Relationship to PM's and SAS's.*—This constraint upon the data to be reflected in the future years of the PFP submission to the Bureau does not apply to PM's and special analytic studies. These are decisionmaking documents which require full consideration of all relevant outputs, costs, and financing needs over the planning period used by the agency, and comprehensive examination of the benefits and costs of alternative approaches to resolving the issues. Such analysis requires an evaluation of the total scope of a proposed program and its anticipated benefits, and consideration of such factors as systems costs, marginal costs, and economic opportunity costs.

8. *Timing and submission of PPB documents.*—PPB is a continuous process. Analytic work cannot produce once-and-for-all answers, nor can periodic planning and programing efforts produce a systematic and effective decisionmaking process. On the other hand, successive analyses within the framework of an integrated PPB system which operates as part of the total management complex of the agency, can

assist in producing successively better Government decisions and in responding to new initiatives and changing circumstances. The decisions to which PPB contributes are basically incorporated in two annual processes—the budget and the legislative program of the President. It is necessary that the preparation and presentation of PPB documents fit the schedules for these two processes. The timing of PPB submissions and the actions involved in each time frame are outlined below.

(*a*) *Illustrative annual cycle for PPB submissions.*—The agency PPB system and related internal procedures should be geared to the following schedule:

In first quarter of calendar year.	Bureau sends letters to agencies identifying Major Program Issues for which PM's are required and suggested special analytic studies. Agency provides Bureau with list of SAS's underway and planned.
Feb. 15 through July 15.	Agencies submit by Feb. 15 PFP updated to reflect programs in President's Budget. Agencies begin submission of draft PM's on a staggered schedule agreed upon by the Bureau and the agency.
March through August.	Bureau works closely with agency staff who are preparing required PM's and SAS's, and reviews those documents for adequacy as a final submission.
July–September.	Agency head makes final decision on his program recommendations. Agency completes final PM's and related SAS's and revises PFP's—adding 1 year and making the PFP conform to agency head's decisions. Bureau responds to agencies on draft PM's submitted in response to issue letter.
Sept. 30	Agency submits final PM's, SAS's as required, PFP, the annual budget, and the annual legislative program to the Bureau.
October–December.	Bureau reviews agency submissions and recommends to the President; Presidential decisions made and communicated to agency.
January	President's budget is transmitted to the Congress. Agency updates PFP to conform to that budget, for Feb. 15 submission to the Bureau.

(*b*) *Copies required.*—Six copies of PM's, SAS's and PFP's should be submitted to the Bureau. Bureau staff may request additional copies.

9. *Responsibility, staffing, and training.*—Responsibility for the development and use of PPB systems rests with the head of each agency. Agency heads are requested to take such action as is necessary to insure that line managers participate in operation of the PPB system, and that they have available sufficient resources to insure participation in the development of PM's, SAS's, and PFP's.

Agencies will be called on to provide pertinent data on the results of resource allocation decisions made under PPB. The accounting system(s) of the agency should provide adequate support for the information utilized in operation of the PPB systems. Where the maintenance of specific accounts for program classifications is not

justified as an efficient and practical approach, information for the past year may be developed through cost allocation or analysis techniques. In such cases there should be a technical note appended to the PFP to indicate the techniques used. Cost distribution practices should furnish a suitable basis for program decisions and provide managers concerned with reliable information.

Agency reporting systems should provide timely data on outputs and costs in budget execution, so that programs may be effectively carried out according to approved plans and related operating budgets. Such systems should be designed to provide data suited to the needs of managers at each level, and to furnish information useful for planning and programing in the next cycle of operations.

To make PPB a fully effective system, a general understanding of the methods and purposes of PPB must be generated throughout the agencies. Agencies are encouraged, therefore, both to make use of the various training and educational programs offered through the Civil Service Commission, and to establish internal orientation and training courses as appropriate.

CHARLES J. ZWICK,
Director.

Attachments follow:

Attachment A
Bulletin No. 68–9

AGENCIES TO WHICH THIS BULLETIN APPLIES

Section 1

Department of Agriculture
Department of Commerce
Department of Defense—separate submission for:
    Military functions (including civil defense and military assistance)
    Corps of Engineers, civil functions
Department of Health, Education, and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Justice
Department of Labor
Post Office Department
Department of State (excluding Agency for International Development)
Department of Transportation
Department of the Treasury
Agency for International Development
Atomic Energy Commission
Central Intelligence Agency
General Services Administration
National Aeronautics and Space Administration
National Science Foundation
Office of Economic Opportunity
Peace Corps
United States Information Agency
Veterans' Administration

Section 2

Civil Service Commission
Federal Communications Commission
Federal Home Loan Bank Board
Federal Power Commission
Federal Trade Commission
Railroad Retirement Board
Securities and Exchange Commission
Small Business Administration
Tennessee Valley Authority

Attachment B
Bulletin No. 68-9

PFP Guidance

The tables that comprise the program and financial plan (PFP) include data on outputs, costs and their financing. This attachment presents guidance on the concepts to be applied in preparing the PFP. For the 1970 budget, this guidance is not mandatory for all agencies, but will apply in all respects to selected agencies which will be notified by the Bureau (see paragraphs 1 and 7a of the Bulletin). It is planned to apply this guidance to all agencies next year, subject to modifications suggested by the pilot applications. All agencies are encouraged to review this guidance carefully; apply it for the 1970 budget to the extent practicable; and make plans for mandatory application of the guidance next year.

1. *Concept of outputs.*—Table I of the PFP submission is to display outputs, i.e., a quantitative measure of the end products or services produced by a program element. The types of outputs to be reflected in the PFP may differ from those to be considered in the PM's and special analytic studies. The PFP is intended to reflect, for decisions reached, the outputs in relatively unambiguous terms. Outputs in these terms might include the number of B–52 squadrons, number of workers trained, etc. Such measures are useful for internal agency programing, although they do not measure the benefits of the program or progress against agency objectives.

PM's and special analytic studies should reflect, for a given program element, a much broader concept of the benefits produced by the element. For example, PM's and studies might consider ordnance on target for B–52 squadrons, or the impact of a training program upon worker earnings—thus facilitating the comparison of either with other elements that produce similar benefits. Normally, however, there will be differences in output mixes, and special qualifications or breakouts required, which will make it difficult to express such measures in unambiguous terms in the PFP. In short the PFP will normally reflect the outputs associated with decisions reached. An appreciation of the reasons for the decisions, and the relevant cost-benefits comparisons, will normally require recourse to PM's and studies.

However, if meaningful measures of achievement and effectivness for a program are available, they should be displayed in the PFP, either on a separate line in table 1, properly defined, or by means of a supplementary table. In certain cases, such as research programs, where benefits are difficult to define, the best available quantitative nonfinancial descriptions of the program should be used.

In some cases—a recreation program, for example—costs in the PFP may best be related to the capacity of proposed recreation facilities, and this might serve as the best output measure. Attainment of the objectives of the program, however, may best be shown by a measure of the use of the facilities—which is an important factor for decisionmaking. Both of these measures, therefore, are relevant and appropriate for presentation.

Agencies should strengthen their efforts to produce more suitable program measures—particularly measures of program benefits, and measures that show the achievement of objectives. These are of prime

importance for analysis and for making informed program decisions.

2. *Concept of costs—the "program level."*—The financial information to be shown in tables I and II of the PFP submission is to reflect the program level for each year in the respective classifications. In most cases, the best financial measure of program level will be budget authority. This includes, for example, lending authority for many loan programs; and new obligating authority for most operating programs, some construction projects, grant programs, and research activities wherever such data are the most suitable indicator of the level of effort contemplated for the program.

There are a number of cases, however, where budget authority is not a good measure of program level because of the type of program and the nature of financing. In such cases, other measures should be used as appropriate, and they should be identified in the stub column of the PFP. Some examples include:

a. For construction and other projects financed on an incremental basis, the program level *for the budget year* should reflect the full amount to which the Government will in fact be committed for projects for which approval is requested in that year. For example, if a project will ultimately cost $200 million, and if the first year budget authority would be $40 million, the PFP should show for the budget year:

(1) A program level of $40 million if, as a practical matter, the project could be stopped at that point.

(2) A program level of $200 million if, as a practical matter, the project would have to be completed once begun.

(3) A program level between $40 million and $200 million if there is an interim stopping point.

b. In many trust funds, budget authority represents appropriated receipts—which are not a good measure of the level of activity because not all receipts will be used under the planned program. In these cases budget outlays differ markedly from budget authority and should be used to show the program level.

c. In some loan and grant programs, available funds are reserved upon approval of an application. These reflect the program level better than budget authority and should be used in the PFP.

d. In some cases, the budget authority provided for a given year does not provide a good measure of program level for that year because of the application of unused balances from other fiscal years. For example, an agency may propose a $50 million project to be financed from an unused prior-year appropriation, without use of any authority provided in the budget year. In such a case, the PFP should reflect a program level of $50 million. If, in this situation, the project was estimated at a $75 million total cost, with $25 million drawn from authority requested in the budget year, the PFP should show a $75 million program level in the budget year.

e. Another exception involves loan collections, sale of assets, and similar transactions—the proceeds of which are used to finance programs in lieu of budget authority. In the budget, these collections are sometimes applied at the appropriation or agency level, and sometimes as departmentwide deductions. An example of the former is the sale of equipment to another government or agency, where the proceeds are credited to the appropriation which originally financed the acquisi-

tion of the equipment. In some loan programs, loan collections are offset against budget authority. Regardless of how they are treated in the budget, such transactions should not be netted from the program level for program elements in the PFP.

f. Some agencies, such as Post Office, parts of GSA, and certain support organizations in the Department of Defense, exist almost entirely to provide services for other agencies or the public, for which the performing agencies are paid. In cases such as these, the program classifications of the performing agency should reflect gross program levels, receipts earned, and net program levels. Agencies which levy user charges or realize proprietary receipts which are creditable against budget authority may follow this practice if the program level is in fact substantially determined by the volume of such charges or receipts.

Reimbursable work in general (e.g., provision of ADP services to another agency) may be treated in the manner just outlined or, at the agency's option, excluded from the PFP.

In cases where a program is financed by the Federal Government and others, the total program level for the element involved may be shown. If this is done, the non-Federal financing should be shown as a deduction at this point, so that the PFP will show the program level which the Federal Government is committed to finance.

The total program levels for the agency are to be reconciled, at the bottom of tables I and II of the PFP, to total budget authority for each year shown in the PFP. Total budget authority for the past year, current year, and budget year must agree with the three columns shown in the budget schedules. Bureau staff are available to assist in this reconciliation effort, and in identifying the most suitable measure of program level to be used for individual programs.

3. *Concept of controllability, the "commitment classification".*—To improve the usefuless of financial information in the PFP for budgetary and planning purposes, a commitment classification is to be employed in table II of the agency PFP submission. This classification will group financial data for programs according to the degree of control that can be exercised by the executive branch in the allocation of resources in the budget and future years (see illustrative table).

Program information should be based upon existing legislation, plus specific legislative proposals put forward by the President. Where activities are subject to annual legislative authorization, the data in the PFP may assume that such authorization will continue to be secured, in the form last approved by the President. Where programs have been authorized for a number of years, with the terminal date falling in the forecast period, renewal may be anticipated but this fact should be appropriately noted in tables I and II.

The commitment classifications to be reflected in table II of the PFP (illustrated at the end of this attachment) are defined in the following paragraphs.

a. *Programs controlled by statutory formulas (class 1).*—This classification brings together all programs where the recipients and the amount to be provided are specified in law. Examples include veterans' compensation and the social security trust funds. Program levels in future years will be based on projections of numbers of beneficiaries and other relevant factors. Programs should be placed in this clas-

sification only in clear cases where the budget provides for a specific or formula-related payment to all qualified recipients. Where the level of appropriation is in fact controlling, the program should be shown in class 6.

b. *Programs controlled by workload level (class 2).*—This classification includes all programs where the work must be performed to meet specified needs, and the volume of the work in fact sets the requirements, as in the case of postal service. Program levels for future years will be based upon projections of workload and productivity changes. The use of this classification should be restricted to clear cases where the budget provides for a given quality of service to all qualified recipients. Where the level of appropriation is in fact controlling, the program should be shown in class 6.

c. *Market-oriented programs (class 3).*—This classification includes programs in which the Government is committed to respond to market conditions. Generally, these are financed by permanent budget authority. The major examples include interest on the public debt and agricultural price supports. The PFP will be accompanied by explanatory material indicating the key assumptions involved in the future-year projections and the probable range of estimates applicable to each year.

d. *New programs requiring legislation (class 4).*—This classification will group all new programs covered in the budget-year legislative program. Budget-year program levels will, as in other cases, be consistent with the budget. Future-year projections will be based upon the instructions for the commitment classification in which the program would otherwise belong: statutory formula, et cetera. If the program is of the type that will be controlled by the level of appropriations (see class 6), equal amounts will be projected for each of the 4 future years, based upon the operating rate that will have been attained by the end of the budget year.

e. *Administration commitments (class 5).*—This classification will include programs to which the President has publicly and specifically committed the administration to changes, either for the budget year or future years. Future-year projections will be based upon this commitment. This should not include budget-year legislative proposals (class 4).

f. *Programs controlled by the level of appropriations (class 6).*—This classification is to group all programs where the program level is in fact controlled by the level of appropriations. This involves cases, for example, where the amount of grants that could be paid to recipients under accepted standards exceed the amount available in the budget. Most grants, foreign assistance, and construction programs, and many research, service, and lending programs are in this class. In all these cases, the programs will be projected in the PFP on a flat or declining trend, in accordance with the specific guidelines which follow, even though increases are projected in population supported or in other indexes of program need. This classification will be subdivided into two parts.

(1) *Construction and acquisition of major capital items (class 6a).*—This will cover construction, the acquisition or improvement of real property, public works activities, and a significant change in capabilities or mode of operations which involves equipment of a

high cost. In general, equipment to be reflected here should involve a 5-year cost of $5 million or more for a given item, or closely related family of items. Major proposals for modernization or mechanization should be included here, even though they involve support of programs otherwise included in the first three classes. Class 6a is not intended to include all equipment which may be reflected as capital items for accounting purposes—for example, office equipment and furniture, commercial vehicles, and similar items acquired to support ongoing operations will normally be excluded.

The budget year program level for these capital items should reflect the full costs to which the Government would be committed if the proposal was approved, including costs that might be financed from subsequent year budget authority (see paragraph 2a). The program level for such items beyond the budget year should be zero.

(2) *Ongoing costs (class 6b).*—This will cover ongoing costs and minor capital items for programs controlled by the level of appropriations. No increases will be shown beyond the budget year, but decreases will be shown where appropriate. Decreases would be appropriate, for example, where the legal basis will change during the forecast period; where a part of the basis for the program will disappear, as in the case of declining food surpluses; or where pilot or demonstration projects or improvement efforts will run their course.

The purpose of this commitment classification is to enhance the usefulness of the PFP as a tool in planning and decisionmaking, including the provision of meaningful agencywide and Government-wide aggregates. It is not intended to be precise and accurate to the last detail. The PFP submission will include a summary of each agency's program level by commitment classes as illustrated in the accompanying table.

4. *Guidelines for projections.*—Budget-year estimates in the PPB submissions will in all cases be consistent with the budget submission, for which guidance is provided in Bureau Circular No. A–11. The guidelines which follow relate to future-year projections.

a. *General price levels and Federal pay rates.*—With respect to the direct Federal purchase of goods and services and employment, general price levels and pay rates should be projected for future years at the same levels as are used in the budget year.

b. *Price levels and economic assumptions applicable to specific programs.*—A small number of Federal activities are heavily or totally dependent upon price and other movements in certain economic sectors. Examples include debt interest, agricultural price supports, and payments tied to the cost of medical services. In these cases, future-year projections should be based upon trends that are the most realistic in terms of the sector involved. The PFP estimate should be accompanied by explanatory material indicating the key assumptions involved in future-year projections, and the possible range of estimates applicable to each year.

c. *Transfer payments that are related by statute to an economic index.*—These types of payments should be projected on the basis of the changes in the pertinent index. Examples include payments to retired personnel that are automatically adjusted with movements in the Consumer Price Index. The projection should be based on the assumption that the average annual change for the most recent 5 years will continue.

(d) *Receipts.*—To the extent that agency receipts are a significant factor in developing the PFP data or in making projections, appropriate explanatory material should be submitted with the PFP. For example, in cases where the volume of trust fund outlays for an agency exceeds $100 million annually, a projection of trust fund receipts should be included with the PFP submission. Such projection should also be prepared in any case where proprietary receipts exceed $100 million annually.

—Receipts from employment taxes should reflect changes in covered employment and average earnings. Tax rates should be those provided in existing law, or in any amendments proposed by the President.

—The effect of price movements in specific sectors, as mentioned above, should also be reflected in receipt estimates.

—Estimates for premiums received and similar items should be consistent with the program projections—if the program projection would imply an increase or decrease in premiums, this should be reflected even if statutory authority is required.

—Receipt estimates based on postal and other rates fixed in law should be projected on the basis of existing law or amendments proposed by the President, recognizing projected workload changes. For those rates which can be altered administratively, receipts should be projected on a basis consistent with workload and cost projections.

—User charges should be included where now authorized, or as proposed by the President. Where the legal basis for such charges, or other receipts, will expire during the forecast period, renewal should be assumed unless this would clearly be inconsistent with other assumptions in the PFP.

In all other cases where the PFP reflects changes in price indexes and other economic assumptions, concise explanatory material should be included with the PFP. In addition, there should also be submitted with the PFP information bearing on any significant financial matters related to the programs shown in the basic tables. Examples include information on large unobligated balances and data on purchase and sale of non-Federal securities.

DEPARTMENT OF GOVERNMENT

PROGRAM LEVEL/BY SUBCATEGORY

[In millions of dollars]

	Actual, 1968	Estimate— 1969	1970	1971	1972	1973	1974
1. Military applications:							
Intelligence	248	260	255	210	195	190	188
Communications	160	190	205	210	215	215	212
Total, military applications	408	450	460	420	410	405	400
2. Space applications:							
Propulsion	121	90	75	70	65	60	63
Navigation	91	111	114	84	96	105	108
Total, space applications	212	201	189	154	161	165	171
Total program level, Department of Government	620	651	64	574	571	570	571
Increase or decrease (—) in unobligated balance	174	—61	—26	26	.....	10	.....
Unobligated balance lapsing	5	3	.....	.....	.....	.....	.....
Increase or decrease (—) in unobligated loan commitments	—5	—8	6	2	.....	5	.....
Budget year construction program to be financed from subsequent budget authority	.....	.....	—120	50	40	30	.....
Current and prior years construction programs for which budget authority is necessary in future years	.....	.....	30	20	10	.....	.....
Loan collections	—20	—25	—28	—31	—31	—34	—35
Purchase or sale (—) of non-Federal securities	100	—50	.....	.....	.....	.....	.....
Intragovernmental transactions	+5	—6	—8	—8	—9	—10	—10
Total budget authority, Department of Government	869	504	503	633	581	571	526
Program level by commitment class:							
1. Statutory formula	388	381	376	367	340	338	343
2. Workload level	48	51	55	59	62	63	64
3. Market-oriented programs	25	28	15	8	10	15	5
4. New programs requiring legislation	.....	.....	10	20	40	45	50
5. Administration commitments	.....	.....	5	10	10	.....	.....
6a. Level of appropriations: Capital acquisitions	48	72	76	.....	.....	.....	.....
6b. Level of appropriations: Ongoing	111	119	112	110	109	109	109
Total program level, Department of Government	620	651	649	574	571	570	571

ATTACHMENT 5

COMPARISON OF EDUCATION PROGRAM AND APPROPRIATIONS STRUCTURES FOR ONE PROGRAM SUBCATEGORY[1]

Program structure (program category—Education)	Appropriation structure	
	Appropriation account	Appropriation—Program activity
Subcategory: Vocational and occupational skills:		
Program element:		
Improving the education of the general population.[2]	Expansion and improvement of vocational education.	Grants to States. Innovative occupational programs. Vocational and technical education construction.
	Higher educational activities[3]	Undergraduate equipment. Strengthening developing institutions. NDEA student loans. Guaranteed loans. College work study. Facilities construction.
	Research and development	
	Other	
Improving the education of the economically and socially disadvantaged.[2]	Expansion and improvement of vocational education.	Special needs.
	Higher educational activities[3]	Strengthening developing institutions. Educational opportunity grants.
	Elementary and secondary educational activities.	Educationally deprived children.
Improving the education of the physically and mentally handicapped.	National technical institute for the deaf.	

[1] This example is taken from the Department of Health, Education, and Welfare.
[2] Also finances part of the "Health Manpower" subcategory.
[3] Activity split into 2 program elements.

ATTACHMENT 6

DEPARTMENT OF TRANSPORTATION ISSUE LETTER FOR FISCAL YEAR 1970 * [1]

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., April 12, 1968.

Hon. ALAN S. BOYD,
Secretary of Transportation,
Washington, D.C.

DEAR ALAN: The purpose of this letter is to identify those planning, programing and budgeting (PPB) efforts which specifically support preparation and review of the 1970 budget. Attachment A lists major program issues (MPI) which we now anticipate should be addressed in your 1970 Program Memoranda; attachment B, the Special Studies to be conducted particularly for the 1970 budget; and attachment C, continuing Special Studies whose principal impact is expected after the 1970 budget. The requested Special Studies incorporate much of the material suggested by the Department and have been discussed with your staff. We will, of course, welcome your additions or recommendations of substitutes at any time. With respect to major program issues to be treated in the Program Memoranda, I recognize that a complete and final identification of all these issues is not possible at this time because new problems may well emerge during the course of the spring and summer. As issues are changed, added and deleted, the Budget Bureau should be consulted so that a statement of the issue and the alternatives can be agreed upon.

A principal intent of the PPB process is to provide early identification and analysis of all major budget-year program issues, including realistic alternatives which should be considered before final decisions are reached and information on their budgetary and policy implications. I therefore want to stress the importance of completing the identification and analysis of as many major program issues as can be identified in time for the draft Program Memoranda.

To be most useful, Program Memoranda should be brief, selective documents, covering the major program issues.

In some of the special analytical studies where we wish to know future program costs or dollar benefits, we are asking you to determine not only the annual time-phased costs or benefits but also their present *discounted* value. We are asking you to employ a discount rate of 10 percent when comparing the costs of equally effective program alternatives and when comparing net dollar benefits. There is some uncer-

* And attachments.

[1] This particular issue letter is considerably longer than most, and is to that extent unrepresentative. It was picked for inclusion because the wide variety of information and analysis requested conveys a better picture of the variety applicable to PPB than any other possible example. It was also desirable to provide continuity between this attachment and attachments 7, 8 and 9.

tainty about the appropriate discount rate; therefore, in those cases where decisions would be changed by small changes in the discount rate, please test the analysis for alternative discount rates of 7.5 and 12.5 percent.

We recognize that the Highway Needs Report recommendations and the Aviation Needs and Financing Report which you currently have under preparation can have a significant influence on Special Studies and major program issues.

Proposed transfer of the mass transit program to DOT from HUD under Reorganization Plan No. 2, 1968, will also affect the major program issues and Special Studies to be addressed by the Department. As time draws closer to the deadline for Congressional reaction on the reorganization plan, we will consult with your staff and HUD's on this matter.

With respect to the Special Studies for 1970, it is recognized that time limitations may prevent the analysis in as complete a form and in as much depth as proposed in the Bureau's outlines. We suggest that priority be given to special studies 1, 2, 3, and 4.

A revision of Bulletin No. 68–2 will be issued shortly, which will elaborate on the points made in this letter and incorporate improvements in the PPB process suggested by our 1969 experience. The principal change will be to require submission of Program Memoranda only for program categories in which major program issues have been identified. I ask that you give it your close personal attention.

Work on the Special Studies and PM's will need continuing review. To this end, I am asking my staff to arrange for frequent consultations with your staff. Last year's experience clearly shows that meeting deadlines is crucial. I urge that the deadlines in the attachments to this letter and in Bulletin No. 68–2 be met and have instructed my staff to call any potential slippage to my attention as early as possible so that I can discuss the problem with you.

Sincerely,

CHARLES J. ZWICK,
Director.

Enclosures follow:

Attachment A

DEPARTMENT OF TRANSPORTATION

MAJOR PROGRAM ISSUES FOR FISCAL YEAR 1970

Program Memorandum I—Intra Urban Transportation

1. Highway engineering improvements

Issue.—What should be the composition of the Federal-aid financing in 1970 of State highway engineering projects considering the costs and the benefits in terms of reduced congestion and improved highway safety? Compare new construction and engineering improvements to existing roads in urban areas.

For alternatives and approach, see SS–68–1 in attachment B.

2. Urban parking facilities

Issue.—If DOT proposes a parking program for 1970, under what guidelines will parking facilities be evaluated and financed? What

measures of the contribution of urban area parking facilities to more efficient urban transportation will be applied? What is the appropriate allocation of effort between fringe and downtown parking capacity? Should the Federal role be to subsidize private initiative, finance State and local initiatives, build capacity to be leased, or build and operate capacity?

3. Bus alternatives in urban commutation

Issue.—What should be the level and composition of DOT's program in 1970 for facilitating the use of busses as an alternative to expansion of highway capacity for automobiles in meeting peak-hour demands for urban commutation?

Alternatives.—This issue is related to the issue on parking. Costs of alternative passenger and fare collection devices, fringe parking, bus or jitney, or other devices should be considered in comparing bus system costs and pivate auto costs. Cost and benefits of the following alternatives should be considered:

Express bus systems, with use of preferential lanes;

Status quo: express bus systems with no preferential treatment;

Preferential treatment for autos, with no restrictions on peak-hour passengers;

Preferential treatment for autos, with restrictions on peak-hour passengers;

Various bus/auto combinations for serving commutation demand.

The evaluation of alternative modes should take account of differences *between social and private* resources and congestion costs and evaluate ways of reconciling them when possible.

Schedule:

Completion date: July 1, 1968.

Program Memorandum II—Inter Urban Transportation

1. Terminal area automation

Issue.—What criteria for optimizing the *level* and *rate* of terminal area automation underlie the selection of the terminals proposed for 1970? What are the tradeoffs between funding levels and procurement/installation schedules?

For alternatives and approach, see SS–68–4 in attachment B.

2. Quiet engine project

Issue.—Should the NASA quiet engine project continue through fabrication and testing of a demonstration engine or only far enough to provide a technical basis for regulation of engine noise? What role can regulation play in bringing about reduction in jet engine noise, and particularly in providing incentives for private development of quiet engines?

For alternatives and approach, see SS–68–5 in attachment B.

3. National capital airports

Issue.—If the Department plans to propose the start of a significant capital investment program at either WNA or DIA in 1970 it should compare the costs and benefits of alternative time-phased programs

affecting total demand and total capacity of the three air carrier airports serving metropolitan Washington.

Alternatives considered should include:

1. No capital improvements at WNA or DIA.
2. Capital improvements limited to buildings and terminal facilities (at several funding levels).
3. Capital improvements limited to ground access to each airport.
4. Various regulatory or pricing solutions designed to distrubute traffic to three airports serving capital area.
5. Various mixes of programs suggested in 1–4, above.

Comparisons among capital improvement programs should be based upon the systemwide benefits and costs of each program considered. The benefits and costs should each be summed over the three (or more) airports in the system. Alternative programs should be compared for their effects on the costs of congestion to airlines and passengers at Washington National Airport and the social cost of noise and pollution as well as the capital and operating costs of the airports.

Ideally, the decision should take account of the total context of intermodal transportation demand in the Washington area. However, suboptimization within Washington's *air* transportation system will constitute a useful first effort while we make ready to cope with the larger problem.

4. NAS enroute traffic control system

Issue.—For the 1970–1980 time frame, what is the optimum NAS enroute traffic control system in the light of proposed changes in the ADC system by DOD? What portion should be funded in fiscal year 1970, and on what schedule should the remainder be installed?

Alternatives

1. Programs at several levels of funding.
2. The optimum program at various air traffic growth rates; for example, your currently estimated rate of growth, and 50 percent and 120 percent of that rate.
3. Programs based on variations in the amounts of airspace coverage (radar altitude and azimuth coverage) and percentages of aircraft covered by radar.
4. A program based on the assumption of more stringent criteria for aircraft operations such as separation standards.
5. Programs with various numbers of centers; for example, 12, 15, 17, and 20.

Alternative programs should be compared in terms of their effects on the volume of air traffic, on delays and on safety, given the projected demand and the supply as determined by other elements of the air transportation system. Forecasts of demand should be consistent with total demand for all modes.

Benefit/cost analyses should be attempted for each alternative considered. Factors that are hard to quantify should be explicitly identified as "unknowns" and discussed as to implications and importance.

5. Railway-highway grade crossings

Issue.—How will DOT's 1970 program deal with the railway-highway grade crossing problems? If DOT proposes a separately-conceived and planned program to reduce railway-highway crossing accidents, how will priorities and time-phasing be determined?

Compare the following alternatives, as far as possible, with respect to their benefits and costs or other considerations such as administrative feasibility.

Alternatives.—Before a large Federal commitment is made to reduction of these hazards, DOT should conduct benefit/cost analyses to determine the optimum level of effort and should consider the appropriate mix of Federal, State, local, and private capital which might be involved. The study should include an inventory and classification of grade crossings and should compare, contrast, and recommend cost and performance evaluation criteria for selection of protective devices at particular types of locations. Alternatives:

1. Status quo, allowing States and localities to deal with specific problem locations as they evidence high-accident tendencies.
2. Large long-term Federal commitment of resources (highway trust fund or other) to reduce all railway-highway hazards.
3. Delegation of solutions to States for inclusion in Federal-aid highway project proposals as they see fit.
4. Require railroad industry to finance all or large part of program based on their encroachment (where this is legally the case) on highway right-of-way.
5. A Federal program to provide research data and criteria to States and localities and let them solve the problem as they see fit.
6. Other feasible variations of above programs at different funding levels and different mixes of Federal, State, and local responsibility.

6. Oil pollution

Issue.—Assuming that proposed legislation on pollution by oil and similar substances will be passed and that funds will be requested in the fiscal year 1970 budget, what should be (a) areas for coverage by regulation and, (b) methods of achieving compliance? What choices are available between prevention and cleanup? What are the tradeoffs between existing methods of prevention and cleanup and R. & D. on new methods (for example, on ship design)?

7. Boating safety

Issue.—Assuming that funds will be requested in the fiscal year 1970 budget, what is the proposed Federal program, taking account of the alternatives and criteria discussed in the SAS outline for "Safety Regulation and Inspection" SS–68–6?

8. Vessel standards and inspection

Issue.—Assuming that funds will be requested in the fiscal year 1970 budget, what is the proposed Federal program, taking account of the alternatives and criteria discussed in the SAS outline for "Safety Regulation and Inspection" SS–68–6?

9. Gas pipeline safety

Issue.—Assuming that funds will be requested in the fiscal year 1970 budget, what is the proposed Federal program, taking account of the alternatives and criteria discussed in the SAS outline for "Safety Regulation and Inspection" SS–68–6?

10. Oil pipeline safety

Issue.—Assuming that funds will be requested in the fiscal year 1970 budget, what is the proposed Feedral program, taking account of the alternatives and criteria discussed in the SAS outline for "Safety Regulation and Inspection" SS–68–6?

11. Railroad safety regulation

Issue.—Assuming that funds will be requested in the fiscal year 1970 budget, what is the proposed Federal program, taking account of the alternatives and criteria discussed in the SAS outline for "Safety Regulation and Inspection" SS–68–6?

Schedule

Completion date: July 1, 1968.

Program Memorandum III—International Transportation

1. Supersonic transport

Issue.—What should be the 1970 level of NOA for the SST?

Among the factors to be considered are the following:

1. The status of the Concorde program—slowdown and inability to fully meet economic feasibility criteria decrease pressure on the United States to make SST a high-priority program.

2. The ability of Boeing to overcome the design deficiencies—delay in reaching fabrication stage would have a significant impact on SST funding level.

3. The ability of Boeing/GE to build a prototype approximating the design requirements for a production model—the degree of confidence that design changes will result in an acceptable model for production will influence the pacing of the program.

Analyze the individual and cumulative effects of these factors on the SST program using ranges of probability of occurrence and/or time intervals.

Assuming that Boeing/GE will furnish their own estimate of 1970 funding needs, what would be the effects on work accomplished, date of completion, and total cost and Government share of phase III, at 90 percent of the B/GE estimate? at 75 percent? at 50 percent? What effect would variations in the phasing of the program have upon the benefits to be realized?

Schedule

Completion date: June 7, 1968.

2. St. Lawrence Seaway

Issue.—Should we proceed with the entire lock repair program in 1970? Since current estimates of repair costs exceed the amount in the authorization request before Congress and since the House committee has yet to take action, how should these repair costs be financed?

Alternatives to be considered: One alternative is to include some

or all of the repair work under regular maintenance and repair which would be financed through tolls. Another alternative is full general fund financing. A third alternative would be to increase the borrowing authority. Various combinations of the three alternatives should also be explored. Also, the cost/benefits of alternative time schedules for making repairs should be considered.

Schedule

Completion date: May 30, 1968.

Program Memorandum IV—Other National Interests

1. Polar activity

Issue: What should be the functions and level of DOT programs in polar activity? Specifically, should an icebreaker replacement be proposed for fiscal year 1970?

For alternatives and approach, see SS–68–3 in attachment B.

2. Oceanographic buoys

Issue: What should be DOT's fiscal year 1970 program in developing the oceanographic data buoy system? What should comprise the next phase?

Alternatives to be considered: Various agencies are involved in marine science programs and several aspects of buoys and buoy systems are under study. Taking into consideration these study efforts, several alternative program approaches should be explored:

Defer next steps in the program while system studies are refined and evaluated.

Design and construct one or two demonstration buoys while system studies are refined and evaluated.

Proceed with a comprehensive system designed to fulfill the the program goals as soon as possible.

Confine work to platform and sensor development.

Schedule:

Completion date: June 15, 1968.

3. State highway safety needs

Issue: What criteria should be applied to State project proposals for highway safety programs to be financed in fiscal year 1970 under the Highway Safety Act of 1966 given (1) the level of 1970 and 1971 authorizations proposed for enactment in the current session, and (2) the choices available to the States from among several programs eligible for Federal aid. For alternatives and approach see SS–68–2.

4. Motor carrier safety

Issue: What is the proposed motor carrier safety program for 1970?

For alternatives to be compared, see the special study outline for "Safety Regulation and Inspection." Within that general framework, the following kinds of organizational and financing alternatives should be compared.

Continue program unchanged.

Complete delegation to the States to regulate motor carriers, with phaseout of Federal program.

Expansion of the current DOT motor carrier safety program—including increase in field inspectors—to achieve adequate sampling and perhaps better enforcement.

Integration of the current Motor Carrier Safety Bureau with the Highway Safety Bureau, delegating inspection to States as a State highway safety standard (under Highway Safety Act of 1966) with guidance and leadership from DOT.

Encourage self-policing by motor carriers and phase out Federal program.

5. Used-car standards

Issue: Assuming that funds will be requested in the fiscal year 1970 budget, what should be the Federal program to guide the development, application, and enforcement of used-car standards?

Compare alternatives presented in the special study outline for "Safety Regulation and Inspection."

6. Motor vehicle compliance program

Issue: Assuming that funds will be requested in the fiscal year 1970 budget, what should be the Federal program guide to insure compliance by the auto manufacturers with new car safety standards?

Compare alternatives presented in the special study outline for "Safety Regulation and Inspection."

7. Traffic and highway safety research

Issue: What should be the 1970 program level for traffic and highway safety research and development? What data are needed to determine causes of traffic accidents and injuries and how will DOT's 1970 R. & D. program develop the needed data?

Both the Traffic Highway Safety Act of 1966 and the Highway Safety Act of 1966 authorize DOT to conduct highway safety research aimed at development of standards and assisting State programs. The total efforts for fiscal year 1969 amounts to over $10 million.

The PM should identify the goals and objectives of DOT's traffic and highway safety R. & D. and compare payoffs to the provision data for various purposes including:

The development of standards;

State program allocation;

Highway safety program management.

The PM should also discuss alternative ways to gather necessary data, including:

Sponsored research, using private resources and facilities;

Direct research, using existing governmental resources and facilities;

Direct research, using a new research and test facility. The resolution of this issue should be related to the findings of the special study on State highway needs.

Program Memorandum V—General Support

FAA training

Issue: What is the optimum training program for FAA over the next 5 years and what portion must be funded in 1970?

Compare the cost and effectiveness of alternatives that vary with respect to:

The degree of centralization.

The phasing of NAS training and its impact on peaking.

The extent to which FAA's training requirements are met through use of simulators? The extent of joint use with other agencies or industry, and the extent of lease or rental versus purchase.

Schedule:

Completion date: May 3, 1968.

Attachment B
PM I
SS-68-1

ISSUE FOR SPECIAL STUDY—HIGHWAY ENGINEERING IMPROVEMENTS

Several targeted programs have been instituted by DOT's Bureau of Public Roads to increase traffic flow and/or reduce traffic accidents, including TOPICS (engineering improvements to improve capacity and safety), spot improvement, and roadside hazard removal. Compare the costs and benefits of programs to improve existing highways with programs to build new highways. Distinguish urban and rural projects.

The benefits should include:

The safety benefits (in terms of lives saved, injuries prevented or ameliorated, and property damage reduced or eliminated);

The efficiency benefits (in terms of reduced time and other costs due to increased capacity).

The analysis should develop cost information for each type of improvement and present data on accident rates and effective capacity before and after improvements.

Alternative ways to improve program execution should also be explored, including:

Status quo, in which each State may choose from among construction and engineering-type projects with minimal incentives for changing program content.

An expansion of measures to publicize benefits to *all* potential beneficiaries, including city and regional traffic engineers, mayors, police chiefs, etc., but waiting for their response.

A direct approach to cities to assess the need for highway engineering improvements in local areas.

Schedule:

Completion date: July 10, 1968.

Attachment B
PM IV
SS–68–2

ISSUE FOR SPECIAL STUDY—STATE HIGHWAY SAFETY NEEDS

State highway safety grants under the Highway Safety Act of 1966 will increase from $25 million (fiscal year 1968) to $140 million (fiscal year 1969), supporting 15 basic program areas:

A. Driver education.
B. Motorcycle safety.
C. Traffic records.
D. Alcohol in relation to highway safety.
E. Periodic motor vehicle inspection.
F. Highway design, construction, and maintenance.
G. Traffic control devices.
H. Identification and surveillance of accident locations.
I. Codes and laws.
J. Traffic courts.
K. Emergency medical services.
L. Driver licensing.
M. Pedestrian safety.
N. Police traffic services.
O. Debris removal.

The 1970 overall program will be largely determined by legislation this year. This study should provide criteria for selecting the optimum combination of programs, given each State's apportionment of total Federal aid for highway safety.

DOT is now preparing a report to Congress on State highway safety needs, which may lay the groundwork for a better study of the sort suggested here.

The study should estimate total Federal, State, and local spending on each program area (or additional areas if desirable) for fiscal year 1969 and marginal benefits and costs at various program levels to determine desirable mixes of State programs assuming that State allocations can be shifted. Allocations for individual States or groups of States should take account of particular circumstances such as the high payoff per unit cost in Northern States of programs to increase safety on icy roads.

The study should compare such alternatives as State operation and private operation (with State licensing) of inspection stations for motor vehicles. Estimates of costs and benefits should include the effects on aspects of highway use other than safety.

Schedule:

Phase I—Completion using currently available data: July 1, 1968.

Phase II—Completion using specially developed data: February 1969.

Attachment B
PM IV
SS–68–3

ISSUE FOR SPECIAL STUDY—POLAR ACTIVITY

The Coast Guard now operates eight oceangoing icebreakers, seven of which are approaching 25 years of age, possibly nearing obsolescence. If the Coast Guard is to continue in this field, the Department's role and the specific requirements to achieve this role must be determined.

A documented examination of the requirements placed on DOT by other agencies should be reviewed to determine the role of DOT and translated into specific DOT programs and resources required. For the icebreakers in particular, agencies should be required to identify specifically the alternatives which they have considered, and priorities among the requirements they pose. For example: Assuming the National Science Foundation base in the Antarctic plans to continue operation for the next 5 years, what is the optimum supply schedule considering the costs and limitations of transportation and storage?

NSF should compare the cost and effectiveness of shipments by plane (both Air Force and private carrier), by ocean vessel, and increasing storage capacity so that less frequent shipment would be needed, possibly releasing the services of an icebreaker. Other claimants for icebreaker services should provide the similar information. The Coast Guard should then aggregate the requirements and compare the total cost and effectiveness of various ways of meeting the requirements, including:

Aircraft and submarines;

Repair of the present icebreakers;

More intensive use of the icebreaker by diversifying its functions, for example, using it as a cargo carrier or a scientific lab; and,

Nuclear versus diesel powered icebreakers.

The phasing of the alternative (and specifically the fiscal year 1970 portion) should also be varied (e.g., design work only, immediate and rapid construction, slow pace of construction because of inflationary pressures).

Cost estimates for each alternative should distinguish but include both Coast Guard costs and the costs borne by other agencies.

Schedule:

1970 implications: July 1, 1968.
Complete study: October 15, 1968.

Attachment B
PM II
SS–68–4

ISSUE FOR SPECIAL STUDY—TERMINAL AREA AUTOMATION

This analysis should compare marginal costs with its benefits in terms of decrease in delays and accidents due to congestion or other causes. Criteria for establishing priorities among automation projects by type of airport and project function should be developed on the

basis of the cost/benefit analysis. The criteria, which would probably include measures of traffic volume and congestion (measured perhaps in terms of the ratio of traffic to design capacity) should produce a ranking of projects closely related to that resulting from actual cost/benefit measures. Alternatively, a procedure might be developed for assessing individual projects on a cost/benefit basis.

The analysis should distinguish complete, operationally independent subsystems within a total automation system and should evaluate each as a discrete and independent project.

Schedule:

Completion date: July 1, 1968.

Attachment B
PM IV
SS-68-5

ISSUE FOR SPECIAL STUDY—QUIET ENGINE PROJECT

The development of a demonstration jet engine 20 PNdB quieter than current engines is estimated to cost at least $60 million. This noise reduction might be achieved at lower cost to the Government if regulation could be used to encourage industry to pick up the technology at an early stage of development. There should be more explicit coordination and evaluation of tradeoffs between regulation activities and R. & D. in aeronautics.

NASA and DOT should collaborate on this joint special analytical study. The results should be joint program proposals from both agencies supported by the analysis and conclusion of the study. It is assumed that DOT will have the legal authority to issue proposed regulations.

The study should provide answers to the questions given below for each agency. The answers should be coordinated and integrated into a joint study. Unresolved differences between the agencies should be clearly stated.

Department of Transportation

1. What nontechnical measures can be taken to create incentives to accelerate the adoption of quieter engines? Incentives for increasing industry participation in research? Can regulation hasten such action? For example, can regulatory action, based on a flow of information from NASA research be phased in by FAA? Is there a role for subsidies (taking account of alternative regulatory action)?

2. Should the Department attempt to facilitate the transfer of research results into the production of commercial engines? Why and how (taking account of alternative regulatory actions)?

3. What technical and cost information on quiet-engine technology is needed by the Department to establish acceptable and effective regulations? What are the benefits of quieter engines in the form of avoided social costs of noise pollution?

National Aeronautics and Space Administration

1. At what stages in NASA's research can information (identified by the DOT) be provided? With what degrees of confidence?

2. What arrangements can NASA make in the quiet-engine project to improve the transfer of results into production of commercial engines?

3. Identify portions of the quiet-engine project which can be deferred or dropped if industry begins work at earlier stages. Estimate the savings that are possible.

Schedule:

Date for submission: July 1, 1968.

Attachment B
PM II & IV
SS-68-6

ISSUE FOR SPECIAL STUDY—SAFETY REGULATION AND INSPECTION

The Department of Transportation currently carries out a number of safety regulation and inspection activities: New car safety standards/compliance; motor carrier safety regulation; used car standards; railroad safety regulation; vessel regulation and inspection; freight standards, certification, and licensing; and oil pipeline safety.

In addition, proposals to extend such activities to additional areas are being considered: boating safety; gas pipeline safety; and comprehensive railroad safety authority.

The improvement of safety cannot be treated as an independent end. A connection should be established between, say, a regulatory and inspection activity for motor carriers and the efficient provision of motor carrier services. The *Federal* responsibility cannot be assumed without considering, for example, the alternatives of self-regulation or State regulation.

This study will consist of two parts. Part I will consist of individual studies of each safety program listed above. Each of these studies should develop a quantitative basis for relating reductions in accidents and their costs to various time-phased safety measures such as education, imposition of safety standards, of fines, of liability standards, etc. It should present statistical data on the magnitude of the safety problem in each area including measures of the rates of accidents, fatalities, injuries, and/or property damage relating them to appropriate measures of the activity involved. Where the rate is sensitive to the measures used, alternative measures should also be presented. Data should be presented regarding the causes for accidents, fatalities, injuries, and property damage, relating thereto various safety measures considered.

The study should estimate the costs of the various measures considered, upon suppliers and users of the various service involved, as well as the direct costs of applying each measure to whatever agency is responsible for it.

Strategies consisting of various mixes of measures should be compared with respect to their effectiveness in reducing accidents and the costs of accidents, and with respect to the costs of applying them. Both the levels of individual measures and the mix of measures should be varied. Where a Federal role is indicated, it should be supported by a demonstration that the end cannot be achieved by other agencies or

private incentives, or that Federal intervention is more effective at a given cost. Where Federal agencies other than the Department of Transportation are involved as, for example, MARAD and the American Bureau of Ships are, in vessel standards and inspection, the possibility of combining Federal responsibilities should be considered.

Part II of the study will consist of a formulation of the broad Federal role in achieving safety and comparative evaluation of the various modal safety activities in contributing to that goal. The conceptual framework and strategy for Federal involvement can be developed while work is proceeding on the individual studies under part I, but the comparison of the costs and effectiveness of the various activities will have to follow the development of at least preliminary data in the individual studies.

Schedule:

Part I: For Major Program Issues in PM II (Inter-Urban Transportation): July 23, 1968.
For Major Program Issues in PM IV (Other National Interests): June 25, 1968.
Part II: Initial report: July 1, 1968.
Interim report: September 1, 1968.

Attachment C
PM IV
No. 1

CONTINUING STUDY OF TRANSPORTATION DEMAND FORECASTING

Review of DOT's Program Memorandums for the fiscal year 1969 budget suggested that the various modal administrations made forecasts for their own areas and developed programs without adequate consideration of demand in other modes or of interaction among modes. Each of the administrations appeared to believe that demand for transportation in its particular mode of interest was autonomous and absolute. Recognition that one mode may substitute for another would have generated alternatives that would replace one mode by another for some purposes.

This study should review current forecasting methods for the various modes to create a methodology for projecting a range of transportation demand. The methodology should insure—

(1) Consideration of economic and noneconomic variables;
(2) Attention to DOT's own effects on demand; and
(3) Internal consistency of modal forecasts within an aggregate transportation forecast.

Projections should aim for greater precision in shortrun than in longrun estimates.

To increase the validity of results from the forecasting methodology to be developed, it would seem that at least two approaches should be followed and reconciled. One should start with individual, modal forecasts based upon correlations between modal demand and specific variables of particular relevance to the mode. Forecasts would then be summed over all modes to establish an aggregate transportation

forecast. The other should start with an aggregate transportation forecast based upon correlations between total demand and general variables such as population, GNP, et cetera. The aggregate forecast should then be distributed among the modes to establish the modal demand forecasts. The resolution of differences between the inductive and deductive approaches should enhance the reliability of the final forecasts.

With the qualifications, changes, and emphasis implied by the discussion above, the phasing of the study which appeared in DOT's work statement for this project can be adopted as follows:

1. Review major forecasts made by modal agencies as to:
   - A. Objective of the forecast.
   - B. Methodology.
   - C. Assumptions.
   - D. Findings.

II. Test the accuracy of the different techniques by comparing forecasts with recorded results where possible.

III. Improve the methodologies or develop new systems by taking into account:

- A. Technological changes, including shifts between modes or substitutes for transportation (e.g., communication developments, industrial location).
- B. Feedback among variables.
- C. Internal analytical consistency.
- D. Sensitivity tests of the models and their use.

Schedule:

Completion dates:

(1) Progress report: July 1, 1968.
(2) Final report: July 1, 1969.

Attachment C
PM II
No. 2

CONTINUING STUDY OF AIR TRAFFIC CONTROL SYSTEM CAPACITY AND DEMANDS

How can the capacity of the Air Traffic Control System be measured? How should forecasts of aviation activity be translated into increased demands upon that capacity?

The projected growth of air traffic and resulting demand upon the Air Traffic Control System portend an enormous increase in capital and O. & M. costs. At present, there is no analytical means by which the capacity of this system can be measured. Similarly, there is no methodology by which the increased demands can be translated adequately into loads upon the system and its components. Until these are developed, judgments as to ATC needs, benefits, and costs cannot be made on a systematic basis.

1. The study should develop a quantitative capacity function to relate the load on components of the system and the system as a whole to performance in terms of safety and efficient movement.

2. Identify components most critical in terms of capacity and relationship to other components and their capacities.

3. Develop a simplified model for selected regions for estimating demands upon system capacity at various levels of projected growth of the several major segments of aviation. The model should be related to general transportation demand forecasts of the Department.

4. Develop data for quantifying benefits and costs of components of the system and of the system as a whole.

Alternatives

Several measures of capacity should be tested for their utility as rule-of-thumb approximations to a capacity function:

1. A peak-period capacity of up to 4 hours' duration, including consideration of the frequency with which it might occur.
2. A modified-peak-period capacity in which system-imposed delays would extend the peak period by 50–100 percent.
3. Capacity considered as a percentage of the theoretical capacity of a longer period of time (such as 8 hours, or daylight hours).
4. Capacity under various operating modes such as restriction of certain classes of general aviation during peak demand hours.
5. Capacity under various aircraft separation criteria.
6. Capacity under various ATC system configurations both in the en route and terminal area.

Schedule:

Completion date: September 30, 1968.

Attachment C
PM II
No. 3

SEARCH AND RESCUE AND CRITERIA AND FORCE ANALYSIS

What should be the nature of Coast Guard involvement in SAR and what is the most effective mix of programs for this involvement?

Recent studies on individual components indicate a need for an analysis of the SAR program on a systemwide basis before major new capital commitments are made. The 1969 Coast Guard Aviation Issue Study in particular underscored the need for further analysis of the potential of advanced techniques and for improving forecasting of manning levels and support requirements.

The analysis should define search and rescue needs and the basis and scope for Coast Guard involvement. On the demand side, the frequency and geographic distribution of incidents should be determined and future demand predicted. The forecasts should consider the effects of projected technological safety improvements to vehicles requiring SAR service.

These results should then be related to the current SAR geographic ranges and response times and to alternative ranges and response times to determine the most cost effective combination of vehicles and operational procedures. Sensitivity analysis should be made using variations in seriousness of events, response times, and rescue capacity.

Among the alternatives to be examined should be the assignment of more responsibility to non-Federal organizations (State or local police, rescue squads) for both SAR activity and communications. Where multipurpose activities are involved, the costs allocated to SAR

should be stated and the basis for the allocation should be explained.

Benefits should include lives saved, injuries averted, and value of damage or loss averted.

Schedule:

An interim report will be due September 1, 1968.

Attachment C
PM IV
No. 4

CONTINUING STUDY OF COAST GUARD RESERVE TRAINING CONCEPTS AND FORCE ANALYSIS

What are the program and manpower requirements for the Coast Guard's wartime mission? What should the Coast Guard Reserve contribute and what should be the composition and strength of the Reserves?

Recent studies of the Coast Guard Reserve training program have indicated that it was based upon World War II mobilization concepts and that it was deficient in quality.

Review of the military missions by DOD should be the first step. These missions should be described in precise, specific program terms. Activity and manpower requirements should then be reevaluated and comparisons made with similar DOD active and Reserve activities. Reserve training concepts should be explored and compared, especially with those of the Navy. Transfer of programs between DOD and the Coast Guard should be examined, including combined or cooperative training activities. The cost and effectiveness of alternatives should be compared.

Various degrees of Reserve readiness should be examined. Similarly, the benefits and costs of assigning various missions or parts of missions to active duty versus Reserve Forces should be explored.

Schedule:

Completion date: May 1, 1968.

Attachment C
PM IV
No. 5

CONTINUING STUDY OF CATEGORIES OF GENERAL AVIATION

Into what categories can general aviation best be subdivided to analyze demand, benefits received, and cost incurred?

Aviation is now categorized as either Air Carrier or General Aviation. The latter category now exceeds 112,000 aircraft and is forecasted to exceed 180,000 in 1977. The category encompasses aircraft ranging in size from the smallest craft up to DC–9's, flown for a wide variety of purposes. Without knowledge of the composition of this category, it is not possible to assess the impact of policy decisions upon the various segments nor to relate the level of user charges imposed to the benefits received.

The study should determine the relevant characteristics of the aircraft, such as flight profiles, their owners or operators, and operational

use; estimate their demands for governmental services; estimate user benefits; and test for homogeneity of the categories. The study should estimate the cost of providing Government service for each category and the effect of user charges on demand.

Factors to be considered are: Criteria for operating regulations and applicability of CAB regulations.

An example of one set of categories is:

General aviation—

1. Public—Commercial (e.g., air taxi).
2. Private—Commercial (e.g., corporate aircraft).
3. Private—Business (e.g., owned and operated by a private individual for his own business, including crop dusters).
4. Pleasure—Group (e.g., flying clubs).
5. Pleasure—Private (e.g., single owner for mainly recreational use).

Schedule:

Completion dates:

Preliminary categorization: June 1, 1968.
Completed study: September 1, 1968.

Attachment C
PM IV
No. 6

CONTINUING STUDY OF FAA PROGRAM EFFECTIVENESS AND FACILITY CRITERIA

What are the best measures of the effectiveness of various FAA programs? How can such measures be used to provide criteria governing the installation of various levels of services and facilities?

Increasing air traffic may result in a greater number of accidents, even though the accident rate remains constant or declines. Measures of effectiveness are needed to guide investment decisions about safety en route and/or at terminal areas. Airport programs are particularly sensitive because of local public concern.

The study should analyze the contributions to increased safety and to decreased delay, and costs should also be explored. The Bureau of the Budget study of the safety effectiveness of towers should serve to indicate the analytical approach to be followed. FAA should apply similar analytical techniques to facilities such as ILS, VASI, terminal radar, and so forth.

This study should assume that the costs of the facilities and services will be borne by the users. The objective is the further development of consistent criteria for installation and operation of en route and terminal navigation aids and facilities.

Schedule:

This should be a 2-year project with first-year efforts by September 1, 1968, limited to the terminal area facilities and development of methodology for measuring various levels and interactions of safety and delay.

Attachment C
PM II
No. 7

CONTINUING STUDY OF THE AIR TAXI ROLE

What are the current and future roles of the air taxi in the air transportation system? What analytical base is needed to assist in determining the proper role of the Government as to their regulation, promotion, and/or facilitation?

There are 3,600 air taxi operators in the United States; however, it is not known how many are active and to what degree. They are engaged in transporting people, property and mail with no restrictions as to routes or schedules. The category is defined with a weight limitation on the aircraft operated. They have special safety requirements. This segment of the industry, commonly called the "third-level air carriers," is growing and has great potential. Their impact on the total air transportation system and their interrelationships with air carriers are not known. The Government has not established firm policies on many aspects of these operations nor on their proper role.

The study should:

Identify composition of this segment of the industry and its current trends.

Identify current role of Government as to regulation and promotion, including:

Definition of the air taxi industry (and subclassifications, if appropriate).

Safety standards related to those applicable to carriers.

Reporting requirements.

Certification practices.

Government use of services (e.g., Post Office).

Define the relationships between air carriers and air taxis.

Forecast demand for the service with and without constraints.

Identify future influences of operations upon airport congestion problems.

Schedule:

Completion date: July 1, 1968.

Attachment C
PM IV
No. 8

CONTINUING STUDY OF RESEARCH AND DEVELOPMENT

What objectives should govern the Department's technical and scientific R. & D. efforts? What specific priorities would flow from such objectives?

The Department, at both the Secretarial level and in the operating elements, conducts a considerable amount of R. & D. work. However, there is not any fundamental policy or unifying direction to these disparate efforts nor are there adequate procedures to assure implementation of forthcoming departmental policies or directions.

The study should:

Develop procedures requisite to the efficient management of the departmental research program.

Formulate the research objectives and priorities of the Department within the framework of the overall Department objectives and priorities, and alternative approaches for achievement of these objectives.

Develop an inventory of all current research programs and capabilities of the Department, including their purposes, costs, and projections.

Catalog the transportation research capabilities of, and the transportation research underway and planned by, agencies and activities outside the Department (i.e., elsewhere in the Federal Government, in State and local governments, and in private industry).

Develop a research and development program rationale with identifiable goals for fiscal year 1970 in the light of the Department's research objectives and priorities, and existing and planned research capabilities and programs both within and without the Department.

Consider alternative courses of action for achievement of the Department's goals and analyze their relative merits.

Schedule:

Management procedures, research objectives and priorities, and alternative approaches: July 31, 1968.

Remainder of Study: March 31, 1969.

ATTACHMENT 7

PROGRAM MEMORANDUM FOR URBAN TRANSPORTATION*

CONTENTS

*U.S. Department of Transportation, fiscal year 1970 programs, program category I, urban transportation. Oct. 4, 1968.

PROGRAM CATEGORY I: URBAN TRANSPORTATION

I. Introduction and Summary

A. *Coverage.*—This program category consists of the following programs:

1. *Subcategory A.*—That portion of the Federal aid highway program (administered by the BPR), which takes place in urbanized areas;

2. *Subcategory B.*—The mass transportation program (administered by the Urban Mass Transportation Administration).

Neither of these subcategories is purely urban. Nevertheless, they are primarily urban and can be looked upon as representing the Department's main contribution to urban transportation. Specifically, most Federal-aid highway expenditures in urbanized areas also facilitate interurban transportation; indeed, by and large they were developed as part of an interurban transportation system. Nevertheless, we look upon these programs from the viewpoint primarily of their important contribution to transportation within the urbanized areas, even though some of the transportation is moving through the area during the course of an interurban trip.

With respect to the mass transportation program, it is not limited to any particular definition of "urban," as grants have been made to several communities under 50,000 population. However, most of the funds have gone to urbanized areas over 1 million in population.

B. *Objectives.*—The objectives of the programs in this category are to serve the needs of urban society by:

1. Increasing the overall economic efficiency of the urban system;

2. Increasing safety in transportation;

3. Increasing the benefits derived from the preservation and enhancement of aesthetic, environmental and social values;

4. Supporting other national objectives when appropriate, such as efforts to decrease poverty.

For the first time, highway program costs have been identified by objective. For urbanized areas, the costs for fiscal year 1970 are:

Urban transportation: highways	*NOA (millions)*
1. Economic efficiency	$1,438.0
2. Safety	454.0
3. Aesthetic environmental and social values	45.3
4. Contribution to desirable urban development	248.6
Total	2,185.9

C. *The fiscal year 1970 program.*—Most of the program level decisions for the urban Federal-aid highway programs (as well as the interurban) have already been made through the legislative process, culminating in the Highway Act of 1968. Nevertheless, the Department believes there are important issues and new or revised programs which should be considered. These, together with mass transportation issues, are summarized in part II below, and discussed in more detail in part III of this memorandum. The program levels estimated for fiscal year 1970, compared to fiscal year 1968 and fiscal year 1969, are as follows:

	NOA (millions)		
	Fiscal year 1968	Fiscal year 1969	Fiscal year 1970
1. Urban transportation:			
(a) Highways:			
1. Interstate program	$1,428.3	$1,460.5	$1,460.5
2. Federal-aid primary program	56.9	58.5	58.5
3. Federal-aid secondary program	57.3	60.4	60.4
4. Federal-aid urban program	182.0	194.2	194.2
5. Topics		180.0	180.0
6. Railway-highway grade crossing elimination	25.9	19.8	19.8
7. Roadside hazard reduction, spot improvement	77.8	81.9	81.9
8. Roadside beautification, billboard and junkyard regulation	.4	9.5	25.9
9. Relocation assistance		35.9	35.9
10. Advance acquisition of R.O.W		40.0	40.0
11. Metropolitan area planning	21.9	18.8	18.8
12. Urban corridor demonstration			10.0
Subtotal, subcategory (a)	1,850.5	2,159.5	2,185.9
(b) Mass transportation program: Total program, subcategory (b)	121.7	168.5	198.0
Total, program category I	1,972.2	2,328.0	2,383.9

Authorizations and appropriations have been made under the Urban Mass Transportation Act of 1964 through fiscal year 1970. However, because this program receives appropriations 1 year in advance, decisions must be made now concerning the authorization and appropriation at least for fiscal year 1971, and a possible fiscal year 1970 supplemental appropriation. Recommendations will be made in a separate submission as soon as these decisions have been made.

II. Summary of Major Program Issues

A. *Issue.*—What steps should be taken to reduce peak hour congestion, especially on high traffic density radial corridors?

Alternatives.—(a) No change in current and newly authorized programs but a major effort exerted by FHWA and UMTA to coordinate their programs; (b) a carefully planned transportation demonstration program focusing all available tools on this program in 10 selected cities with a higher percentage of cost sharing (75 percent) and additional funds authorized for this purpose; (c) a major new program providing additional funding to solve this problem in many urban areas.

Recommendation.—Alternative (b). Fiscal year 1970 cost: $20 million to be shared equally by FHWA and UMTA; 5-year cost: $150 million.

B. *Issue.*—What steps should be taken to improve "ghetto" area transportation, particularly to jobs?

Alternatives.—(a) No change in current program levels, but a greater effort exerted to decrease the severity of this problem; (b) a structured, 2-year mass transportation demonstration program in 15 to 25 urban ghettos, as an increment to the existing mass transit demonstration program; (c) a major new ghetto mass transportation program.

Recommendation.—Alternative (a). Fiscal year 1970 cost: No additional funds requested.

C. *Issue.*—Should the mass transportation program provide funds for advanced acquisition of rights-of-ways?

Alternatives.—(a) No; (b) yes, on a limited basis; (c) yes, on a more comprehensive basis.

Recommendation.—Alternative (b). Fiscal year 1970 cost: $10 million; 5-year cost: $50 million.

D. *Issue.*—Are there steps that would be worth undertaking to improve the newly authorized fringe area parking program?

Alternatives.—(a) No change in the new authorization but with a major effort made to implement the new provisions; (b) relax the criterion that the parking facility be within or adjacent to a Federally aided highway right-of-way by changing existing legislation; (c) provide a $20 million annual authorization in the Highway Trust Fund for the program, with a liberal interpretation of existing provisions.

Recommendation.—Alternative (a). Fiscal year 1970 cost: No additional funds requested.

E. *Issue.*—What reasonable steps can be taken now to improve, and make more representative, the metropolitan transportation planning process established pursuant to Section 134 of the 1962 Highway Act?

Alternatives.—(a) Evaluate the process by a study within FHWA; (b) require representation on the policy committee of the metropolitan transportation planning organization to be proportionate to the population of the communities in the metropolitan area, and provide additional funds for their activities; (c) require the establishment of metropolitan development agencies having authority not only to plan transportation activities but to implement the plans.

Recommendation.—Alternative (a). Fiscal year 1970 cost: No additional funds requested.

F. *Issue.*—How should the use of interdisciplinary teams and consideration of point development be expanded?

Alternatives.—(a) Encourage more use, and initiate appropriate research to measure their implications; (b) require the establishment of interdisciplinary teams as a prerequisite for Federal highway aid in urban areas over 1 million population, and provide additional planning funds for their use; (c) same as alternative (b), and obtain new legislation for a loan fund for the extra early costs of joint development projects.

Recommendation.—Alternative (a). Fiscal year 1970 costs: No additional funds requested.

In addition to these issues, the program memorandum reports on two special studies which have been submitted separately:

G. *Bus alternatives in urban commutation.*—This study compares the costs of two alternative approaches to meeting peak hour demand in urban areas: Private automobile transportation systems and bus-based systems.

H. *SS–68–1, highway engineering improvements.*—This study makes some preliminary comparisons of the costs and benefits of new highway construction versus three current programs for improving existing highways.

III. Analysis of Major Program Issues

A. Should an effort be made to establish a comprehensive corridor transportation demonstration program?

1. Statement of the problem

A considerable degree of the total urban transportation congestion problem is experienced on high traffic volume radial corridors during peak hours. Numerous Federal transportation programs are available to provide assistance in meeting this problem, some of them only recently enacted. Accordingly, a question exists as to whether steps can be taken now to incorporate several individual programs into a coordinated, multimodal effort to solve transportation problems.

2. Background

Existing Federal transportation programs have literally pumped billions of dollars into urban areas; yet, the problem of peak hour traffic congestion still exists, especially in high density radial corridors. Approximately $2 billion is spent annually to build new highway facilities in urban areas, and nearly $800 million has been appropriated since 1964 to improve urban mass transit facilities. A tremendous investment has been made, but the urban transportation problem continues to exist. More efficient use of existing and new programs and facilities is needed, by integrating and molding them into a cohesive and efficient multimodal urban transportation system. Now is a particularly appropriate time to undertake such an effort, because of the enactment of two significant new features in the 1968 Highway Act: fringe area parking and $200 million for TOPICS.

3. Alternative proposals

(*a*) *Coordination of existing programs at current levels of spending.*—One obvious deficiency in administering Federal urban transportation programs has been corrected as a result of the transfer of the UMTA to DOT. Now that a single agency has full responsibility for administering and coordinating urban transportation programs, the chances of developing multi-modal transportation systems has improved significantly. Existing programs, then, could be restructured somewhat and a greater effort made to coordinate FHWA and UMTA programs to accomplish some of the goals of this proposal within existing funding levels. Therefore, no new legislation would be necessary.

(*b*) *Select a limited number of urban areas for demonstration projects and provide a higher Federal matching formula and additional funds for this purpose.*—With the advice of the FHWA and UMTA and the cooperation of the States and metropolitan areas involved, a selected number of urban areas would be designated as demonstration cities for implementing carefully planned comprehensive transportation demonstration programs. The programs would focus on high density corridors, and would make possible unified, broad-gaged experimentation directed toward the integration of all urban transportation services by combining mass transit demonstration and grant programs, traffic operations programs, and fringe parking programs. Federal matching would be increased to 75 percent for programs now having a lower ratio.

Approximately 10 urban areas would be selected for the first year's pilot program, and additional areas and more expanded programs would be added as experience is gained. The additional cost would be about $2 million per area, or $20 million for the total program, with approximately one-half coming from FHWA and one-half coming from UMTA. The additional $2 million would be used (a) to increase the Federal matching share of pertinent programs to 75 percent (for programs which now have a lower Federal share) and (b) to provide for selected additional costs of such projects (e.g., preplanning, post-evaluation, etc.).

(*c*) *A new permanent program to provide such Federal assistance to all urban places over 25,000 population.*—This alternative is similar to alternative "b" above, but it would provide new funds for assistance to *all* urban areas over 25,000 population to solve their corridor congestion problems. Present estimates indicate that over $3 billion would be needed for capital expenditure on transit systems, exclusive of rail systems, during the next 10 years, much of it for corridor movement. Improved public transportation systems could increase the demand for fringe parking spaces by as much as 400,000 at a cost of $400 million. Other elements of the program could bring the cost to between $5 billion and $10 billion in 10 years. Thus, although this approach would be much more inclusive, the cost would be high.

4. Recommended alternative

Alternative "b" above is recommended for implementation. It offers the possibility of significant benefits for a reasonable cost. The results of a limited number of structured demonstrations will provide valuable information to be utilized in designing more permanent programs at the most appropriate funding levels. By better focusing existing and new programs, significant progress could be made in this area without cutting back in other areas that are equally important.

The comprehensive transportation demonstration program would be designed to have the following characteristics:

(*a*) Implementation would be within specific, high traffic volume corridors, rather than on a project basis.

(*b*) Two or more individual Federal-aid programs (e.g., Federal-aid highway construction, mass transit grants, fringe parking, TOPICS) would be combined.

(*c*) Existing transportation facilities would be utilized, with a minimum emphasis on *new* capital improvements whenever possible.

(*d*) To assure reasonably prompt implementation, Federal funding would be made available on an 75 percent matching basis for programs currently funded at a lower ratio.

(*e*) The program would be flexible in nature, to allow the identification of local problems and needs and establishment of combinations tailored to meet those needs.

(*f*) Specific programs would be designed in conjunction with metropolitan planning activities, and would be approved only if a systematic appraisal of alternatives had been made to insure maximum payoffs.

(*g*) Adequate funds would be provided for each demonstration program.

(*h*) To insure that a wide range of alternatives would be made available for local authorities, selected Federal requirements would be waived as necessary. One example might be the present guidelines

for permitting the construction of exclusive bus lanes on urban freeways. Studies have shown that efficient bus service can be more effective than autos in moving people during peak periods at bus flows that are less than those required by existing regulations.

(i) A carefully developed program of data collection and analysis would be required in every case, so that the information obtained could be used as building blocks to establish more efficient continuing programs.

The activities to be included in a demonstration program would be those selected by the applicant and the Federal agencies involved as most likely to advance the solution of local problems. The following list merely suggests the kinds of things or combination of things that might be done. In many cases, the Federal expenditure would be only for extra planning, administrative, and evaluation costs.

Preferential treatment for public transportation on common rights-of-way, including reservation of lanes.

Directional controls, including reversible lanes.

Fringe area parking tied to a mass transit system.

Pricing experiments to influence demand—including progressive parking rates, parking rates declining as auto occupancy increases, variable route tolls.

Experimental control of parking—by hours or location.

Joint parking fees and transit fares.

Flexible routing and scheduling of transit vehicles.

"Jitney" collection and distribution service.

Fare collection and transit vehicle adaptations.

Premium transit service at extra fare.

Improved transit information services—signs, schedules, route maps, color codes, public address systems.

Pedestrian and vehicular grade separations.

Improved interchanges between modes.

Development of separate lanes for passenger loading and unloading.

Centralized electronic traffic control and surveillance systems.

Channelization of intersections.

Metering of traffic into expressways, with preference for buses.

Public information and education programs to facilitate demonstrations.

Staggered work hours.

B. SHOULD A SPECIAL PROGRAM BE ESTABLISHED TO PROVIDE CONVENIENT AND INEXPENSIVE MASS TRANSPORTATION FOR GHETTO AREAS?

1. Statement of the problem

Metropolitan mass transportation systems often do not service ghetto areas adequately, even though many ghetto residents are almost entirely dependent upon public transportation for access to jobs, as well as to participate in social and recreational activities, to allow them to shop, or even to conduct personal business.

2. Background

In 1966 there were approximately 9½ million poor people (those living below the poverty level established by OEO) living in the central cities of metropolitan areas. In 1967 the unemployment rates

in central cities of urban areas was nearly 25 percent higher than the rate for the Nation as whole, and the unemployment rate of nonwhites was about double the rate of whites in the central city. The unemployment rate in the Watts area of Los Angeles just before the riots of 1965 took place was estimated to be about 34 percent.

For the Nation as a whole, according to 1967 Bureau of the Census data, approximately 83 percent of the white households owned one or more autos; however, only about 52 percent of nonwhites owned an auto. In the Washington, D.C., metropolitan area about half of the families in the central city do not have cars available, while in the suburbs only about 9 percent are without cars. In the Watts area in 1965, about 42 percent of all households had no car available.

One of the reasons for poverty is unemployment; if a person does not have the means to seek employment or the ability to travel to and from work readily, his chances for employment are seriously reduced. The growth in new employment opportunities, particularly the less skilled jobs, is concentrated in the outer fringes of many metropolitan areas. However, those job opportunities do little good for the person who cannot find reasonable means of transportation to reach them.

Limited mass transit demonstration projects designed to assist the central city poor in seeking and holding employment are currently being sponsored by Federal, State, and local government in four urban areas. Similar projects are being planned in at least six other metropolitan areas. Although some encouraging results have been experienced in satisfying the need for reducing the degree of unemployment, all the complex factors associated with this problem have not been identified entirely. The results do indicate that this problem must continue to be explored if reasonable and just solutions are to be found.

However, experience has shown that virtually no transit operation has the financial resources available to meet the expenses involved in making changes which do not show an immediate improvement in the balance sheet. Therefore, some form of Government aid would appear to be necessary, at least on an interim basis, if the ghetto transportation problem, particularly regarding the journey to work, is to be solved.

3. Alternative solutions

(a) *Continuation of Existing Transit Programs at Current Levels of Spending.*—The Urban Mass Transportation Act of 1964, as amended, authorizes grants and loans to public agencies to improve mass transit service in urban areas, as well as demonstration grants. However, capital grants for equipment may not be the most efficient means of improving transportation to ghetto areas, and the existing funding level of the demonstration program may not be adequate to provide a significant series of demonstrations related to this critical problem.

(b) *Provide additional funds earmarked for a ghetto-to-work demonstration.*—With the advice of the FHWA and UMTA, a selected number of urban areas would be designated as demonstration cities for implementing a specific demonstration program. The cost of this alternative could be limited to an average of about $2 million per urban area over a 2-year period. This level of program expenditure would

provide money for careful preproject planing, including the matching of people with jobs, for experimenting with different bus collection and distribution systems, for providing such service in several corridors within the urban area, and for evaluating the results. This would allow for the development of comprehensive demonstration programs in from 15 to 25 urban areas, at a first-year incremental cost of about $25 million.

(c) *A continuation of existing programs at an increased level of spending.*—Special funds would be established for supporting ghetto transportation demonstration programs for any urban areas requesting assistance. It is anticipated that probably the largest 100 urban areas would request funds for some form of a demonstration; thus, an average of about $1 million per urban area would require $100 million to make a relatively significant impact upon this problem throughout the Nation.

4. Recommended alternative

Alternative "a" above is recommended for implementation at this time. There are four demonstration projects currently being directed to the problem described here, and at least six more are planned for the future at relatively moderate funding levels. Current test programs should proceed as planned, so that more comprehensive programs can be established if, after more experience is gained, it appears that improvements in transportation are an effective means of reducing poverty or its effects.

Since there is relatively little information available at the present time to establish a permanent program in any urban area, the demonstrations should be carefully designed to answer as many of the following questions as possible:

(a) To what degree can unemployment be reduced among the ghetto residents by improving public transportation?

(b) Can employment opportunities be improved significantly by establishing facilities which provide ghetto residents with information concerning suburban jobs and the means of getting there?

(c) Can cooperation be obtained from suburban employers and public officials so that ghetto residents can be matched with available jobs?

(d) Can coordination between different bus companies serving the same metropolitan areas be achieved?

(e) Is existing conventional transit equipment adequate for providing this kind of service, or should carpools (including loans for purchasing autos), jitneys, minibuses, et cetera, be tested and evaluated?

(f) Can people be transported to jobs in the suburbs more economically than bringing jobs into the central city?

(g) Can service be provided eventually on a permanent basis at a reasonable cost and with a reasonable profit without a subsidy?

(h) What kind of subsidy is the most effective for providing the best level of service:

(1) A fare subsidy; if so, what level is necessary?
(2) Operating subsidy to the transit company?
(3) Capital grants?
(4) Loans?
(5) Combinations of above?

(i) Can both peak hour (primarily work) trips as well as off-peak hour (primarily shopping, social, recreation, personal business) trips be served adequately?

(j) Can weekend demand be served adequately in addition to weekday demand?

(k) Can ghetto transportation facilities be coordinated with suburban commuter facilities to allow for maximum utilization of all equipment?

(l) What is the actual demand for transportation service to and from ghetto areas, and what are the social, economic, and land use variables that are related to that demand?

(m) What is the best management structure to be incorporated to provide adequate bus service:

(1) Transit company management only?
(2) Local government management only?
(3) Private industry represented?
(4) Ghetto resident representation?
(5) Combination(s) of the above?

(n) Can a procedure be established which will allow for a continuing reappraisal and updating of the transit system?

C. Should a Program Be Established To Provide Funds for Advance Acquisition of Right-of-Way for Mass Transit Facilities, Including Excess Condemnation?

1. Statement of the problem

At the present time a rail rapid transit system is under construction in one metropolitan area (San Francisco), is definitely planned for construction in one other area (Washington, D.C.), and is under serious consideration in five others. The rights-of-way necessary for these facilities have been estimated to cost about $200 million. Under existing conditions the land required for rights-of-way will be purchased at the time it is needed. There is no Federal assistance program and limited local funds available for purchasing separate right-of-way in advance or in combination with the right-of-way needed for new urban freeways. One of the major costs of building a new urban transportation facility is for the necessary right-of-way, and land prices are rising rapidly. Moreover, under present circumstances considerable amounts of transit induced social benefits accrue to a few private parties (e.g., land developers).

2. Background

A new section has been wisely added to the Federal-Aid Highway Act of 1968 which provides funds for the advance acquisition of highway rights-of-way. If similar authority were inserted in the Urban Mass Transportation Act, considerable savings could be achieved for mass transit systems especially if key adjacent land areas could be purchased simultaneously.

3. Alternative proposals

(a) *No new authority or funds.*—This alternative would endorse the status-quo, and considerable potential savings would be lost.

(*b*) *Provide a special loan fund for a limited program of advance right-of-way acquisition.*—Section 3 of the Urban Mass Transportation Act would be amended to authorize acquisition of:

(1) All or part of the right-of-way of any existing transportation system that is facing abandonment, or

(2) All or part of the underdeveloped land that would be needed to complete an existing right-of-way, provided that such acquisitions would be consistent with transportation plans in the area.

Authorization would be made for $10 million to be appropriated each year for loans for the above purposes. The loans would be paid back from the transit construction funds at the time of construction.

(*c*) *Provide a special loan fund for a comprehensive advance acquisition program.*—This alternative is similar to alternative "b" above, but it is more comprehensive in scope. Authorization would be made for $25 million to be appropriated each year for loans for the general purpose of purchasing advance rights-of-way for mass transit facilities and would allow for:

(1) Purchase of limited excess land near transit stations

(2) Joint advance acquisition of highway and rail rapid transit rights-of-way, when such an undertaking is feasible

(3) Purchase of entire legs of mass transit routes planned for future construction.

This more comprehensive authority could result in considerable overall savings when the urban transportation planning process identifies high-density corridors that could profit from joint development. It could also permit the mass transit system to profit from the increases in land values that it induces.

4. Recommended alternative

Alternative "b" is recommended for implementation this year. Alternative "c" was rejected at this time, because it is felt that such a program should proceed in a limited way at first so that the experience necessary to establish more comprehensive programs in the future can be obtained.

D. SHOULD ADDITIONAL ASSISTANCE BE PROVIDED FOR FRINGE PARKING FACILITIES?

1. Statement of the problem

The Highway Act of 1968 will, for the first time, authorize the use of highway trust funds to provide the capital costs of fringe parking facilities under certain conditions. Considering the potentially significant benefits that this type of program may have in establishing more effective transportation systems, additional encouragement and emphasis coming from DOT may be desirable and warranted.

2. Background

Fringe parking facilities can help maximize user convenience and reduce line-haul capacity requirements. For example, the Cleveland Transit System provides over 5,000 free fringe parking spaces at seven suburban rapid transit stations. The CTS provides service to over 60,000 passengers each weekday; on shopping nights this is increased by another 6,000 passengers per day. The provision of fringe parking spaces has had an important impact on the success of this operation.

The Milwaukee & Suburban Transport Corp. has combined express freeway bus service with free fringe parking facilities, and has thereby increased transit usage on the express freeway bus routes by

over 400 percent. Four out of five users are licensed drivers, two out of three have one or more autos available for use, and over 50 percent were either auto drivers or passengers before this service was initiated.

3. Alternative proposals

(*a*) *Encourage the implementation of existing legislative provisions with a liberal interpretation of those provisions.*—This alternative would accept the existing parking provisions in the 1968 Federal-Aid Highway Act. Considerable effort would be exerted by the FHWA to encourage the implementation of the provisions contained in the new legislation, including a liberal interpretation of those provisions. For example, if an acceptable location for a fringe parking lot were not located adjacent to a Federal-aid facility, permission could be granted to add an existing street or a new connection to the lot to the Federal-aid system.

The advantage of accepting this alternative is that valuable experience would be gained in utilizing this important and necessary element of the Federal urban aid program, so that broader and more far-reaching programs could be recommended in future legislative programs if warranted. One difficulty that might be encountered in accepting this alternative is that proposed parking projects would compete with highway construction projects for funds, and parking projects might not receive as much consideration as would be desirable.

(*b*) *Relax the criteria established for locating parking projects by legislative action, with no additional funds provided.*—This alternative recommends that fringe parking facilities be authorized by new legislation to permit construction near or in the vicinity of Federal-aid highways in urban areas, and not necessarily adjacent to or within the highway right-of-way. Funds would also be authorized for building or improving connections to those facilities. However, no special funds would be earmarked for this program.

(*c*) *Relax the criteria established for locating parking projects and provide a special authorization in the highway trust fund for this program.*—This alternative is similar to alternative "a" above, except that new legislation would be requested to establish special funding authorization and a pool of money within the highway trust fund for the construction of fringe parking facilities. It has been estimated conservatively that by 1975 there will be a need for 367,000 new fringe spaces at a cost of $387 million, or about $78 million a year for 5 years beginning in fiscal year 1970. Providing this entire amount through the fringe parking program in the 1968 Highway Act would require $39 million annually in Federal matching funds. However, this alternative under consideration would authorize $20 million annually as an initial major effort, with priority given to projects related to the corridor demonstration program discussed in issue "A" above.

4. Recommended alternative

Alternative "a" above is recommended for implementation. By exerting a major effort to carry out the intent of the policy provisions in the 1968 Federal-Aid Highway Act, this program could present a major possibility for improving urban transportation systems at relatively moderate costs. As progress is made and experience gained in utilizing fringe parking facilities, a thorough and detailed analysis of the advantages and weaknesses of the existing program would be

made to determine the most appropriate changes that might be needed in future legislative programs.

5. Desirable characteristics for fringe parking facilities

Experience indicates that fringe parking lots must have the following characteristics to be successful:

(*a*) They must be adjacent to or integrated with fast and frequent mass transportation service to provide a total travel time that is competitive with the auto.

(*b*) They must be provided at little or no cost to the user.

(*c*) They must be located beyond traffic bottlenecks, generally some distance from the CBD, to avoid those traffic problem areas and to help relieve congestion there over time.

(*d*) There must be easy access to and from major arterials.

(*e*) There must be ample parking capacity to minimize the time needed to park, then walk to the mass transit vehicle.

Private enterprise, which accounts for approximately 94 percent of the investment made in total off-street urban parking facilities, has been reluctant to invest in fringe parking lots because of the need to keep charges at a minimum. Yet, studies have shown that fringe lots should be a necessary element in the transportation system. For example, in a study conducted for the Automobile Manufacturers Association the following estimates were made, showing the desirable range in fringe parking facilities as a percentage of CBD facilities:

Urban area population:	*Fringe parking spaces as a percentage of CBD spaces*
500,000	10–20
1,000,000	15–25
2,000,000	20–30
5,000,000	25–35

6. Criteria for evaluating fringe parking potential

Any requests submitted by the States for Federal participation in the development of fringe parking facilities should be accompanied by a report showing the results of a detailed analysis of the demand for fringe parking and the impact expected following the implementation of the proposed plan. The study and analysis must be conducted as part of the comprehensive urban transportation planning process, with adequate consideration given to the integration of parking with the other elements of the urban transportation system.

Since this program is a relatively new one, there are few specifically known measures of success than can be applied to determine the adequacy of one alternative plan over another. However, on the basis of the limited data available for fringe parking programs currently underway there are several factors that are felt to be significant in evaluating the potential success of new programs. Estimates of the following should be made, and they shall be used as a basis for evaluating the feasibility of a particular program:

(a) Increase in mass transit usage, with corresponding increase in operating revenue.

(b) Decrease in freeway usage during peak hours, and possible reduction in the future needs for freeway lane miles in a particular corridor or several corridors.

(c) Reduction in severity or elimination of specific traffic bottlenecks during peak hour flows.

(d) Decreased door-to-door travel time for peak hour work trips, for both autos and mass transit users.

(e) Reduction in parking needs within the CBD.

E. WHAT STEPS CAN BE TAKEN TO STRENGTHEN METROPOLITAN PLANNING AGENCIES?

1. Statement of the problem

The metropolitan planning bodies established in accordance with section 134 of the Federal-Aid Highway Act have been instrumental in the development of comprehensive land use and transportation plans in urban areas, many of which had done little or no planning previously. The accomplishments of these bodies have been significant, but there are several deficiencies in the planning process which might now be investigated to determine the steps necessary to improve the planning function even further. One problem that seems to be emerging more clearly in many urban areas is the difficulty of implementing plans both from a procedural and a practical point of view.

2. Background

In requiring that the planning process be the basis for approving Federal-aid highway projects, Congress recognized the urgency of continuing, cooperative, comprehensive planning in urban areas. Perhaps the greatest value of the planning process that is now underway in more than 200 urban areas is that the numerous jurisdictions located within the boundaries of the area are working together in arriving at solutions to areawide transportation problems. Although their accomplishments are numerous, there still exists some difficulties in the process that must be overcome if the planning process is to play its proper role in advancing the goals and objectives of the community as it grows. For example:

(a) The central city within the metropolitan area many times does not have equitable representation in the decisionmaking process.

(b) Because of the structural characteristics of metropolitan planning agencies, metropolitan planning is advisory in nature, depending upon the voluntary acquiescence of the local units within its sphere of interest for acceptance of its proposals. Thus, its success is largely dependent upon its ability to persuade and convince its numerous and autonomous constituents, and the tools available to implement plans are limited.

(c) Quite often, the State highway departments may have a disproportionately large influence on these bodies, and the resulting highway construction decisions.

(d) Frequently there is inadequate citizen participation in the planning process.

3. Alternative proposals

(a) *Study the deficiencies that exist in the planning process.*—Recognizing the need to improve the planning process to make it a more effective tool in establishing and implementing long range urban development plans, a study would be conducted within the FHWA to determine the steps necessary to correct existing deficiencies.

(b) *Make the metropolitan planning agencies more representative and more effective, and provide additional planning funds.*—The provisions of section 134 of the Federal-Aid Highway Act would be amended to require that metropolitan planning agencies be more representative of the metropolitan area. An additional $5 million would be provided nationally above the current $18.8 million to hire additional competent personnel and to expand the scope of work undertaken.

(c) *Establish metropolitan development agencies having full powers of implementation.*—Metropolitan development agencies (MDA's) would be required in each urban area to plan and implement comprehensive land development and transportation plans having an areawide implication, in order for that area to qualify for Federal-aid highway funds. The work of the MDA would be subject to direction and guidance from representatives of all the affected political jurisdictions within the metropolitan area. The authority of the MDA to *implement plans* would help to ameliorate the serious jurisdictional problems that arise when an attempt is made to adopt an areawide program of any sort under current arrangements.

4. Recommended alternative

Alternative "a" above is recommended for implementation. By making an evaluation of the urban planning process within FHWA, the sources of existing problems and the best means for solving those problems could be identified. Then, the necessary steps could be taken, including legislative action if necessary, to improve the process.

Alternative "b" was rejected, because at the present time it is not clear exactly how this goal could be accomplished most effectively. Alternative "c" was rejected, because it is too ambitious an undertaking at this time.

F. SHOULD THE USE OF INTERDISCIPLINARY TEAMS AND THE CONSIDERATION OF JOINT DEVELOPMENT BE EXPANDED IN THE TRANSPORTATION PLANNING PROCESS?

1. Statement of the problem

The completion of the Interstate Highway System is being stalled in many urban areas at the present time, because the communities involved object to the potential damage that these facilities might have on the urban environment. In some instances, if earlier and more complete consideration had been given to the potential environmental and social impacts of the proposed highways, such controversies might have been avoided and the total transportation and land development efforts improved.

2. Background

The powerful impacts of transportation on urban development can and should be used in a positive way and as a tool in creative urban planning. One way of accomplishing this goal is by fostering joint transportation-land use efforts to develop and revitalize the Nation's urban communities. Interdisciplinary teams, consisting of engineers, planners, architects, sociologists, and other professionals concerned with urban development, could accomplish this most effectively by combining their talents and applying them to the complex problems

facing our urban areas, including the joint development of transportation and other capital improvements.

(a) The interdisciplinary team approach has been utilized recently in several urban areas in an attempt to develop transportation corridors that are functional, esthetically pleasing, and socially and politically acceptable. However, in most cases they have been used as a remedy to cure a complex transportation issue that has arisen, in part, because less than complete consideration was given at an earlier point to some of the complex social, esthetic, and environmental implications of the proposed highway project. These teams are currently working in Baltimore, Chicago, and New York City; similar efforts are being planned in other urban areas at the present time.

(b) *Joint development.*—The urban highway program in Washington, D.C., has been delayed and complicated for many reasons. One major reason has been the difficulty of finding suitable housing for persons and families who will be displaced by the proposed highway construction. Realizing the critical nature of this problem, the District of Columbia Department of Highways and Traffic initiated a study in 1967 of the feasibility of developing air-rights housing and related facilities over and adjacent to the center leg of the Inner Loop Freeway. The scheme recommended by the Highway Department's consultant consisted of a development of 327 low to moderately priced dwelling units, together with a playfield, a children's recreation area, and adult landscaped recreation and sitting spaces. The proposed air-rights project would accommodate the 192 families to be displaced by the freeway, and it would provide space for new families as well. The costs to be incurred by implementing this program were considered to be reasonable and capable of being financed by DOT, DHUD, local agencies, and private enterprise.

There are numerous legal, financial, technical, and administrative problems that present formidable obstacles in any attempt to plan and implement joint development projects. However, if the Department of Transportation is committed to doing its share in rebuilding and revitalizing urban areas, serious consideration should be given to making the consideration of joint development an integral part of the urban transportation process.

3. Alternative proposals

(a) *Encourage more use of the interdisciplinary team approach and the consideration of joint development projects, with no additional funds provided; initiate research to measure the implications of joint development projects.*—More encouragement would be directed by FHWA to State and local planning agencies to incorporate interdisciplinary teams as an integral part of the urban transportation planning process, but no additional funds would be provided for this purpose. The "teams" would be utilized initially during the corridor planning stages of the planning process so that early consideration could be given to engineering as well as social, economic, and esthetic qualities of potential transportation facilities. The teams would also consider more detailed design features of specific transportation projects within each corridor, including the potential for joint development projects, during the engineering design stages. At the same time, existing funds would be utilized to make a thorough analysis of the legal,

administrative, technical, and financial implications of joint development.

(b) *A Federal mandate for action, with new funds provided for planning.*—This alternative would require that interdisciplinary teams be established in each urban area having a population over 1 million. Additional funds amounting to approximately $5 million the first year, $10 million the second year, and $15 million each year thereafter, would be authorized for the additional expenses that would be incurred for planning and other contingencies. In addition, feasibility studies of the potentials of joint development in all new urban highway corridors would be required as an element in the urban planning process so that early consideration could be given to joint development projects.

(c) *A Federal mandate for action, with additional funds provided for both planning and implementation of joint development projects.*—This alternative is similar to alternative "b" above, except that in addition a loan fund of $50 million annually for 5 years would be established for making loans to the States for purchasing extra land and for the additional construction costs associated with joint development projects. This money would be repayed by the States when the joint development construction took place, from the sale of the excess land or air rights.

4. Recommended alternative

Alternative "a" above is recommended for implementation. The advantage of this alternative is that it would not place undue requirements on the States at this time when experience in these areas is limited. With more vigorous effort by FHWA, interdisciplinary teams would be incorporated as an integral part of the planning process in many urban areas, perhaps limiting such activities to those places over 1 million in population initially. Valuable experience would be derived from such an undertaking, and this would supplement the knowledge gained from the research conducted in this regard.

Alternative "b" was rejected, because it is not considered appropriate at this time to add another mandatory condition for Federal aid in urban areas. The existing requirements and interpretation of section 134 of the Federal-Aid Highway Act offer adequate controls for insuring the proper employment of the best planning tools available. Similarly, alternative "c" was rejected because there is not sufficient experience available to support such a major effort at this time.

The interdisciplinary team approach and the joint development concept offer potentially valuable planning and design techniques that could be extremely beneficial in ameliorating future transportation dilemmas. Therefore, the vigorous advancement of these concepts seems warranted at this time, within the framework recommended in alternative "a".

Some of the benefits to be derived as a result of the involvement of interdisciplinary teams in the planning process include the following:

The potential urban development possibilities that involve both private and public funds could be explored.

Particular attention would be given to the complementary features of highways and mass transportation facilities, so that better balanced and integrated transportation systems could be established.

Better channels of communication could be established between the community and both technical and planning groups.

Some of the benefits to be derived by consideration of joint development possibilities include the following:

Transportation facilities would be better integrated with the urban environment, both aesthetically and functionally.

A reasonable means would be provided for creating replacement housing for families and new locations for businesses that are displaced by new construction. This is particularly urgent in light of the major relocation provisions of the 1968 Highway Act.

Cities would have an opportunity to regain some of the tax loss usually incurred in condemning taxable property for rights-of-way.

Additional usable floor space would be provided in high density core sections of the metropolitan area, where such space is at a premium.

G. BUS ALTERNATIVES IN URBAN COMMUTATION—SPECIAL STUDY

1. Statement of the problem

At the present time there are limited alternative means for commuters to travel to and from work in most urban areas. The effectiveness of mass transportation systems has been gradually deteriorating, automobile ownership rates have climbed steadily, and a rapidly increasing demand for new urban freeways has resulted. New freeway construction, however, has not kept pace with the need for providing additional peak hour commuter transportation facilities.

2. Background

Limited experience has shown that buses can be used to ease peak hour traffic congestion if they are improved and properly integrated with other segments of the urban transportation system. Demonstrations making use of fringe parking lots, more efficient methods of collection and distribution, exclusive bus lanes, and the like, show potential for attracting significant numbers of former auto drivers or passengers.

An analytical study was made in which a mathematical model was developed to examine the differences between the costs of auto and express bus systems, with a view to determining their cost-effectiveness under alternative circumstances and assumptions. This study was made to assist the Department in determining future approaches for satisfying peak hour demands for urban commutation.

The results of this study, titled "A Bus-Auto Cost Model" is being forwarded separately; it contains detailed information, conclusions, and recommendations. Therefore, the purpose of this document is to merely summarize that report.

3. Summary of results

In general, the conclusions of the analytical study are as follows:

(a) If construction of a new freeway for private auto use is the alternative to the construction of an exclusive reversible bus lane in the median of an existing freeway, the bus system has the advantage, within the limits of the assumptions that are made.

(b) If the construction of a new freeway for private auto use is the alternative to the construction of an exclusive two-lane bus roadway in its own right-of-way, the bus system again has the advantage.

(c) An advantage for the car, or at least a clear-cut standoff, emerges if a reversible lane is added to an existing freeway and its use is restricted to car pools so that the auto occupancy rate is in the range of 3.5 to 4.

H. HIGHWAY ENGINEERING IMPROVEMENTS—SPECIAL STUDY

1. Statement of the problem

The Bureau of Public Roads administers three programs that have been established to increase highway traffic flow and/or reduce traffic accidents; they are TOPICS, spot safety improvements, and roadside hazard removal.

The purpose of the analysis made in this special study is to compare the *costs and benefits of those three programs* with *programs having the specific objective of building new highways.* On the basis of this analysis, recommendations are made concerning the composition of Federal-aid financing of State highway engineering projects for fiscal year 1970.

2. Background

Special Study SS–68–1, titled "Highway Engineering Improvements," was prepared by the Bureau of Public Roads and is being forwarded separately. It contains a detailed analysis of the highway engineering programs under discussion; therefore, this document simply contains a summary of the data contained in the BPR report.

The data available to describe the output and the benefits of these programs are limited, and work must continue in the future to provide more quantifiable information on which to base investment decisions. The data in table A were derived from the data contained in Special Study SS–68–1. An attempt was made to summarize the costs, outputs, and benefits of four general categories of programs:

(*a*) *New or reconstructed rural highways*, including Interstate and ABC programs.

(*b*) *Improvements to existing rural highways*, including TOPICS, roadside hazard removal, and spot safety improvement programs.

(*c*) *New or reconstructed urban highways*, including Interstate and ABC programs.

(*d*) *Improvements to existing urban highways*, including TOPICS, roadside hazard removal, and spot safety improvement programs.

The broad classifications described above were the only ones that could be used with some consistency in an attempt to compare the costs and benefits of *new construction* to *engineering improvement programs.* Also, the only benefits that could be utilized for this purpose were the ones measuring *accidents prevented*, *increase in speed*, and *increase in capacity.* Even with this limited summary, an examination of table A shows that there are still key data items that are not available as well as a lack of consistent units for measurement of output.

3. Conclusions

If the data were considered solid enough to draw conclusions, it would show that approximately one accident is prevented for $10,000 of expenditures in each of the foregoing programs, except for new rural highways where the ratio is $1,000 :1.

However, the data are too limited at the present time to permit confidence in such evaluations of the costs and benefits of the various programs under discussion. The programs in general are expected to result in important positive benefits, as described in the detailed special study. In administering these programs the Bureau of Public Roads will place more emphasis on developing a better means of evaluating their impact in more quantifiable terms than is possible now.

TABLE A.—SUMMARY OF COSTS, OUTPUT, AND BENEFITS FOR FEDERAL-AID HIGHWAY PROGRAMS

Program	Total cost (millions)	Total output	Total benefits		
			Accidents prevented	Increase in average speed	Increase in capacity
1. New urban highways	$1,648.7	2,785 lane miles	167,190	5 m.p.h. Interstate; 1 m.p.h. ABC.	Not available.
2. Improve existing urban highways	325.2	111,600 intersections for TOPICS, and 1,055 miles for roadside hazard; spot safety output not available.	25,000	2 m.p.h.	Do.
3. New rural highways	2,675.8	23,712 lane miles	[1] 2,318,000	5 m.p.h. Interstate; 1 m.p.h. ABC.	Do.
4. Improve existing rural highways	247.0	8,100 intersections for TOPICS, and 10,750 miles for roadside hazard; spot safety output not available.	25,000	Not available	50 percent at intersections, 15 to 25; 25 percent systemwide.

[1] Does not include secondary, which is not available.

I. AUTHORIZATIONS FOR THE URBAN MASS TRANSIT ADMINISTRATION

1. *Statement of the problem.*—Section 4(b) of the Urban Mass Transit Act of 1964 as amended authorizes the appropriation of funds through fiscal year 1970. Because of the advance appropriation feature of this program, there is a need now to determine the authorization and appropriation levels for UMTA at least for fiscal year 1971. Also to be considered is the possibility of a supplemental appropriation for fiscal year 1970.

2. *Background.*—There are two questions that must be answered at this time. First, what is the appropriate authorization level that should be considered; and second, should the current pattern of 2-year authorizations be continued?

3. *Alternatives and recommendations* are in development at the present time. They will be forwarded separately when the necessary decisions have been made.

ATTACHMENT 8

SPECIAL ANALYTIC STUDY

URBAN COMMUTATION ALTERNATIVES

By Office of Planning and Program Review, Department of Transportation, October 1968

CONTENTS

I. Instruction and Summary

A. PURPOSE OF THE STUDY

It does not require any impressive marshaling of statistics or any subtle convolution of logic to know that the Secretary of Transportation and public officials at all levels of government face a serious problem in the conditions that commuters must contend with in their daily trips to and from work. Crowded roads and ensuing delays in the work trip are generating public pressure for action on the part of government in many of our cities. The purpose of this study is to test alternative methods of attacking this problem.

B. SCOPE AND LIMITATION OF THE STUDY

1. Rail transit

The analysis excludes rail transit alternatives to increased highway capacity and considers only bus transit alternatives. This does not constitute an out-of-hand rejection of rail alternatives, but, rather, it was felt that it was not possible to achieve full treatment of both bus and rail alternatives with the time and resources available for this study. Since rail transit, with its large fixed investment requirements, requires very high volume levels for economical operation, it is applicable to a narrower range of conditions than is bus transit. It was decided that initial efforts, then, should be concentrated on bus transit as the more widely usable transit alternative. A future effort may well be devoted to an analysis of rail transit.

2. Social costs

In order to make a proper evaluation, all costs associated with the two systems should be evaluated, but social costs, such as community disruption resulting from freeway construction, air pollution, noise, and esthetic effects, are very difficult to quantify. The quantification of these effects is, again, beyond the scope of this study, because of time and resource limitations. However we think it is reasonable to believe that costs of this nature will be incurred more heavily by the auto system, because of its greater requirement for land, and the much larger number of vehicles involved.

3. Commuters' preferences between bus and auto

Again, because of time and resource limitations, this study makes no effort to analyze the demand for transit on the part of the commuter.

Specifically, this study does not attempt any analysis of commuters' preference for transit vis-a-vis autos. However, we do have evidence that suggests that the auto commuter's demand for transit is very sensitive to the quality of the transit service (and not particularly sensitive to the fare), and there is fragmentary evidence (Peoria, Milwaukee, Skokie Swift) to suggest that a high quality transit service can attract auto riders.

On the basis of this evidence, the bus system that is used in this study is an elaborate and expensive one, which is designed to provide a level of service to the commuter that is comparable, or nearly so, to the service he gets by using his car.

4. CBD orientation

This study does not cover the full gamut of work trips, but is limited to trips between suburban residential areas and central business districts. The model that has been developed for this analysis, however, could be modified in the future to treat trips to areas that are more spread out than central business districts.

C. DESCRIPTION OF THE ALTERNATIVE SYSTEMS

The study contemplates a system that takes the commuter from his house in a suburb to a point within three blocks of his place of work in the central business district. The system includes a collection service which moves the passenger from the door of his house to an

express bus station where there is a maximum of 5 minutes between bus departures. Thence, the express bus takes the passenger to a point in the CBD where he transfers, with virtually no wait, to a bus on a distribution route that takes him to within three blocks of his ultimate destination. There need not be more than two or three stops on the distribution route.

The following minimum standards of service are specified:

1. No waiting time for the suburban collection system. Passengers either drive, or are driven, to the line-haul station in private cars, or are picked up by a jitney service which comes to their door at a prescheduled time, or walk.
2. A maximum headway of 5 minutes between buses at any line-haul station (a minimum of 12 buses an hour).
3. Seating for all passengers in all phases of the system.
4. No stops on the line-haul run. From each suburban station there is nonstop express service to the CBD.
5. Some provision is made, for example, an exclusive bus lane, that permits high-speed unimpeded operation of the express bus between the suburban station and the CBD regardless of the conditions that may be confronting other traffic.

Under the assumptions that are used in the study, it is possible for such a system to provide door-to-door trip times, including walking and waiting times, that can easily come within 5 minutes of auto time, and can match or even beat car time, depending on the route lengths involved and the conditions under which the car is assumed to be operating. It should be noted, however, that the bus system postulated in the analysis does require two transfers of the passenger that uses the jitney service, and one transfer for kiss-and-ride or park-and-ride passengers.

It must be clearly understood that the bus system described above is not being offered in this paper as the "best" or "optimal" bus system. It has been used in the study simply because it is elaborate and expensive, and because, as stated above, cost comparisons between bus and auto systems have little meaning unless the bus system under consideration offers a very high level of service.

To recapitulate, then, the study is a comparison of the costs of creating additional capacity for moving commuters between a central business district and their suburban home through the creation of new highway capacity to handle more auto traffic on the one hand and the creation of a high-speed, high-quality express bus service on the other hand. The study does not engage in any analysis of commuters' preferences between bus and auto, but it acknowledges the existence of this problem by using a very high quality bus system for the cost comparison. Social costs, such as community disruption, pollution, noise, and esthetic effects are not included in the cost comparison.

D. COSTS

Costs that are treated are:

—Freeway construction and maintenance
—Investment in vehicles (buses and automobiles)
—Fuel, maintenance, and repair costs
—Construction and maintenance of parking facilities
—Overhead costs for the bus system
—Insurance or accident costs
—Wages of bus operators.

The analysis itself consists of a fairly simple mathematical model which takes distances, times, and numbers of people to be carried and generates and compares costs for the two alternative systems over any desired range of distances and passenger volumes. There is no attempt to relate these costs to any particular city. The model is general and a number of simplifying assumptions, and it should not be taken as an abstract, and covers a wide range of conditions. It uses averages and effort to estimate with any high degree of accuracy the costs of operaing the type of bus system contemplated in any particular area. To do this would require detailed data on conditions pertaining to a particular situation. However, it can be taken as a reasonable estimate of the relative costs between bus-based versus auto-based systems.

E. CONCLUSION AND RECOMMENDATION

The results of the anlysis may be summed up as follows:

1. If construction of a new freeway for private auto use or the addition of lanes to a planned freeway is the alternative to the construction of an exclusive reversible bus lane in the median of an existing or planned freeway, the bus system has the advantage.

2. If the construction of a new freeway for private auto use is the alternative to the construction of an exclusive two-lane bus roadway in its own right-of-way, the bus system again has the advantage.

3. An advantage for the car, or at least a standoff, emerges if a reversible lane is added to an existing freeway and its use is restricted to carpools so that the auto occupancy rate is in the range of 3.5 to 4 passengers per auto.

The results of the analysis strongly suggest that the expansion of highway capacity to carry automobiles is an uneconomical way of alleviating congestion in peak-hour work trips between the central cores of large cities and outlying residential areas.

Given that the problem of commuters' demand for transit is not directly confronted in the study, and realizing that the model is an abstraction, not representing any particular real-world situation, the analysis shows that the cost savings that can be realized through the installation of a transit system as an alternative to additional highway capacity are likely to be very substantial. In view of the fact that transit systems of the level of service contemplated by the study do not now exist in any large urban radial corridors, and are unlikely to exist without some form of government support, at least at the outset, a very strong case is developed for departmental promotion and support of demonstration projects in selected cities so that the questions not answered by the analysis can be examined under real-world conditions.

II. Results

(Note: In the tables used in this section, all results are obtained with the standard set of data shown in the section on data, unless otherwise specifically noted.)

A. WHERE A NEW FREEWAY IS UNDER CONSIDERATION

1. A freeway exists in a corridor, but it is congested at peak loads and the alternatives under consideration are the construction of a new freeway or the installation of a reversible exclusive bus lane in the median of the existing freeway. The bus cost advantage is overwhelming. The cost of a new four-lane freeway alone will exceed the present value cost of the bus system. The same results will apply to any situation when provision is made for the bus to run at high speed at a cost of $600,000 per mile or less. See table 1a.

2. There is peak-hour congestion in a corridor, but no freeway. A freeway is not necessarily required for off-peak purposes, so the question is whether to build a freeway or put in an express bus system. There is no existing right-of-way into which an exclusive bus road can conveniently be fitted. Although there are probably cheaper ways of doing it, this example provides for an exclusive two-lane bus road in its own right-of-way at $2,600,000 per mile. The results are unambiguous. See table 1b.

3. There is peak-hour congestion in a corridor, there is currently no freeway, but it has been decided that a freeway should be built for off-peak purposes. The question is whether the freeway should provide capacity for the peak loads or whether this capacity should be provided by an express bus service utilizing a reversible exclusive lane. If such a lane is incorporated in the planning stage, its cost will be much lower than in the case where it is added to an existing freeway—$100,000 per mile has been used as the cost figure in the model. This is simply the $600,000 per mile used when a bus lane is to be installed in an existing freeway, minus the $500,000 per mile allowance for structure rebuilding (see highway costs in section on data). Here, again, the results are unambiguous. See table 1c.

B. ALTERNATIVES THAT DO NOT INVOLVE NEW HIGHWAY CONSTRUCTION, BUT DO INVOLVE EXPANDING CAPACITY OF EXISTING SYSTEMS

The auto alternatives that would be involved here are adding two lanes to an existing freeway or installing a reversible lane in the median and letting cars use it instead of buses. In the latter case, there is no differential whatever between the bus and auto systems with respect to highway maintenance and construction costs. This is the area where ambiguity arises in the results. Table 2a. shows the results of running the model with the standard data, but with all highway construction and maintenance costs out. The bus retains its advantage but it is no longer very great. Table 2b. shows the results when downtown parking costs are dropped to $1,500 per space for both land and construction, and the price of a car dropped to $1,400. This is undoubtedly too low for multistory parking garages, but it is intended to acknowledge the possibility of use of surface parking lots as well.

The difficulty with the car is not the amount of the price, but the extent to which people who use cars for commuting are using a second

car, and the extent to which such people would not buy a second car if they did not commute by auto. Thus while it is probably not realistic to charge up the full price of the car to commuting as is done in the standard set of data, it is not realistic to put it at zero either. There are no data for firmly establishing what percentage of the price of the car should be used, so that the treatment of the price of the car becomes a large part of the ambiguity under those circumstances where the bus-auto cost difference is not large.

As table 2b. shows, the bus-auto difference is still positive but it is in an area where changes of a few million dollars, which formerly could be ignored, could now become significant. In interpreting these results, it should be noted that the ambiguity works both ways. While they do not demonstrate an overwhelming advantage for the bus, neither do they show that the auto system is necessarily cheaper, and as soon as the highway costs for the auto alternative get ahead of the highway costs for the bus alternative, the cost advantage for the bus begins to move out of the ambiguous region. Further, these auto alternatives are only valid when we are talking about a capacity increment that can be handled by one highway lane. Thus, depending on what is regarded as an acceptable level of service to the auto commuter, these alternatives become irrelevant for the fourth or fifth columns in the tables; that is, at levels of 2,400 or 3,000 people per hour. In order to make a finding for the auto system on the basis of cost advantages when increments in existing highway capacity are achieved, one would have to be very sure that the capacity increase in question was sufficient for the problem.

One would also have to make allowance for the possibility that the bus system might generate other benefits besides the peak-hour movement of commuters, such as land-use impacts, use for reverse commuting and off-peak uses.

Finally, table 2c. shows the results in the car-pooling case with the occupancy ratio at 3.75. Here, the auto system actually comes out ahead on a cost basis, although not by an enormous amount. A decision on this alternative would have to turn on whether people would car-pool to the required extent, whether car pooling can provide the same level of service as the kind of bus systems we are talking about (it may well not) and on the evaluation of other benefits from the bus system.

TABLE 1A.—CONSTRUCTION OF NEW FREEWAY VERSUS INSTALLATION OF EXCLUSIVE BUS LANE IN EXISTING FREEWAY

	Hourly passenger volume				
Average line-haul: Distance (miles):	600	1,200	1,800	2,400	3,000
	Total bus system costs (millions)				
7	$10	$15	$19	$24	$27
6	9	14	18	23	26
5	9	13	17	21	25
4	8	13	16	20	24
	Total auto system costs (millions)				
7	$60	$69	$79	$89	$99
6	54	64	74	83	63
5	48	58	68	77	87
4	43	52	62	71	81
	Auto system cost minus bus system cost (millions)				
7	$49	$54	$60	$66	$72
6	45	49	55	61	67
5	40	44	51	56	62
4	35	40	46	51	57
	Ratio of auto system cost to bus system cost				
7	5.9	4.5	4.1	3.8	3.6
6	5.8	4.4	4.1	3.7	3.6
5	5.6	4.3	4.0	3.6	3.5
4	5.5	4.2	3.8	3.5	3.4

TABLE 1B.—CONSTRUCTION OF NEW FREEWAY VERSUS 2-LANE BUS ROAD IN ITS OWN RIGHT-OF-WAY

	Hourly passenger volume				
Average line-haul: Distance (miles):	600	1,200	1,800	2,400	3,000
	Total bus system costs (millions)				
7	$25	$32	$36	$41	$45
6	22	29	33	38	42
5	19	26	30	35	39
4	16	23	27	32	35
	Total auto system costs (millions)				
7	$60	$69	$79	$89	$99
6	54	64	74	83	93
5	48	58	68	77	87
4	43	52	62	71	81
	Auto system cost minus bus system cost (millions)				
7	$35	$38	$43	$45	$54
6	33	35	40	45	41
5	29	32	37	42	49
4	27	29	35	39	46
	Ratio of auto system cost to bus system cost				
7	2.4	2.2	2.2	2.2	2.2
6	2.5	2.2	2.2	2.2	2.2
5	2.5	2.2	2.2	2.2	2.3
4	2.7	2.3	2.3	2.2	2.3

TABLE 1C.—ADDING LANES FOR AUTOS TO PLANNED FREEWAY VERSUS PROVIDING EXCLUSIVE REVERSIBLE BUS LANE IN MEDIAN OF PLANNED FREEWAY

	Hourly passenger volume				
Average line-haul: Distance (miles):	600	1,200	1,800	2,400	3,000
	Total bus system costs (millions)				
7	$7	$11	$15	$20	$23
6	6	11	14	19	22
5	6	10	14	18	21
4	6	10	13	18	29
	Total auto system costs (millions)				
7	$35	$45	$55	$89	$99
6	32	42	52	83	93
5	29	39	48	77	87
4	26	36	45	71	81
	Auto system cost minus bus system cost (millions)				
7	$28	$33	$40	$70	$76
6	26	31	37	65	71
5	23	28	34	59	65
4	20	26	32	54	60
	Ratio of auto system cost to bus system cost				
7	5.2	3.9	3.6	4.6	4.3
6	5.1	3.8	3.6	4.4	4.1
5	4.8	3.7	3.5	4.2	4.0
4	4.6	3.5	3.4	4.0	3.8

TABLE 2A.—ALL HIGHWAY CONSTRUCTION AND MAINTENANCE COSTS AT ZERO

	Hourly passenger volume				
Average line-haul: Distance (miles):	600	1,200	1,800	2,400	3,000
	Total bus system costs (millions)				
7	$5	$10	$14	$18	$22
6	5	10	13	18	21
5	5	9	13	17	21
4	5	9	12	17	20
	Total auto system costs (millions)				
7	$10	$20	$30	$40	$50
6	10	20	29	39	49
5	10	19	29	39	48
4	10	19	29	38	48
	Auto system cost minus bus system cost (millions)				
6	5	10	16	22	28
5	5	10	16	22	82
4	5	10	16	22	28
	Ratio of auto system cost to bus system cost:				
7	1.8	2	2.2	2.2	2.3
6	1.9	2	2.2	2.2	2.3
5	1.9	2	2.3	2.3	2.4
4	1.9	2	2.3	2.3	2.4

TABLE 2B.—ALL HIGHWAY CONSTRUCTION AND MAINTENANCE COSTS AT ZERO, LAND AND CONSTRUCTION FOR DOWNTOWN PARKING PLACE AT $1,500, PRICE OF CAR AT $1,400

	Hourly passenger volume				
Average line-haul: Distance (miles):	600	1,200	1,800	2,400	3,000
	Total bus system costs (millions)				
7	$5	$9	$12	$15	$19
6	5	8	11	15	18
5	5	8	11	15	17
4	4	8	11	14	17
	Total auto system costs (millions)				
7	$6	$11	$17	$22	$28
6	5	11	16	22	27
5	5	11	16	21	27
4	5	10	16	21	26
	Auto system cost minus bus system cost (millions)				
7	$1	$3	$5	$7	$9
6	1	3	5	7	9
5	1	3	5	7	9
4	1	3	5	7	9
	Ratio of auto system cost to bus system cost				
7	1.2	1.3	1.4	1.4	1.5
6	1.2	1.3	1.5	1.5	1.5
5	1.2	1.3	1.5	1.5	1.5
4	1.2	1.3	1.5	1.5	1.5

TABLE 2C.—CAR-POOLING CASE, ALL HIGHWAY CONSTRUCTION AND MAINTENANCE COSTS AT ZERO, PRICE OF CAR AT ZERO, OCCUPANCE RATIO FOR COMMUTING AUTO AT 3.15

[Dollars in millions]

	Auto system cost minus bus system cost				
Hourly volume	600	1,200	1,800	2,400	3,000
Average line-haul, distance:					
7	0	0	—$1	—$1	—$1
6	0	—$1	—1	—1	—1
5	$1	0	—1	—1	—1
4	1	0	—1	0	0

III. Assumptions and Data

The major nonquantitative assumptions underlying the study are set forth below. Immediately following is a set of tables showing the values for all of the variables used in the study and their source. This is followed by a discussion of the model's sensitivities and the effects of the assumptions.

—Origins and destinations are assumed to be evenly distributed over space in both the suburban residential area and the central business district.

—The flow of passengers over this time is assumed to be uniform for the two morning rush hours and the two evening rush hours.

—Although the costs for the bus system are computed on the basis of 4 hours of operation a day, a full annual wage is used for the cost of a vehicle operator.

A. COST PARAMETERS

Designation	Description	Value	Source
	1. MILEAGE COSTS		
B	Cost per mile for bus: Includes maintenance, fuel, insurance, overhead.	$0.30	Meyer, Kain & Wohl.*
B_1	Cost per mile for auto: Includes fuel and maintenance.	$0.038	FHWA publication—"Cost of Operating an Automobile."
B_2	Cost per mile for 9-passenger jitney: Includes same costs as B.	$0.158	FHWA figures on fuel and maintenance for auto plus MKW figures for insurance and overhead on bus.
B_3	Cost per block for bus	$0.025	Cost per mile for bus, divided by 12.
	2. PER-VEHICLE COSTS		
H_0	Annual maintenance for space for fringe parking lot.	$60	Meyer, Kain & Wohl.
H	Annual maintenance for space for downtown parking.	$150	Do.
H_1	Annual salary of a busdriver	$9,000	Do.
H_2	Price of a 50-seat, air conditioned bus	$30,000	Do.
H_3	Investment per bus in yards and shops	$4,500	Do.
H_4	Price of 9-passenger jitney	$3,500	Sumner Myers (informal conversation).
H_5	Price of a car	$2,800	FHWA—"Cost of Operating an Automobile."
H_6	Insurance cost for commuting auto	$100	Meyer, Kain & Wohl.
H_7	Insurance cost for park-and-ride auto	$30	Do.
H_8	Construction cost per space for fringe parking lot.	$400	Do.
H_9	Construction cost per space for downtown multilevel parking garage.	$3,000	Do.
J_1	Land cost per space for fringe parking	$600	Do.
J_2	Land cost per space for downtown parking (multilevel).	$2,000	Do.
	3. HIGHWAY CONSTRUCTION AND MAINTENANCE		
G	Construction cost per lane-mile for urban freeway.[1]	$800,000	Lane-mile average obtained from figures in Meyer, Kain & Wohl.
G_1	Land cost per lane-mile for urban freeway	$500,000	Writer backed into this number by taking $1,300,000 as a conservative estimate for total lane-mile cost of urban freeway and then subtracting $800,000 for construction.
G_4	Construction cost per mile for single reversible express bus lane in median of existing freeway.	$600,000	$500,000 is for rebuilding of all structures, BPR Data on urban interstate suggests structure frequency of one per mile. Informal discussion with BPR officials suggested $6–14 per square foot of deck space as range for bridge cost. Informal discussion with highway engineer suggested 500 square feet of deck, as average. $100,000 per mile for single lane is an increase in MKW figure of $80,000 per lane mile for base and paving.
R	Freeway maintenance per lane mile	$9,000	Meyer, Kain & Wohl.

[1] In event of alternative of adding lanes to existing freeway without right-of-way acquisition being considered, then G is $750,000. Again, $500,000 per mile for structure rebuilding is used, or $250,000 per lane-mile. Assuming a 2-to-1 side slope on both sides of a depressed highway, use of unit cost data obtained from BPR staff gives $500,000 lane-mile for base and paving of new lanes and shoulders, excavation of side slope and construction of a retaining wall.

*Meyer, Kain & Wohl, *The Urban Transportation Problem* (Harvard Univ. Press, 1965). This work is sometimes referred to in the text of this study as MKW. [Editors note.]

B. TIME AND SPEED PARAMETERS

Designation	Description	Value	Source
S	Running speed of bus on line haul in miles per hour.	60	This is based on assumption that bus has exclusive lane all the way to CBD. To the extent that this assumption is not used, adjustments must be made in this value. Corresponding adjustment would also have to be made to the number of miles of exclusive lane to be charged to the bus system.
T_1	Running speed of jitney in collection area in seconds per mile (equivalent to 25 miles per hour).	144	Meyer, Kain & Wohl.
T_2	Running speed for bus on CBD streets in seconds per block (13 miles per hour).	22.5	Do.
T_3	Acceleration deceleration delay in seconds	5	Do.
T_4	Loading-unloading time in seconds per passenger.	5	Meyer, Kain & Wohl—this number does not allow for time savings from simplified fare collection systems or loading arrangements which allow for the use of more than 1 door.
T_5	Delay per stop for the jitney in seconds	10	Developed from data in HUD report on Peoria demonstration project.
T_6	Turnaround time and unloading-loading time for line-haul bus in seconds.	370	Meyer, Kain & Wohl—120 seconds for turnaround plus 5 seconds per passenger, 50 passengers per bus, for loading-unloading. (MKW use a lower figure for loading-unloading in their analysis by assuming centralized fare collection and multidoor loading and unloading.)

C. CAPACITIES AND OCCUPANCY RATIOS

C_1	Capacity of line-haul bus	50	Meyer, Kain & Wohl.
C_2	Capacity of jitney	9	Sumner Myers (informal conversation).
C_4	Occupancy ratio for commuting auto	1.5	Meyer, Kain & Wohl—also, a generally accepted figure in the field.
C_5	Occupancy ratio for kiss-and-ride auto	1.1	Meyer, Kain & Wohl.
C_7	Occupancy ratio for park-and-ride auto	1.1	Do.

D: OTHERS

Designation	Description	Value	Source
D_s	Distance from line-haul route to side of collection area, one-half the width of the collection area.	2	A somewhat arbitrary selection. Informal conversation with BPR staff revealed that Virginia bus companies, in connection with Shirley Highway project, had felt that 10 minutes on collection trip was about the most a passenger would put up with. If the collection station is in the middle of a 4-mile square (16 square miles), the jitney system will operate under a 10-minute time limit for the 1st passenger picked up without being too expensive. If autos can operate at 25 miles per hour in area, all points are within 10 minutes for kiss-and-ride and park-and-ride. The same thinking lead to 16 square miles as maximum size for collection area for a single station.
L_1	Length of collection area in miles	4	Any value can be used depending on how long such areas are actually likely to be. Available data on lengths of radial bus routes suggests that four miles is certainly not too long. It is used as a minimum in this analysis. Little has been done with larger values because the bus cost advantage goes up with distance.
I_1	Headway constraint on station spacing in number of departures per hour. The model will not permit an additional station in a given area unless I_1 can be satisfied for all stations.	12	As is pointed out in the text, this is a matter of preference between reducing collection costs and time or reducing waiting time at station. Higher values of I_1 will increase costs, but not greatly.
Z_1	Proportion of passengers on jitney	.3	Primarily, an arbitrary selection. From the cost point of view it does not make much difference. If all passengers use the jitney service, the result is somewhat lower costs than obtain the values shown here. This is because there are economies of scale prevailing with the jitneys, and because park-and-ride is quite expensive.
Z_2	Proportion of passengers using kiss-and-ride	.3	
Z_3	Proportion of passengers using park-and-ride	.3	
G_3	"Capacity" of a lane for autos	1,500	Theoretical maximum on interstate lane is 2,000. Traffic should flow freely, if not fast, at 1,800. At 1,800 speed is around 35 miles per hour. At 1,500 it is in the 40's. The value used here reflects a judgment about the conditions under which people will feel "congested." Effect of raising it above 1,500 is to raise the volume level at which model rejects 1 extra lane's worth of capacity for autos from 2,400 to 3,000.
I	Discount rate (percent)	10	Rate suggested by BOB. Model not very sensitive to adjustment to 7.5 percent or 12.5 percent.
L	Time horizon (years)	20	Arbitrary selection. A longer period slightly favors the auto system.

The data on mileage costs, prices of vehicles, and drivers' wages is either fairly firm or pitched on the high side as far as the bus system is concerned. A few cents one way or another in cost-per-mile figures or a couple of thousand dollars one way or another in drivers' salaries or vehicles prices does not have a significant effect on the model's results. For example, with a 20-year life and 10-percent interest rate a difference of $3,000 in a driver's salary is a present value difference of $25,500 per vehicle. The largest number of transit vehicles that obtains in the model with the standard assumptions and the volume and distance ranges customarily used is 82, so that this is a total difference of $2,091,000 for the present value of the cost of 20 years' operation of an express bus system; $2 million is a small figure when the bus-auto cost difference is large, and in the circumstances where it would have a

noticeable effect, the results of the model are not claimed to be unambiguous in any event. Further, 82 vehicles obtain at a volume level, 3,000 people per hour, where the results never are ambiguous (except in the car-pooling case).

The time and speed parameters are fairly conservative, and, again, drastic changes do not significantly effect total costs. For example, dropping the jitney's running speed from 25 to 15 m.p.h., and simultaneously dropping the speed of the distribution vehicle on a downtown street from 13 to 8 m.p.h., brings a change in the total cost of the bus system in the area of $2 million. The assumption of 60 m.p.h., on the line-haul for the bus may bring questions, but it depends on the provision of an exclusive lane for the bus for the whole trip. If we relax this assumption, it is level of service, not cost, that suffers. For instance, dropping the line-haul bus speed to 30 m.p.h. and eliminating any expenditure for an exclusive bus lane brings about a reduction in bus cost for the linehaul.

The highway cost figures are somewhat rough and ready, but the assumption of $1,300,000 a lane-mile for freeways, in built-up areas around large cities and actually entering large cities is conservative. The figures used for the cost of adding lanes to an existing freeway or installing a reversible lane in the median are somewhat rough, but ought to be in the ball park.

A very big assumption is that of the even distribution of the originations and destinations in time and space. That is, we are assuming even densities over the collection area and over the CBD, and we are assuming an even flow of passengers over the 2 peak hours in the morning and the 2 peak hours in the evening. Neither assumption is very close to the real world, but they greatly simplify the model. The assumption of even densities puts an upward bias in bus costs, because in the real world, there would undoubtedly be concentration of origins and destinations in both the collection area and the CBD that could be taken advantage of to reduce costs.

The even flow over time puts a downward bias in bus costs, because if the buses were scheduled according to this assumption, there would be overloading at the highest part of the peak, violating the requirement that seats for all have to be provided. To meet this problem without reducing schedule frequencies, additional buses would have to be provided at the maximum demand time. If one wished to allow extra buses in, say, the peak 20 minutes, total bus costs could be put up 10 to 20 percent to allow for this. This would not affect the results of the model when the cost difference is large. It would have an effect in the area which has already been acknowledged as ambiguous.

On the other hand, this assumption may well put more of a downward bias in car system costs. This is because the bus system can absorb a bulge in the peak-hour flow at some cost increment but without any sacrifice in the level of service. This is not true for the auto system. If we wish to assume the level of service, for example, that goes with 1,500 cars per lane per hour, and assign lanes to the auto systems on this basis, any bulge in the peak flow will lower that level of service, and this can be corrected only by adding additional lanes up to the point that the desired level of service is provided for the height of the peak.

Although we are contemplating a system to be operated only in the peak hours a full year's salary is assumed for a vehicle operator. Consultation with a Labor Department staff member suggested that this is a safe assumption for 4 or 5 hours of work a day. Depending on the actual details of union contracts in different areas it might be possible to get by for less, but this would be by no means a certainty.

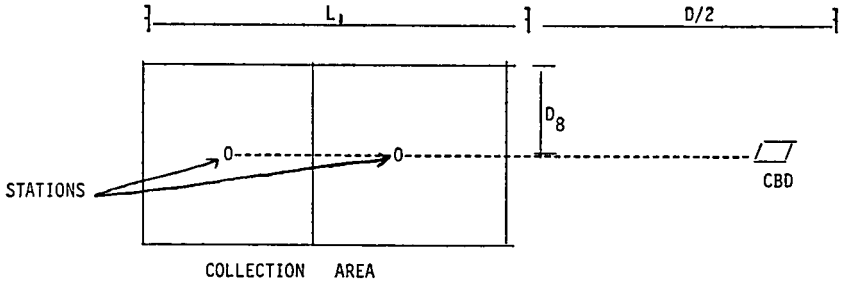
Lastly, it would be noted that the model takes no account of costs for suburban stations (other than for parking space) or for a downtown terminal. In both these cases, it is believed that these costs would not be large enough to affect the conclusions reached by this analysis. The writer does not know at exactly what volume level an elaborate downtown terminal would be required to handle the shift of passengers from the distribution routes to the line-haul express buses, but he believes it would be at a level such that the cost differential between the bus and auto systems would be much too large to be affected by the terminal.

IV. The Model

A. The Setting

In order to make comparisons between the costs of bus and auto systems it is necessary to take into account the suburban collection system, the line-haul and the downtown distribution system to estimate costs for the express bus and the equivalent auto trip.

Schematically, we are talking about something that looks like the following diagram:



Some of the variables that are used throughout this analysis are illustrated in this diagram. These are:

D: That portion of the round trip distance that lies between the inner edge of the collection area and the CBD; D/2 is the one-way distance.

L_1: The length of the collection area.

D_8: The distance from the line-haul route to the edge of the collection area; one-half the width of the collection area.

B. BASIC BUS COST EQUATION

The bus operating costs connected with carrying a given number of people a given distance depend on the number of buses required and the vehicle-miles that will be run up. For these purposes, bus operating costs include all costs that are incurred in buying and running a fleet of buses, but do not include highway construction and maintenance, stations or terminals or parking lots. Thus, the basic equation for bus operating costs is:

$$BOC = \alpha U + \beta M$$

where U = number of buses required for operation
M = annual vehicle-miles of travel required for peak-hour
α = annual costs per bus
β = annual costs per bus-mile
BOC = bus operating costs

In analyzing the factors that U and M depend on, it is easiest to begin by thinking of a single loop within a system; that is, of a single route running between two defined points (in the case of the line-haul, a suburban station and a downtown terminal).

The general proposition is that the number of buses required for peak-hour service is a function of the hourly volume in the loop (in the peak-hours), the time required for a round trip and the capacity of a bus. Annual mileage is, again, a function of the number of passengers to be carried in the peak-hour, the capacity of a bus, as well as the length of a round trip.

For the ith loop in a given line-haul system, the following statements hold:

$$U_i = \frac{V_i t_i}{c}, \text{ and } M_i = 1020 \frac{d_i V_i}{c}$$

Where U_i = the number of buses required for the ith loop of the systems for the peak-hour demand
V_i = the total number of people to be moved in a peak-hour in the major direction, i.e., in in the morning, out in the evening.
t_i = round trip time, in hours, for the ith loop of the system.
c = the capacity of the type of bus used.

It is easy to see how these pieces are put together. V_i/c, the total number of people to be moved in an hour, divided by the capacity of a bus, gives the total number of bus trips per peak-hour required. Multiplying this by round trip time (for the ith loop) gives the total number of buses required to handle peak-hour volume.

For example, if 2,000 passengers per peak-hour are handled by the ith line-haul station, and the capacity of a bus is 50, then it is clear that 40 round trips will be required to move those passengers, i.e., $V_i/c = 40$. If it takes a half-hour for a round trip, i.e., $t_i = 1/2$, then 20 buses will be required to meet peak-hour demand in the ith loop: $V_i t_i/c = 20$. This formulation works just as well when the round trip time exceeds an hour. For example, if $t_i = 1.2$, then using the same values for V_i and c used in the previous example, $V_i t_i/c = 48$. In this situation, not all of the buses will make the same number of round trips over the whole 2-hour peak period. Only 32 of the 48 buses will have to go back for a second trip during the 2-hour peak.

In the expression for annual mileage for the ith bus loop, $M_i = 1020\ d_i U_i/c$, the only new variable appearing is d_i, the round trip distance for the ith loop, and 1020 is the number of peak hours in a year (255 working days in a year, and 4 peak hours in a working day, two 2-hour peaks each way). Again, this is a very simple statement, $V_i d_i/c$ gives mileage in one peak hour: the number of round trips in the peak hour, V_i/c, times the length of a round trip, d_i. Annual mileage is then simply obtained as the product of the mileage in a peak hour, $V_i d_i/c$, times the number of peak hours in a year, 1020.

The expression for the cost of the ith loop in a line haul system can then be written as:

$$BOC = \alpha \frac{V_i t_i}{c} + \beta 1020 \frac{d_i V_i}{c}$$

It should be noted that the time required for a round trip depends not just on the distance and average running speed, but also on loading-unloading times per passenger and the number of passengers, deceleration-acceleration delays per stop and the number of stops, and, finally, turnaround time at the end of the run.

Up to now, we have been talking about the cost of the line-haul between a single station in a corridor and the CBD. The cost of a set of loops will be the summation of the costs of each loop, or:

$$BOC = \sum_{i=1}^{g} \alpha \frac{V_i t_i}{c} + \beta 1020 \frac{d_i V_i}{c}$$

where

BOC = system cost

g = the number of loops in the system.

This form, however, is not convenient for manipulation or analysis of system costs, because it requires that values for V_i and d_i be established separately for each loop, that costs be computed separately for each loop and then summed. What is required is an expression in which system values are substituted for V_i and d_i. This can be done by making the following two assumptions:

(*a*) That hourly passenger volume during the peak-hours V_i, be the same for all loops in the system; and

(*b*) That the line-haul stations be equally spaced, i.e., that the distance between any pair of successive line-haul stations be the same for all such pairs. (This assumption says nothing about the distance between the CBD terminal and the first line-haul station. For example, if we assume a 2-mile spacing between line-haul stations, this assumption does not compel us to think of the nearest-in station as being 2 miles from the downtown terminal; we can assume any distance we like from the CBD to the beginning of a string of line-haul stations, as long as we think of the stations as being equally spaced once the string begins.)

With these assumptions, we can write an equation for the cost of a set of express bus loops serving a whole corridor, as follows:

$$\mathrm{BOC} = \alpha \frac{Vt}{c} + \beta 1020 d \frac{V}{c}$$

Where V is the total passenger volume to be moved in the corridor in a peak-hour, and d is the average distance of a line-haul station from the downtown terminal.

Lastly, the treatment of costs from a time point of view must be mentioned. Because the model is set up to compute both present value and annualized costs, and because vehicles (cars and buses) have fairly short economic lives, it is not sufficient to simply distinguish between capital expenditures and current expenditures. Accordingly, four categories of costs are used which are as follows:

W_1: Current expenditures.

W_2: Investment in assets with a relatively short economic life such that they will require replacement within the time horizon under consideration.

W_3: Investment in assets, exclusive of land, whose economic life is sufficiently long that they will not require replacement within any reasonable time horizon (35 years is the longest that has been considered in this analysis).

W_4: Investment in land.

The distinction between W_3 and W_4 is without meaning as far as present value is concerned, but it is relevant when capital costs are being annualized with a capital recovery factor.

Total cost on a present value basis is:

$$K_6W_1+(1+K_7)W_2+W_3+W_4$$

Where K_6 = The present value of an annuity of a dollar a year for whatever horizon and interest rate are being used:

K_7 = The present value multiplier for the future replacements of the items included in W_2. In this study, these items are all vehicles and the paving of fringe parking lots. A life of 10 years for these assets has been used throughout. Thus, with a time horizon of 35 years, K_7 would be the sum of the present values of a dollar, 10, 20, and 30 years in the future.

On an annualized basis, total cost is:

$$W_1+K_3W_2+K_4W_3+K_5W_4$$

Where K_3 = Capital recovery factor (CRF) for 10 years at whatever interest rate is being used.

K_4 = CRF for the time horizon of the study.

K_5 = CRF for 35 years. This represents a departure from conventional practice with respect to land which is to use an infinite life in which case the CRF is equal to the interest rate. The reason for the departure is to make a slight allowance for uncertainty. The use of an infinite life rests on the assumption that the price of land perfectly discounts the future rent stream. The rather slight penalty inflicted by using 35 years instead of infinity is intended to make some allowance for the possibility that the price may underestimate the future rent stream. With a 10-percent discount rate, 35 years is very nearly the same thing as infinity. In any case, it is not a very

important issue, because as far as considering the difference between the total costs of bus and auto systems is concerned, our attention will be confined to present value. Annualized costs will be used only for establishing average costs per person/trip to get some notion of the pricing implied by the kind of bus systems we are talking about.

C. BUS LINE HAUL COSTS

1. *Current Costs* (W_1)

W_1 consists of drivers' salaries; fuel, maintenance, repairs, insurance, administration, and overhead on a mileage basis; and maintenance of an exclusive buslane. The equation is as follows:

$$W_1=H_1U_0+R1020D_7\frac{V}{C_1}+R\left(\frac{D}{2}+L_1\left(1-\frac{1}{2G_0}\right)\right)$$

where: H_1U_1=drivers' salaries

$$B1020D_7\frac{V}{C_1}=\text{mileage costs}$$

$$R\left(\frac{D}{2}+L_1\left(1-\frac{1}{2G_0}\right)\right)=\text{buslane maintenance}$$

Each of these expressions and its derivation will be treated below.

(*a*) Drivers' salaries=H_1U_0

where H_1=A driver's annual wages

U_0=the number of buses required

$$U_0=\left[\frac{V}{C_1}\left(\frac{D_7}{S}+\frac{T_8}{3600}\right)\right]^*$$

Where V=hourly passenger volume

C_1=capacity of a line-haul bus

D_7=average round-trip distance for a line-haul run in miles

S=average running speed on the line-haul in miles per hour.

T_8=loading and unloading time plus turnaround time.

This expression is the same as Vt/c, discussed above; $(D_7/S+T_8/3600)$ being the expression for round trip time. Since D_7* is round trip distance in miles, and S is average running

The brackets with a star, [], are used here, and throughout this paper, to mean the value within the brackets rounded up to the next greatest whole number. Brackets without a star mean the value rounded down to the next smallest whole number.

**$D_7=L_1+D_1$, round trip distance from middle of collection area to inner edge, plus round trip distance from inner edge of collection area to CBD.

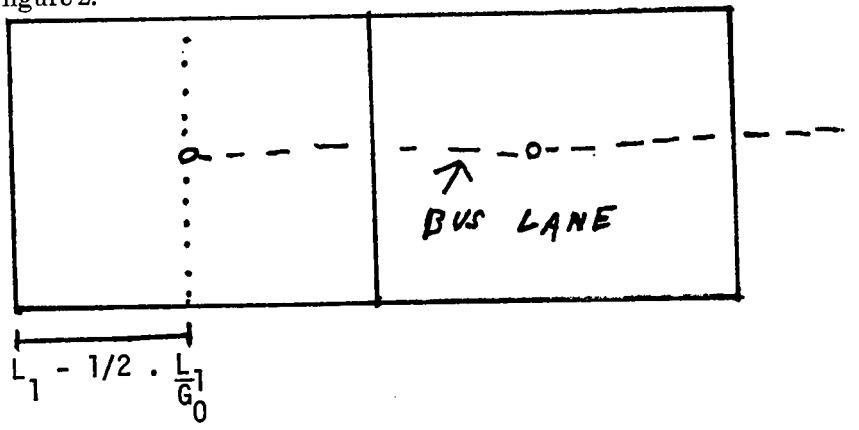
speed in MPH, D_7/S is the round trip time, in hours, that is accounted for while the bus is moving. Since we are talking about a no-stop system on the line-haul, we have dispensed with separate expressions for loading-unloading, acceleration-deceleration time and the delays, in seconds, accounted for by loading, unloading, and turnaround time. Dividing T_8 by 3,600 converts this value into hours so that the amount within the parentheses is total round trip time in hours.

(*b*) $\beta\ 1020\ D_7V/C_1$ is exactly the same as the $\beta\ 1020\ dv/C$ discussed in part "B" above and requires no further explanation.

(*c*) Annual maintenance of bus lane is:

$$R\left(\frac{D}{2}+L_1\left(1-\frac{1}{2G_0}\right)\right).$$

where R=annual maintenance costs per lane mile of highway and all the rest of it is the length of the bus lane. G_0 is the number of line-haul stations. This expression can best be understood by referring to figure 2.



The bus lane is assumed to run from the outermost station to the CDB. Thus D/2 is the length of the bus lane outside the collection area. The length of the bus lane in the collection area is equal to the length of the collection area minus the distance from the last station to the outer edge of the collection area. Since the collection area is assumed to be equally divided among the stations, and each station is assumed to be located at the centroid of its part of the collection area, what we want is L_1 minus one-half the length of the collection area pertaining to an individual station. Thus, the length of the part of the bus lane lying in the collection area is:

$$L_1-\frac{1}{2}\cdot\frac{L_1}{G_0}=L_1\left(1-\frac{1}{2G_0}\right)$$

since $\frac{L_1}{G_0}$ is the length of the collection area for an individual station.

The derivation of G_0, the number of stations, depends on passenger volumes and a judgment about headways. That is, for a total collection area of some given size, the rate at which the number of stations is permitted to increase with volume starting from 1, depends on whether one is more interested in reducing headways to cut waiting times or in reducing the size of the collection area served by each station to cut times on the collection trip. The equation for G_0 looks like this:

$$G_0=\left[\frac{V}{I_1 C_1}\right]$$

where I_1 is the number of buses per hour per station required before the model will add another station. The following example may help to clarify this:

For $I_1=12$					
Volume	600	1, 200	1, 800	2, 400	3, 000
Stations	1	2	3	4	[1]4

For $I_1=20$					
Volume	600	1,200	1,800	2,400	3,000
Stations	1	1	1	2	3

As the above footnote implies, the model also provides for a maximum area to be served by a single station and for minimum spacing between stations. It is set up so that the provision for a maximum collection area will override the headway constraint. That is, if the total collection area postulated exceeds the maximum for a single station, the model will supply more than one station, even if the volume level is too low to provide for 12 buses an hour at each station.

2. *Investment in assets with short lives* (W_2)

$$W_2=H_2U_0$$

where H_2 is the price of a bus, and U_0 is, again, the number of line-haul buses required. This requires no further explanation.

3. *Investment in assets with long lives* (W_3)

$$W_3=H_3U_0+G_4\left(D/2+L_1\left(1-\frac{1}{2G_0}\right)\right)$$

where H_3 is the per bus investment in yards and shops and G_4 is the lane-mile cost of constructing an exclusive bus lane in an existing right-of-way. The expression in the parentheses following G_4 is the one for the length of the bus lane that was explained above.

4. *Investment in land* (W_4)

Given the assumption that no new right-of-way is to be acquired, no land costs will be incurred for the line haul.

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[1] These examples are computed assuming a maximum collection area of 16 square miles for a single station, $D_s=2$, $L_1=4$, and a minimum station spacing of 1 mile. Under these conditions there cannot be more than four stations.

D. COLLECTION

1. *Jitney service*

In calculating costs for the jitney service, we begin with the assumption that we confront the worst possible case: the even distribution of the jitney passengers in time and space. We do not admit the possibility that riders can be conveniently grouped to facilitate the jitney operation. Thus, we assume that the same proportion of the passengers on each departing line-haul bus will have arrived at the station by jitney and that each such set of passengers is evenly distributed over the collection area for the station in question. For each line-haul bus departure, a set of jitneys must be circulating through the area, picking up passengers and arriving in time for the departure in question.

In terms of the bus cost equation each such set of jitneys is analogous to a single bus circulating over its route. The number of trips required is given by the number of line-haul bus departures per hour from the station, V/G_0C_1: the total number of departures per hour from the entire collection area, V/C_1, divided by the number of stations, G_0.

Thus, in order to know the number of vehicles required for jitney service we have to know round trip times, which will give us $\left[\frac{VT_0}{G_0C_1}\right]^*$, the number of sets of jitneys required per station where T_0 is the round trip time for the jitneys. Then in order to know the total number of vehicles required we must also know the number of jitneys per set, A_0. Thus the equation for the total number of vehicles required for the jitney service is:

$$U_0 = G_0A_0\left[\frac{VT_0}{C_1G_0}\right]^*$$

The problem, then, is to develop functions for A_0 and T_0. Time and the number of jitneys are, in part, functions of each other. For any given area to cover and number of people to collect, the time will be shorter the more vehicles are doing the collection. By the same token, the number of vehicles employed in collection may be varied according to some desired maximum time for the collection trip. This interrelationship is explicitly recognized in the model. The number of jitneys, A_0, is first calculated, and the value thus obtained is then used to calculate the time of the trip for the first passenger picked up. If this trip time does not satisfy whatever time constraint has been imposed on the collection trip, A_0 is increased by one and the resulting trip time again compared to the limit. The process is repeated until the time limit is satisfied.

The first calculation of A_0 is based simply on the proportion of line-haul passengers using the jitney service and the capacity of a jitney. The equation is:

$$A_0=\left[\frac{Z_1C_1}{C_3}\right]^*$$

where

Z_1=percentage of line-haul passengers using jitney service
C_1=capacity of line-haul bus
C_3=capacity of jitney

An example may be helpful.
Let

$$Z_1=.3$$
$$C_1=50$$
$$C_3=9$$

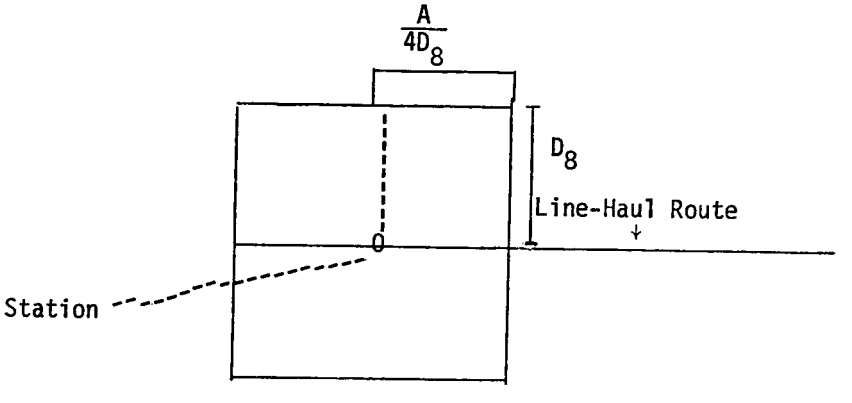
Then

$$A_0=\left[\frac{.3\times 50}{9}\right]^*=\left[\frac{15}{9}\right]^*=[1.67]^*=2$$

Thus, on capacity considerations alone, two jitneys per set are required.

In developing the time function for the jitney service, the big problem is working out the distance a jitney will have to travel on its collection run. Here we rely on the assumption of even distribution of the passengers over the collection area. First, we separate the total collection trip distance into two components: (1) the distance from the station to the first pickup plus the distance from the last pickup to the station; and (2) the length of the run from the first pickup to the last pickup.

In other words, we are splitting the jitney's collection trip between an out-back run and a pickup run. The average jitney trip is assumed to go halfway from the station to the edge of the collection area before its pickup run begins, and is also assumed to make its last pickup at a point halfway from the station to the edge of the area. Thus, the average out-back roundtrip distance is the average distance from the station to the edge of the collection area. The following diagram illustrates the manner in which this value is roughly approximated in the model.



The equation for the average "out-back" distance, D_1, is:

$$D_1=\frac{4D_s^2+A}{8D_s}$$

where

D_1=average round trip distance from station to any point in collection area

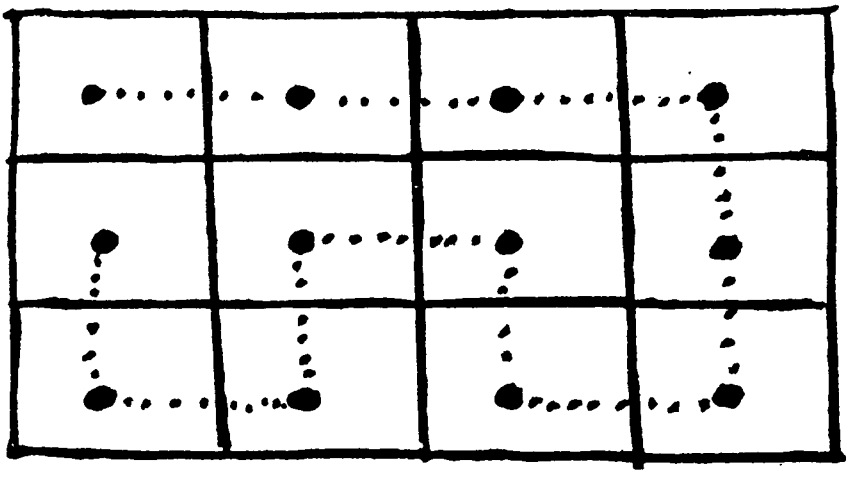
A=area served by collection station $\left(\frac{2D_sL_1}{G_0}\right.$, total collection area divided by the number of stations)

This is nothing more than the average of the distances from the station to edge of the area along a line parallel to the line-haul route and a line perpendicular to the route, or the average of half the width and half the length.

Since D_s is one-half the width, the length is given by $\frac{A}{2D_s}$, and one-half the length by $\frac{A}{4D_s}$. Thus

$$D_1=\frac{1}{2}\left(\frac{A}{4D_s}+D_s\right)=\frac{4D_s^2+A}{8D_s}$$

With the "out-back" portion of the jitney's run out of the way we can turn to the part where it is actually making pickups. Here, the procedure is to divide the collection area by the number of passengers to be picked up to establish the size of the area in which each passenger is located, given our assumption about the even distributions of the passengers over the area. Further, we assume that each passenger is located in the centroid of his area, so that the average distance between them is given by the square root of the area in which each passenger is located. The following illustration may be helpful.



The large rectangle may be thought of as the area in which a jitney is to pick up its passengers. The smaller rectangles represent the location of each passenger in the centroid of his area. The dotted line connecting the "passengers" represents the route of the jitney. It may been seen that the total length of the pick-up run is equal to the number of dots, minus one, times the distance between the dots. Since the areas in which the passengers are, are all equal, and, since we may think of the "average shape" of these areas as a square, the square root of one of these areas will be equal to the distance between the dots.

In order to establish the size of the area in which each passenger is located, the area, A, is divided by the number of jitney passengers per line-haul bus departure, $Z_1 C_1$, so that the distance between the pick-up points is then:

$$\sqrt{\frac{A}{Z_1 C_1}}$$

The number of passengers to be picked up by a jitney on a run is obtained by dividing the number of passengers per line-haul bus departure by the number of jitneys per set, A_o, that is $Z_1 C_1 / A_o$. Thus the function for the distance covered by the jitney on its pickup run is:

$$\sqrt{\frac{A}{Z_1 C_1}}\left(\frac{Z_1 C_1}{A_0} - 1\right)$$

The distance covered by the first passenger picked up, D_3, is:

$$D_3 = \sqrt{\frac{A}{Z_1 C_1}}\left(\frac{Z_1 C_1}{A_0} - 1\right) + \frac{D_1}{2}$$

$D_1/2$ is added to provide for the length of the trip back to the station after the last pickup is made. The time of the trip for the first passenger picked up is:

$$T_9 = \frac{T_1}{60} D_3 + \frac{T_5}{60} \frac{Z_1 C_1}{A_0}$$

where T_9 = trip time in minutes for first passenger picked up.
T_1 = average speed of jitney in seconds per mile.
T_5 = time lost per stop in seconds.

In the operation of the model in the computer, this time is compared to whatever constraint on the time of the collection trip has been established.* If the constraint is satisfied, the values for A_o, time, and distance that have been computed are then used to calculate the cost of the jitney operation. If the constraint has not been satisfied, A_o is increased by one and the distance and time are calculated again. This procedure is repeated until the time constraint has been satisfied.

*10 minutes has been used in the analysis.

A numerical example may be helpful. Suppose we have a collection area of eight square miles. This would be the case, for example, with:

$$L_1=4$$
$$D_8=2$$
$$I_1=12$$
$$V=1200$$

The "out-back" distance will be:

$$D_1=\frac{4D_8^2+A}{8D_8}=\frac{24}{16}=1.5$$

If $C_1=50$, $Z_1=.3$, $C_3=9$, then, as noted earlier, $A_0=2$, before any adjustment to meet a time constraint is made. These values can now be inserted in the function for the length of the jitney trip for the first passenger picked up:

$$D_3=\sqrt{\frac{A}{Z_1C_1}}\left(\frac{Z_1C_1}{A_0}-1\right)+\frac{D_1}{2}$$

$$D_3=\sqrt{\frac{8}{.3\times50}}\left(\frac{.3\times50}{2}-1\right)+\frac{1.5}{2}$$

$$D_3=\sqrt{\frac{8}{15}}\left(\frac{15}{2}-1\right)+.75$$

$$D_3=(.73\times6.5)+.75=5.495$$

Then, let T_1, the average running speed for the jitney, be 144 seconds per mile (25 m.p.h.), and T_5, the delay per stop, be 10 seconds. The time, in minutes, for the first passenger picked up will be:

$$T_9=\frac{T_1}{60}D_3+\frac{T_5}{60}\frac{Z_1C_1}{A_0}=\frac{144}{60}\times5.495+\frac{10}{60}\times7.5=13.188+1.25=14.43$$

If we have a time constraint of 10 minutes, it will not be satisfied, A_0 will be increased by one and the procedure will be repeated:

$$D_3=.73\left(\frac{15}{3}-1\right)+.75$$

$$D_3=(.73\times4)+.75=3.67$$

Then

$$T_9=\frac{144}{60}\times3.67+\frac{10}{60}\times5=8.808+.83=9.641$$

The time constraint is now satisfied and the values for time and distance that have been established can now be used to calculate the costs of the jitney system. As will be recalled from the early part of this discussion, the function for the total number of jitneys required is:

$$U_0 = A_0 G_0 \left[\frac{VT_0}{C_1 G_0}\right]^*$$

To get total round-trip distance for the jitney run, we just add the "out" distance to the previously established distance, D_3, which was length of the pick up run plus the "back" distance, $D_1/2$. Total round trip distance for the jitney, D_4, is

$$D_4 = D_3 + \frac{D_1}{2}$$

Time, in hours, for the jitney round trip is:

$$T_0 = \frac{T_9}{60} + \frac{T_1}{3600}\left(\frac{D_1}{2}\right)$$

This completes the description of the functions necessary for the calculation of the number of jitneys required, and provides the necessary information for the mileage.

$\frac{V}{C_1}A_0$ gives the total number of jitney trips per hour. $\frac{V}{C_1}A_0 D_4$ gives the total jitney mileage per hour, so $1020\ \frac{V}{C_1}A_0 D_4$ gives total annual vehicle miles.

We can now proceed to classify jitney costs according to the life of the investment.

a. Current costs (W_1)

$$W_1 = H_1 U_0 + B_2\ 1020\ A_0 \frac{V}{C_1}$$

where

H_1 = a driver's annual salary

B_2 = cost per mile for a jitney

b. Investment in assets with short lives (W_2)

$$W_2 = H_4 U_0$$

where: H_4 = the price of a jitney vehicle

c. Investment in assets with long lives (W_3)

$$W_3 = 0$$

It is assumed that investment in specialized maintenance shops for small vehicles will not be required, particularly when there will be fringe parking lots at each station where the jitneys can be parked.

d. Investment in land (W_4)

$$W_4=0$$

No investment in land is required for the jitney service.

2. *Kiss-and-ride*

In kiss-and-ride collection the passenger is driven to the station and dropped off by someone (presumably his wife). Thus, the only cost involved is that for the additional mileage on the car involved. The mileage for kiss-and-ride is given by:

$$Z_2\ 1020\ D_1\ \frac{V}{C_6}$$

where: Z_2=proportion of line-haul passengers using kiss-and-ride.
C_6=occupancy ratio for kiss-and-ride.

Z_2V gives the number of kiss-and-ride passengers per hour, and

$Z_2\ \frac{V}{C_6}$ gives the number of kiss-and-ride vehicles arriving at the line-haul station per hour. For the average round trip distance we use D_1, the average "out-back" distance that we established for the jitney, because, again, we want the average distance from the station to any point in the collection area.

Thus, $Z_2\ 1020\ \frac{V}{C_6}\ D_1$ is the total annual mileage

Since the only cost is mileage cost, current costs (W_1) are all we have to contend with for kiss-and-ride:

$$W_1=B_1\ Z_2\ 1020\ \frac{V}{C_6}\ D_1.$$

3. *Park-and-ride*

In park-and-ride collection, the passengers drive to the station and park in a fringe parking lot. For park-and-ride the number of vehicles is:

$$U_0=2Z_3\ \frac{V}{C_7}$$

where Z_3=proportion of line-haul passengers using park-and-ride
C_7=occupancy ratio for park-and-ride auto.

$Z_3\ \frac{V}{C_7}$ will give the number of vehicles required for an hour's worth of park-and-ride passengers, but this must be multiplied by two, because the private automobile cannot recirculate and be used again as the transit vehicle is used.

For annual mileage for park-and-ride we have:

$$Z_3\ \frac{V}{2C_7}\ D_1\ 1020$$

This is the same as the function for kiss-and-ride mileage except that it has been divided by two. This is because the park-and-ride vehicle makes only one round trip for the total work trip, not two as for kiss-and-ride. The park-and-ride vehicle covers half its round-trip distance in the morning and the other half in the evening.

a. Current costs (W_1)

$$W_1=(H_0+H_7)\ U_0+B_1\ Z_3\ D_1\ 1020\ \frac{V}{2C_7}$$

where H_0= annual maintenance per space in fringe parking lot.
H_7= incremental insurance cost for park-and-ride auto.
B_1= fuel, oil and maintenance costs per mile for an automobile.

b. Investment in assets with short lives (W_2)

$$W_2=(H_5+H_8)\ U_0$$

where H_5=price of a car
H_8=cost of construction for parking space for one car.

c. Investment in assets with long lives (W_3)

$$W_3=0$$

Park-and-ride does not involve investment in any long-lived structures.

d. Investment in land (W_4)

$$W_4=J_1\ U_0$$

where J_1=price of land for one parking space.

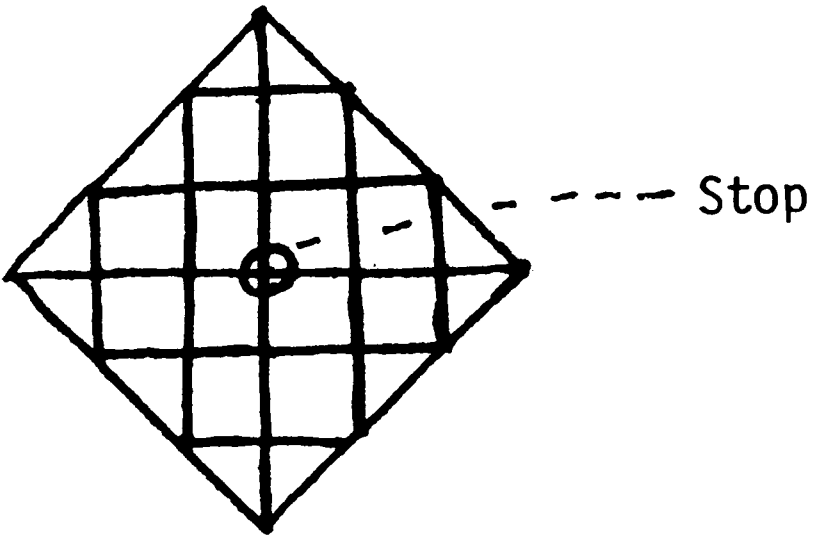
E. DISTRIBUTION COSTS

The mechanism for costing the downtown distribution system is based on an assumption (found in MKW) that people will tolerate a walk of up to three blocks at the downtown end of the system. This assumption permits us to avoid having a stop at every block on the downtown distribution routes and provides a way of relating the number of stops required to the size of the CBD. The area (in blocks) that can be served by a single stop, for any given maximum walking distance is:

$$b=2w^2$$

where b=the area served by a stop
w=maximum walking distance

If we look at such an area laid out on a grid, we see that we have a square, with the stop at the centroid, and the distance w, being half the length of the diagonal of the square. It looks this this:



As may be seen by counting, the area in the illustration comprises 18 square blocks. For the purposes of the model, three CBD sizes were selected:

CBD Size I —288 blocks or 2 square miles
Size II —162 blocks or 1.13 square miles
Size III— 72 blocks or 0.5 square miles

(We are following MKW here in using a linear block equal to $\frac{1}{12}$ of a mile.)

These CBD sizes were chosen for two reasons:

A. When built up of 18-block areas as in the illustration they form convenient symmetrical shapes.

B. These sizes cover a range which approximately coincides with the range of CBD sizes actually prevailing in the large cities in the country according to MKW (with the exceptions of New York and Washington which are so far outside the range otherwise prevailing as to constitute special cases by themselves). The following table shows these CBD sizes.

City	CBD sizes (square miles)
New York	9.1
Chicago	1.0
Philadelphia	2.2
Boston	1.4
Washington	6.1
Los Angeles	1.6
San Francisco	1.3
Cleveland	2.0
Detroit	1.1
Atlanta	1.7
Pittsburgh	0.7
New Orleans	0.4
St. Louis	1.2
Baltimore	0.8
Dallas	0.6
St. Paul	0.3
Minneapolis	0.4
Providence	0.3
Fort Worth	0.3
Milwaukee	1.2
Miami	0.9
Cincinnati	0.5
Rochester	0.3
Seattle	0.7
Kansas City	0.9
Denver	0.4

NOTE: While this table lends support to the range of CBD sizes that we have selected, it should be noted that this range is considerably at variance with that used by MKW for the same purpose. They used CBD sizes of 1, 1.875, 2.625 and 4.5 square miles, but do not offer any explanation for this choice.

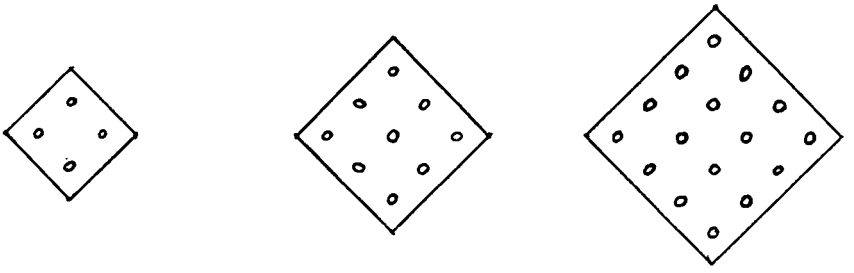
The distance and time for the distribution round trip depend on the degree to which we wish to split up the stops among separate distribution routes. The following table shows round trip distances (in blocks) for all three CBD sizes according to the number of distribution routes that is chosen. The figures displayed in part II on results were obtained using CBD size II with four routes. Using CBD size I with five routes increase total bus costs by about $4 million. It will be noted that the numbers of distribution routes have been limited to those that divide evenly into the number of stops, minus 1. This is done for the sake of convenience so that it will not be necessary to worry about some distribution routes carrying more people than others. It is assumed that one of the stops is the point at which the line-haul bus discharges its passengers and turns around to go back to the suburban station. The table also shows the number of passengers per route when 50 passengers are distributed over all routes. This information is used to allow for use of a bus smaller than the 50-seat variety. Where appropriate, the model uses the price of an 18-passenger minibus or a nine-passenger jitney for the price of the distribution vehicle.

NUMBER OF ROUTES

CBD size	Number of stops	1		2		3		4		5		8		15	
		Stops per route	Round trip distance	Stops per route	Round trip distance	Stops per route	Round trip distance	Stops per route	Round trip distance	Stops per route	Round trip distance	Stops per route	Round trip distance	Stops per route	Round trip distance
I	16	15	102			5	42			3	28.8			1	17.6
II	9	8	54	4	30			2	18			1	12		
III	4	3	24			1	12								

NUMBER OF PASSENGERS PER ROUTE (ASSUMING 50 PEOPLE TO BE DISTRIBUTED ON EACH RUN)

I	16		47			16									4.0
II	9		45		23				12		10.0		6		
III	4		38			13									



CBD SIZE III
.5 SQUARE MILES
72 BLOCKS
4 STOPS

CBD SIZE II
1.125 SQUARE MILES
162 BLOCKS
9 STOPS

CBD SIZE I
2 SQUARE MILES
288 BLOCKS
16 STOPS

With distances thus established, we can consider the calculation of round trip times. In addition to running time, it is necessary to take account of loading-unloading time per passenger and acceleration-deceleration time per stop. No allowance is made for turn-around time, because it is assumed that the distribution vehicle will be ready to load passengers for another trip as soon as it arrives back at the terminal from the preceding trip. The time function is:

$$T_0=\frac{T_2F_3+\frac{T_3(K-1)}{F_0}+\frac{T_4C_1(K-1)}{KF_0}}{3600}$$

where T_2=Running time of bus on city streets in seconds per block.

T_3=Acceleration-deceleration delay in seconds.

T_4=Loading-unloading time per passenger in seconds.

F_0=Number of routes.

F_3=Round-trip distance in blocks.

K=Number of stops.

As will be noticed from the time parameters, the first term in the numerator is for running time, the second for acceleration-deceleration delays and the third for loading-unloading time.

The first term is entirely straightforward: round trip distance multiplied by running time.

In the second term, $\frac{T_3(K-1)}{F_0}$, $\frac{K-1}{F_0}$ gives the number of stops per route, being the total number of stops aside from the one serving as the terminal divided by the number of routes emanating from the terminal.

To provide the number of passengers per route we have, in the third term: $\frac{C_1(K-1)}{KF_0}$

The assumption here is that we have a set of distribution vehicles departing from the terminal to correspond to each line-haul bus arrival so that the number of people to be carried on each set of round trips on the distribution routes is the same as the number of people on the bus. This assumption is valied only as long as we think of a single corridor feeding the terminal with a volume probably not much greater than 3,000 per hour. However, any bias in this assumption will be on the high side since with more than one corridor the distribution costs would be distributed over several corridors, and if the volume coming into the terminal were such that it was impractical to match every arriving bus with a fleet of departing distribution vehicles, the average cost, at least, of distribution would go down as greater numbers of people were carried over the same set of routes.

Thus we take the capacity of a line-haul bus, C_1, as the number of people to be carried on one distribution run. To distribute this number over the routes, we must first allow for the people whose destinations are within walking distance of the terminal. Following our assumption of the even distribution of origins and destinations over space, the proportion of passengers that will use the distribution system will be $\frac{K-1}{K}$. For example, if there are nine stops, one-ninth of the passengers will walk from the terminal and eight-ninths will use the distribution system. $\frac{C_1(K-1)}{K}$ will then be the number of people carried on the distribution system for any line-haul bus arrival. This number, divided by the number of routes, F_0, gives the number of passengers carried on a distribution route for a single trip:

$$\frac{C_1(K-1)}{KF_0}$$

The function for the number of distribution vehicles is:

$$U_0=F_0\left[\frac{VT_0}{C_1}\right]^*$$

Where T_0=round trip time for a distribution vehicle.

$\left[\frac{VT_0}{C_1}\right]^*$ gives the number of vehicles per route required for the distribution system, so multiplying by the number of routes, F_0, gives the total number of vehicles.

For total annual vehicle miles, or, more accurately, vehicle blocks, we have: $1020\ F_0\ F_3\ \frac{V}{C_1}$. $F_3\ \frac{V}{C_1}$ is blocks per peak-hour for a single route, so $F_0\ F_3 \frac{V}{C_1}$ is blocks per peak-hour for all routes and $1020\ F_0\ F_3\ \frac{V}{C_1}$ is total annual vehicle blocks.

a. Current cost (W_1)

$$W_1 = H_1\ U_0 + B_3\ 1020\ F_0\ F_3\ \frac{V}{C^1}$$

where H_1 = annual salary of a driver;

B_3 = mileage cost per block.

b. Investment in assets with short lives (W_2)

$$W_2 = F_1\ U_0$$

where F_1 = price of the distribution vehicle.

c. Investment in assets with long lives (W_3)

$$W_3 = H_3\ U_0$$

where H_3 = per/bus investment in yards and shops.

d. Investment in land (W_4)

$$W_4 = 0$$

No investment in land for distribution purposes is contemplated by the model.

F. AUTO COSTS

In considering auto costs, we do not have to be concerned with time since the private vehicle does not have the potential of recirculating for another load of passengers. Thus, we can treat the entire trip as a single entity, simply adding up the average round-trip distances for the suburban, line-haul, and CBD portions of the trip. As with the bus line haul, however, we have to be concerned with the length of the highway, and, in addition, for the auto we have to be concerned with the number of lanes.

For the number of vehicles, we have:

$$U_0 = 2\ \frac{V}{C_5}$$

where C_5 = average number of passengers per vehicle. $\frac{V}{C_5}$ gives the hourly vehicle requirement which has to be doubled, since the private car only makes one trip.

For the annual vehicle mileage, we have:

$$510\ (L_1+D+D_1+D_2)\frac{V}{C_5}$$

where D_1=average round-trip distance from centroid of entire collection area to any point in collection area.

D_2=average round-trip distance in the CBD portion of the trip.

The average round trip on the line-haul portion of the trip is given by L_1+D. D accounts for the portions of the trip between the CBD and the inner edge of the collection area. L_1, the length of the collection area, is the average round-trip distance on a freeway, within the collection area, since we assume that the average trip will get on the freeway in the middle of the collection area.

D_1, the average round-trip distance from the centroid of the total collection area to any point in the total collection area, is to allow for the distance traveled by the auto before it gets on the freeway. It should be noted that this D_1 is not the same as that used for the collection system. For the collection system, D_1 was related to the area pertaining to an individual station, and, here D_1 pertains to the entire collection area, regardless of the extent to which it is subdivided.

It is, however, calculated in the same manner; that is, it is the average of the distance from the centroid of the area to the edge measured on a line perpendicular to the line-haul route and on a line parallel to the line-haul route.

D_2 is the round-trip distance from the edge of the CBD to the centroid of the CBD. The following table gives its values for the CBD sizes used:

CBD Size	D_2
I	2
II	1.5
III	1

For the length of the highway, we have: $D+L_1$.

This is simply the distance from the CBD to the outer edge of the collection area.

For the number of lanes we have: $E_1=2\left[\frac{V}{C_5G_3}\right]^*$

where: E_1=number of lanes

G_3="capacity" of a lane in vehicles per hour.

"Capacity" is placed in quotes, because what is meant is not the theoretical limit on a lane's vehicle-per-hour capacity, but the level of VPH at which the auto commuter will not feel that he is in a congested situation. Given such a number, and the occupancy ratio, C_5, the expression in the brackets will provide a number which will then be rounded up to the next largest whole number to give the one-way lanes required, and then doubled to give the total number of lanes. If the situation being considered is the construction of a freeway versus not constructing a freeway, the number of lanes will be held to a

minimum of four, on the ground that urban freeways of less than four lanes are not going to be built. If the situation being considered is the adding of lanes to a freeway that has been, or is to be built, the model is modified to let the number of lanes drop to two.

a. Current expenditures (W_1)

$$W_1=(H_6+H)U_0+B_1510(L_1+D+D_1+D_2)\frac{V}{C_5}+RE_1\left(\frac{D}{2}+L_1\right)$$

where: H=annual maintenance expense for downtown parking place.

H_6=annual insurance cost for commuting by auto.

B_1=mileage cost for auto (fuel, oil, tires, maintenance)

R=annual maintenance cost per lane-mile of freeway.

b. Investment in assets with short lives (W_2)

$$W_2=H_5\ U_0$$

where H_5=price of a car.

c. Investment in assets with long lives (W_3)

$$W_3=H_9U_0+GE_1\left(\frac{D}{2}+L_1\right)$$

where H_9=construction component of the cost of a downtown parking space.

G=construction component of the lane-mile cost of a freeway.

d. Investment in land (W_4)

$$W_4=J_2U_0+G_1E_1\left(\frac{D}{2}+L_1\right)$$

where J_2=land component of the cost of a downtown parking space.

G_1=land component of the lane-mile cost of an urban freeway.

G. A NOTE ON THE COMPUTER PROGRAM

A computer program has been written, in BASIC, embodying the set of relations described above. The program is in permanent storage so that modifications to the model can be easily effected.

The computerized model calculates the total cost of the bus system over any specified range of line-haul distances and hourly volumes, does the same for auto systems, the result being carried in distance-volume matrices, and subtracts the bus-cost matrix from the auto-cost matrix to provide a matrix of the differences between these costs. For the bus system, collection, line-haul, and distribution costs are calculated and printed out separately before being totaled. In addition to total costs, data on mileage, number of vehicles, times and number of collection stations are also printed out.

With respect to the line-haul distance, the portion that is permitted to vary is the distance between the CBD and the inner edge of the collection area. The length of the collection area is held constant over any single run through the program. In its current form, the model

computes costs over a distance range of 2, 3, 4, and 5 miles from the inner edge of the collection area to the CBD. With respect to the volume, it uses hourly volumes running from 600 to 3,000 in increments of 600; that is, 600, 1,200, 1,800, 2,400, and 3,000. It can, of course, be run at higher ranges but, as appears in the section that discusses the results of the model, it is only in these lower volume ranges that any question arises as to the difference between bus and auto system costs.

ATTACHMENT 9

PROGRAM AND FINANCIAL PLAN—DEPARTMENT OF TRANSPORTATION

FISCAL YEAR 1970 PROGRAM AND FINANCIAL PLAN

PROGRAM CATEGORY I—URBAN TRANSPORTATION

TABLE 1—OUTPUTS AND BENEFITS

	Fiscal year—						
	1968	1969	1970	1971	1972	1973	1974
A. Highways:							
1. Interstate system:							
Outputs: Lane miles	1,550	1,550	1,550	1,550	1,550	1,550	1,550
Benefits:							
Added daily VMT carried (1,000's)	16,840	17,260	17,690	18,135	18,590	19,050	17,640
Range of fatalities prevented	50–86	51–88	52–90	53–92	54–95	57–95	52–90
Accidents prevented	14,945	15,315	51,700	16,085	16,475	16,890	15,650
2. Other primary:							
Outputs: Lane miles	360	365	370	----	----	----	----
Benefits:							
Added daily VMT carried (1,000's)	5,170	5,320	5,385	----	----	----	----
Fatalities prevented	35	35	40	----	----	----	----
Accidents prevented	3,799	4,145	4,190	----	----	----	----
3. Secondary system:							
Outputs: Lane miles	350	375	375	----	----	----	----
Benefits:							
Added daily VMT carried (1,000's)	1,805	1,920	1,920	----	----	----	----
Fatalities prevented	13	14	14	----	----	----	----

Accidents prevented	1,440	1,525	1,525	
4. Urban extensions:				
Outputs: Lane miles	1,085	1,225	1,225	
Benefits:				
Added daily VMT carried (1,000's)	8,245	8,900	8,900	
Fatalities prevented	60	65	65	
Accidents prevented	6,495	6,950	6,950	
5. TOPICS				
6. Railway-highway grade crossing elimination:				
Outputs: Crossings improved	237	214	292	
Benefits: Estimated fatalities prevented	45	50	60	
7. Roadside hazard reduction; spot improvement:				
Outputs:				
Miles of highway reconstruction to acceptable standards	995	1,037	1,037	
Projects completed	45	104	104	
Benefits: Range of accident reductions (thousands)	5–15	5–15	5–15	
8. Roadside beautification; billboard and junkyard removal:				
Outputs:				
Number of billboards removed	70		920	
Number of junkyards screened or removed	195		300	
9. Relocation assistance:				
Outputs: Number of displacements		43,045	43,045	
10. Metropolitan area planning:				
Outputs: Number of studies	205	210	215	
11. Advance acquisition of rights-of-way:				
Outputs: Number of States using advanced funds		17	32	

TABLE 2.—BUDGET AUTHORITY

[In thousands of dollars]

	Fiscal year—						
	1968	1969	1970	1971	1972	1973	1974
A. Highways:							
1. Interstate System	1,428,300	1,460,500	1,460,500	1,600,000	1,600,000	900,000	----------
2. Other primary	56,900	58,500	58,500	----------	----------	----------	----------
3. Secondary system	57,300	60,400	60,400	----------	----------	----------	----------
4. Urban extension	182,000	194,200	194,200	----------	----------	----------	----------
5. TOPICS	----------	180,000	180,000	----------	----------	----------	----------
6. Railway-highway grade crossings	25,900	19,800	19,800	----------	----------	----------	----------
7. Roadside hazard reduction and spot improvement	77,800	81,900	81,900	----------	----------	----------	----------
8. Roadside beautification, and billboard and junkyard regulation	400	9,500	25,900	----------	----------	----------	----------
9. Relocation assistance	----------	35,900	35,900	----------	----------	----------	----------
10. Metropolitan area planning	21,900	18,800	18,800	----------	----------	----------	----------
11. Advance acquisition of rights-of-way	----------	40,000	40,000	----------	----------	----------	----------
Subtotal, subcategory A	(1,850,500)	(2,159,500)	(2,175,900)	(1,600,000)	(1,600,000)	(900,000)	(----------)
B. Urban mass transit:							
1. Present program	----------	168,484	252,898	303,000	3,000	3,000	3,000
2. Legislation	----------	----------	----------	----------	400,000	500,000	600,000
Subtotal, subcategory B	(----------)	(168,484)	(252,898)	(303,000)	(403,000)	(503,000)	(603,000)
Total, category I	1,850,500	2,327,984	2,428,798	1,903,000	2,003,000	1,403,000	603,000

TABLE 3.—PROGRAM LEVEL BY COMMITMENT CLASS, BUDGET AUTHORITY

[In millions of dollars]

	Fiscal year—						
	1968	1969	1970	1971	1972	1973	1974
1. Statutory formula: Coast Guard retired pay	48.2	52.4	55.7	58.5	61.4	64.4	67.4
2. Workload level							
3. Market-oriented programs							
4. New programs requiring legislation:							
Mass transit			5.0	300.0	400.0	500.0	600.0
Boating safety			5.0				
SLS lock repair		13.1					
Airport development			95.0				
Air revenue program			170.0				
Subtotal, line 4	(—)	(13.1)	(275.0)	(300.0)	(400.0)	(500.0)	(600.0)
5. Administration commitments:							
Interstate highway grants	3,526.6	3,691.8	3,680.2	4,000.0	4,000.0	2,225.0	
Other highway grants	1,335.4	1,883.0	2,003.5				
Highway safety grants	100.0	75.0	100.0				
Mass transit		168.5	175.0				
Airports grants (current program)	66.0	70.0	30.0				
Subtotal, line 5	(5,028.0)	(5,888.3)	(5,988.7)	(4,000.0)	(4,000.0)	(2,225.0)	(—)
6. Level of appropriations:							
(a) Capital acquisitions	161.2	210.7	266.1	157.7	7.0	7.0	6.0
(b) Operating programs	1,109.2	1,245.8	1,490.3	1,414.8	1,418.2	1,414.0	1,408.2
(c) Research and development	187.3	51.2	478.8	264.4	142.8	34.0	12.0
Subtotal, line 6	(1,457.7)	(1,507.7)	(2,235.2)	(1,836.9)	(1,568.0)	(1,455.0)	(1,426.2)
Total, budget authority	6,533.5	7,461.6	8,554.6	6,195.4	6,029.4	4,244.4	2,093.4

ATTACHMENT 10

THE FEDERAL BUDGET BY PROGRAM STRUCTURE

SPECIAL ANALYSIS R

SELECTED AGENCY BUDGETS BY PROGRAM CATEGORIES

Reprint of Pages 253 to 273 From
Special Analyses, Budget of the United States, 1970

Detail will not necessarily add to totals because of rounding

BUREAU OF THE BUDGET
January 1969

SPECIAL ANALYSIS R

SELECTED AGENCY BUDGETS BY PROGRAM CATEGORIES

The tabulations shown in this analysis reflect for 3 years—1968, 1969, and 1970—the programs of selected agencies as classified in the categories and subcategories used in the agency Planning-Programing-Budgeting (PPB) systems.

While program structures have hitherto been published for most of the major agencies, this is the first time that data on budget authority have been presented in these terms. Since all agencies have not reached an equal stage of PPB development, some executive agencies in the Federal Government are not covered in this analysis.

The PPB System in the Federal Government

Installation of the Planning-Programing-Budgeting system on a Government-wide basis was initiated by the President in August 1965. PPB is an effort to promote more systematic use of modern management tools that have been demonstrated to be of value in Government. The PPB approach was employed to enable the Government agencies and the President to:

- Identify national goals with greater precision and determine which goals are the most urgent;
- Develop and analyze alternative means of reaching goals most efficiently;
- Provide information on the total long term systems cost of programs on a basis that can be related to the benefits derived from each program;
- Set out specific proposed plans for several years ahead to achieve stated objectives; and
- Permit better control over programs and budgets by strengthening measurement and analysis of program performance in relation to costs.

Progress Under the Planning-Programing-Budgeting System

While the impact of PPB is still of modest proportions in the civilian agencies, its effects are becoming evident.

- Most major agencies have created a PPB System to carry out the President's directive. Many of these agencies have dedicated staff resources specifically to the PPB process.
- These agencies, with only a few exceptions, have established end purpose-oriented PPB program structures, as illustrated in the tables, enabling them to classify their funds by major program categories and subcategories. These program structures were used, in varying degrees, in the decisionmaking process leading to the budgets for 1968, 1969, and 1970.
- Major program issues are being identified in advance of the time when budget decisions have to be made and subjected to systematic analysis.
- The introduction of PPB has provided an impetus toward increased use of formal analysis in the decisionmaking process. The development and consideration of alternatives has been

stepped up, both in the programing stage and at the budget decision stage. The emphasis on cost effectiveness analysis as part of the analytical effort has drawn attention to ways of achieving given objectives at least cost, or attaining maximum results from given outlays. Benefit/cost analysis, which had been previously practiced chiefly in the military agencies and the water resources field, is now underway on various programs in most major agencies of Government.

- As experience has been gained, the various elements of the PPB approach and the annual budget process gradually are being more effectively interrelated, so that the analytical results of PPB are playing a greater role in decisionmaking for the annual budget.

Program Distribution of Budget Authority

The following tables for each agency distribute budget authority by PPB program category and, in many cases, by subcategory. In preparing the 1970 budget, a substantial portion of the budget review process was carried out in these program structure terms. However, the budget is presented to and acted upon by Congress in terms of the appropriation structure as presented in the Budget Appendix. The amounts shown by program category and subcategory in this analysis are derived by distribution of the appropriation totals. This distribution is only as precise as the underlying agency accounting system permits. Statistical allocations have been used where necessary to distribute the appropriation amounts to the program structure.

Not all budgetary items are covered by the program structure. For example, adjustments to agency budget authority totals for proprietary receipts from the public are usually not related to the program structure. Each table, however, reconciles the total amounts shown in program structure terms to total budget authority for the agency—identifying items excluded from the program structure and any necessary adjustments.

Seventeen agencies are covered by this special analysis; they account for $200.2 billion, or 95 percent of the total proposed budget authority of $210.1 billion for 1970 for the entire Federal Government. The budget authority not covered in this analysis is largely accounted for by numerous smaller agencies, most of which have not been required to install a PPB system. Many of the agencies not included, however, are employing PPB techniques in varying degrees.

DEPARTMENT OF AGRICULTURE

The programs of the Department of Agriculture seek to provide an adequate supply of food, fiber, and timber; maintain farm income; improve the nutritional level and protect the health of the entire population; and promote the continuing development of rural areas. To achieve these goals the Department performs research, education, conservation, marketing, regulatory, domestic and foreign food aid, agricultural adjustment, credit, insurance, national forest management and rural development activities.

The program structure shown below consists of a set of subcategories representing the major missions of the Department. The subcategories are grouped under four major categories representing the broad unifying goals that provide a focus for the Department's program planning efforts, and one general support category.

Table R-1. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Income and abundance:			
Farm income	3,359.1	5,358.5	4,023.2
Agricultural production capacity	606.1	586.6	496.4
Agricultural marketing and distribution system	108.4	114.6	113.4
Category total	4,073.7	6,059.7	4,632.9
Growing nations—new markets:			
Food for Freedom	1,606.6	301.1	1,017.7
Export market development	79.9	88.8	28.1
Agricultural development	6.2	3.5	11.5
International agricultural services	7.2	7.4	7.5
Category total	1,699.9	400.9	1,064.8
Dimensions for living:			
Diets and nutrition	912.0	1,041.8	1,102.7
Health and safety	84.4	110.8	134.1
Education and training	21.7	22.5	23 5
Services for living	44.5	44.9	45.7
Category total	1,062.6	1,220.0	1,305.9
Communities of tomorrow:			
Community development services	29.1	31.0	40.0
Housing	253.0	29.7	62.6
Public facility and business expansion	430.2	354.6	371.6
Resource protection and environmental improvement	245.7	215.6	204.3
Recreation, wildlife, and natural beauty	60.7	63.6	67.9
Timber	326.6	333.4	337.3
Category total	1,345.3	1,027.8	1,083.8
General support:			
General administration	4.6	4.8	5.1
Program support	38.8	39.9	45.4
Category total	43.4	44.7	50.4
Total distributed to programs above	8,224.8	8,753.2	8,137.8
Deductions for offsetting receipts	−395.4	−415.1	−435.0
Total budget authority, Department of Agriculture	7,829.4	8,338.1	7,702.8

DEPARTMENT OF COMMERCE

The statutory functions of the Department of Commerce are to foster, promote, and develop the foreign and domestic commerce and the manufacturing and shipping industries of the United States. Related functions include the promotion of area and regional economic development and performance of Government scientific and technical activities. These progams are conducted in appropriate relation to the overall requirements of business and industry as well as to the broad social and economic objectives of the Nation.

The Department's functions are grouped into eight program categories as shown in the following table:

Table R-2. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Business development:			
International business development	16.4	20.0	28.5
Promotion of travel to the United States	3.0	4.5	6.0
Business assistance	7.8	8.3	8.7
Export control	5.4	5.5	5.5
Foreign direct investment control		3.7	4.7
Category total	32.5	41.9	53.4
Area and regional development:			
Areas	156.1	117.0	94.5
Districts	26.0	53.5	84.1
Urban areas	20.3	16.7	25.0
Special problem areas	17.9	18.4	18.7
Indian areas	18.4	30.0	31.5
Regional development	21.1	26.2	35.7
General administration	19.8	20.4	22.0
Category total	279.6	282.2	311.5
General purpose data production, analysis, and statistical services:			
Data production	34.1	42.8	167.4
National income and product accounts	2.9	3.1	3.3
Statistical assistance and services	2.6	3.0	3.0
Data processing equipment and systems development	4.2	.2	.2
Category total	43.9	49.1	174.0
Physical environment:			
Weather and marine forecasts and warning services	77.7	83.8	90.5
River and flood prediction and warning services	3.9	4.1	4.6
Earth description, mapping, and charting services	12.5	13.0	13.9
Marine description, mapping, and charting services	18.0	19.3	20.9
Telecommunications and space services	3.6	4.2	3.9
Environmental satellite services	30.6	22.5	12.3
Environmental data services	4.8	5.6	5.5
Research	13.6	13.3	13.8
Retired pay, commissioned officers	1.0	1.2	1.2
Category total	165.7	166.9	166.6
Physical measurements and standards program:			
Basic measurements and standards	11.0	13.1	14.2
Materials measurements and standards	15.8	17.5	18.7
Technological measurements and standards	5.0	5.8	7.2
Category total	31.7	36.4	40.0
Marine transportation:			
Active foreign trade capability	364.7	345.8	247.6
Research and development	9.4	6.9	11.3
Reserve capability for emergency needs	5.4	5.5	5.4
General support	14.8	14.2	15.8
Category total	394.3	372.4	280.0

Table R-2. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY—Con.**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Technology:			
Intellectual-industrial property protection	38.8	42.5	46.1
State technical services	6.5	5.3	5.8
Information dissemination	3.0	4.3	4.6
Innovation policy and encouragement	.2	.2	.2
Category total	48.6	52.4	56.8
General administration	4.7	5.2	5.8
Total distributed to programs above	1,000.9	1,006.4	1,088.1
Deductions for offsetting receipts	−26.3	−21.3	−21.8
Intragovernmental transactions	−4.7	−6.8	−5.7
Total budget authority, Department of Commerce	969.9	978.3	1,060.5

DEPARTMENT OF DEFENSE—MILITARY

The military programs of the Department of Defense provide for the security of the United States. Forces are grouped—regardless of the branch of military service—according to the national security missions or programs to be accomplished as shown below:

Table R-3. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category	1968 actual	1969 estimate	1970 estimate
Strategic forces	7,364.5	8,309.6	9,087.4
General purpose forces	31,124.3	29,606.0	29,856.3
Intelligence and communications	5,492.4	5,697.2	5,832.4
Airlift and sealift	1,813.0	1,402.0	1,889.2
Guard and Reserve forces	3,166.0	2,565.5	2,848.6
Research and development	4,395.4	4,598.0	5,500.3
Central supply and maintenance	8,175.4	8,662.8	8,848.8
Training, medical, and other general personnel activities	9,358.3	9,481.7	9,967.8
Administration and associated activities	1,292.1	1,404.3	1,407.3
Support to other nations	1,736.8	2,450.7	2,408.8
Retired pay	2,095.0	2,450.0	2,735.0
Total distributed to programs above	76,013.0	76,627.8	80,381.8
Undistributed nonprogram financing adjustments	415.5	−132.9	−144.3
Total budget authority, Department of Defense	76,428.5	76,494.9	80,237.5

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

The Department has responsibility for the administration of a broad range of Federal health, education, and welfare programs.

Its programs have been grouped into four program categories and an overall management category as shown in the table below. Each program category is further divided into subcategories according to major purpose.

Table R-4. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Education:			
Development of basic skills	2,389.0	2,289.3	2,179.0
Development of vocational and occupational skills	269.3	268.3	304.1
Development of academic and professional skills	1,330.9	966.2	1,020.7
Library and community development	87.9	86.8	96.0
General research (nonallocable research)	25.7	25.6	31.1
General support	35.5	41.3	45.3
Category total	4,138.3	3,677.5	3,676.2
Health:			
Development of health resources	2,315.0	2,185.7	2,395.6
Prevention and control of health problems	457.1	480.8	480.5
Provision of health services	7,345.7	9,980.3	10,739.0
General support	48.5	54.9	64.4
Category total	10,166.5	12,701.8	13,679.4
Social and rehabilitation services:			
Improving individual capability for self-support	408.9	596.4	853.6
Improving the social functioning of individuals and families	225.7	321.5	399.2
General development of social and rehabilitation resources	114.6	127.9	132.6
General support	32.0	37.7	43.1
Category total	781.3	1,083.5	1,428.5
Income maintenance:			
Aged assistance	18,476.8	21,339.4	24,787.0
Disability assistance	3,207.0	4,196.6	4,842.6
Other individual and family support	7,755.5	9,500.6	10,769.6
General support and increasing knowledge	236.4	277.0	327.3
Category total	29,675,7	35,313.6	40,726.5
Executive direction and management (Office of the Secretary)	24.0	25.0	35.2
Total distributed to programs above	44,785.8	52,801.5	59,545.8
Net deductions for interfund transactions and receipts from the public not distributed above	−97.5	−964.4	−522.3
Total budget authority, Department of Health, Education, and Welfare[1]	44,688.2	51,837.1	59,023.5

[1] While the budget authority for the Department of Health, Education, and Welfare agrees with that shown in the budget document, there may be minor differences in the distribution among categories and subcategories. These result from some differences in classification of budget authority. For example, emergency health in Part 3 is classified as National Defense and is therefore excluded from the health tally in Part 3. It has however been included in the budget authority shown above.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

The Department has the responsibility for administering the principal Federal programs which provide assistance for housing and for the development of the Nation's communities; assisting the President in coordination of Federal activities which affect urban community, suburban, or metropolitan development; encouraging local and private solution of housing and urban development problems; promotion of interstate, regional, and metropolitan cooperation; and increasing the efficiency of the private homebuilding and mortgage lending industries. These activities are grouped below in five major program categories plus supporting services.

Table R-5. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Assuring decent housing for all Americans:			
Assuring an adequate supply of low- and moderate-income housing	3,148.3	1,300.8	746.2
Promoting the efficient functioning of private housing markets	1,062.9	296.5	2.5
Category total	4,211.2	1,597.3	748.7
Assuring adequate and efficient local public and private facilities and services	402.3	202.8	195.7
Improving the physical environment of urban communities	850.0	1,062.5	1,112.2
Improving the social environment of urban communities:			
Creating model neighborhoods in demonstration cities	212.0	312.5	750.0
Assuring equal opportunity in access to housing and other facilities	----------	4.0	14.5
Category total	212.0	316.5	764.5
Improving management of community development activities:			
Improving governmental planning and executive management of community development	45.0	43.8	65.0
Improving urban information and technical assistance support to State and local governments	2.2	----------	5.0
Additional education and training for efficient urban development and management	3.5	3.5	9.0
Category total	50.7	47.3	79.0
Improving management of departmental programs and resources:			
Research and demonstrations in urban technology	10.0	18.3	32.7
Provide executive direction and general support	50.1	57.0	74.1
Category total	60.1	75.3	106.8
Total distributed to programs above	5,786.3	3,301.7	3,006.9
Intragovernmental transactions and other adjustments, net	−.5	−58.5	----------
Total budget authority, Department of Housing and Urban Development	5,785.9	3,243.2	3,006.9

DEPARTMENT OF THE INTERIOR

The Department of the Interior is concerned with the management, conservation, and development of the Nation's water, energy, minerals, fish, wildlife, forest, and outdoor recreation resources. It also has major responsibilities for Indian and territorial affairs. The Department's functions are grouped into the following nine major program categories:

Table R-6. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category	1968 actual	1969 estimate	1970 estimate
Water supply and control	671.7	652.8	667.6
Energy production, distribution, and supply	218.3	209.5	223.6
Minerals exploration, production, and supply	42.0	40.2	41.6
Land-forage-timber	118.7	121.2	118.3
Aquatic living commercial resources	50.0	49.5	51.4
Recreation use and preservation	366.5	429.0	422.3
Indians	361.4	351.0	359.4
Territories	58.2	55.8	69.2
Other programs	85.6	93.8	97.5
Total distributed to programs above	1,972.4	2,002.9	2,050.8
Deductions for offsetting receipts	−1,518.1	−1,477.2	−1,568.2
Intragovernmental transactions	−38.9	−32.0	----------
Total budget authority, Department of the Interior	415.3	493.7	482.6

DEPARTMENT OF JUSTICE

The chief purposes of the Department of Justice are to provide means for the enforcement of the Federal laws, including those pertaining to immigration and naturalization; to furnish legal counsel in Federal cases; to construe the laws under which other departments act; and to provide assistance to States and localities in law enforcement. It conducts all suits in the Supreme Court in which the United States is concerned, supervises the Federal penal institutions, and investigates and detects violations against Federal laws. It represents the Government in legal matters generally, rendering legal advice and opinions, upon request, to the President and to the heads of the executive departments. The Attorney General supervises and directs the activities of the U.S. attorneys and marshals in the various judicial districts, and coordinates much of the Federal activity which seeks to assure civil rights. The Department's programs are grouped into 11 major categories as shown below.

Table R–7. PROGRAM DISTRIBUTION OF BUDGET AUTHORITY
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Reduction of crime:			
Organized crime	15.1	18.4	20.1
Interstate crime	45.4	50.9	52.5
Federal crime	62.8	67.5	69.2
Crime prevention	1.3	1.7	1.8
Category total	124.6	138.6	143.7
Law enforcement assistance:			
Improvement of State and local law enforcement planning	1.7	19.0	20.0
Improvement of State and local law enforcement operations	3.3	29.0	230.0
Research and development of devices, systems, and procedures	.3	3.0	22.8
Support to law enforcement personnel for education and training	25.0	36.4	49.8
General support	.5	2.2	3.8
Category total	30.7	89.6	326.3
Correction of offenders:			
Custody and physical security of offenders	12.3	12.1	14.2
Inmate care and maintenance and operation of institutions	38.3	37.5	49.1
Rehabilitation of offenders	14.1	13.7	17.1
Assistance to non-Federal correctional systems	----------	.1	2.6
Research	.2	.4	1.1
General support	.9	.8	.9
Category total	65.8	64.6	84.9
Control of narcotics and dangerous drug abuse:			
Identification of dangerous drugs	----------	.3	.4
Control of traffic in narcotics and dangerous drugs	6.0	16.5	20.7
Treatment of narcotics and dangerous drug offenders	.2	.9	3.3
Law enforcement assistance	----------	.2	.4
Public education	----------	.1	.4
Research	.4	.9	1.3
General support	.3	1.8	2.8
Category total	7.0	20.7	29.3
Internal security and governmental integrity:			
Integrity of Government personnel	19.6	21.6	22.3
Security of Government, Government programs, and Government property	1.2	1.3	1.3
Security of Government international affairs	.5	.6	.6
Identification, exposure, and control of subversive movements	26.2	28.2	28.9
General support	.1	.1	.1
Category total	47.6	51.7	53.2
Civil rights and community relations:			
Equal employment opportunity	1.7	2.0	2.1
Housing	.4	.9	1.2
Public education	1.2	1.4	1.6
Interference with civil rights	11.7	13.3	13.8
Voting	1.4	1.7	1.7
Federally assisted programs	.4	.4	.5
Public accommodations and facilities	.6	.2	.2
Community relations assistance	2.0	2.3	3.7
Category total	19.4	22.0	24.8

Table R-7. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY—Con.**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Competition in the American economy:			
Anticompetitive conduct	4.0	4.3	4.6
Anticompetitive market structures	3.2	3.5	3.7
Governmental intervention and influence	.9	1.0	1.1
Category total	8.2	8.8	9.4
Legal representation and advice to Federal officers and agencies:			
Integrity of the revenue system	7.1	7.6	8.1
Defense of monetary claims	5.6	6.2	6.6
Recovery of money owed the United States	5.1	5.9	6.4
Integrity of administrative action	4.1	4.6	5.0
Land acquisition	2.8	3.0	3.3
Protection and development of natural resources	1.2	1.4	1.6
Category total	25.8	28.7	30.9
Support of the Federal judicial system:			
Recommendations of judicial appointments	.1	.1	.1
Facilitation of litigation	17.0	18.4	19.8
Protection of the integrity of the judicial system	1.2	1.4	1.6
General support	1.1	1.2	1.3
Category total	19.5	21.0	22.8
Immigration and naturalization:			
Control of persons entering the United States	45.3	48.0	50.3
Control of aliens in the United States	25.4	26.0	27.1
Naturalization	4.5	4.9	5.0
Central information record	7.1	7.4	8.0
General support	4.6	4.9	5.0
Category total	87.0	91.3	95.4
General support:			
Executive direction	2.4	2.5	3.3
Personnel	.4	.5	.5
Information	.5	.7	.7
Administrative services	2.9	3.2	4.2
Category total	6.2	6.8	8.7
Total distributed to programs above	441.9	543.7	829.4
Deductions for offsetting receipts	−4.4	−4.6	−4.6
Total budget authority, Department of Justice	437.5	539.1	824.8

DEPARTMENT OF LABOR

The basic goals of the Department of Labor are to increase the employment and productive potential of the civilian labor force, particularly the disadvantaged; to minimize the effects of unemployment by providing income support; and to promote and protect the rights and interests of all Americans who are actual or potential members of the work force.

Programs to achieve these overall goals are carried out by the Department's constituent bureaus and other organizations under a variety of subgoals and objectives. At present, the Department's programs are grouped into six major program categories plus a general support category as follows:

Table R–8. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**

(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Manpower development assistance:			
Training	396.4	412.2	666.3
Special manpower programs	20.3	15.8	18.0
Work programs	13.0		
Research	5.0	5.0	5.2
Policy planning and evaluation	2.0	2.4	2.6
Comprehensive manpower program planning			34.0
Information	.1	.2	.8
Manpower management data systems	.8	.8	3.5
Administration	2.3	2.6	3.0
Category total	439.9	439.0	733.4
Employment assistance:			
Employment market information	18.0	20.3	21.1
Job development and placement services	145.6	143.9	149.2
Employability assistance	69.3	91.0	94.5
Civil rights compliance	1.1	.9	.9
Administration	80.8	86.3	90.3
Category total	314.9	342.4	356.0
Income maintenance:			
Unemployment insurance	93.0	154.5	116.9
Workmens compensation	61.4	69.5	60.9
Unemployment trust fund (excluding amounts distributed to other subcategories)	3,461.8	3,407.9	3,716.2
Administration	13.6	20.7	21.2
Category total	3,629.9	3,652.6	3,915.2
Wage and labor standards:			
Wages and working conditions	23.3	25.3	25.3
Occupational fatalities and injuries	2.6	2.9	3.4
Utilization of women workers	.7	.7	.8
Research in the area of wage and labor standards	2.2	2.2	2.3
Administration	1.6	2.2	2.2
Category total	30.4	33.3	34.0
Labor-management relations:			
Administration of reporting and disclosure laws	6.6	6.8	6.9
Veterans reemployment rights	.8	1.0	1.2
Labor-management relations assistance	.3	.4	.4
Research and policy development	.3	.3	.3
Administration	.6	.6	.6
Category total	8.6	9.0	9.4

Table R-8. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY—Con.**

(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Data collection, analysis, and dissemination:			
Manpower and employment statistics	7.7	8.2	8.7
Prices and living conditions	3.5	3.6	3.7
Wages and industrial relations	3.5	3.6	3.7
Productivity, technology, and growth	1.2	1.4	1.4
Foreign labor and trade	.5	.5	.5
Field services	1.2	1.3	1.3
Administration	3.5	3.5	3.6
Revision of the Consumer Price Index			.6
Category total	21.0	22.0	23.5
General support:			
Executive direction and management	4.4	4.9	5.1
Legal services	4.8	5.2	5.1
International labor activities	1.3	1.4	1.4
Category total	10.6	11.4	11.6
Total distributed to programs above	4,455.3	4,509.7	5,083.1
Deductions for offsetting receipts	−3.2	−.6	−4.1
Pay supplemental and other separate transmittal		1.8	
Total budget authority, Department of Labor	4,452.1	4,510.9	5,079.0

POST OFFICE DEPARTMENT

The program structure of the Post Office Department is descriptive of the major functions involved in providing postal services from the acceptance of mail through delivery and the supporting activities required to maintain an effective service. Currently, the Department's functions are grouped into eight program categories as shown below.

Table R-9. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**

(in millions of dollars)

Program category	1968 actual	1969 estimate	1970 estimate
Direct services to mailers	1,273.8	1,400.2	1,438.7
Processing of mail	1,453.1	1,585.8	1,622.8
Delivery services	2,053.6	2,244.4	2,295.5
Transportation	602.9	630.0	645.0
Enforcing postal laws and regulations	24.9	28.2	32.0
Research, development, and engineering	22.1	34.0	50.0
Administrative postal support	441.2	522.7	576.2
Logistical postal support	764.2	899.1	1,095.9
Total distributed to programs above	6,635.8	7,344.4	7,756.2
Financing adjustments	61.9	−20.9	
Postal revenues	−5,505.3	−6,287.6	−7,006.4
Total budget authority, Post Office Department	1,192.4	1,036.0	749.8

DEPARTMENT OF TRANSPORTATION

The broad objectives of the Department of Transportation are to:

- Increase economic efficiency through improved transportation;
- Increase safety in transportation;
- Increase the benefits derived from the preservation and enhancement of environmental social values, when impacted by transportation; and
- Support other national objectives, such as national defense and scientific research.

The objectives of the specific programs of the Department are identical with, or in support of, these broad departmental objectives. The Department's programs are grouped into four major program categories plus a general support category as follows:

Table R-10. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Urban transportation:			
Highways	1,868.0	2,153.2	2,171.3
Urban mass transit		168.5	202.0
Category total	1,868.0	2,321.7	2,373.3
Interurban transportation:			
Highways	2,804.0	3,238.4	3,281.2
Rail	16.0	18.6	23.3
Air	679.7	829.3	1,156.8
Water	181.6	184.5	194.5
Intermodal	2.5	2.4	2.4
Category total	3,683.9	4,273.2	4,658.1
International transportation:			
Highways	5.0	2.0	
Air	143.9	1.4	1.4
Water	59.6	58.4	49.3
Category total	208.4	61.8	50.8
Other national interests:			
National security, boundaries, and treaties	93.7	90.7	89.1
Support of science	9.4	25.8	21.5
General transportation safety	153.5	141.1	177.7
Other highway programs	129.4	104.0	106.5
Category total	386.1	361.7	394.8
General support:			
Research and development	33.1	37.1	59.5
General highway planning	54.8	61.9	62.2
Administration	251.2	288.6	318.6
Coast Guard retired pay	48.2	52.4	55.7
Category total	387.3	440.1	496.1
Total distributed to programs above	6,533.7	7,458.5	7,973.0
Deductions for offsetting receipts	−19.7	−27.8	−20.4
Intragovernmental transactions	−15.1		
Total budget authority, Department of Transportation	6,498.9	7,430.7	7,952.6

DEPARTMENT OF THE TREASURY

The Treasury Department is responsible for the central fiscal operations of the Federal Government. The Treasury PPB system deals with the operating elements of the Department, which are funded mainly through annual appropriations but also receive a substantial amount of reimbursements and other miscellaneous funds.

The Department's functions are grouped into program categories as shown in the table. Not included in the PPB structure is interest on the public debt, which accounts for most of the budget authority for the Department, and several permanent appropriations which are aggregated in the adjusting entry in the table.

Table R-11. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Administration of Government finances:			
Public debt	55.9	58.5	61.0
Issuance, payment, and servicing of Government checks	37.9	43.9	44.9
General activities	4.8	4.6	4.5
Category total	98.6	107.0	110.4
Collection of revenue:			
Revenue accounting and processing	143.6	151.2	158.1
Taxpayer assistance and services	62.3	68.7	69.8
Delinquent accounts operation	78.4	85.6	89.4
Delinquent returns operation	22.4	23.2	28.8
Audit of tax returns	237.6	262.4	281.7
Tax fraud investigations—taxpayers in general	27.1	27.3	25.9
Taxpayer appeals	33.2	35.6	37.4
Alcohol and tobacco revenue and regulatory controls	16.0	18.0	19.8
Collection of customs duties	78.2	87.4	93.3
General activities	48.9	56.4	63.3
Category total	747.8	815.8	867.5
Manufacture and distribution of coins, currency, and other financial instruments	14.2	15.2	19.4
Special law enforcement:			
Tax fraud investigations—racketeer segment	9.5	14.9	17.2
Alcohol and firearms investigations	19.8	22.3	25.9
Other investigations	26.2	24.7	28.4
Security responsibilities	7.9	10.3	12.9
General activities	.1	.1	.1
Construction of facilities		.8	1.9
Category total	63.5	73.1	86.4
Policy determination and related activities	7.0	7.8	8.5
Total distributed to programs above	931.1	1,018.9	1,092.2
Items not included in the program structure:			
Interest on the public debt	14,573.0	16,000.0	16,800.0
Other appropriations not included in the program structure	312.7	303.0	278.4
Deductions for offsetting receipts	−1,077.2	−978.4	−1,115.2
Intragovernmental transactions	−82.0	−86.3	−81.4
Total budget authority, Treasury Department	14,657.6	16,257.2	16,974.0

ATOMIC ENERGY COMMISSION

The Atomic Energy Commission conducts a variety of production, research and development, and supporting activities to discharge its responsibilities for national defense and the peaceful applications of atomic energy. The agency's functions are grouped into eight major program categories, as follows:

Table R-12. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Procurement and production of source and special nuclear materials:			
Procurement of uranium concentrates	125.5	104.3	66.3
Production of special nuclear materials	360.4	371.1	361.5
Category total	485.8	475.4	427.8
Military applications:			
Nuclear weapons	886.8	1,139.4	950.4
Naval propulsion reactors	115.0	128.5	139.8
Category total	1,001.7	1,267.9	1,090.2
Development of space applications:			
Space propulsion	72.8	59.1	55.5
Space electric power	56.1	51.7	38.8
Category total	128.9	110.8	94.4
Development of central station nuclear power:			
Converter reactors	24.2	26.0	19.5
Advanced converter and low-gain breeder reactors	52.0	31.8	32.8
High-gain breeder reactors	84.5	163.2	116.6
Desalting applications	2.8	7.9	5.0
General research and development	3.4	3.0	2.8
Category total	166.9	231.9	176.7
Development of other civilian applications:			
Merchant ship propulsion reactors	.1	1.4	----
Terrestrial electric power development	6.9	4.1	4.7
Isotopes development	8.3	8.5	8.1
Civilian applications of nuclear explosives	17.9	15.2	14.5
Category total	33.2	29.2	27.3

Table R-12. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY—Con.**
(in millions of dollars)

	1967 actual	1968 estimate	1969 estimate
Basic research:			
High energy physics research	152.8	186.9	242.9
Other physical research	175.4	214.1	184.3
Biomedical research	93.2	101.9	97.9
Category total	421.4	502.9	525.1
Nuclear science and technology support:			
Supporting reactor development activities	114.2	154.2	130.2
Training, education, and information	18.0	17.9	17.4
Category total	132.2	172.1	147.6
General support:			
Program direction and administration	95.3	108.6	114.7
Community support	6.4	6.8	10.1
Security investigations	6.8	7.7	7.9
Cost of work for others	14.3	31.3	13.1
Construction planning and design	1.4	3.9	----------
Category total	124.2	158.3	145.8
Total distributed to programs above	2,494.3	2,948.5	2,634.9
Adjustments to budget authority, net	13.9	−377.7	−196.7
Total budget authority, Atomic Energy Commission	2,508.2	2,570.8	2,438.1

GENERAL SERVICES ADMINISTRATION

GSA provides, on a centralized basis where it is efficient to do so, a variety of goods and services for the agencies of Government. Among the things provided are: office and other building space, supplies, automatic data processing equipment, property and stockpile management, communications, motor transport, records management services, and other common services. It also operates the National Archives and presidential libraries.

GSA's PPB system groups these diversified activities into five basic program categories to facilitate analyses of costs and effectiveness. A sixth program category covers agency direction and a variety of support services.

Table R-13. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Facilities:			
Acquisition	163.6	94.3	114.7
Management	274.4	288.3	301.7
Service direction	1.5	1.5	1.6
Category total	439.5	384.1	418.0
Supply services:			
Provision of supplies	58.8	65.2	65.2
Supply management	1.1	1.2	1.2
Automated data management services	11.6	2.4	2.4
Service direction	1.9	2.0	2.0
Category total	73.5	70.9	70.8
Other property management and disposal services:			
Property management	13.5	13.3	14.4
Real property disposal	4.3	4.5	4.4
Personal property disposal	7.4	8.0	8.3
Program support	1.0	1.0	1.0
Service direction	.6	.6	.6
Category total	26.8	27.5	28.8
Transportation and communications services:			
Transportation (other than motor equipment)	2.4	2.4	2.4
Motor equipment	.4	.4	.4
Communications	1.8	1.9	1.9
Public utilities	.1	.1	.1
Service direction	.7	.7	.7
Category total	5.4	5.5	5.5
Records services:			
Management	11.7	13.1	13.5
Archival services	4.8	5.9	7.0
Federal Register	.6	.6	.7
Service direction	.6	.7	.7
Category total	17.8	20.4	21.9
Agency direction and support services:			
Executive direction	1.8	1.9	1.9
Administrative operations	12.8	13.7	13.8
Allowances and services to former Presidents	.3	.3	.4
Presidential transition		.9	
Category total	14.9	16.8	16.2
Total distributed to programs above	577.8	525.2	561.3
Deductions for offsetting receipts	−196.8	−205.9	−273.9
Total budget authority, General Services Administration	381.0	319.3	287.4

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The principal statutory functions of NASA include conducting research for the solution of problems of flight within and outside the earth's atmosphere, conducting activities required for the exploration of space with manned and unmanned vehicles, and arranging for the most effective utilization of the scientific and engineering resources of the United States with other nations that are engaged in aeronautical and space activities for peaceful purposes.

These functions are reflected in the program structure shown below. The table shows the NASA budget authority distributed to the category level except for the general support category which is shown at the subcategory level.

Table R-14. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Extension of manned space flight capability	2,829.7	2,180.8	2,011.0
Lunar exploration	46.5	13.6	22.5
Planetary exploration	109.1	106.8	174.6
Astronomy	92.9	90.1	76.4
Space physics	73.9	64.4	62.0
Space biology	37.5	30.0	28.0
Space applications	110.3	105.0	148.6
Space technology	237.7	193.7	198.5
Aircraft technology	84.6	94.9	105.4
Supporting activities:			
Tracking and data acquisition	275.9	279.7	298.0
Other supporting activities	102.4	70.2	102.1
Research and program management	639.3	648.6	650.9
Total support activities	1,017.6	998.5	1,051.0
Total distributed to programs above	4,639.8	3,877.8	3,878.0
Financing adjustments	−51.0	117.2	−117.5
Deductions for offsetting receipts	−1.5	−2.9	−3.0
Total budget authority, National Aeronautics and Space Administration	4,587.3	3,992.1	3,757.5

VETERANS ADMINISTRATION

The Veterans Administration administers laws authorizing benefits for former members of the Armed Forces, and for their dependents and survivors. The agency's functions are grouped into six major program categories, as follows:

Table R-15. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Compensation for service-connected disabilities and death:			
Compensation for veterans disabilities	1,950.4	2,080.0	2,162.6
Compensation to survivors	515.6	525.2	532.4
Miscellaneous	16.3	10.2	10.3
Administrative support	37.7	40.7	44.6
Category total	2,520.1	2,656.1	2,749.9
Alleviation of financial needs of veterans and survivors not connected with military service:			
Veterans pensions	1,270.3	1,283.5	1,286.6
Survivors pensions	778.2	848.6	904.7
Burial allowances and related benefits	66.9	71.0	20.2
Administrative support	44.7	47.9	52.4
Category total	2,160.1	2,251.1	2,263.8
Educational and training assistance:			
Readjustment educational assistance to veterans	378.5	570.5	668.6
Rehabilitative training of disabled veterans	22.8	31.0	37.9
Educational assistance to children of deceased and disabled veterans	33.2	37.2	37.6
Administrative support	38.5	45.8	46.6
Educational assistance to wives and widows	----------	1.4	17.4
Category total	473.0	685.8	808.1
Housing and other credit assistance:			
Credit assistance for homes, farms, and businesses	149.0	----------	----------
Servicing and management of loans and properties	701.6	9.5	5.7
Administrative support	38.7	40.6	43.3
Category total	889.3	50.1	49.1
Insurance:			
Veterans life insurance trust funds	744.7	754.3	760.4
Veterans life insurance revolving funds	1.6	4.3	6.0
Administrative support	18.2	19.3	21.2
Category total	764.6	777.9	787.5
Health services:			
Direct medical care	1,280.3	1,369.1	1,427.5
Medical and prosthetic research	45.9	48.1	59.7
Research and development in health services	4.9	5.0	4.8
Education and training	64.1	79 1	96.1
Medical support and miscellaneous services	41.1	44.7	49.2
Construction of facilities	56.6	11.9	101.4
Category total	1,492.9	1,557.9	1,738.7
Total distributed to programs above	8,300.0	7,978.9	8,397.1
Deductions for offsetting receipts	−494.0	−483.9	−480.1
Intragovernmental transactions	−5.4	−6.0	−5.6
Total budget authority, Veterans Administration	7,800.7	7,489.1	7,911.4

NATIONAL SCIENCE FOUNDATION

The fundamental purpose of the National Science Foundation is to strengthen basic research and education in the sciences. The Foundation's activities are reflected in the program structure shown below.

Table R-16. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Support of scientific research:			
Scientific research project support	170.6	177.3	197.0
Specialized research facilities and equipment	18.9	7.0	15.0
National research programs	15.5	13.0	23.2
National research centers	31.5	25.7	25.7
Category total	236.5	223.0	260.9
National sea grant program	5.0	6.0	10.0
Computing activities in education and research	22.0	17.0	22.0
Institutional support for science	83.2	41.0	74.0
Science education support:			
Precollege education in science	54.7	49.0	48.8
Undergraduate education in science	21.5	20.0	20.5
Graduate education in science	48.7	47.1	48.2
Category total	124.8	116.1	117.5
Science information activities	14.4	11.0	14.0
International cooperative science activities	1.4	1.8	2.0
Planning and policy studies	2.4	2.5	2.9
Program development and management	15.4	16.6	17.0
Total distributed to programs above	505.2	435.0	520.3
Adjustments to budget authority, net	−10.2	−35.0	−20.3
Deductions for offsetting receipts	−3.5	−1.1	−1.1
Total budget authority, National Science Foundation	491.5	398.9	499.0

OFFICE OF ECONOMIC OPPORTUNITY

The Office of Economic Opportunity contributes to the national goal of eliminating poverty by aiding in the development of Federal antipoverty policies and programs and by administering or coordinating various antipoverty program efforts. Achievement of this goal involves the provision of opportunity for people and communities to help themselves through work, education, and training in a decent and dignified environment. Effort to reach these subgoals is carried out through activities under several major program categories, as shown in the table.

Table R-17. **PROGRAM DISTRIBUTION OF BUDGET AUTHORITY**
(in millions of dollars)

Program category and subcategory	1968 actual	1969 estimate	1970 estimate
Employment:			
Job training and work experience assistance	625.6	752.7	825.1
Other employment assistance	16.2	16.5	17.0
Category total	641.8	769.2	842.1
Individual and family improvement:			
Compensatory and other educational assistance	568.4	577.0	614.7
Health assistance	60.7	95.5	127.8
Other individual and family assistance	8.3	8.8	10.8
Category total	637.4	681.4	753.3
Community betterment:			
Resource mobilization assistance	293.5	294.8	312.2
Volunteer assistance	29.2	32.0	37.0
Housing assistance	11.9	14.1	24.4
Legal assistance	35.9	42.0	50.0
Loan assistance	17.0	6.0	12.0
Economic development assistance	21.6	23.9	48.0
Other community betterment assistance	62.1	66.1	72.0
Category total	471.2	478.9	555.6
Poverty research and evaluation	3.6	3.6	13.0
General support:			
Executive direction and administration	11.9	12.5	12.6
Coordination and other	1.5	2.5	3.4
Category total	13.4	15.0	16.0
Total distributed to programs above	1,767.4	1,948.0	2,180.0
Deductions for offsetting receipts	−.5	−.5	−.5
Total budget authority, Office of Economic Opportunity	1,766.8	1,947.5	2,179.5

ATTACHMENT 11

SUMMARY OF ANALYSIS OF MAJOR PROGRAM ISSUES DURING THE FISCAL YEAR 1970 PLANNING AND BUDGET CYCLE (JANUARY TO DECEMBER 1968)

Major program areas	Major program issues (number)	5-year potential impact on budget (billions)	Issue analysis completed by final budget review		Issue analysis in progress (number)	Issues not analyzed (number)	Percent of completed analysis used in decision process [1]
			Number	Percent of dollars impact			
1. Community and economic development	114	$18	35	37%	40	39	89%
2. Human resources	64	11	25	26	6	33	16
3. Science and technology	42	8	31	61	6	5	70
4. General government	51	6	13	8	13	25	75
Total for domestic programs	271	$43	104	35%	65	102	68%
5. International and national security affairs [2]	109	100	90	85	5	17	89
Total	380	$103	149	44%	80	151	82%

[1] This number represents the percent of the potential dollar impact of all completed analyses that was actually influenced in major or minor fashion, by the analyses.

[2] The definition of issues and completion is somewhat different for international and national security problems which are only partially tied to the budget cycle, so the numbers in this row are only roughly comparable to the other four areas.

NOTE: It should be emphasized that this table represents a composite of the subjective judgments of staff members familiar with analysis in the various areas. The process by which it was developed was to ask those staff members to list the issues posed as a part of the FY 1970 cycle and then to appraise each one, on a judgmental basis, in terms of its impact. Thus the data only suggest the relative magnitudes involved. Because of the complexity of the decision process, no attempt was made to assess the marginal impact of analysis, that is, the result that occurred as compared with the result that would have occurred without the analytic work.

ATTACHMENT 12

SELECTED PAPERS IN PROGRAM ANALYSIS (1966–1967)—AN ANNOTATED BIBLIOGRAPHY*

EXECUTIVE OFFICE OF THE PRESIDENT, BUREAU OF THE BUDGET

Introduction

This selection of analytical studies is intended to provide an insight into the status of program analysis now practiced in the U.S. Government. Copies of the studies listed here have been collected at the Bureau of the Budget Library and are available for reference by persons qualified to use the Library. The Bureau of the Budget cannot undertake to supply the studies made by other agencies, and many of its own studies were prepared in a very limited number of copies. While the collection can offer a good illustration of many analyses that have been done, it is not representative of the full spectrum of analysis being practiced. It does not include studies which cannot be made public because they either contain classified information or are embodied as part of budgetary submission documents.

The principle of selection was to offer examples of the studies covering a variety of types of questions posed, of the techniques and methods used, and the type of public programs analyzed. No attempt was made to be exhaustive, and in the interest of keeping down the size of the collection, for several types of analyses only representative examples of a larger number of studies were included.

Some of the papers included in this selection are methodological, but the attempt was made to select primarily papers with empirical content. Some papers are in draft form, are technical in nature, and do not necessarily represent the position of the Department or agency. Much of the recent analysis of public programs conducted in the Federal Government originated under the operation of the Planning-Programing-Budgeting System which was introduced Government-wide in August 1965. However, examples of other analyses have also been included, among them the benefit-cost studies of the water resource projects and a paper on the social indicators.

Selection of these studies for the present collection does not signify any particular stress or value laid on their content by the Bureau of the Budget. The intent of this selection is primarily reportorial. This is the first annotated listing of program analyses conducted by the Federal Government or under its auspices in the recent years. The listing and the library collection may be updated in the future from time to time.

*Compiled in April 1968. [ED. NOTE.]

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U.S. Office of Economic Opportunity. *Evaluating the War on Poverty*, by Robert A. Levine

Evaluation, as such, is discussed at three levels: War on poverty evaluation; individual program evaluation; and relative program evaluation (comparison among programs). Thus far in evaluating the entire war, only the number-of-people-in-poverty criterion was used.

Individual programs are evaluated for their proximate effects and their antipoverty effectiveness. These programs are divided into four categories: Manpower—to provide jobs; individual improvement—education and health; community betterment—environmental change and service delivery; and income maintenance. In evaluation of manpower programs the proximate and ultimate criteria are quite similar. Evaluation in this area is relatively easier than most. Cost-benefit studies have been completed and the results throw a good deal of light on the effectiveness of these programs. In the individual improvement category, which consists of primarily educational programs, evaluation is much less straightforward and little has been done systematically, although some discoveries have been made—the new thrust toward full-year Headstart as opposed to summer; the difficulty of deriving later earning capabilities from early-year and in-school programs. Evaluation is quite complex for the community-betterment category, especially in the areas of delivery of certain services and measurement of the poorly defined "social change" that this category of programs is supposed to bring about. But as in all the above categories, some hard evaluations—general and systematic—are underway. Examples are the cost-benefit analysis of family planning and city-by-city comparison of community action. However, it is too early and data are insufficient at this time to evaluate the effectiveness of some of these programs. Finally in the last category—income maintenance—the proximate and ultimate tie is virtually the same; although OEO at this time does not fund any income-maintenance programs. Evaluation to date has been relatively simple, although more complex evaluations are being considered and evaluative experiments have been begun.

U.S. Office of Economic Opportunity. *Benefits and Costs in the Upward Bound Programs*, by Judy Segal. June 24, 1967. 6 pp.

For Upward Bound, benefit-cost ratios have been calculated for three types of "success" situations: (1) high school graduate over high school dropout; (2) 1 to 3 years of college attendance over high school graduation; and (3) college graduate over high school graduate. The ratios vary from .94 to 2.77. The overall benefit-cost ratio will vary depending on the proportion of youngsters "succeeding."

U.S. Office of Economic Opportunity. *Benefit/Cost Estimates for Job Corps*, by Glen Cain. Madison, Institute for Research in Poverty, University of Wisconsin, 1967. 51 pp.

A number of benefit-cost ratios for Job Corps are reported. Different assumptions about the appropriate concepts and measures of the

costs and benefits lead to ratios that range between .60 and 1.89. The interval from 1.02 to 1.70 is suggested as encompassing a set of ratios that are conservative and realistic. An important limitation of this study is that the sole measure of benefits is the improvement in labor market earnings of the corpsmen. Given the constraints imposed by the data the measure of benefits should be considered as a lower bound.

U.S. Department of Agriculture—Planning-Evaluation-Programing Staff. *Measuring the Effects of U.S. Department of Agriculture Programs on Income Distribution*, by Vernon C. McKee and Lee M. Day. 48 pp.

Do programs administered by the Department of Agriculture narrow the income gap between Americans—or do they increase the income gap? To answer this question, a special study measured the effects of selected Department programs on income distribution. The method of analysis involved computing a statistical measure of the inequality of income distribution by States and a measure of the inequality of program disbursement by States. The measure of inequality used was the Gini Index computed from Lorenz curves.

Programs were divided into two groups: (1) those aimed at improving the income or well-being of farmers, and (2) those aimed at improving the income or well-being of the population generally. Most of the programs aimed at farmers tended to reduce the interstate inequality of income. All of the nonfarm programs tended to reduce the inequality of incomes without exception. This study is being published as part of the background reports of the President's Commission on Rural Poverty.

U.S. Department of Agriculture. Economic Research Service. *Margins Speculation and Prices in Grains Futures Markets*, prepared by Robert B. Nathan Associates, Inc., December 1967. 245 pp.

For a number of years bills have been before the Congress which would provide authority for the Commodity Exchange Authority to regulate margins on grains futures contracts as a means of controlling speculative excesses which (presumably) produce erratic price fluctuations to the detriment of orderly marketing. To evaluate the possible effectiveness of this tool, and its administrative feasibility, a special study was conducted in 1967 to define and measure speculation and its relation to price fluctuations, and to measure the relation of margin changes to speculation and price movements.

The study indicates that: (1) speculators' influence on price making has been relatively less dominant during the last 20 years, and commitments of hedgers and spreaders have become relatively more dominant; (2) the price effects of speculation can be measured quantitatively; (3) for an extended period in 1947–48 high initial margin requirements probably did in fact help curtail very short-term price fluctuations; (4) but there is evidence that speculators' transactions often moderate rather than accentuate price volatility; (5) margins entail costs which are passed back to the producer or forward to the consumer; and (6) given the present state of market data collection and analysis, the Commodity Exchange Authority would find it dif-

ficult to determine whether, when, and how to apply margin controls to limit price volatility. Judicious decisions would be practicable only with significantly larger efforts in data collection, retention, and interpretation. Numerous and important administrative problems would exist.

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE. *Opportunities for Timber Management Intensification on the National Forests*, by Robert Marty and Walker Newman. July 1967. 25 pp.

This special study presents estimates of the economic efficiency of timber management intensification for 60 different classes of commercial timberland on the national forests. It inventories the opportunities for intensification treatments now available in young timber stands and shows the cost and result of accomplishing these treatments in the order of economic priority for three different levels of total investment. The major findings are:

National forest timberlands eventually can sustain a maximum annual harvest of 5.1 billion cubic feet without management intensification.

Investments in intensified timber culture will return 3 percent or more on 72 million acres of timberland at prospective stumpage price levels.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. *The Demand for Domestic Timber, 1962–2060.* January 1967. 8 pp.

The study was designed to ascertain the effect of price changes on the consumption of industrial wood, the effects of changes in wood use relative to GNP, and the effect of changes in the population. The study indicated that: (1) Timber demand is uncertain for any single year, but is likely to rise in the long run; (2) demand estimates are equally sensitive to changes in population, GNP, and unit wood use assumptions—that is, a 1-percent change in any one causes a 1-percent change in estimated demand for the year 2000; (3) timber shortages are almost certain to cause wood product price increases before the year 2035; and (4) a scarcity of timber costs much more than a surplus.

U.S. DEPARTMENT OF AGRICULTURE. *Benefit/Cost Analysis of Research on Live Poultry Handling.* 3 p.

Two and three-tenths billion broilers are produced annually in the United States. Less than 1 percent are consumed by producers. Of the birds received at commercial poultry processing plants, 15–20 percent are downgraded because of bruises caused by improper handling. Research to develop improved methods, equipment, and techniques to reduce labor requirements and bruise damage was calculated to have a favorable benefit/cost ratio of 1,164:1, assuming 3 more years of research and using a 5 percent discount rate. Effectiveness was estimated at 100 percent, representing the proportion of potential most likely to be achieved by 1974.

U.S. DEPARTMENT OF AGRICULTURE. *Benefit/Cost Analysis of Research on Scab Resistant White Potato Varieties.* 3 p.

Losses incurred from common potato scab are estimated at 2.5 percent annually and increasing. This is one factor tending to increase per unit cost of potato production. Research proposals to develop scab resistent varieties of white potatoes were calculated to have a favorable benefit/cost ratio of 92.8:1, assuming a 10-year research program and using a 5 percent discount rate. Effectiveness of the proposed research was estimated at 80 percent, representing the proportion of potential benefits most likely to be achieved.

U.S. DEPARTMENT OF AGRICULTURE. *Benefit/Cost Analysis of Research on Southern White Pine Genetics.* 3 p.

Fusiform rust is a prevalent disease of Southern White Pine. Frequently 10 to 50 percent of the trees in a plantation are infected and die before they reach minimum thinning size. Heavy infestation can result in complete loss of the investment of planting. Genetic research to develop rust resistant strains indicates that planting rust resistant trees can result in an average 20 percent increase in the number surviving in a plantation. At the present annual level of research it is estimated to take 20 years to produce high-yield strains resistant to fusiform rust. By that time large scale, highly productive seed orchards will have been established with clonal material from new strains grafted on to common-origin root stocks. The principal obstacles to accelerated progress are problems with grafting and culture of the limited hybrid material for testing and the propagation of the strains for wide commercial production in seed orchards. Equivalent results could be achieved in about 12 years with an accelerated research program. An analysis of the costs and benefits (increased yields in cubic feet of timber at present prices) of an accelerated research program compared with the present level of effort indicates a rate of return on all costs to implement an accelerated program of 12.3 percent and a benefit/cost ratio of 44.5 to one with a 4 percent discount rate.

U.S. DEPARTMENT OF AGRICULTURE. *Pest Control Program Analysis—Witchweed.* 16 pp.

Witchweed is a parasitic seed-bearing plant which attacks more than 60 species of plants including corn, sorghum, sugarcane, and small grains. While found now only in parts of North and South Carolina, it is, potentially, a very costly pest. Losses to corn from witchweed in South Africa, where it is common, are reported to be greater than losses from fungus diseases and insects combined. Since there is no known way to eradicate witchweed, the objectives of the program are to limit the production of the long-lived witchweed seed, and to limit its spread. This is achieved by applications of herbicides, quarantines, surveys, and research.

Costs and benefits of alternative programs, and a non-program option, were calculated using crop losses avoided and costs of eradica-

tion. The internal rate of return, estimated by comparing the effects of the present program with the consequences of letting the parasite spread, was 96 percent. This assumes a 40-percent annual increase in infested acreage. The present program, compared to a 3-year suspension, yielded an internal rate of return of over 200 percent.

U.S. Department of Defense. *Recommended FY 67–71 Airlift and Sealift Forces Attachment to Supplement to Bureau of the Budget Bulletin No. 66–3.* December 21, 1965. 31 pp.

This attachment is a declassified Defense Department paper on Airlift and Sealift Forces. It provides one example of the analytic method and level of detail required in the preparation of a program memorandum.

U.S. Department of Defense. *Army Corps of Engineers. Salem Church Reservoir, Rappahannock River, Va.* Washington, Government Printing Office, 1967. 106 pp. (S. Doc. No. 37, 90th Cong., 1st Sess.)

A report of the Board of Engineers for Rivers and Harbors, Department of the Army, which recommends that the Salem Church project be modified to provide for a multiple-purpose dam and reservoir, with a downstream dam and reservoir for reregulation of flow releases, for flood control, water quality control including salinity control, water supply, hydroelectric power, and recreation. The total cost of the proposed project is estimated at $79,500,000 of which $69,100,000 would be for initial construction and $10,400,000 for future expansion of the recreational facilities. The total annual charges are presently estimated at $3,464,000 and the total average annual benefits at $7,290,000. The benefit-cost ratio is 2.1.

U.S. Department of Defense. Army Corps of Engineers. *Park River Basin, Conn.* Washington, Government Printing Office, 1967. 70 pp. (S. Doc. No. 43, 90th Cong., 1st Sess.)

The report recommends the modification of the existing flood control project in Hartford, Conn.

Total installation costs of the proposed project are estimated to be $31,100,000, of which $30,300,000 would be Federal and $800,000 would be non-Federal for lands, damages, and relocations. Average annual costs, including operation and maintenance cost, are estimated at $1,130,000.

Average annual flood damage reduction benefits are estimated to be $1,420,000. The benefit-cost ratio is estimated to be 1.3 to 1 based on a 100-year period of analysis and 1.04 for a 50-year period. The costs of the proposed project and the resulting benefits are based on single-purpose urban flood protection.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Motor Vehicle Injury Prevention Program.* August 1966. 183 pp. (Program Analysis 1966–1; Disease Control Programs)

This report represents an attempt to use benefit/cost analysis to compare alternative programs which the Department might under-

take in motor vehicle accident prevention and control. It examines several approaches and mixes of approaches, attempting to indicate which are most efficient in reducing injuries and deaths from motor vehicle accidents.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Income and Benefit Programs.* October 1966. 83 pp. (Program Analysis 1966–2)

This report presents the results of analysis of income and benefit programs—those programs designed to provide individuals and families with supplements to their current incomes. Attention was restricted to the money payment programs, and a range of alternative changes were analyzed. Primary focus was on the impact of changes on the incidence of poverty in the United States.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Cancer.* October 1966. 111 pp. (Program Analysis 1966–3; Disease Control Programs)

The analysis outlines the relative costs and estimated direct benefits of specified proposals for programs to control cancer of five anatomic sets. It examines only the direct costs of the Government programs and the direct effect among the people who would take part in these proposed programs.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Arthritis.* September 1966. 133 pp. (Program Analysis 1966–4; Disease Control Programs)

The study examines the possible costs and potential benefits of possible levels of program effort, designed to improve diagnosis and treatment of arthritics, thereby increasing their productive lives.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Adult Basic Education; Work Experience and Training.* September 1966. 32 pp. (Program Analysis 1966–7; Human Investment Programs)

Human investment programs are programs which have a primary objective of raising the future incomes of selected population groups through the provision of education, training, or rehabilitative services.

The two programs analyzed in this study are aimed at similar target groups: adults whose abilities to earn incomes are impaired by lack of basic education or basic vocational skills and employment experience. The analysis of these programs indicates that potential benefits exceed costs.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Selected Disease Control Program.* September 1966. 38 pp. (Program Analysis 1966–5; Disease Control Programs)

The report presents and summarizes the results of previously completed disease control program analyses. It develops comparative

data between programs to highlight such factors as number of deaths averted, the cost per death averted and the benefit-cost ratio.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Maternal and Child Health Care Programs.* October 1966. (Program Analysis 1966–6)

This study examined a range of 14 alternative M & CH programs. One principal finding indicated that to provide comprehensive health care for poor children would require the services of more pediatricians than exist today in the country. It indicated the need for more experimentation with the physician assistant concept. A program of early case finding and treatment of handicapping conditions was found to be an extremely efficient method of dealing with the most pressing health problems of children.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Elementary & Secondary Education.* September 1966. 61 pp. (Program Analysis 1966–8; Human Investment Programs)

The Elementary and Secondary Education Act of 1965 was the first large-scale Federal aid program to reach the Nation's public and private schools below the college level. Title I of this act provides funds for programs designed to aid economically and socially disadvantaged children in schools with concentrations of students from low-income families.

This study presents a survey of analyses and evaluation studies of compensatory educational activities, focused on applicability of the findings for evaluation of title I; it does not present results of title I project evaluations. The studies analyzed in this report present results that are relevant for future research. Major emphasis is on evaluation of educational effectiveness. Other topics include allocation criteria and the quantification of long-term benefits and recommendations for future work.

U.S. Department of Health, Education, and Welfare. Office of Planning and Evaluation. *An Economic Analysis of the Control of Sulphur Oxides Air Pollution.* December 1967. (Program Analysis 1967–9; Human Investment Programs)

Air pollution is complicated by many factors ranging from a multiplicity of emitters and receptors, to the difficulties of structuring institutions to administer an effective AP program. Because of these complexities, the air pollution program analysis group developed a pilot model which could eventually provide a framework for evaluating alternative air pollution abatement programs.

The model demonstrates three things: (1) the type of information required to select a preferred regional abatement policy; (2) the types of constraints to be overcome before actually activating the techniques; and (3) the amount of cost differential resulting from the application of various public policy alternatives to the problem of reducing pollution.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Problems of Assessing the Effectiveness of Child Health Services: Economic Aspects*, by Rashi Fein. May 5, 1967. 14 pp. (Occasional paper No. 1)

This is a paper presented at the Conference on Pediatric Research, Airlie House, Warrenton, Va., March 16, 1967. It explores the principles of measuring benefits of health programs.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Strengthening Education Manpower*, by Doris Kearns. July 17, 1967. 24 pp. (Occasional paper No. 2)

This paper emphasizes the need to define the educational manpower problem in terms of *distribution* and of *quality* of supply, rather than gross numerical shortage.

U.S. Department of Health, Education, and Welfare. Office of Program Coordination. *Federal Teacher Training Programs: A Preliminary Appraisal*, by Robert Inman. August 1967. 17 pp. (Occasional paper No. 3)

The recent passage of the Education Professions Development Act presages considerable expansion of the Federal effort in teacher training. In fiscal year 1967, the Federal Government spent approximately $138 million on programs to train and retrain elementary and secondary school teachers.

The study assumes that teachers have a positive educational influence on students and that individuals can be trained to be effective teachers. It raises some questions about present Federal teacher training programs. Is the money being wisely spent? Is it going where the need is greatest? How might present programs be altered to improve their effectiveness? What new training programs for elementary and secondary school teachers should be considered?

U.S. Department of Health, Education, and Welfare. Office of Planning and Evaluation. *Some Thoughts on the Allocation of Resources to Biomedical Research*, by Richard Zeckhauser. November 1967. 118 pp. (Occasional paper No. 4)

A think piece which dicusses possible techniques of analysis, current characteristics of bio-medical research, NIH programs and mechanisms, comparisons with other research fields, the interplay between research, medical schools and physician manpower, projected future growth rates, and suggested future studies.

U.S. Department of Health, Education, and Welfare. Public Health Service. Office of Program Planning and Evaluation. *Kidney Disease Program Analysis: A Report to the Surgeon General.* Washington, Government Printing Office, 1967. 211 pp. (Public Health Service publication No. 1745)

This study examines and evaluates alternative approaches to the reduction of serious kidney diseases. Major alternatives are hemodialysis, transplantation, and prevention programs.

U.S. Department of Health, Education, and Welfare. *A Report to the President on Medical Care Prices.* Washington, Government Printing Office, 1967. 38 pp.

The study analyzes the reasons behind the rapid rise in the price of medical care and offers recommendations for moderating the rise. The report attributes the price rises to the pressure of the rising demand for medical services, the relatively slow growth in the supply of physicians, rising wage costs in hospitals without commensurate increases in productivity, and the increasing complexity of medical care provided to the patient. The report sets forth recommendations which would moderate the rise in medical prices through the more efficient use of medical resources.

U.S. Department of Health, Education, and Welfare. Vocational Rehabilitation Administration. Division of Statistics and Studies. *An Exploratory Cost-Benefits Analysis of Vocational Rehabilitation.* August 11, 1967. 71 pp.

This is an exploratory, and partial, cost-benefits analysis for vocational rehabilitation. It focuses on one among many benefits of vocational rehabilitation. This analysis found that, because of vocational rehabilitation services, clients whose cases were closed during fiscal year 1966 will experience an increase of $35 in their earnings and value of work activity over their working lives for every dollar expended on them.

U.S. Department of Health, Education, and Welfare. *Work Experience and Training Program.* June 1967. 18 pp.

The primary object of Title V, Work Experience and Training Program, has been to increase the employability and earning power of the hard-core poverty population, not to produce highly skilled production workers and technicians. In particular, the program has been focused primarily on heads of families who are unemployed, and actual or potential recipients of public assistance. In 1965, this group numbered approximately 1.3 million poor households.

This paper was prepared to help inform the Subcommittee on Employment, Manpower, and Poverty and the Congress of the problem encountered in Title V, the ways in which the resources from a wide variety of sources have been brought to bear on these problems as well as how effective they have been, and the complexities surrounding any attempt to meaningfully evaluate such a program.

U.S. Department of Health, Education, and Welfare. Social and Rehabilitation Service. Children's Bureau. *Federal Programs Assisting Children and Youth*, Interdepartmental Committee on Children and Youth, December 1967, 95 pp.

This report provides information on interagency Federal programs to meet the needs of children and youth, including the resources provided for education, training, health, nutrition, employment, and social services, as well as some indicators of the benefits accrued in recent

years toward achievement of program goals. It presents figures on expenditures for programs directly administered by the Federal Government and on Federal grants-in-aid to State and local governments and to private agencies. It represents a start toward compilation of data that would be needed to estimate cost-benefit ratios for the children and youth programs conducted by the many Federal agencies.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT. *A Proposed Methodology for Comparing Federally Assisted Housing Programs*, by William B. Ross. 17 pp. A paper prepared for the panel on cost-benefit analysis for Government decisions at the 79th annual meeting of the American Economic Association, San Francisco, Calif., December 28, 1968.

It is a progress report on how one analytic staff in one agency is attempting to approach one specific policy problem cycle. The aim of the paper is to describe what we believe to be a useful analytic methodology for the Federal decisionmaker; we try to be explicit about the stages of analysis in which we choose to defer concentration while presenting for critical review those tentative proposals which now appear to us both to be relevant and to lead in useful directions.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT. *Systems Cost Analysis of Mortgage Insurance Programs.* 6 pp.

This analysis involves the identification of each case that enters the FHA apparatus and recording of its financial history through the various stages until some form of final liquidation occurs. The record also needs to identify certain characteristics that may be expected to have some bearing on its financial outcome so that policy analysis may examine the experience of groups of similar cases and evaluate the difference between groups.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT. *Local Government Borrowing, 1963–64.* 32 pp.

This analysis is a preliminary attempt to explore the public facilities loan program on the basis of data for 1963–64 derived from special tabulations received from the Investment Bankers Association, the only organization which, to the Department's knowledge, attempts to collect data on a regular basis on new issues of municipals by, among other things, size of community.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT. *An Evaluations of the Open Space Land Program—1961–67.* 34 pp.

This study is in response to a request from the Bureau of the Budget to evaluate the open space land "program output to determine the degree to which general objectives have been and are likely to be accomplished." This analysis does not include open space development

projects, or the newer developed land activities under section 705 of the Housing Act of 1961, as amended.

U.S. Department of the Interior. Bureau of Reclamation. *Oahe Unit, Missouri River Basin Project, South Dakota.* Washington, Government Printing Office, 1967. 274 pp. (H. Doc. 163, 90th Cong., first sess.)

A recent example of the benefit-cost studies of the Department of the Interior, Bureau of Reclamation. The Oahe project would provide a water supply for the irrigation of 190,000 acres of land in the James River Basin of eastern South Dakota by the construction of canals, reservoirs, pumping plants, and related facilities to transport water stored behind the Oahe Dam on the Missouri River. The project will provide incidental benefits to municipal water, flood control, fish and wildlife, and recreation. The benefit-cost ratio for the project is estimated at 1.6 using direct benefits over a 100-year period at 3⅛ percent interest. The Federal investment for the Oahe unit is estimated at approximately $192 million.

U.S. Department of the Interior. *Prospects for Oil Shale Development:* Colorado, Utah, and Wyoming, May 1968. 134 pp.

This paper discusses the demand and supply of energy, the nature of the oil shale resources, its technology and economics, and the development of a shale oil industry, including Federal leasing procedures. It analyzes the Nation's potential energy demands, including the Federal Government's role and interest in the resource as a potential energy source, with particular emphasis on use of federally owned resources in the best public interest. Technology and economics of oil shale are appraised in detail, and there is a section that discusses the problems that may arise in development of an oil shale industry.

The report anticipates that commercial development of oil shale resource will be by private enterprise. Competitive bidding is emphasized strongly, and much discussion is devoted to avoiding speculative holding of resources, windfalls, protecting the environment, and assuring a fair market value rate of return to the Federal Government from the leasing of federally owned resources.

U.S. Department of Justice. *The Objectives of Land Acquisition: Systems Analysis and the Land Acquisition Process*, by Hugh Nugent, 1966. 23 pp.

The first half of this paper contains a concise discussion of the application of PPB to the Department of Justice generally. It includes discussion of the subcategories chosen by the Department and of some difficulties involved in choosing objectives and measuring output. The second half consists of an analysis of specific problems that are brought to the surface when systems analysis is applied to the Department's land acquisition policy. It attempts to establish a framework for analysis on questions of procedures of land acquisition, the status of the title taken, problems of title insurance, and the type of comparative cost analysis which needs to be undertaken.

U.S. Department of Justice. Bureau of Prisons. *A Description and Comparative Study of Recidivism in Pre-Release Guidance Center Releasees*, by Reis H. Hall, Mildred Milazzo, and Judy Posner, December 28, 1966. 11 pp.

This is a quantitative evaluation of the Bureau's experience with prerelease guidance centers that analyzes their effectiveness in reducing recidivism rates. It concludes that "for the first time in our attempts to evaluate correctional treatment programs for Federal offenders, a significant decrease in recidivism has been demonstrated for selective groups who successfully participated in our prerelease guidance center program. That a program may have a differential impact on offenders with various characteristics has also been shown. Because of the significance of these findings, it is imperative that replication of both this study and of the base expectancy study upon which this study depends be made."

U.S. Department of Labor. Manpower Administration. Office of Manpower Policy, Evaluation, and Research. *Illustrative Cost/Goal Analysis in the U.S. Employment Service Area*, prepared by Planning Research Corp., October 1967. 41 pp. (PRC D–1503).

The objective of this illustrative cost/goal analysis was to use available data for 1965 to investigate the effectiveness of the U.S. Employment Service and of its functional parts.

U.S. Department of Labor. Manpower Administration. Office of Manpower Policy, Evaluation, and Research. *Cost/Effectiveness Analysis of On-the-Job and Institutional Training Courses*, prepared by the Planning Research Corp., June 1967. 46 pp. (PRC D–1297)

This analysis was undertaken to illustrate cost/effectiveness techniques as applied to manpower training programs.

U.S. Post Office Department. Office of Planning and Systems Analysis. *Five Methods of Delivery; A Study and Cost Estimate.* October 14, 1966. 76 pp.

This systems analysis study presented a detailed comparison of five possible residential delivery methods: door, curb, eight-unit kiosk, 40-unit kiosk, and 80-unit kiosk. The study determined that the average cost per patron per year for door delivery equalled $22.35 more than curb delivery. Detailed cost comparisons of the alternatives under varying route assumptions were presented.

U.S. Post Office Department. Office of Planning and Systems Analysis. *Lobby Services Study.* January 1967. 43 pp. and app.

This comprehensive study of the services offered in post office lobbies investigated the proper balance between window and vending machine programs. Results of the study indicated total potential savings of 32 percent in lobby manpower costs through consolidation of window services and 14 percent through the use of additional vending equipment. Combined potential annual savings from these proposals measured approximately $11 million.

U.S. POST OFFICE DEPARTMENT. BUREAU OF FINANCE AND ADMINISTRATION. *Experimental Numeric Speech Translator for Parcel Post Sorters.* 6 pp.

This cost-benefit analysis portrayed the estimated cost impact anticipated from the installation and operation of a Numeric Speech Translating System. Three alternative methods of operating the system were explored with annual operating cost savings of $5,682 and $2,956 resulting for two of the methods. The findings set forth in the report included the projected return on investment and payout period for the equipment.

U.S. POST OFFICE DEPARTMENT. BUREAU OF TRANSPORTATION AND INTERNATIONAL SERVICES. *Priority Mail Programs.* March 31, 1967. 38 pp.

The priority mail program is defined as a nationwide mail distribution system for fastest dependable delivery of single-class, single-rate letter mail. This study proposed an operating plan, including a timetable and recommendations, for full-scale implementation of the priority mail program. Recommended short-range action included the expansion of first-class mail airlift and tightening of post office processing times. Recommended long-range action included the consolidation of air- and first-class mail categories.

U.S. DEPARTMENT OF STATE. BUREAU OF EDUCATIONAL AND CULTURAL AFFAIRS. *An Application of Computers to the Planning of Educational and Cultural Exchange Programs*, David L. Osborn, April 26, 1966. 48 pp.

This paper presents an innovative technique for quantifying the worth of activities of State Department's Bureau of Educational and Cultural Affairs, programs and activities ordinarily accepted as unquantifiable. It presents a means for organizing the value judgments of experts to assess the cost effectiveness of activities and alternatives to achieve relatively intangible objectives. The technique underwent experimental testing in the State Department subsequent to the release of this paper.

U.S. DEPARTMENT OF TRANSPORTATION. FEDERAL AVIATION ADMINISTRATION. *Staff Study of Costs versus Benefits of Airport Approach Aids*, August 18, 1967. 57 pp. (Coordination draft, RD–640)

The study was prepared to supplement the work of the Approach and Landing Aids Committee by providing a cost-benefit input, and to provide supporting documentation for a selection order incorporating VASI systems into the national airspace system. Economic benefits of approach aids were estimated for the year 1977, about midway through the useful life of facilities installed during the next few years.

The primary quantifiable benefits of VASI is increased safety through a reduction in the probability of VFR hard landing and overshoot/undershoot accidents. Measures of the value of vertical guidance during VFR approaches were derived for air carrier (37 cents per itinerant landing) and general aviation (65 cents per itinerant landing).

The major economic benefit of an ILS is in reducing landing minimums, which permits a higher percentage of flight completions. Costs of flight disruptions were estimated for each proposed jet use runway by means of equations in which number of enplaned passengers was a variable.

Only about 80 percent as many approach aids would be installed on air carrier jet use runways by the cost-benefit criteria as by the Approach and Landing Aids Committee's operational requirements. However, under the cost-benefit criteria an additional 104 approach aids would be installed at FAA tower airports that are not scheduled to receive air carrier jet service by 1972.

U.S. Department of Transportation. Coast Guard. Office of Operations. *Buoy Tender Utilization Study*, August 1967.

Because of an indication that the cost per navigational aid was rising rapidly, the Coast Guard conducted an analysis of the utilization of buoy tenders, which are the primary and most costly facility for the servicing of navigational aids.

Based upon an analysis of operational factors, the study concluded that a careful redeployment of tenders, coupled with a selected change in the type or location of aids, would permit replacement of some tenders by less costly buoy boats and reassignment of other tenders without replacement.

Because of this study, the Coast Guard was able to decommission six small tenders and to reassign four large tenders to other mission areas. This resulted in a cost avoidance in capital expenditures of $18,700,000 and a reduction in annual operating expenditures of $2 million. The 270 personnel billets thus made available were reallocated to other high-priority operational programs.

U.S. Department of Transportation. Federal Aviation Administration. Systems Research and Development Service. Systems Analysis Division. *Alternative Approaches for Reducing Delays in Terminal Areas*, prepared by Milton Meisner, Edward Van Duyne and Walter Faison, November 1967. 141 pp.

This study presents alternative approaches, regulatory and technical, to reducing aircraft delays in terminal areas. Delays and benefits versus cost were examined for runway, taxiway, and ILS improvements; new airports; air traffic control procedural changes; automation of the final approach control function; and reduction of schedule peaks. The specific airports studied were: Kennedy International, La Guardia, Newark, Washington National, Chicago O'Hare, Los Angeles, San Francisco, and Oakland.

U.S. Department of Transportation. Federal Aviation Administration. *A Program to Provide Approach and Landing Aids at Scheduled Air Carrier Turbojet Airports*, prepared by the Approach and Landing Aids Committee. January 1968.

The purpose of this study was to develop a program to provide approach and landing aids at air carrier turbojet airports; to achieve lower minimums and provide vertical and lateral approach guidance. The benefits to be expected from the installation of approach and landing aids are: (1) Increased safety on approach and landing, (2) elimination of circling approaches, (3) increased locations for instrument training, (4) noise alleviation, (5) increased reliability of service to the public, (6) reduction in cancellations, overflights, diversions, or delays (air carrier-general aviation-military), (7) reduction in Government subsidy for local-service carriers, (8) increased national economic activity due to improved air transportation.

Of the 545 airports in 48 States which were reviewed, it was estimated that approximately 345 would receive turbojet service by 1972.

U.S. Department of the Treasury. *Special Study: Analytical Framework for Law Enforcement Programs.* 54 pp.

The study reviews existing Treasury law enforcement goals, objectives, and information base in the light of the PPBS framework. It recommends a series of steps to improve the analytical basis for decisionmaking. These include: Improvement of the data base so as to relate costs more closely to outputs, more meaningful measurements of effectiveness, and the development of data to permit better analysis of the effectiveness of alternative strategies. The study provides an integrated view of the analytic requirements for law enforcement.

U.S. Department of the Treasury. *A Marginal Analysis of Customs Foreign Mail Packages Examination Operation in the New York Region*, by John Garmat. March 18, 1968.

This is a study of the New York mail examination operation undertaken by the Bureau of Customs. The general format of this study was one of examining all mail packages that were received during some specific period. From this were evolved some general management evaluations of the program, with particular emphasis on dutiable packages.

U.S. Department of the Treasury. Office of Planning and Program Evaluation. *Coin in Circulation*, by George R. Morrison. June 1967. 62 pp.

Log-linear and linear regression methods respectively were used to estimate coin in cirulation and then to forecast coin needs for the planning period (5 years). Central to the technique for estimating

coin in circulation described in this paper is the calculation of average rates for disappearance of coin. Findings indicate that the rate or disappearance is fastest in the first few years after issuance, and that there is an upward trend in the average rates of disappearance of coin of all denominations. In forecasting future coin inputs the most useful independent variables were found to be consumer expenditures, revenues from sales taxes and revenue from coin intensive industries. This paper provides not only estimates of coin in circulation and growth and attrition rates, but also a method for calculating them. By periodically updating these estimates to keep them current an analytical framework for estimating short- and long-term coin production requirements is provided.

U.S. Department of the Treasury. Office of Planning and Program Evaluation. *A Program for Coin Production and Distribution*, by Daniel Orr. March 31, 1967. 40 pp.

The program outlined in this paper is a "random-walk" model of inventory and production scheduling. Essentially it involves the absorption of demand fluctuations through accumulation and decumulation of inventories. Production remains constant as long as inventories remain within predetermined upper and lower limits. This paper describes methods for determining the initial parameters and provides a "feedback control loop" which functions both to review and revise these parameters. Dry-run tests done for the years 1962 and 1963 indicate that implementation of this system could provide a smooth scheduling of production and distribution. The technique proposed would need to be tested to see whether it was adaptable to the new Philadelphia Mint to be opened in 1968. The study provides an interesting conceptual adaptation of an important methodology to a Government manufacturing operation.

U.S. Department of the Treasury. Internal Revenue Service. *Technical Materials Relating to Development of Discriminant Function Techniques for Selecting Individual Income Tax Returns for Examination.* February 1968. 32 pp.

A nonparametric discriminant function model for classification is developed. The objective of the research was to develop electronic, mathematical approach to implement existing methods of selecting returns for audit. A number of approaches were considered. This paper gives technical and methodological details about one of them. Using hypothetical data based upon individual business type tax returns, the paper details in a clear and easy to follow step-by-step illustration of a technique for developing a classification model. The technique is described in this paper so that the experiences of the Internal Revenue Service's research workers can be made available to other technicians who are investigating the use of discriminant function methods of analyzing operational research problems.

U.S. General Services Administration. Program and Policy Planning Staff. *Operations Research Study of the Interagency Motor Pools*, by Michael E. Gilchrist and Marvin H. Danziger. May 1967. 55 pp. and apps.

The report is presented in seven sections with supporting analysis and reference documents in appendixes. The first three sections deal with a forecasting technique for use in setting the size of dispatch fleets at individual pools. Additional sections report on the need for better locations for dispatch pools and more emphasis on dispatching to meet agencies' needs for vehicles.

U.S. Equal Employment Opportunity Commission. *Affirmative Enforcement.* October 5, 1967. 24 pp.

This program embodies a 5-year plan to identify business units, apprenticeship programs and unions which violate the statute on a systematic basis and to produce compliance by these entities. The initial goal is to focus on establishments as to which discrimination appears to be blocking entry into the employment of the greatest number of minority group workers and as to which ending discrimination will produce the maximum in increased wages per dollar expended.

U.S. Information Agency. *A Model Program Memorandum for the Country of Erewhon.* September 1966. 59 pp.

This model program memorandum analyzes an actual USIA country program. It was prepared to provide a working model for PM's on USIA programs in other countries.

U.S. Information Agency. *USIA Objectives and PPBS.* 1967. 9 pp.

This paper discusses the problems of formulating objectives for USIA in terms useful for program decision. It covers the comparative merits of programing by themes versus programing by target groups, and the problems of relating objectives to resources and of measuring progress.

U.S. Bureau of the Budget. *The Evaluation of Non-Marketable Investments*, by Vartkes L. Broussalian. Washington, Center for Naval Analyses, Systems Evaluation Group, 1966. 53 pp. (SEG Research Contribution No. 9).

The evaluation of nonmarketable investment, of which defense projects are the most typical, presents difficulties not encountered in the case of *marketable* investments. The net effect of these difficulties is to render the operation of discounting, which is implied by economic theory for the evaluation of marketable investments, meaningless. Hence the search for a theoretically correct rate of discount to apply to such investments is bound to be futile. The benefits and costs of a nonmarketable investment must ultimately be evaluated directly without the intermediate step of discounting. However, neither from a theoretical nor from a practical point of view can there be any objection to providing the decisionmaker with present values calculated

on the bases of different rates of discount, so long as no claim is made as to which is *the* correct one. But it is absolutely essential to provide him with a series of costs and benefits undiscounted.

U.S. BUREAU OF THE BUDGET. *Special Analyses*, Budget of the United States, fiscal year 1969. 194 pp.

This volume contains facts and figures on special aspects of the President's budgetary recommendations transmitted in the Budget of the U.S. Government, 1969. Thirteen special analyses are included, most of which cover national interagency programs with operational responsibility divided among many Federal agencies; for example, Federal education, training, and related programs; Federal health programs; Federal research, development, and related programs; Federal aid to State and local governments; and principal Federal statistics programs. The analyses are largely tabular and descriptive and in the 1969 volume incorporate only the beginnings of more rigorous PPB analysis. They do make a major start on cross-agency program analysis.

U.S. BUREAU OF THE BUDGET. PROGRAM EVALUATION STAFF. *Some Determinants of High School Educational Achievement*, by James C. Burrows. October 1966.

This paper analyzes the effectiveness of different inputs into primary and secondary education. While socioeconomic background is a major determinant of the achievement level of students, school variables can also have a significant measurable effect. In the specific findings presented in this study, all conclusions were based on cross-sectional associations of variables, and these relationships do not necessarily imply cause-and-effect relationships.

U.S. BUREAU OF THE BUDGET. PROGRAM EVALUATION STAFF. *A Primer on the Analysis of Air Pollution Control.* September 1967. 24 pp.

The problem of air pollution can be analyzed in two stages: finding the proper level of air quality, and then setting up the proper incentive system that will lead to that level. Cost benefit analysis is the basic tool to conceptualize the first half of the problem.

The costs are costs of abatement and the benefits are reductions in the damage gained from lowering pollutant levels. Damages include health, aesthetic and economic material damages. The problems of measurement are so great that a cost-benefit analysis may not produce numerical answers—the optimal air quality standard and the least cost allocation of abatement to achieve this quality. However, by pushing a cost-benefit approach as far as possible, a framework can be built to fit the various pieces of the problem and thus make it more tractable. The second half of the problem turns on more philosophical issues. This paper will show that no matter what incentive strategy is chosen the optimum target is the same.

U.S. BUREAU OF THE BUDGET. PROGRAM EVALUATION STAFF. *Chemical Escapes From Reality: What Is the Public Interest?* September 1967. 29 pp.

Tools of economic analysis were used to establish a rational basis for allocating resources among alternative Federal programs dealing with drug misuse. Specifically, the study looks at the costs imposed on society by drug misuse and the effectiveness of various Government programs in reducing these costs.

The paper is divided into three parts: Part I provides a general description of the present drug misuse problem and how the Government is responding to it; part II sets up the model used to evaluate various programs; and part III investigates the data.

U.S. BUREAU OF THE BUDGET. PROGRAM EVALUATION STAFF. *Criteria for Evaluating Urban Renewal Projects.* September 1967. 38 pp.

The primary purpose of this paper is to develop a set of criteria for evaluating urban renewal project applications and to suggest specific measures for these criteria. An operational rating system is then developed so that applications can be ranked in terms of the suggested criteria. The criteria and rating system represent an expansion of the initial effort of the Department of Housing and Urban Development (HUD) to establish a rational selection system based on three national goals.

U.S. BUREAU OF THE BUDGET. PROGRAM EVALUATION STAFF. *Manpower Programs: Design and Analysis.* May 1968. 166 pp.

This is a collection of five analytical studies of Department of Labor and other manpower programs. The studies are both theoretical and empirical. They provide the basis for long-range analysis of manpower programs and have implications for resource allocation. In so doing, they also provide insight into the programs, raise a number of pertinent questions, and provide partial answers to a number of policy questions.

U.S. BUREAU OF THE BUDGET. PROGRAM EVALUATION STAFF. *A Review of Federal Support of Graduate Students*, by C. T. Whitehead. August 1966. 66 pp.

The Federal Government will spend about $270 million for fellowship and research assistantship support of full-time graduate students in the 1966–67 school year. In 10 years, that expenditure can be expected to be between $570 million and $980 million if enrollment and Federal support trends continue. The current fragmentation of support among agencies and among types of support and the extreme lack of information about the impact of Federal support programs on graduate education as a whole form an inadequate foundation for decisionmaking and point up the need for the Federal Government to assess the graduate student support situation as a whole.

This study has taken a tentative first step toward improving that

situation by assembling a reasonably complete and coherent picture of the current situation in graduate student support and by attempting to project the cost of Federal support into the future for realistic alternative enrollments and support concepts. Following an analysis of some of the economics of graduate student support, the possible benefits, costs, and feasibility of converting Federal fellowships and research assistant-ships to part-loan stipends are examined in detail. Several alternative loan-grant combinations are presented and offer what appears to be an attractive alternative to current support programs.

U.S. BUREAU OF THE BUDGET. *Analysis of Tax Administration: A Case in Evaluation of Public Programs*, a talk by Nestor E. Terleckyj at the State Budget Directors' Institute, Natural Bridge State Park, Ky., September 19, 1967. 24 pp.

The paper describes the analysis as it actually has been approached. It first describes the definition of objectives, which consist largely of maximizing revenue obtained from a given tax administration budget, but with consideration for equitable treatment of taxpayers. The paper proceeds to show how the results of the maximization process change as a wider range of practical considerations is being brought into the picture, i.e., how the total revenue depends successively on the number of cases reviewed, the intensity (unit cost) of the review, the state of technology and effectiveness of methods for selecting cases, and finally on the underlying propensity on the part of the taxpayers to comply voluntarily with the tax laws.

U.S. BUREAU OF THE BUDGET, *Measuring Productivity of Federal Government Organizations*, 1964, U.S. Government Printing Office. 370 pp.

This publication presents some examples of methods used to analyze inputs and outputs by measuring the productivity of certain organizations in each of five Federal agencies—the Treasury Department, the Veterans' Administration, the Post Office Department, the Federal Aviation Agency, and the Department of the Interior. It provides the results of a research study, conducted by the Bureau of the Budget in cooperation with the five agencies, to develop methodologies that yield productivity estimates for comparing the amount of resources used with the volume of products and services produced by the selected organizations over several years between 1949 and 1962.

U.S. BUREAU OF THE BUDGET, RESOURCES PLANNING STAFF, *Federal Programs for Human Resource Development*, by Michael S. March. (Published by Joint Economic Committee, Congress of the United States, 90th Congress, Second Session, in vol. 1 of Compendium on *Federal Programs for the Development of Human Resources*, 1968, pp. 111-155).

This paper assembles and analyzes data on Federal funds for education and training, medical and health related, and cash benefit pro-

grams with a view to illuminating the implicit priorities for allocation of resources for the development of human resources. A beginning toward a framework for comparing interprogram or intersector benefits costs is suggested. This framework is illustrated by some tabulations of data indicating the relative shares of the aged, of children and youth, and of the poor in these major program sectors. Other focuses for further analysis are identified.

An appendix dealing with the coverage, gaps, and possible future directions of public programs for the poor displays the distribution of Federal funds for programs assisting the poor by category and by agency. It also identifies a series of major trade-offs or alternatives with respect to Federal programs for the poor.

U.S. BUREAU OF THE BUDGET. *Gottschalls Report*, by the Committee on Chronic Kidney Disease. September 1967. 197 pp.

This report considers, for patients with chronic uremia, the role of two forms of therapy—hemodialysis and transplantation—their cost and present availability, and the number of patients who would benefit from such treatment.

U.S. BUREAU OF THE BUDGET. *Objectives of Public Expenditure and Measurement Systems*, by Nestor E. Terleckyj. A paper given at a joint session of the American Economic Association and the American Statistical Association, Washington, D.C., December 28, 1967. 32 pp.

This paper examines how well the existing measurement systems serve the distribution and especially the allocation objectives, and reviews some of the ongoing developments which promise major improvements in the data base serving these policies. It is focused on Federal Government spending, with only a peripheral attention to the State and local government expenditures or to the regulatory programs.

U.S. BUREAU OF THE BUDGET. *Program Planning and Budgeting Theory: The Planning-Programing-Budgeting System to Advance Effectiveness*, by Willard Fazar. June 19, 1968. Presented to the Institute on Federal Library Resources, Services and Programs at the Catholic University.

This paper contains a brief orientation to acquaint librarians and library scientists with the total PPB system and the potential benefits of its application in library environments. It defines PPBS and provides illustrative examples of thhe kinds of end products that would be useful for decision makers to make program and resource allocation decisions. It also presents some major guiding principles.

U.S. BUREAU OF THE BUDGET. "A Proposed Research Program for Hospital-Medical Care," by Paul Feldman. *Health Services Research*, Summer 1967. pp. 170–180.

This proposal for a Federal Government program of health services research, written in spring of 1966, played a key role in development of the National Center for Health Services Research and Development, announced by the President early this year. The paper points to the lack of economic incentives for development of cost-saving innovations for hospitals compared to incentives to develop innovations improving the quality of care. It indicates the analytic procedure which, if followed, would lead to an efficient program of research, and points out several aspects of the analysis that are critical requirements for its successful application.

U.S. BUREAU OF THE BUDGET. "On the Optimal Use of Airports in Washington, D.C.," by Paul Feldman. *Socio-Economic Planning Sciences*, vol. 1, No. 1, 1967, pp. 43–49.

This paper reviews several proposals for relieving the congestion of ground facilities at Washington National Airport through limitation of air traffic. It concludes that to insure efficient use of all passenger air terminals in the area, a set of differential prices should be established to provide an opportunity for passengers to choose whether they shall save time or money on flights to and from Washington. In addition, suggestion is made that the pricing system should take into account the social cost of increased noise generated by the operation of jet planes in the area.

ATTACHMENT 13

COMPARISON OF FISCAL YEAR 1967 AND FISCAL YEAR 1970 CONGRESSIONAL BUDGET SUBMISSIONS FOR ONE PROGRAM*

1967

RELOCATION AND ADULT VOCATIONAL TRAINING FOR INDIANS

Subactivity	1965 amount available	1966 amount available	Fiscal year 1967 estimate	Increase (+) or decrease (−), 1967 compared with 1966		
				Total	Pay cost[1]	Program
(a) Relocation services	$2,797,036	$3,039,000	$3,039,000	----------	$10,000	−$10,000
(b) Adult vocational training	9,320,061	11,473,520	12,145,000	$671,480	21,000	+650,480
Total	12,117,097	14,512,520	15,184,000	671,480	31,000	+640,480

[1] To provide for increased pay cost for fiscal year 1966 positions.

Note: The estimate of $15,184,000 is an increase of $671,480. The increase consists of:
(1) A decrease of $10,000 in relocation services and a decrease of $34,000 in adult vocational training due to program savings resulting from improved manpower utilization and cost reduction actions.
(2) An increase of $10,000 in relocation services and an increase of $21,000 in adult vocational training for increased pay costs.
(3) An increase of $684,000 to provide the full range of adult vocational training services including employmen following training for approximately 200 applicants currently awaiting this service.

Program of work.—These two programs provide financial assistance to Indians to enable them to become self-sufficient through adequate employment. The relocation services phase of the program provides services and financial assistance to Indians who are prepared to accept immediate employment. The adult vocational training program (Public Law 959) provides training which will lead to self-support. Relocation services will provide service and financial assistance to approximately 1,775 units (4,083 persons). The funds requested for adult vocational training services will provide services and financial assistance to 3,726 units (7,785 persons) in training. Financial assistance and services will also be available for approximately 2,500 units (8,250 persons) in on-the-job training.

Examples of recent accomplishments.—There are approximately 380,000 Indian persons living on or adjacent to reservations for whom the Bureau assumes some responsibility. Opportunities for self-support on or near the reservations are inadequate and the increasing population is faced with the alternative of relocating to areas where opportunities for self-sufficiency are available or remaining partially or wholly dependent upon some form of public assistance. This program assists these people to leave the reservation area and accept em-

*Department of the Interior, Bureau of Indian Affairs. Program subcategory: Relocation and Adult Vocational Training.

ployment or training which will qualify them for employment. Since the inception of this program through June 30, 1965, over 89,447 persons will have benefited from either institutional training services, on-the-job training or direct employment assistance. Staff effort by Bureau Offices with the cooperation of the State employment services, employers, and others concerned have made employment opportunities available to meet the needs of Indian people. Realistic counseling and guidance are provided to encourage them to take advantage of these opportunities and they are assisted to adjust to the living and working conditions of the new community.

1970

RELOCATION AND ADULT VOCATIONAL TRAINING FOR INDIANS

Subactivity	Fiscal year 1968 amount available	Fiscal year 1969 amount available	Fiscal year 1970 estimate	Increase (+) or decrease (−) 1970 compared with 1969
A. Relocation services	$7,173,448	$8,558,000	$19,026,000	+$10,468,000
B. Adult vocational training	13,614,952	15,818,000	25,000,000	+9,182,000
Total	20,788,400	24,376,000	44,026,000	+19,650,000

A. *Relocation Services.*—Fiscal year 1969, $8,558,000; fiscal year 1970, $19,026,000; increase, $10,468,000. The increase consists of:

Explanation	Increase (+) or decrease (−) Amount	Positions	Total program	Total positions
To provide services and financial assistance to Indians who are preparing to accept employment	+$10,468,000	55	$19,026,000	342

Need for increase

All Americans should have the opportunity to realize their full potential—economic, political, social, and cultural. Indians have the right to expect equality of opportunity with all other Americans. They are entitled to a standard of living equal to that of the country as a whole with freedom of choice to remain in their homeland or opportunity to move to the towns and cities of America. Whatever their choice, they must have adequate job opportunity and be equipped with the necessary skills to qualify for and retain employment.

There are over 600,000 Indians in the United States, over 400,000 of them living on or near reservations. They live in varying degrees of poverty which stem from lack of job opportunities, lack of educational opportunities, underdevelopment of resources and cultural differences. The Indian unemployment rate is about 37 percent—10 times the national average. A large portion of Indian families have incomes that are below the $3,800 poverty level. Without a positive employment assistance program, the problem will worsen as populations increase.

Jobs need by 1974

Current unemployment	49,000
Current underemployment	27,000
To employ new entries into labor force (1968–74)	51,400
To raise labor force participation to U.S. rates	4,000
Total jobs needed (1968–74)	131,400

During the past 2 years, initial reservation development studies have been completed for all major reservations to ascertain the income potential and related costs for fully developing each reservation's resources to maximize Indian income and employment. While much can and is being done to increase reservation employment and income opportunities, it will not be possible to provide full employment for a major portion of either the current or future labor force entirely through reservation development programs. If the on-reservation programs are accelerated as proposed in this budget, an additional 49,400 jobs would be provided by 1974. (An increase of 21,800 over what would be accomplished at the 1969 program level.) However, this will fall far short of meeting employment needs as there still would be need for some 82,000 additional jobs. This emphasizes the urgency for providing the Indian people with off-reservation employment opportunity through direct employment assistance and institutional training.

For on- or near-reservation employment, the greatest opportunity is industrial development and development of the institutions of the community. For individuals, the choice is more complex. Many Indian young people will opt to work in their communities for a better way of life. Others, eager to make their way in the competitive larger society, will wish to leave the reservation and fit into the economy as productive workers wherever suitable jobs are available and conditions are conductive to a good life. This second choice, always voluntary, has been made real in the past for over 115,000 Indian people through the employment assistance program.

While motivation of individuals has been a deterrent to a maximum program of relocation in the past, today, as a result of the example of relatives and friends who have left the reservation and as a result of improved job opportunities throughout the Nation, a large backlog of individuals awaits assistance in finding off-reservation jobs, some near home and a majority in the State of origin.

The last Congress recognized this opportunity by increasing the authorization of the adult vocational training program from $15 million to $25 million. Even with the constraints of the current budget, the option of finding off-reservation jobs and job training is so popular with Indians and so viable that the relocation and the adult vocational training programs should be expanded as proposed.

Indian employment goals by 1974 are:

Provide employment opportunity for the estimated 131,400 Indians that will need such assistance.

Reduce unemployment in the present labor force to rate consistent with the national average (currently less than 4 percent).

Increase labor force participation rates from the current 56 percent to the national average rate of 61 percent.

Reduce underemployment by providing full employment opportunity.

Provide jobs for new labor force entries of young people and returning veterans.

The following table summarizes the additional job opportnities that should result from the increased program levels proposed in the 1970 budget:

	Jobs provided by 1974	
	Without recommended increase	With recommended increase
Additional Indian jobs provided by on-reservation programs	27,600	49,400
Jobs provided by relocation and adult vocational training programs	39,000	70,400
Adjustment for replacement and duplications	−3,000	−13,700
Underemployment and unemployment	67,800	25,300
Net 1968–74 change in underemployment and unemployment	−8,200	−50,700

If reservation programs and relocation and adult vocational training programs were continued at 1969 levels they would not make significant improvements in the Indian employment situation. They would be barely sufficient to keep up with a growing population and to prevent a worsening employment situation. However, under the proposed program, projected employment improvement will be increased 6 times over and above that of the 1969 level program by 1974. Projected income improvement under the program would bring 78 to 95 percent of the trainees above the poverty level of $3,800 for a family of five. In addition, such a program would bring increasing returns as these programs are expanded to increase employment and otherwise lessen economic dependence on the Federal Government.

Program of work.—Direct job placement efforts in urban areas are currently running at the rate of 2,780 annually and will be expanded to 6,530 annually in 1970 with the proposed increase in funding to $19 million. Residential family training which is currently running at a rate of 905 annually will be expanded to 1,280 trainees with the 1970 increase. Expansion of on-going relocation services programs will require $17.1 million of the total $19 million increase. These programs will, with the addition of the following specific new projects, enable the Bureau to increase the fiscal year 1970 relocation services initial placements by about 3,900 or 124 percent over fiscal year 1969 initial placements. The specific new projects are:

(1) Experience has shown that distance to employment centers played a significant role in motivating Indians to relocate. To further alleviate this we propose the establishment of two additional placement centers in cities located near Indian reservations. The cost for these centers will require an increase of $200,000.

(2) The vicious poverty cycle of a particular group of Indians, the so-called hard-core poor, will deepen unless the residential training program is immediately expanded to offer these individuals an opportunity to better themselves economically. The Roswell Employment Training Center (RETC) was spe-

cifically designed for this purpose. RETC facilities will be expanded under the proposed program to accommodate 200 more trainees, bringing it up to full capacity of 500 which yield about 650 graduates annually.

At present, residential training centers, which are extremely popular with the Indian people, since they serve entire families, have a potential service population of approximately 7,700. Many of these are willing to forgo welfare assistance in order to take this training. This expansion of the RETC will require an increase of $1,050,000.

(3) One of the most difficult groups of Indians to serve are the "Solo Parents." These consist of unwed mothers, widows, and divorcees with children who have special problems and need special attention and treatment. A recent survey has been made and it was found that there is an immediate potential of approximately 2,150 applicants in this group. Many of these are now receiving Aid for Dependent Children but would prefer to learn a skill and become gainfully employed. To assist this group, we propose to establish a pilot "Solo Parent" program in one of the larger western cities where training and employment opportunities are good and where individual special problems can be minimized or resolved. This program will require an increase of $300,000. The immediate goal of this project is to develop a program suitable to the training needs of "solo parents" so that they are able to enter the world of work at a level comparable to other institutional trainees. Project evaluation will enable the BIA to determine the feasibility of a full scale effort aimed at the special problems of "solo parents."

(4) $400,000 is included to provide for increased costs for transportation, subsistence en route to the employment and subsistence until the first paycheck is received.

B. *Adult vocational training.*—Fiscal year 1969, $15,818,000; fiscal year 1970, $25,000,000; increase $9,182,000. The increase consists of:

Explanation	Increase (+) or decrease (−)		Total program	Total positions
	Amount	Positions		
To provide training which will lead to self-support....	+$9,182,000	41	$25,000,000	321

Need for increase

About 50 percent of the 49,000 unemployed, 27,000 underemployed and most of the 55,000 new entrants into the labor force will require job training, either institutional or on-the-job (OJT), before they can become employed. The increased emphasis being placed upon commercial and industrial development of Indian reservations also requires supportive increases in both institutional vocational training and OJT placements.

Program of work.—The proposed fiscal year 1970 program would provide $22.4 million of AVT funds for institutional training; an increase of $8.8 million. This program will assist 9,130 institutional trainees of which 7,175 are new entries and will result in 3,935 initial

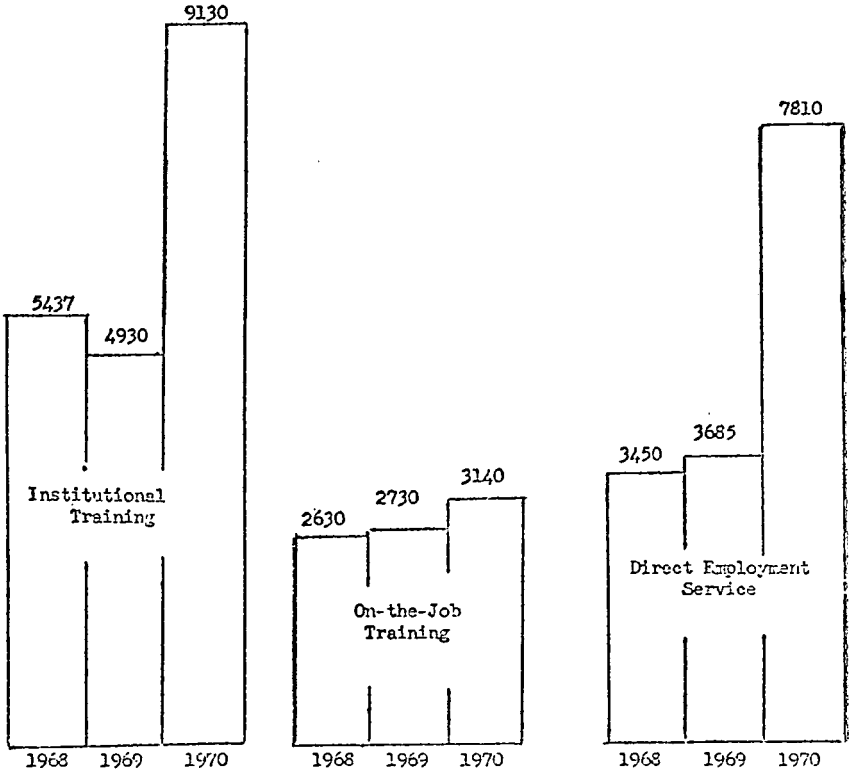
trainee placements in fiscal year 1970, an 86-percent increase over fiscal year 1969.

The proposed fiscal year 1970 OJT program amounts to $2.6 million of adult vocational training funds, an increase of $0.4 million over fiscal year 1969. This program will serve 3,140 trainees during fiscal year 1970 and of these, 2,140 will be new entries into training. The OJT program will be closely coordinated with the commercial and industrial development program.

Examples of recent relocation and adult vocational training accomplishments

A graphic presentation of employment assistance output by activity for fiscal years 1968, 1969, and 1970 is shown below. It should be noted that 1969 outputs are depressed due to increased subsistence grants put into effect in fiscal year 1969 thereby raising the per-unit cost of training.

EMPLOYMENT ASSISTANCE SERVICES BY ACTIVITY
FISCAL YEAR 1968 (ACTUAL), 1969 (ESTIMATE), AND 1970 (ESTIMATE)
SINGLES AND HEADS OF FAMILY SERVED



Since the inception of the employment assistance program through June 30, 1968, 31,479 single persons or heads of families were placed directly into employment from which 67,522 persons benefited. During fiscal year 1968 there were 3,172 new entries into institutional vocational training increasing the total serviced since enactment of Public Law 959 to 21,253 entries, 13,538 completions, 5,883 discontinuances with 1,832 still in training at the end of the fiscal year. From this training about 13,905 initial skilled job placements have resulted, benefiting approximately 23,640 persons. On-the-job training placements have totaled 8,082 benefiting 24,245 persons.

The family residential training centers at Madera, Calif., and Roswell, N. Mex. are operated under contract by Philco-Ford Corp. and Thiokol Chemical Corp. respectively. As of June 30, 1968, these centers had accommodated 840 entries of which 158 had completed and 170 had discontinued with 486 families still in training. These centers have become extremely popular with Indian people in the lower education and lower skills group.

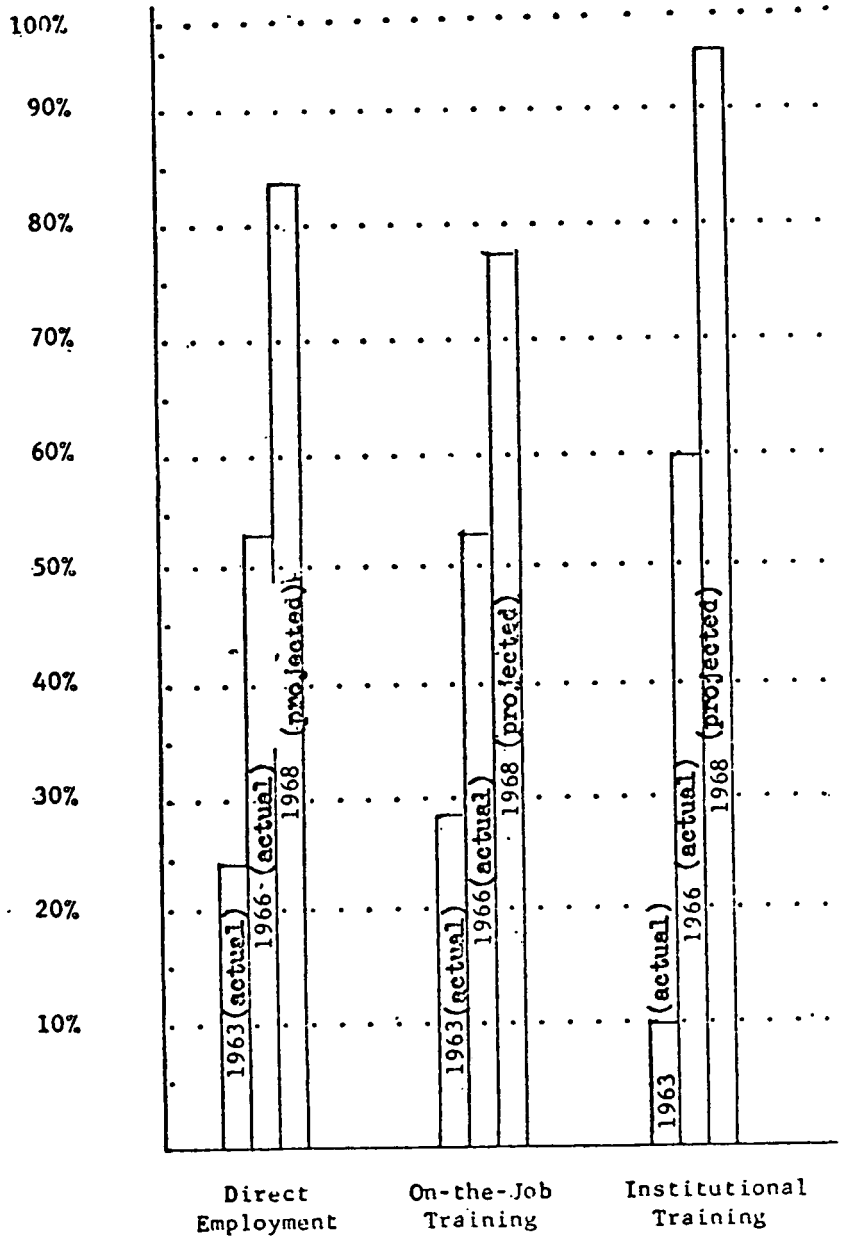
The placement services recently initiated in the cities of Tulsa, Oklahoma City, and Minneapolis-St. Paul have resulted in 533 job placements during fiscal year 1968.

On October 12, 1967, a "Joint Statement of Principles of Cooperation" was entered into with the Bureau of Prisons. The objective being to assist Indian offenders to achieve self-dependence upon their release from confinement through help in acquiring needed skills, changes in attitudes and other resources necessary to adjust acceptably to the community. From October 1967 through June 30, 1968, 61 parolees were assisted. Of these 46 are still in the program and 15 dropped out.

In 1963, 5,108 persons received services in the fields of direct employment, on-the-job training, and institutional training. During 1966 a study was completed of the socioeconomic status of 327 of the 1963 program recipients. The results of that study were published in October 1966 as "A Followup Study of 1963 Recipients of the Services of the Employment Assistance Program, Bureau of Indian Affairs."

As part of on-going evaluation of employment assistance programs, the Bureau completed another survey of the 1963 recipients of employment assistance. Eighty-five percent of the trainees originally surveyed in 1966 were again interviewed for this 1968 study to determine their present socioeconomic status. The following chart illustrates progress of the sample program recipients between 1963 and 1968, as related to the commonly accepted "poverty level" which currently is $3,800 for an average family of five. The progress shown is probably the most important indication of the success of the various employment assistance programs.

Percent of 1963 Program Recipients above Poverty Level



Actual average 1966–67 earnings for recipients of all services showed that 186 male recipients were averaging $4,774 per year by 1967 and 93 female recipients were averaging $2,238 for an overall weighted average of $3,929 per year.

Based upon hourly wages being earned in 1968, the average direct employment recipient has a projected annual income of $4,306 and a projected household income of $6,430 (more than head of household employed). The average on-the-job training trainee has a projected annual income of $3,702 and a $7,921 projected household income. The annual income of institutional trainees projects at $4,909 with a household projection of $7,460.

In order to meet training requirements of Indians unable to benefit from either direct placement or conventional training programs, residential family training was initiated by the BIA at Choctaw, Miss., in February 1967. Since then, additional centers have been opened at Madera, Calif., and Roswell, N. Mex. As of December 31, 1968, 1,196 Indian persons have participated in this type of training; 317 have actually completed training and were placed in jobs.

Residential family training has not been in existence long enough to permit extensive evaluation such as that made of adult vocational training and direct employment. However, two preliminary evaluations have been made of the work experience of 120 of the first trainees to complete or partially complete training at the Madera Center.

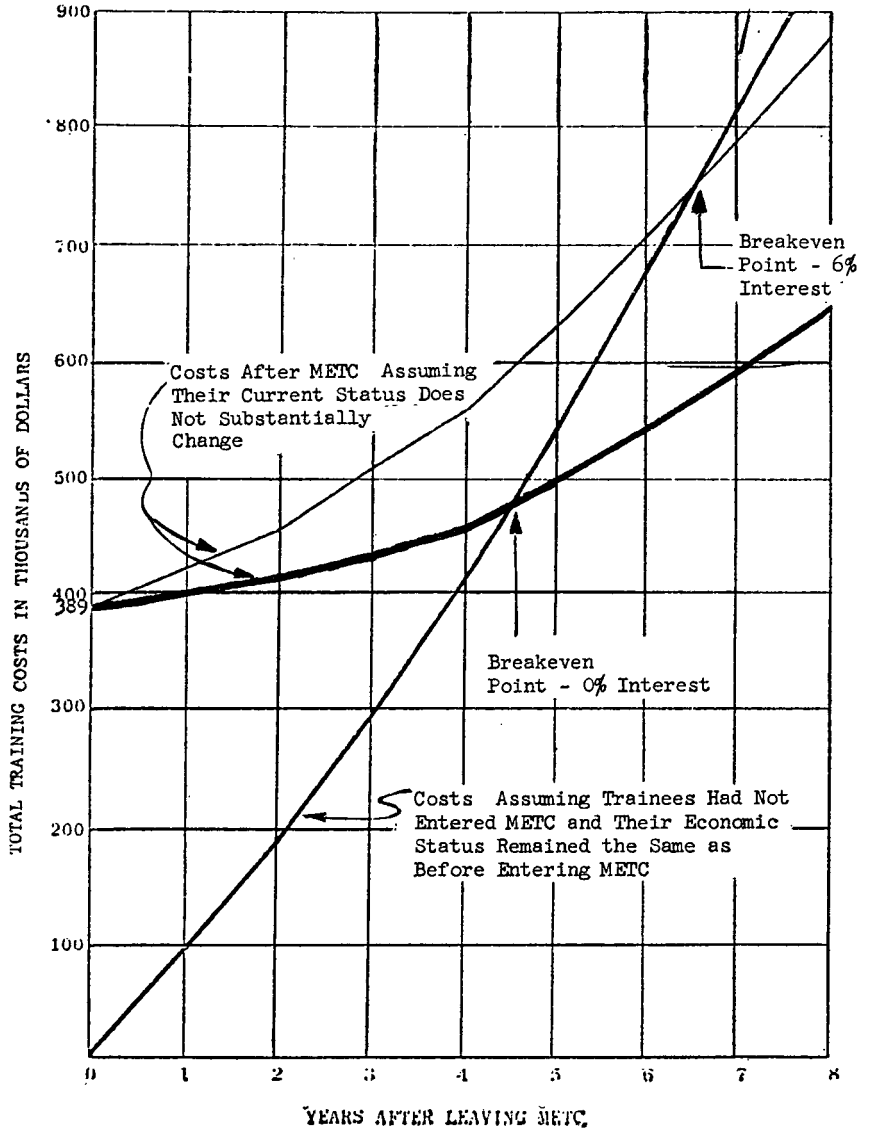
A. Madera Employment Training Center—Analysis of cost to Government

A cost analysis was made of METC graduates and those partially completing training to evaluate the economic benefits that may accrue to the Government as a result of the METC program.

The method used in the METC cost analysis was to compare, for the selected group (120 trainees and 69 children), their current status against their status prior to entering the training center, assuming that, if this group had not gone through the training program, their current status would be the same as it was prior to entering the training center. The following cost factors were considered— (1) METC training cost ($389,000), (2) welfare costs, (3) education costs of the children (reservation school costs versus locally administered public schools), (4) health service costs. (Government provides complete health services to reservation Indians.) In addition, the payment of income taxes by gainfully employed graduates of the program was considered as an element which would reduce costs to the Government.

The following graph illustrates the results of the study. It compares costs of the sample trainees with hypothetical costs assuming they had not undergone training:

Cumulative Cost Comparisons of METC Trainees - With and Without METC



Conclusions derived from the cost analysis and illustrated above are:

1. At a 0 percent interest rate the breakeven point is 4.5 years. That is, considering all costs, METC training, welfare, health, and education, the cost to the Government after 4.5 years for the METC trainees begins to be less than if they had not received any training.

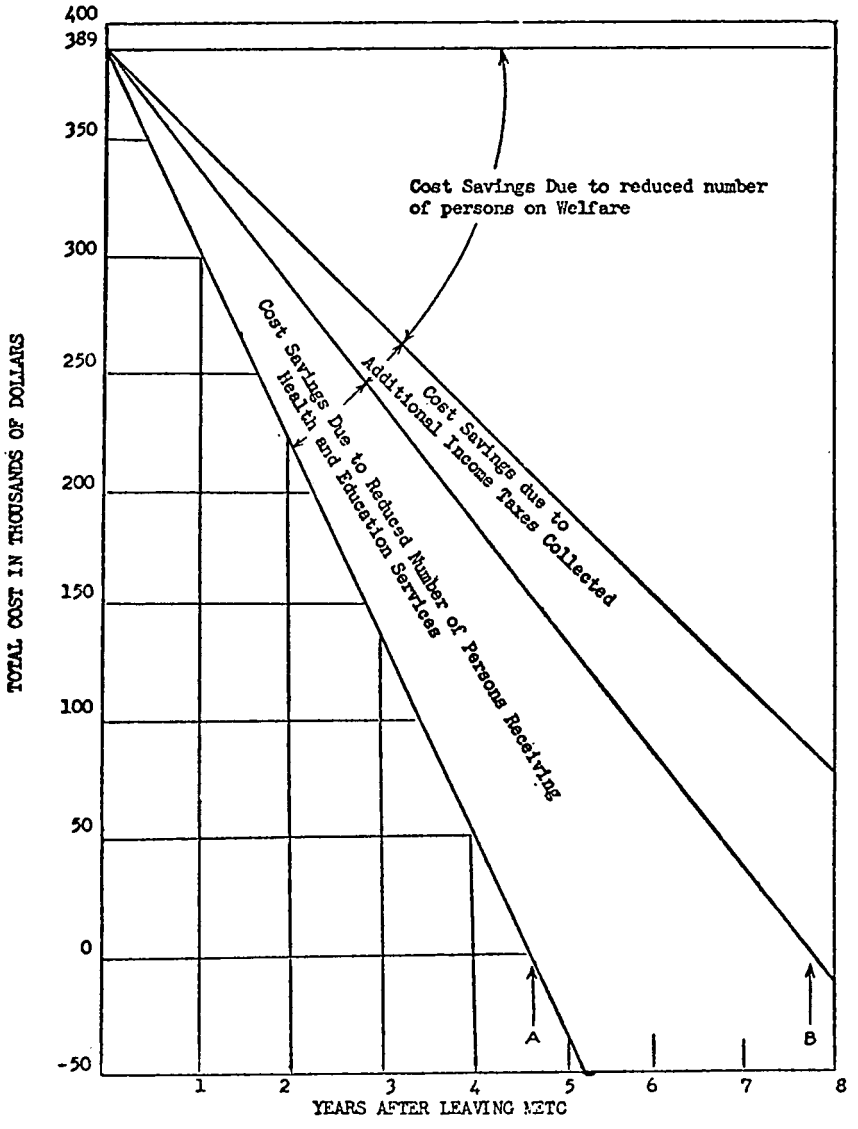
2. At 6 percent interest the breakeven point is 6.6 years, again considering all costs.

The following graph shows the cumulative cost differences between costs with METC training and without METC training assuming no interest charges. It shows that:

1. The Government will have obtained benefits equal to its costs 7.7 years after completion of training considering only the immediately realizable cost savings of welfare and negative costs of income taxes. This point is represented at B on the graph.

2. If other costs savings for health and education services are included the breakeven point is 4.5 years (point A). While these savings in health and education costs are not defined as readily as welfare costs or tax payments, they nevertheless do contribute to the economic feasibility of the residential training concept.

METC TRAINING COSTS LESS WELFARE COSTS REDUCTION, INCOME TAX PAYMENT INCREASE, AND HEALTH AND EDUCATION COST REDUCTIONS



B. METC cost-benefit analysis

The METC cost-benefit analysis considered only benefits accruing to the trainee as compared to cost to both the trainee and the Government. Using this technique METC training has a benefit-cost ratio of about 3 to 1 assuming a work span of 40 years at the constant wage rate.

The following table summarizes the computation of the METC benefit-cost ratio.

Computation of benefit-cost ratio for METC (per trainee)

Benefits: Present value of additional annual earnings, per trainee	$11,078.00
Prior to METC 45 trainees were employed at an average hourly wage rate of $1.84 or an annual income of $3,800. After METC 57 trainees were employed at an average hourly wage of $2.19 or an annual income of $4,550. Additional annual earnings per trainee= $\frac{(4,550\times57)-(3,800\times45)}{120}=\$736.25$	
The present value of this amount for 40 years (assuming an average age of trainees is 25 and retirement is at age 65) at a 6% rate of interest is $11,078.	
Costs:	
Training costs per trainee surveyed	2,806.41
Estimated cost per training "slot" per year is $5,000. Monthly cost per trainee is $417 $\left(\frac{\$5000}{12}\right)$. Average length of training for the 120 trainees surveyed was 6.73 months. Therefore, the average length of training multiplied by the monthly cost yields an average cost per trainee of $2,806.41 (6.73×$417=$2,806.41).	
Clothing allowance per trainee	94.50
Allowance of $60 per trainee and child; an average of .575 children per trainee.	
Foregone earnings per trainee	799.19
Number of trainees working prior to METC times their monthly income times the average length of training divided by the total number of trainees. $\frac{45\times3,800\times\frac{6.73}{12}}{120}$	
Total costs	3,700.10

Benefit-Cost Ratio: $\frac{\$11,078}{3,700}=2.994$

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