altered. The ICC does not concern itself with the plight of producers in remote areas of Canada who can no longer compete in certain markets in the United States.

It is unlikely that the decision to revoke antitrust immunity from collective rate making will be changed to protect the U.S. consumer. It is likely that there will be significant disruption in international commerce, that traditional rate structures will be eroded, and that some producers may suffer. If the overall effect of increased competition is perceived to benefit the U.S. consuming public, any pleas from affected Canadian concerns will most probably be ignored.

CONCLUSION: WHITHER COLLECTIVISM?

The underlying theme of this paper has been a comparison of the Canadian and U.S. systems of railroad regulation and a discussion of how recent changes in the latter have influenced activities in the former. The issues are complex and the ramifications are widespread, but they can be summarized as follows.

1. The Canadian regulatory structure, basically unchanged since the National Transportation Act was passed in 1967, has allowed railroads considerable pricing freedom and has contributed to a financially strong and competitive Canadian railroad industry.
2. U.S. railroads, in contrast, were overburdened by an outmoded regulatory framework and found themselves hampered by regulations that were causing them to lose more and more traffic, contributing to a serious deterioration of the country's entire railroad industry.
3. As a result of pressures to save the industry from total bankruptcy, and coinciding with a general trend toward deregulation of U.S. industry, the Staggers Rail Act of 1980 was passed granting virtually complete pricing freedom to railroads. The result was a move toward more innovative and competitive pricing schemes in the United States, a trend that affected the Canadian railroad industry as well.
4. Deregulation ended the antitrust immunity enjoyed by railroads operating through rate bureaus. The application of the antitrust laws was extended to all traffic terminating in the United States, even if it originated outside the country.
5. As a result of this extraterritorial application of U.S. antitrust law, collective rate making by Canadian railroads on international traffic is in jeopardy.

Rarely has a piece of legislation been passed in the United States that has had such significant implications for a Canadian industry, in both the pricing and the legal arenas. Canadian railroads have reacted to the new environment in a competitive manner, reducing rates where there was potential erosion of market share.

The complications caused by the antitrust laws, combined with the lack of support for rate bureau immunity from a number of Canadian shipper organizations, has probably had the most deleterious effect on rate-making practices in Canada. Although the future of collective rate making by the Canadian railroads is in some doubt, it is probably safe to assume that there will never be a return to the level of immunity that existed before U.S. deregulation. Canadian shippers indicate, however, that industry opinion regarding this matter is divided.

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Evaluation of FAA's Economic Analysis Guide

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ABSTRACT

FAA's 1982 "Economic Analysis of Investment and Regulatory Decisions--A Guide" was reviewed for its effectiveness in determining the economic desirability of aviation-related project investment and regulatory alternatives. The FAA Guide was found to be excellent because it is (a) a comprehensive tool for analyzing investment and regulatory alternatives, (b) based on sound transportation economic concepts, (c) direct in approach, (d) easily understood, (e) well organized, and (f) not likely to become outdated because updating procedures are provided. Major weaknesses are (a) unavailability of important references that are cited, (b) lack of examples to assist users' understanding, and (c) reliance on potentially numerous hand calculations. The FAA Guide recommends the treatment of intangible and quantifiable nonuser benefits and costs in the benefit-cost analysis; the reviewer, however, recommends that the benefit-cost analysis include only quantifiable aviation user benefits and project or regulatory costs.

In 1982 the Federal Aviation Administration (FAA) published Economic Analysis of Investment and Regulatory Decisions--A Guide (1), economic (benefit-cost) analysis guidelines for evaluating FAA's investment and regulatory decisions. In recent years, transportation agencies (e.g., AASHTO, UMTA, and FRA) have been providing guidance on applying economic analyses to transportation problems (2,3,4). The primary purpose of these guidelines is to assist the decision-making process by providing economic analyses of alternatives under evaluation and by determining the most economically efficient way to accomplish an alternative.

The purpose of this paper is to evaluate the strengths and weaknesses of the FAA Guide's organization and approach and to call attention to the Guide as a valuable tool. FAA regulations and investments involve millions of dollars; however, only rarely are major investment decisions subjected to rigorous economic analysis. In the first 2 years after the Guide's publication, no known major airport improvement has been evaluated using the methodology of the Guide. In this paper, perceived weaknesses of the Guide are emphasized for the benefit of current and potential users and in the hope that when the Guide is updated the points made here will be considered. The perceived weaknesses do not detract from the overall high quality of the Guide.

ORGANIZATION

Strengths

Overall, the Guide is well organized, well written, and concise. Together, these factors contribute to the Guide's excellent potential for use. The Guide's economic approach should be readily understood, regardless of the potential user's aviation or economics background.

The Guide is effectively organized into seven chapters following a logical sequence from an introduction and an overview of economic analysis to the core chapters dealing with estimation of aviation benefits and costs. Subsequent chapters deal with decision criteria, sensitivity analysis, and inflation. The Guide contains three appendices. Appendix B, Standardized Values, is three pages long and contains virtually all economic benefit dollar values needed for the economic analysis.

The writing style is simple, direct, and generally easy to understand; there are, however, exceptions. For example, the important sentence about the value of increased passenger demand benefits (1,p.3-20, paragraph 2, lines 1-4) may be confusing to many potential users. Such critical ideas should be repeated in different words, expressed as an equation, or illustrated by an example. References are handled well.

One of the outstanding aspects of the Guide is the conciseness with which economic analysis principles are handled. The "economic problem" and fundamentals of economic analysis are easy to understand. These topics are presented in a way that should not discourage layman users when they first attempt to use the Guide. Just enough economic theory is presented to give the approach credence without burdening the user. The Guide is neither too technical nor too general; an excellent balance, which gives the reader a satisfactory explanation of the procedures, has been reached.

The Guide is truly a guide for economic analysts rather than a cookbook to be followed. Standardized dollar values and basic steps are provided that should result in reasonable closeness in fit among different users. Yet there is ample flexibility for aviation planners and economic analysts to determine such important aspects as delay reduction and whether to aggregate or disaggregate aircraft types. The importance of using sensitivity analysis on important input values is emphasized. An associated attribute of the Guide is that if widely used by FAA and aviation analysts, it would become the standard methodology to determine economic impacts of investments and regulations. This uniform approach would assist in improving economic analysis of aviation-related investments and regulations and in comparing impacts nationwide.

Weaknesses

The analyst must rely on numerous outside essential noneconomic sources for input. Although these sources are properly referenced, as discussed later, some of them are not readily available.

The Guide implies but does not state either its purpose or what it provides. It would be desirable for the first section of the Guide to include a statement to the effect that this guide allows the user to address whether the benefits of aviation investments and regulations exceed the costs of producing those benefits. The first section should also include the ideas expressed in the second paragraph of the abstract of the Guide.

Although the Table of Contents is comprehensive, the lack of an index at times detracts from the Guide's usefulness as a quick reference or as a source for answers to specific questions. A glossary of key terms would be helpful. For instance, it would be helpful if the definition of the term "cost" (e.g., on p. 1-2 cost represents that which is foregone, and on p. 4-1 cost represents resources consumed) and the discussion of whether the term "passengers" does or does not include crew members were in one section of the Guide.

A major fault of the Guide is that is provides few examples of how it can be used. Two comprehensive examples of the Guide's approach to evaluating regulations or investments would greatly assist potential users' understanding.

GENERAL APPROACH

Summary

The Guide presents an informative, eight-step, economic analysis process:

1. Define the objective,
2. Specify assumptions,
3. Identify alternatives,
4. Estimate benefits and costs,
5. Describe intangibles,
6. Compare benefits and costs and rank alternatives,
7. Perform sensitivity analysis, and
8. Make recommendations (1,p.2-4).

The Guide's economic analysis process is illustrated in Figure 1. The text of the Guide deals primarily with step 4 (estimating benefits and costs). Steps 6 and 7 also receive considerable treatment. Steps 1, 2, 3, 5, and 8 are addressed only briefly.

The Guide recommends a willingness-to-pay evaluation approach and recognizes three primary areas in which FAA investments and regulations generate benefits:

1. Safety improvement;
2. Capacity increases and delay reductions that can be further broken down into (a) aircraft operat-

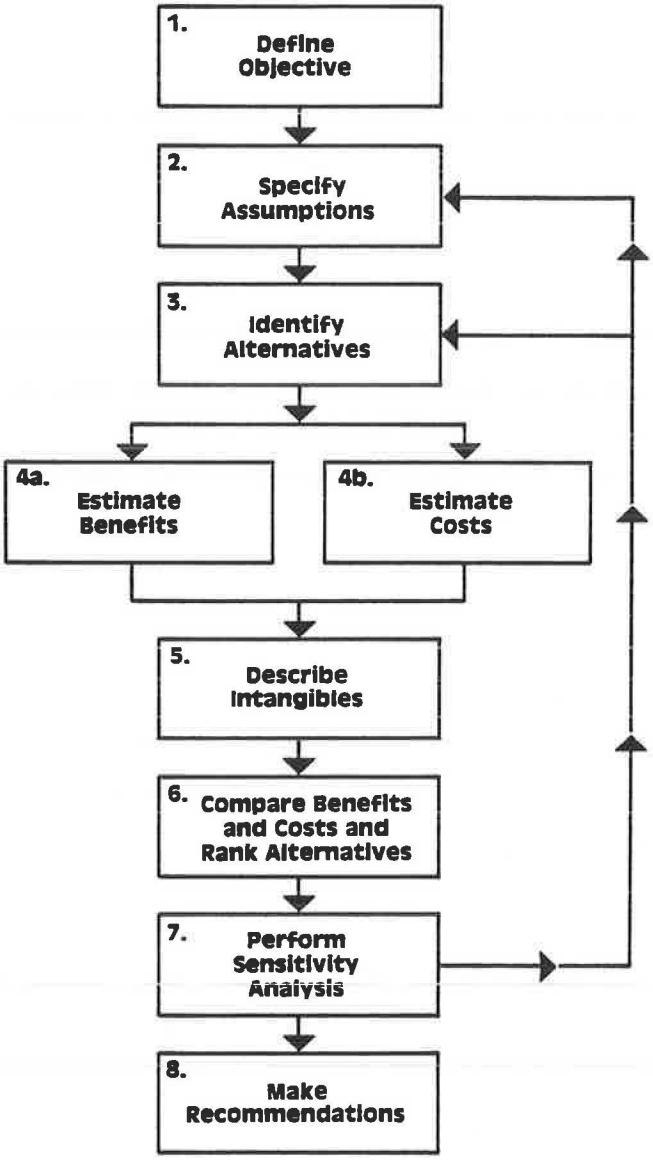

FIGURE 1 Economic analysis process.

ing expense reductions and (b) reductions of passengers' wasted time; and

3. Cost savings (e.g., increased employee productivity).

Other benefits (e.g., noise reduction) are also presented.

A life-cycle cost approach is proposed in which the total cost to the government and public of establishing and operating or complying with an investment project or regulation is included. Costs are grouped in four major categories:

1. Research and development costs,
2. Investment costs,
3. Operation and maintenance costs, and
4. Termination costs.

The Guide recommends use of the net present value criterion to evaluate the economic desirability of alternatives and sensitivity analyses of key input parameters.

Strengths

Although the Guide presents no innovative approach, it is an important contribution to transportation economics literature because of its potential use on a wide variety of aviation-related questions and its reliance on sound economic theory.

The Guide's willingness-to-pay approach is consistent with the majority of transportation and nontransportation economic thought. The dollar values used are obtained from a comprehensive 1981 FAA study (5) and represent dollar amount estimates of what society and users should be willing to pay for a specific benefit (e.g., the perceived benefit of preventing an aviation fatality).

Weaknesses

The Guide appears to be in agreement with the predominant position that all benefits and costs should be calculated to whomever they accrue. For example, the Guide states that "any [economic] analysis, of course, should include all known benefits whether or not they can be classified in the three main categories" (1,p.3-26)--safety, capacity increases and delay reduction, and cost savings--that can typically be expected to flow from FAA investment and regulatory activities. Three examples of additional benefits are presented: noise reduction, missed-approach benefit, and avoided-accident investigation costs. The Guide does not allude to nonproject-related costs (e.g., value of residential property located adjacent to a new airport).

Although the quantification of all benefits and costs associated with a proposed action is a noble and appealing goal for an economic analysis, this author (as well as other professionals) believes it is impractical. It is difficult enough to determine user benefits and project costs without expanding a benefit-cost analysis into such technical and pecuniary externalities as noise and other environmental pollution, residential and commercial property values, employment, airport sales, and wildlife kills. It is in these "other" quantifiable areas, as well as in the evaluation of intangible benefits and costs, that controversies over benefit-cost analyses most frequently occur.

The Guide conveniently mentions only one of many quantifiable nonuser benefits (noise reduction) or costs and then reverts in the remainder of the text to only a user analysis based on safety improvement, capacity increases and delay reductions, and cost savings.

The discussion of what benefits and costs should be included in an economic analysis would be much better if it were limited to user benefits and project costs, reflecting the predominant thought found in transportation economic studies. The question that this "user" economic analysis addresses is whether an investment or regulation is economically justified strictly on a transportation basis, not whether the proposed action is desirable for the whole social, economic, and environmental community. Nonuser and nonproject-related economic benefits and costs (e.g., property values and regional economics) would be better handled outside the benefit-cost analysis in the overall determination of the desirability of an alternative or a regulation. The Guide properly recognizes that, if these other benefits and costs are to be included, a range in dollars would be appropriate and such benefits and costs could be evaluated in the sensitivity analysis.

Two of the three examples of other benefits presented are actually elements of the Guide's three major benefit categories. The missed-approach bene-

fit is an element of the capacity increases and delay reduction category, and the avoided-accident investigation costs are an element of the safety category. These elements should either be deleted or made part of the general categories. The missed-approach benefit should be an element of the Guide's approach because it relates directly to delay reductions, whereas the avoided-accident investigation costs should not because all other user dollar values of the Guide are derived from FAA's economic values document (5). If it is determined that avoided-accident investigation costs should be included in the determination of how much society is willing to pay to prevent accidents, those costs would be better handled in the economic values document (5) than in the Guide.

There may be some debate about whether step 5, describe intangibles, of the Guide's eight-step benefit-cost analysis process is indeed part of a benefit-cost analysis. Properly or improperly, these intangibles usually are treated outside the benefit-cost analysis, so that the benefit-cost analysis considers only quantifiable benefits and costs. However, the distinction between quantifiable and nonquantifiable benefits and costs and the ease or certainty with which dollar values may be placed on many benefits and costs are not clear.

Although the willingness-to-pay approach to determine benefits and costs predominates in the Guide, the Guide may have slipped into a resources-consumed approach in Chapter 4 on cost estimation (1,p.4-1). If benefits are perceived primarily as reductions in cost and a resources-consumed approach is used, many of the benefit values found in Appendix B would drop dramatically.

As do many economic studies, the Guide suggests that the values used represent minimum estimates of the dollar amounts society as a whole would be willing to pay for specified benefits. However, values that are conservative from one point of view can be exactly opposite from another point of view. If the values presented in Appendix B are indeed conservative, that implies society is not devoting adequate resources to meet aviation needs and the ranking of alternatives may not be accurate. The most realistic values, not conservative values, are needed. The Guide alludes to the proper use of realistic values instead of unduly high or low values in the judgmental accident evaluation subsection (1,p.3-12) and in the sensitivity analysis section; however, the Guide never formally states that realistic values are desired.

If a conservative approach to the evaluation of benefits is desired, the proper place to handle such an analysis is in the sensitivity analysis. Some analysts, however, may not find the Appendix B values conservative. For example, even after recognizing that air travelers do have higher incomes than automobile travelers, the Guide's value of time for air travelers of $17.50 per hour (1980 dollars) versus $2.40 per hour (1975 dollars) for highway users (2) might appear relatively high. The Guide's value to prevent a fatality is $530,000 (1980 dollars) compared with $190,000 (1981 dollars), as prescribed by the National Safety Council (6) for a highway death. Many state departments of transportation use the latter figure.

SPECIFIC APPROACH

Strengths

The Guide's specific approach is implicitly direct in estimating benefits and costs, comparing benefits and costs and ranking alternatives, and performing sensitivity analysis (steps 4, 6, and 7 of the Guide's eight-step economic analysis process). Safety, time, and operating benefits, the essence of the benefit analysis, are presented in fewer than 20 pages. Guidelines are provided for estimating the change in demand or increased passengers due to airport improvements.

The classification of cost components is detailed and helpful to a potential user. A brief discussion on cost concepts is provided that should prove helpful in understanding the multifaceted term "cost." The Guide pays proper attention to beginning-of-the-year, end-of-the-year, midyear, and continuous-compounding conventions in quantifying benefits and costs over time. It properly recommends that a midyear or continuous procedure be used.

Although, if done correctly, all benefit-cost analysis methods will yield the same ranking of alternatives, the Guide is consistent with most current economic thought in recommending the net present value method as the primary benefit-cost decision criterion. The Guide properly recognizes the importance of sensitivity analysis in the decision-making process to account for the imprecision and uncertainty that characterize most benefit-cost analyses.

Consistent with most other guidelines, the Guide recommends the use of constant instead of current dollars and that the constant dollars of the analysis year be selected as the unit of measurement. General and real inflation are handled properly. Price indexes are referenced, and procedures for updating all economic input values are addressed. Thus the Guide will not become outdated because of changing price levels.

Weaknesses

Although the Guide's approach to estimating benefits and costs appears simple and direct, the specific approach is never stated or illustrated. As long as all the steps are considered, results should be the same; however, confusion could exist about which step to perform first (e.g., should benefit values be updated before or after the dollar stream of benefits is calculated). Economic study features (i.e., discount rate, evaluation period, and study years) are treated in step 6 (comparing benefits and costs). These economic study features more properly belong in step 2 (specify assumptions). Similarly, cost updating procedures appear late in the text, but updating costs should be one of the first steps in estimating benefits and costs.

Adequate justification is given for the use of a 10 percent real discount rate, as prescribed by the U.S. Office of Management and Budget Circular A-94 (7) for federal programs and projects. However, many professionals (including this author) (2) believe that the 10 percent rate is unrealistically high for a real discount rate and that a more appropriate rate is from 4 to 7 percent. The effect of using a discount rate as high as 10 percent is to overrate projects with larger benefits in the near term and larger costs in the long term relative to projects with long-term benefits and short-term costs. Although perhaps locked into the 10 percent rate, specific reference to a sensitivity analysis of the discount rate would be appropriate.

Although updating procedures appear clear, no specific guidance is provided on how to update benefit values in Appendix B. However, FAA's updating methodology can be found elsewhere (5).

Replacement and restoration costs of damaged aircraft are given in Appendix B; however, no guidance is given on which cost category should be used

or what percentage of aircraft accidents necessitates aircraft replacement. Guidance in this replacement/restoration area could be important in the evaluation of safety projects because restoration costs are one-third of replacement costs.

Although the section on capacity increases and delay reductions (1,p.3-13) details procedures on the impact of capacity increases on aircraft operating expenses and passengers' wasted time, it does not relate these increases to safety benefits. Furthermore, if one accepts the Guide's viewpoint that other benefits and costs should be included in the benefit-cost analysis, capacity increases would properly have a negative noise impact. The Guide addresses only effects of capacity increases on delay aspects rather than relating capacity increases to safety and, as appropriate, other impacts.

An alternative method of handling different numbers of operations with improvement and no-improvement assumptions is to use the average value of the operations of these two alternatives and calculate benefits on that average value. For instance, if the base case results in 20,000 operations a year and the improvement case results in 22,000 operations a year, the use of 21,000 operations a year in calculating benefits for both cases may be a worthwhile simplifying assumption.

As stated earlier, the Guide is not self-contained; the economic analyst must rely on outside sources to obtain such items as accident rates, air traffic demand, and cost estimates. This is one of the major drawbacks of the Guide. Sources of this crucial information are given, but many of them are not readily available if they are available at all. Therefore, the aviation planner or economic analyst is missing vital information and must rely on other data sources or professional judgments. Extensive reliance on judgment can cause significant variability in results. The Approach Aid Established Criteria Model, which is presented as "a comprehensive model for estimating safety and other benefits for approach and landing aids" (1,p.3-11), is unavailable. This model was not completed and draft material is not available for use. Without the model, the statement that "this [safety] subsection presents methodology for determining deaths, injuries, and damages prevented by risk reduction" (1,p.3-8) is not true. In the cost estimation section (1,p.4-8), the statement is made that "Guidance in preparing F&E [facilities and equipment] cost estimates for many established FAA projects in contained in F&E Cost Estimating Procedures and Summaries Handbook, FAA Order 6011.4, September 23, 1976" (1,p.4-8). However, when this author attempted to obtain a copy of the order to perform a benefit-cost analysis of improvement alternatives at a major air carrier airport, he was told that the order is for official FAA use only and is not available to the public.

In computing the present worth of an alternative, the Guide suggests its methodology must be applied to each year over the life of the capacity improvement (1,p.3-19). Because a computer model does not accompany the Guide, the calculation of benefits and costs on a yearly basis for an airport expansion project with five alternatives and a study period of 20 years would be cumbersome and subject to a high degree of error because of the number of calculations. The situation would be exacerbated if a 50-year capacity improvement life were used. An easier solution to this calculation problem is available, assuming a computer is not used and the stream of benefits or costs increases or decreases at an approximately equal annual percentage rate. The process is to calculate values for 2 years, one value associated with the first year and the other with later year, and use the procedure presented in A Manual on User Benefit Analysis of Highway and Bus-Transit Improvements, 1977 (2,p.30). For instance, if the cost benefit from a major airport improvement is $14 million the first year and $42 million the twentieth year, the stream of benefits over the 20 years with a 10 percent real discount rate can be readily calculated as approximately $180 million.

In a sensitivity analysis, the number of calculations increases dramatically, and a computer program is essential for multifaceted alternatives. Lack of a computer program may limit the Guide's use to relatively uncomplicated alternatives; however, this author has found it relatively easy to produce a computer program based on the Guide's methodology to handle major airport investment alternatives (8).

Although the Guide provides general guidance on parameters and the degree to which values should range in the sensitivity analysis, the Guide does not provide any specific guidance on appropriate ranges for benefit values. For instance, there may be differences of opinion about the value of travel time and what society is willing to pay to prevent a fatality. An analyst could vary the stated values by up to ±100 percent, as illustrated in the text, but values recommended by other sources or generated by other approaches (e.g., resources used versus willingness to pay) would be even more useful. A range of real discount rates (e.g., 4 to 10 percent) would also be desirable.

CONCLUSION

The FAA economic analysis guide is one of the best transportation economic guides published. It is based on sound transportation economic concepts and is generally easy to understand, direct in approach, and applicable to a wide range of aviation improvements and regulatory alternatives. The Guide's values can be readily updated. However, the Guide is heavily dependent on outside sources, some of which are referenced but not available, and lacks useful examples. The Guide's approach may result in a large number of hand calculations if the number of alternatives or years being evaluated is large and sensitivity analyses are desired. This author believes that the Guide should use a user benefit analysis approach rather than a more comprehensive approach encompassing all quantifiable and intangible benefits and costs. Overall, the Guide represents an important contribution to transportation economics literature, and, for better aviation-related decisions, its use should be encouraged.

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Quick Benefit-Cost Procedure for Evaluating Proposed Highway Projects

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ABSTRACT

There has been a need within New York State's Department of Transportation to quickly evaluate proposed highway projects from an economic standpoint. The ability to do so would be a valuable tool for use in deciding which projects deserve further consideration in setting priorities. The procedure described in this paper is a quick method of estimating operating and travel time costs under before and after project conditions (the difference is an approximation of benefits to be derived). These benefits can then be compared with the project's estimated construction costs for an evaluation of the project's worth. Accident costs must be considered separately because they are site specific and difficult to generalize. This quick benefit-cost procedure can be applied to a variety of project types, including closed and posted bridges, highway resurfacing, and major reconstruction.

A number of methods are used to evaluate the worth of proposed highway projects. The methods range from major corridor analyses, which use elaborate and detailed computerized networks and programs that simulate traffic under a variety of conditions, for urban areas, to a "back of the envelope" calculation for a little-traveled rural facility. Within the New York State Department of Transportation (NYSDOT) there was a need for a quick method of determining whether a proposed project was economically feasible, apart from other considerations that might be used to evaluate its need or worth. Such a procedure could serve as a first-cut filter to either eliminate projects that do not meet some minimum benefit level or to alert the project analyst that, for a project to be feasible, additional considerations (economic, social, or political) must be taken into account.

In New York State a highway project proposal is submitted by a regional office in the form of a Project Initiation Report (PIR). This report contains a description of the problem along with background, forecasts, maps, proposed solutions, and project cost estimates. However, an estimate of benefits to be derived is usually not available. Therefore, the quick benefit-cost procedure presented here was developed to provide this important input at an early stage in the project evaluation process. David I. Gooding, Planning Division, NYSDOT, developed an unpublished package of ten tables documenting costs of the various components and the aggregate operating and total time costs of highway travel for automobiles and trucks from 1967 through 1981. The procedure provides a fairly comprehensive estimate of vehicle operating costs and time costs. Accident costs are not considered because they are site specific and not amenable to the types of generalizations that can be drawn concerning the other two classes of costs.

OVERVIEW OF QUICK BENEFIT-COST PROCEDURE

NYSDOT's Planning Division currently uses two highway user cost accounting programs in conjunction with its traffic simulation packages (1,2). Using the speed and congestion levels developed, the programs assign and summarize operating, travel time, and generalized systemwide accident costs. The quick procedure is a simplified manual version of this cost assignment process. It employs nomographs that can be entered with a minimum of information. To use this procedure, one needs only posted speed, average running speed, traffic with some estimate of vehicle mix, and highway section length for both the before and after conditions. Operating and travel time costs are calculated for both conditions and are then subtracted. The result can then be compared with the project costs by any of the various benefit-cost relationships.

In the nomographs (Figures 1-4), posted speed and average running speed are surrogates for facility