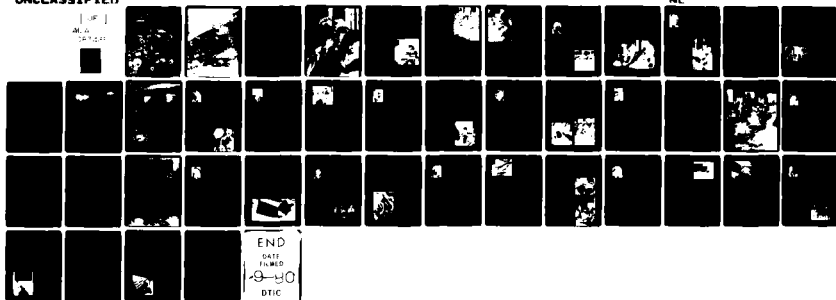


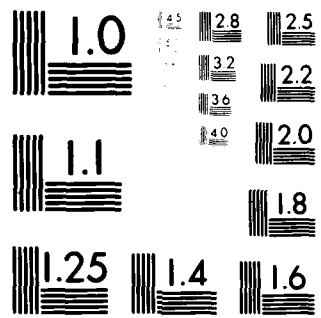
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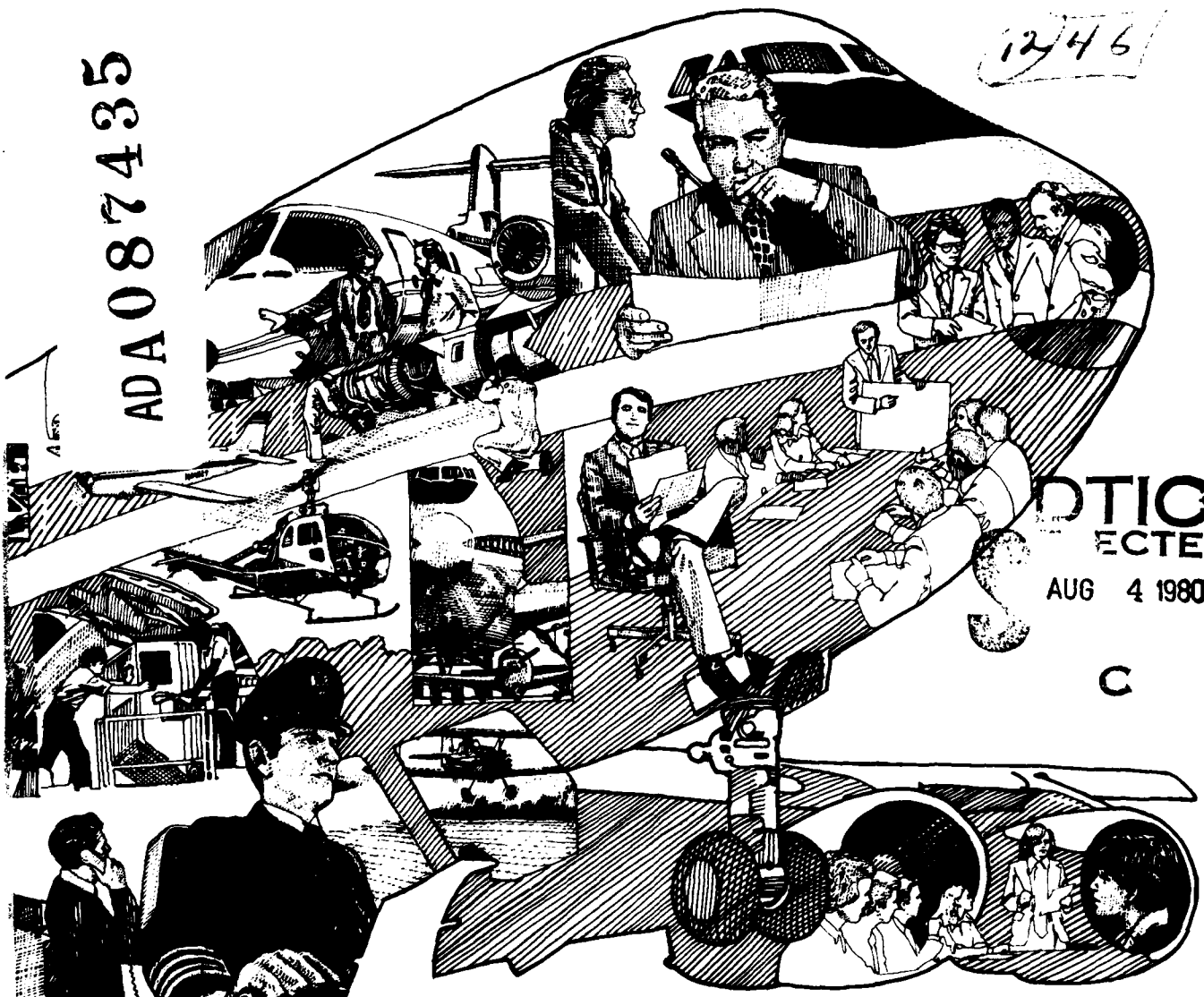
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**Fourth Annual FAA  
Forecast Conference  
Proceedings (4th)**

**October 1978**

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# Part One

## Introduction

### Proceedings Summary

The Fourth Annual Federal Aviation Administration Forecast Conference drew a diverse audience from all parts of the aviation community. As has come to be expected at the seminars, workshops, and conferences promoted by the Outreach Program of the Aviation Forecasting Branch, the discussion was lively. Criticism and suggestions were offered by speakers and participants for the Federal Aviation Administration's (FAA) forecasting effort.

The conference served to significantly increase understanding and interaction among those who are involved in the forecasting process. The morning session—"Forecasting and Government Decision Making"—focused on the forecasting needs of decisionmakers at the airport, state, regional, and federal levels. Dr. Lawrence R. Klein spoke at the luncheon on the relationship between national economic forecasts and the transportation sector of the economy. The afternoon session—"State and Local Forecast Applications"—witnessed spirited discussion on the impact that national forecasting activity has on planning and management efforts at the state and local levels.

#### The Morning Session

Ms. Mary M. Anderson, Associate Administrator for Policy Development and International Aviation Affairs, opened the conference with the welcoming address.

The tone of the conference was set by Mr. Gene Mercer when he put future FAA forecasting efforts in the context of past and present accomplishments. A major thrust of his presentation was the need for continued frank and open discussion between the FAA Aviation Forecasting Branch staff and the aviation community. Only through such exchanges would it be possible to fulfill the diverse forecasting needs of the community, while at the same time having his staff stay within the FAA's increasingly constrained budget.

The first panelist to speak, Mr. Donald Poloskey, reacted to the national forecasting effort from his role as an airport planner in Detroit. He saw the national forecasts as generalized network projections of limited utility for a specific airport. He pointed out that recent national forecasts used base year data which happened to be very high in the case of Detroit. This seemed to distort the numbers for the out-years.

Mr. Richard Hodgkins offered the State of Massachusetts as a test-bed for the development of state-level forecasting models. Two forecasting problems manifest themselves most clearly at the state level: (1) the lack of good data from the many smaller airports, and (2) the political issues which surround development of individual airports.

Dade County, Florida, was presented as one of the largest systems of airports in the country. "Its forecasting needs," said Mr. I. H. Carr, "are complex and reflect the special functions of the six airports." His forecasts for aviation activity in the county is in close agreement with FAA projections for the long-term, but less so in the short-term. After describing the forecasting methods used in Dade County, his comments on the national forecasts centered on the lack of disaggregation for wide-bodied jets and the absence of foreign carriers in the international forecasts.

"What if" scenarios were the focus of Mr. Hal Becker. The energy crunch and other similar major events do appear on forecasts; yet, they do have a tremendous impact on the national aviation system. There is a need to incorporate "what if" contingencies in forecast documents. He acknowledges that fulfillment of this need would be difficult since much of their impact is derived from their unexpectedness.



## The Afternoon Session

The promise of help from technology in counting aircraft operations at nontowered airports was offered by Ms. Marjorie Sorensen. She described the workings of a reasonably simple piece of equipment designed to overcome one of the major problems in forecasting, i.e., obtaining reliable current and historical counts of activity at nontowered airports.

Mr. Jim Goff described the efforts of the State of South Carolina to give their forecasts high visibility through computerization for real-time output. They are working with the FAA in accomplishing this task. It is hoped that this effort will make it easier to coordinate airport master plans with the state system forecast.

Airport planning consultants often must decide whether to produce a completely defensible forecast or analyze alternatives for their clients. The realities of the fixed-price contracts under which they operate often do not allow both to be done adequately. This is the dilemma in which Mr. Don Cress has often found himself. From his perspective, the national forecasts merely provide him with another set of numbers to be explained to the client. He appreciated the inclusion of alternative scenarios in the national forecasts as it gives him ammunition in turning aside requests for "exact" numbers, a general problem in forecasting.

The special problems encountered in a low population-density state such as Arizona were discussed by Mr. Harry Wolfe. The need for sophisticated forecasting techniques is not as great in Arizona as the need to identify based aircraft and operations at widely scattered small airports.

In the last panel presentation, Mr. Tom Darmody outlined a new concern for forecasters. The judicial system now closely links the aviation forecasting and environmental impact setting processes. The courts tend to see forecasts, not so much as pre-decision documents but as action documents. He went on to outline a number of suggestions for action by the FAA.

The conference was brought to a close by Mr. Duane Freer, Director of the FAA Office of Aviation Policy. In recapping the events of the conference, Mr. Freer suggested that in the future the FAA might give greater attention to short-term, rather than long-term, forecasts. He stressed the need for greater use of judgement in forecasting—a process greatly aided by interaction such as he had seen at the conference. The austere FAA budget again received mention as did the need for close cooperation among all segments of the aviation community to further improve the forecasts.



## Federal Aviation Administration Forecasting Initiative Overview

The Federal Aviation Administration (FAA) Forecasting Initiative is providing increasingly more powerful tools and information for use in the aviation community. This was the message heard often at the Fourth Annual FAA Aviation Forecast Conference held on October 24, 1978, in Washington, D.C. Conference participants, as well as the invited speakers and panelists, generally noted the accomplishments of the past year reflected in the improving utility of aviation forecasts prepared by the FAA. A comparison of the criticism and suggestions offered at this conference and at the 1977 conference indicated that many data base shortcomings and methodological problems have been overcome. The suggestions and requests heard this year revealed a higher level of sophistication and knowledge among aviation forecast users across the Nation and forecasters at the FAA.

The FAA Forecasting Initiative was undertaken to promote this end through greater state, regional and local forecaster and planner involvement in the forecasting process. Much has been accomplished in the past four years. In 1978:



- **General Aviation** data bases have been expanded broadly, and new forecasting tools are now available which predict activity both at the national and state level.
- **Air Carrier** activity has been forecasted in greater detail, with separate projections now made for trunk, local service, commuter, international, supplemental, and cargo air carriers.
- **Geographic and Temporal Disaggregation** has become more detailed and precise in FAA aviation forecasts.
- **Alternative Forecasts** of aviation activity that could result if social and economic patterns evolve differently from baseline assumptions now have become a standard feature of FAA aviation forecasts.

Future forecasts will be the product of extensive interaction among forecasters at all levels—from the individual airport planner to the FAA and among forecast users at airports, in industry, and in government. While the FAA effort will continue to grow in sophistication in response to community commentary, it must share some of the forecasting effort with other planners in the National Aviation System.

Aviation forecasting is an interactive process. The aviation community is very diverse—the familiar wide-bodied commercial jet is only a small part of it. Also, it is fragmented—including the small operations of some, if not all, giants in American industry. Forecasting for the myriad needs of this community

requires either an extensive and intensive communications process or clairvoyance. Needless to say, communication is the key to the process.

Maximization of utility for the forecast can be accomplished only when all the elements of the community provide their special expertise and diverse perspectives on the future. Assumptions must be defined and refined continuously. The data base always needs greater accuracy and specificity. Flight operations need to be counted into an evermore complex matrix with geographic, temporal, and type of operation axes. Forecast methodologies change because of refinements from mathematics and improved computerization technologies. More and more applications are found for the forecasting output, thus requiring more specialized forecasts. It is clear that the FAA cannot respond unilaterally to all the forecasting needs that may be defined.

The FAA will continue exercising its leadership role in aviation forecasting in 1979. Its national forecasts are evolving further under the guidance of the "contract" made through the Outreach Program of seminars, regional conferences, and technical exchanges. State, regional, and local input is already a significant component of the annual and hub forecasts. The 1979 National Forecast incorporates alternative economic scenarios to give state and local planners more information for their own operations. Movement of this conference to October reflects the FAA's effort to coordinate its activities with the needs of state and local planners.

The present year, 1979, will bring new FAA concentration on making the forecasting process more interactive in nature. For example, whenever possible the FAA will share its data base with state and local planners. This will promote greater accuracy in the files as multiple sources of information interact. The FAA hopes that by sharing its data, more of the specialized forecasting needs may be met by the needing agencies.

There is a secondary motive behind the strong initiative in 1979 for more interactive forecasting. It seems everyone is under strong budgetary constraint. This is certainly true for the FAA. It does not have the resources to do all that the aviation community would have it do. Through interactive forecasting, the FAA can respond to the most pressing national needs and help others fulfill their own needs on a more local basis.

National priorities and specialized assistance: These are the watch words for the FAA Forecasting Initiative. The goal of providing planners in the National Aviation System with the best possible forecasts remains solidly in place. However, as a reflection of the growing sophistication evident among planners and forecast users and the budgetary constraints, the FAA orientation is changing. Aviation forecasting is coming of age as a shared responsibility of all participants in the National Aviation System.

## Part Two Proceedings

### FAA Initiatives: Forecasting for Decisionmaking



**Ms. Mary M. Anderson**  
Associate Administrator  
for Policy Development  
and International Aviation  
Affairs

After welcoming the participants, Ms. Anderson summarizes the reaction FAA has received from the aviation community on its forecasting activities and outlines recent activities undertaken in response to that commentary. She then announces the new initiative of the FAA to involve state and local participants more actively in the forecasting process. She emphasizes the future austere budget within which the FAA will be operating. Even greater interaction between state and local officials and the FAA in the forecasting process is encouraged to overcome financial problems and to further improve the quality of the forecasts.

It is my pleasure to welcome you to the Fourth Annual FAA Aviation Forecast Conference. Many of you have participated in previous meetings in this series and have made valuable contributions to our forecasting program. We think you will see the results reflected in the documents distributed this morning and in the discussions that follow throughout the day.

We are trying to increase the usefulness of our forecasts in planning and decisionmaking, not only for the FAA, but for the entire aviation community. Several years ago, we opened up the forecasting process to encourage greater public and industry participation. The impact of that decision can be measured by the continuing improvements in our forecasting materials. We think you will find the latest forecasts do a better job of meeting your specific needs.

#### Commentary to Date

After last year's conference, we published a summary of the proceedings which reflected your major concerns about our forecasting program, and this morning I want to mention a few of those concerns expressed to us by you. You asked that our forecasts treat aviation traffic in terms that are most familiar and useful to you; that is, in terms of traffic by geographic area, by time-of-day, by market share, and by means of transport. You said that realistic forecasts must be built from local socio-economic and aviation activity data; that is, from the "bottom up" as opposed to the "top down" disaggregated approach we have traditionally employed. You also stated your interest in forecasting and analytic methodologies that can address "what if" situations. And finally, there was a very clear message expressing major concern with various aspects of the FAA forecasting role in the aviation community.

#### FAA Response

Gene Mercer, who heads our Aviation Forecast Branch, will speak with you shortly on the agency's response to those comments. He will discuss the resulting forecasting system and, perhaps more importantly, he will address the concepts by which we are developing our forecasts in consultation with you. We are now increasing the use of "bottom up" aggregation in building our forecasts to reflect the impact of local reality. This input is feeding first into our regional plans and from them into our national plans. Secondly, our data increasingly reflects the complex and fragmented market served by aviation, and our assumptions include the judgements of expert people in the field. Finally, as a part of our formal Outreach Program, we are conferring with you as we build our data bases to make certain that our forecasting methodologies correspond with your perceptions and that our schedules match your planning cycles.



We hope that these changes reflect the signals we have been getting from you over the past 18 months. We urge that you continue to give us the benefit of your thinking. We need your running commentary so that our forecasts can reflect the real world in which we all work.

#### **State and Local Initiative**

You will remember that at the spring conference in Los Angeles, I stressed that national policy and decisionmaking must be reflective of data collected from state and local aviation activity. That is where we begin today, and Mr. Mercer will discuss the specifics of our current proposals to shift the focus of our FAA forecasting initiative toward the state and local area. So I will not discuss this at length, but I do want to note the correspondence between the message given in Los Angeles and our current program emphasis on state and local interaction. I also want to emphasize our commitment to working in a broad policy sense with states, regions and localities. We are all convinced that forecasting must address the real world in which we work in order to be a credible factor in the policymaking process. With the shift in emphasis to data resources on state and local activities, your frank commentary continues to be extremely significant.

#### **Limited Federal Resources**

Finally, we want to address the realities of limited resources in this and succeeding years as this Administration moves to improve the efficiency and effectiveness of government within a very austere budget. Although there are extensive opportunities for serving our constituency, we will be focusing our efforts on analyses that address the central FAA mission of providing for the continued development of our aviation system. Therefore, we must know your priority listing for high-payoff activities. Where would you like us to invest our reduced resources? We want your reaction to our recently initiated modeling efforts such as the general aviation dynamics model and the geographically-specific commuter model, and we want your reaction to specific outreach efforts such as regional planning conferences and hub forecast conferences.

Gene Mercer will discuss in some detail the need to set priorities in shaping resource requests and allocations. In this regard, we need your specific input for consideration in ultimate decisions. Be extremely candid and address the harsh realities. Our budget choices are harsh. As we allocate resources, we must make choices that maintain and improve the decisionmaking utility of forecasting not only at the national level, but also at the state and local level. Your participation is our most real guarantee that our budget choices will be the best choices.



## FAA Aviation Forecasts



**Mr. Gene Mercer**  
Chief  
Aviation Forecast Branch,  
FAA

Mr. Mercer opens by reviewing commentary received from the aviation community over the past year. The FAA forecasting effort continues to evolve in response to this commentary. Following a review of the 1979 FAA aviation forecasts, Mr. Mercer closes by stressing the need for the FAA plans to more actively involve local officials in the forecasting process.

The FAA forecast initiative has been established to involve state, local and regional forecasting and planning people in the development of national aviation forecasts. The objective is to make these forecasts more useful for planning, not only at the national level, but also at the state and local level. Today, I will speak briefly about the progress and status of this FAA initiative and about the forecasting system that has evolved. Then, following a brief overview of the 1978 forecasts, I will discuss our 1979 state and local initiative.

Since our Third Annual FAA Aviation Forecast Conference in December 1977, we have developed new data bases, redesigned existing and developed new forecasting models, and published proceedings from that session summarizing your comments. We have taken that commentary as a form of a contract with the aviation community and have tried to evolve our forecasts to be more useful to management in decisionmaking at both the local and national levels.

You stated a need for forecasts that were more specific in nature, with greater emphasis on geographic and temporal disaggregation, traffic identification, and so on. This immediately posed a dilemma as to the proper FAA role in developing local forecasts. It also created problems in that it demands a great deal of data that may or may not be available—particularly general aviation operations data.

Your second point was the desire that forecasts be built from the bottom up as opposed to the historical FAA procedure of disaggregating national-level forecasts. This implied a great deal of coordination with state, local and regional authorities in the development of forecasts.

There was great concern expressed as to the proper role of the FAA in forecasting. We do not want to usurp authority for forecasts at the state and local level, yet we have recognized that national planning requires national-level forecasts to be consistent with forecasts at the state and local level. In response, we have coordinated our forecasting process with the annual process utilized by the states. For example, we moved the forecast conference up from December to October as the result of a suggestion from last year.

The fourth item we heard was the need for alternative forecasts to serve as a basis for contingency planning. Of course, you realize, the basic purpose of FAA forecasting is to provide our management with a tool for manpower and facility planning. Therefore, we must have a very clear and concise baseline forecast. We recognize, however, that situations could develop over the longer term which would alter long-term facility requirements. Therefore, we developed two alternative forecasts for the 1979 forecast document.



### **The FAA Forecasting System**

Following the forecast conference last year, we conducted numerous consultation seminars and conferences in the various regions to serve as a basis for evolving our forecasting process. The forecasting system that has evolved has five distinct parts:

- Information sources
- National aviation activity forecasts
- Regional activity forecasts
- Local activity forecasts; and
- FAA Outreach Program.

#### **Information Sources**

The information sources consist of standard aviation activity data bases, the Wharton forecasts of national economic activity, and regional economic activity forecasts by the Department of Commerce. We also sponsor a series of supporting studies that address specific data problems. For example, many regions disagree with the projections of per capita income developed by Obers back in 1972. We have attempted to incorporate local and regional information and to adjust these projections accordingly. We have asked for and received reports from local airport managers on a monthly basis. This provides us with information about specific airport activity much earlier and in much greater detail than is reported in standard publications. We are utilizing more of the data gathered for state and airport master plans in our forecasting models. We have also undertaken specific studies. For example, a fixed-base operator project by the Bureau of Census will evaluate, on a sampling basis, the services provided by operators in various airports and will ascertain how these services impact growth at the local facility.

#### **National Forecasts**

We are working toward greater specificity in our national activity forecasts. We have developed a commuter forecasting model to cover this very rapidly growing segment of aviation. In addition, we have developed a supplemental air carrier model, an international model, and the general aviation dynamic forecasting model.

#### **Regional Forecasts**

We have instituted a series of site forecasts for 25 large hub airports and all surrounding airports in an effort to improve regional forecasting. We also recently developed a general aviation state forecasting model. We introduced it on August 3, 1978, at a conference in conjunction with the MIT Transportation Systems Center in Boston.

#### **Local Forecasts**

Historically, we have developed all forecasts for FAA facilities in terminal areas, enroute centers, and flight service stations. Recently, we have begun to develop models that incorporate local economic and demographic data in our terminal area and enroute center forecasts. We have also developed a short-term, quarterly forecasting model that utilizes data

from the most recent 16 quarters and projects out two years. This allows us to monitor how accurate the forecast is. And for the first time, our flight service station forecasts will be based totally on local socioeconomic and demographic data.

#### **FAA Outreach Program**

The outreach program ties all this together. It consists of seminars, regional conferences, and technical exchanges between forecasters and planning people not only in the state and local area, but in the entire aviation community. It also includes conferences with the general public. For example, FAA headquarters now develops draft forecasts which are then taken to regional headquarters for review. After regional comments and suggestions have been incorporated, we issue another draft which is taken to airport operators, local and regional planning authorities, the aviation community, the general aviation industry, and any interested individual. In some cases, we also conduct seminars and invite the public, including people who are basically opposed to aviation growth such as the environmentalists and noise people. At this point, there still may not be a consensus on our growth projection, but at least there is a common understanding of the assumptions we have made and our basis for the forecasts we have prepared.

We also hold technical exchanges with state governments to ascertain if our national forecast models and data bases can be adapted to aid state-level efforts. In these exchanges, we have received a great deal of data and recommendations for design changes in our forecasting effort.

We have developed forecasts for two alternative economic scenarios in this year's forecast document. We utilized the economic and aviation conditions existing in the high growth 1961-66 timeframe to arrive at an upper bound for our baseline forecast. Likewise, we utilized the recessionary period of 1971 through 1973 to establish a lower bound.

#### **Baseline FAA Forecasts**

##### **Socioeconomic Assumptions**

The socioeconomic conditions for our baseline forecasts of aviation activity were derived from the Wharton forecasts made in the spring of 1978. These projections indicated strong short-term growth with more conservative growth over the longer term. Gross national product (GNP) was projected to grow at a 4.3 percent rate in 1979 and at a 3.1 percent rate between 1989 and 1990.

##### **Aviation Forecasts**

As a result, we see strong general aviation (GA) growth in the near-term, particularly business activity. We also see the development of new suburban airports and an increase in GA pilot use of IFR. In 1978-1979, we anticipate growth in the general aviation fleet to be 6.5 percent. However, as a result of escalating fuel prices throughout the forecasting period, we anticipate some dampening of growth toward the latter end of the 12-year period. By 1990, growth in the aviation fleet is expected to be approxi-

mately 3 percent. Greatest absolute growth will occur in single-engine piston aircraft, but the greatest rate of growth will occur in the more sophisticated, multi-engine piston and turbo-prop aircraft. In 1978, there were 784,000 active pilots. By 1990, we anticipate there will be 1,155,000.

Air carrier growth will be dramatically affected over the near-term by action taken by the Civil Aeronautics Board (CAB) in 1977 and in 1978. There will be a great jump in enplanements (10 percent growth in 1978 over 1977) as a result of the fare policy promulgated by the CAB and now enacted into legislation by the Congress. By the end of the forecast period, we anticipate a more normal growth rate of around 5 percent between 1989 and 1990, a rate still greater than GNP growth.

The commuter industry has been one of the fastest growing segments of the commercial aviation field. We foresee continued growth in this industry as a result of deregulation and the replacement of certificated air carriers with commuter services in certain markets. Also, we have identified a number of new markets that will obtain commuter service within the 12-year period. Although commuter growth will proceed at a 13.1 percent rate between 1978 and 1979, we anticipate the commuter industry will be growing only slightly faster than the overall air carrier industry by the end of the forecast period.

Air cargo was deregulated a couple of years ago, and we have seen spirited growth since then. We expect air cargo to continue growing at a very healthy

rate over the entire forecast period with greater sophistication developing in the movement and handling of cargo. International traffic will grow at a much higher rate than domestic traffic.

The military forecasts are supplied to the FAA by the Department of Defense. They project no growth over the forecast period, anticipating a stable number of aircraft and hours flown. This means that military aviation will become a decreasing portion of FAA workload throughout the forecast period.

#### FAA Workload Forecasts

FAA tower operations will continue to grow at a very rapid rate early in the forecast period (6 percent between 1978-1979). By the end of the forecast period, growth in tower operations will decline to about 1.4 percent owing to a decline in general aviation growth and a leveling off of growth in the air carrier industry. Commuter and general aviation traffic activity will contribute most to growth in activity at towered airports. Total tower operations are projected to increase from the current level of 67 million a year to just slightly over 100 million annually by 1990. Greatest growth will occur in itinerant general aviation operations and second highest growth will occur in local general aviation operations. So you can see how general aviation is becoming an increasingly important segment of the industry.

Instrument operations continue to grow at a very high level and we anticipate a continuation of this trend for some time, particularly in the general aviation and commuter areas. However, a point will be reached where most general aviation itinerant flying will be by IFR, and again, growth then will parallel more closely total operations.

Increasing use of the National Aviation System by commuters and general aviation will result in rapid growth of IFR operations at our enroute centers. Between 1978 and 1979, we anticipate a 5.7 percent increase. This growth rate will fall to about 3.2 percent growth in 1990. Significantly, general aviation is becoming a much more significant portion of enroute traffic.

The most rapidly growing FAA function is flight services provided by our flight service stations. For example, pilot briefings for general aviation will grow 10.8 percent in 1979.

#### Alternative Forecasts

Besides forecasting baseline "most likely" aviation activity, we also investigate aviation growth under slow growth and high prosperity scenarios. For the slow growth case, energy is the key. It will be scarce, very expensive, and affect all the economic indicators that drive our aviation forecasts. There will



be substantial unemployment, high inflation, and restricted disposable income. Under the impact of deregulation, we foresee a basic restructuring of the air carrier industry.

Conversely, under the high prosperity scenario, technological advances in energy and successful conservation measures will result in a very healthy economy, and just the opposite effect will occur. Regulatory reform in this scenario, will be as effective as its most ardent supporters predicted it would be.

Gross national product will increase to \$1.90 trillion in 1990 in the slow growth case versus a high prosperity increase to \$2.34 trillion. The oil and gas deflator index (100 on a 1977 base) would be 467 under the slow growth scenario versus 328 under the high prosperity scenario.

National aviation activity will be depressed by slow growth. Stagnation will be the outlook for the general aviation field and a critical shortage of capital will occur in the air carrier industry. Absolute growth will lag the baseline forecasts by about 2 years: that is, by 1990, we will only be at our 1988 baseline forecast level.

Under high prosperity and in a healthy economy, we would expect increasing growth in both air carrier and general aviation traffic. The result would be a 2-year acceleration in reaching our 1990 forecast level: that is, we would reach it in 1988.

If slow growth were to occur, implementation of the upgraded third-generation ATC system could be delayed. Under a high-growth scenario, it would be necessary to speed the development of new technology and the addition of facilities to accommodate the very rapid growth in air transportation.

#### **Fluctuating Forecasts**

The FAA issues forecasts on an annual basis, and the year-by-year fluctuations in these forecasts are frustrating both to us and to you. These fluctuations are caused by many things. For example, the forecast for passenger enplanements in 1971 prior to the energy crisis was very high. Directly after the energy crisis, the forecast was lower. The opposite effect occurred in 1977. Prior to the lower fares promoted by the CAB, our 1985 forecast for passenger enplanements was at the lower end of the scale. This year, as a result of what has happened, the forecast has been raised to the higher end of the scale.

The major issue is how to cope with these variations. We have recently awarded a contract to evaluate our forecast performance and to analyze our forecast models. This project will place our historical forecast models on a common basis, put in data from a particular period of time, and evaluate how the forecasts predict as compared to what actually occurred. The objective is to identify errors and to ascertain if they were caused by inadequate data, poor assumptions about the future, or if there was something basically wrong with the structure of the model. This will be a long-term project, and we hope that it will allow us to improve our basic forecasting models and to pinpoint the data required for a realistic forecast.

#### **State and Local Initiative**

In summary, I would like to return to our efforts to increase the participation of state, local, and regional planning authorities in the development of our national aviation forecasts. This initiative began in 1978, and we want to continue this process throughout 1979. Our objective is closer interaction between Headquarters' personnel and planners and forecasters in the field, as well as the implementation of an operating cycle that permits forecasts to influence the planning process on an annual basis. We are labeling this our State and Local Initiative for 1979, and it is what the panelists will be discussing today.

Our morning panel will be chaired by Lynn Jackson, Chief, System Concepts Branch of the FAA. The panelists will discuss those forecasts that are needed for decisions at the state, local, and regional level. I will chair this afternoon's panel of planners who will address the forecasts required for their planning, when they need them, and what they have not gotten.

As Ms. Anderson commented, we are operating under a restrained budget. I can think of a thousand things we could do to improve our forecasting process and develop new data bases. However, we lack the resources. We must establish a priority system that distinguishes between those things that are absolutely essential to the forecasting effort and those things that are just nice to have. In other words, we must get as much out of our limited resources as we possibly can. To help establish our priorities, we have included in your registration packet what we call our forecasting initiative priority feedback. We have listed the various information sources and the special studies we are working on. We want you to tell us whether or not each project is worthwhile, identify different directions we might take, or just include anything we can use to improve the entire forecasting process. If you cannot fill it out and leave it with us today, take it with you and mail it in. I assure you, we will evaluate what you say. We must have your reactions on our present course of action and your guidance for our future efforts.





## State System Forecasting



**Mr. Jim Goff**  
South Carolina  
Aeronautics Commission

Mr. Goff describes a program now underway to modify FAA forecasting models for use by the state of South Carolina. The objective is a real-time, computerized forecasting system that can generate up-to-date forecasts upon command and can be used to allocate available aviation resources among the various state airports and projects.

### Computerizing the State Airport Systems Plan

In January 1978, South Carolina embarked on a program of computerizing its state airport systems plan. The motivating force was the fact that every-time we tried to use our 1974 plan, the information, the forecast, the data base, and everything else was invalid. Initially, we envisioned such a system that anytime anyone came into our office and asked for information about a certain airport in the state, we could provide them with up-to-date data and a current forecast. I went to the FAA and asked them if we could adapt their forecasting models to our computer system in South Carolina. We discovered, as everyone has said today, that the FAA operated on a quarterly and yearly schedule that is different from ours. So we engaged the economic division at the University of South Carolina to adapt the FAA programs to our schedule and needs.

While the FAA is pushing 10-year planning, we want ours to be totally real-time. We have a man inspecting airports throughout South Carolina every day to see what changes are taking place. Any information he comes up with is fed into the computer which can then run a new forecast, perform a demand/capacity analysis, or analyze different environmental factors. We envision being able to do all this in a 10-minute period when the system is ultimately finished. In essence, we would have a state systems plan comprised of many master plans.

### Resource Allocation

In South Carolina, we have a capital improvements plan for which the legislature gave our agency \$1.8 million last year to administer to the different airports throughout the state. In addition, we got \$250,000 from the FAA for general aviation airports in South Carolina. We now have to establish a priority system for allocating that money. We do not administer to the air carrier airports because the FAA has its own priority program in the Southern region. They consult with the different air carrier airports and prioritize projects for them. We are trying to inter-relate all these activities so that our priority system and the FAA's priority system work hand-in-hand. The objective is to have an ultimate system in which we know what is going on at all times.

We tried to use loop detectors in single runways. We found we could not classify the type of aircraft. We know how many operations there are per year, but we could not get a breakdown of the different classes.

### Working with the FAA

We are going to work with the FAA in modifying their forecast models for our needs. We have had 21 master plans, one state system's plan, and three regional plans done in our state since 1970, and we could find nothing that jived throughout the whole thing. In fact, we have a small county down on the coast of South Carolina for which the consultants in the state system's plan recommended a 5,000-foot runway. The county has 16,000 people and they projected it was losing 900 people per year. The county is comprised of 45 percent marshland, and I asked the consultant why a 5,000-foot runway? He said, "You have to understand your state development board has an 11-21 jet, and they have to land there to study industrial sites." I said, "Well, that's real good, but what about the marshland? Where are you going to locate the industry?" So that is part of the problem. Our intention is to go totally computerized and to have an instantaneous response capability for anyone who comes into our office.



## Airport Management



**Mr. Donald J. Poloskey**  
Detroit Metropolitan  
Wayne County Airport

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Mr. Poloskey presents a case study of how the aviation activity of a major airport is influenced by the local economy. These influences are related to the process of forecasting national aviation activity. He finds that national forecasts and local forecasts differ in their projections because of their varying perspectives.

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The Wayne County Road Commission is the operator of two airports. Detroit Metropolitan Wayne County Airport is a large hub airport in the Detroit region. In 1978, the airport will handle approximately 10 million passengers and will record approximately 266,000 aircraft operations. Detroit Metro handles general aviation and air cargo operations, in addition to air carrier traffic.

The Wayne County Road Commission has also recently taken over the operation of Willow Run Airport of World War II fame. Willow Run Airport is classified as a receiver airport, principally serving general aviation and contract air cargo operations. It also is the home base of General Motors and Chrysler Corporation's aircraft fleet. Willow Run is towered and will log approximately 210,000 operations in 1978.

As operator of these two airports, the Road Commission is charged with the responsibility of planning and implementing changes to improve service. In order to plan for the future needs of the airports, the Road Commission currently has a master planning consultant under contract to complete master plans at each airport. These studies are funded under the Planning Grant Program and will determine whether new facilities will be required, and where they should be located, and whether additional land is needed.

The entire master planning process is designed to provide the information required by management so they can make the necessary decisions to meet future demands. Because of the high cost of airfield improvements, the master plan must provide an accurate estimate of future demand at each airport. The key to providing a useful master plan is to have an accurate forecast.

Preliminary forecasts have been prepared by the consultant for both airports. The planning timeframe is the year 2000. Realizing that the accuracy of the forecasts is reduced somewhat beyond the three- to five-year range, the consultant has made predictions based on a number of techniques. He then selects the most likely upper and lower limits and determines a median forecast from this range.

As an example, forecasts of general aviation aircraft were made in the study area using three models:

1. Socioeconomic;
2. Share of the Nation; and
3. Continuation of past trends.

The socioeconomic model was selected as the most reliable in this case because it assumes that future aircraft based at Willow Run and Detroit Metro will be a function of the socioeconomic growth of the study area. These results closely parallel the FAA's projected growth rate for the Great Lakes Region. The total aircraft were then distributed to each airport under study, based on characteristics of the airports within the region and policies of the Board of Road Commissioners.

Five methodologies were used to forecast domestic enplaned passengers at Detroit Metro Airport. The techniques used in the analysis were:

1. Metro passengers, as a percent of forecast total U.S. domestic passengers;
2. Metro passengers per capita in southeast Michigan;
3. Least squares projection;
4. Logarithmic projection; and
5. Annual compound growth rate.

These five projections were plotted at five-year intervals, and the consultant selected the percent of U.S. total methodology and the logarithmic projection as the high and low ranges that would produce the most reasonable forecasts.

Total passengers predicted were expressed in terms of low, high and median ranges recognizing the likelihood that surges and pauses in growth appear from year to year. The forecasts for Metro also reflect stimulation factors due to anticipated service improvements and a liberalized regulatory climate. These forecasts compared favorably to the most recent FAA forecasts for passengers enplaned, although Detroit's forecasts are generally lower than the 1978 FAA forecasts.



Air cargo forecasts at both airports were also derived by utilizing several methodologies. These were:

1. Share of the Nation;
2. U.S. Gross National Product;
3. Motor Vehicle Production Growth Rate, assuming an increase in air cargo weight shipped per vehicle produced;
4. Motor Vehicle Production Growth Rate, assuming a constant weight of air cargo shipped per vehicle produced;
5. FAA's Projected Growth Rate; and
6. FAA's Projected Growth Rate constrained after 1989.

No particular methodology was selected, but it was concluded that the expected range of probable growth of Detroit cargo would average around 4.35 percent annually. This is above the expected gross national product growth of 3.9 percent and below the FAA forecasted national rate of 4.7 percent.

Our master plan studies are entering the demand/capacity phase, and both are expected to be complete in two years. As can be seen by the experience in Detroit, we feel that no single methodology can be used to accurately predict aircraft activity over the long-term with 100 percent assurance. Various types of forecasts are used as a basis of master planning programs at specific sites since they take into account underlying factors that influence local aviation activity.

The FAA forecasts are basically used as network forecasts. Network forecasts are generalized, must cover large geographic areas, and must deal with the total system of airports in the United States and the world. When dealing with site specific forecasts, such as Detroit Metro and Willow Run Airports, we find that the requirements change. Specific airport forecasts have to be tailored to the social and economic characteristics of the area being studied. The FAA forecasts are helpful in identifying trends in aviation.

The FAA forecasting methodology assumes that enplaned cargo in the Detroit area will grow as the Nation grows. We have found in studying historical data that this does not hold true. Detroit cargo is highly automotive-oriented, and drastic fluctuations in cargo shipped have been identified. These fluctuations seem to occur every three years and follow auto union contract negotiations. Much of Detroit's automotive air cargo is the "panic" type that would generally be shipped by another mode of transportation; but because of its urgent need at a distant assembly plant, a decision is often made to ship by air. Much of this cargo is shipped on a very short notice. As you can appreciate, this characteristic of Detroit's air cargo makes it very difficult to predict.

Another assumption of the FAA forecast is that 1977 was a typical year, and projections were made without examining enough of the previous cargo history as well as the future industrial outlook of the Detroit market area. During 1977, cargo tonnages were at record levels, but past history indicates we may have reached a peak and a down cycle will be appearing soon. We must guard against forecasting on an over-optimistic basis when the economy looks good and under-optimistically when the economy looks bad because the forecasts will be distorted. Elimination of peaks and valleys would result in better overall trends and would aid airport management's funding of construction projects. Bond issues are frequently used to provide funds for airport development projects, and poor forecast data would seriously affect cash flow projections which support these bond issues.

The FAA's forecast, as well as the Road Commission's site-specific forecast, indicates that general aviation is anticipated to grow rapidly in the future. It appears that steps should be taken to accommodate general aviation as a system of relievers, such as Willow Run. This policy would free up major hub airspace for air carrier service, as well as increase capacity and safety at these busy airports. Improved funding levels under ADAP would insure that improvements at reliever airports can keep pace with demand.

We at Detroit Metro agree that the 1978 FAA forecasts are improved over past versions. We also believe the FAA is on the right track, and we endorse the efforts to provide regional forecasts and use local data as well as "slow growth" and "high prosperity" growth scenarios. However, it is suggested that the FAA clarify their assumptions as to what relationships deregulation will have on passengers and air fares. It appears deregulation could have some serious effects on aviation in the future. Further refinements in future FAA forecasts will only increase their utility as input to airport master plan studies.

## State Aviation Commissions



**Richard F. Hodgkins**  
Aeronautical Director,  
State of Massachusetts

Mr. Hodgkins describes the forecasting process used in Massachusetts and identifies four major areas in which the FAA could assist state-level forecasting. These include a reliable methodology for generating statewide forecasts, good ways of forecasting activity at individual small airports, a simple means for counting activity at nontowered airports, and methods for getting greater use for existing facilities.

### **The Need for Forecasting**

Forecasting is necessary so that future needs can be assessed. The need for new facilities must be known early enough so that all community, environmental, and design activities can be completed and the facility built when it is needed—and not ten years later. Today in Massachusetts, only a few new facilities are likely to be acceptable politically. The possibility of a new airport being constructed is politically impossible at this particular time and doubly impossible environmentally. So in a way, forecasting is even more crucial to us. Handling increased activity is much harder if you have to do it with existing facilities.

Over the longer 15 to 20-year term, we need only the broadest outlook. Attempting anything more detailed is a waste of time and, probably, a lot of federal funds. We also do not need forecasts derived from various methodologies that prove to be wildly wrong within just a few years. This is the case with many of our master plan forecasts, some of which are wrong by plus or minus 40 percent in 3 to 4 years. However, we do need state-level forecasts of future activity at individual airports. We also need forecasts that can be adjusted as the world changes.

### **The FAA and State Forecasting**

Unquestionably, FAA forecasting has come a tremendously long way in the last few years. I can appreciate what has transpired, and I think a great deal of it has to do with the personalities involved as of late. Quite a lot now is available at the national level to help the Federal Government see the direction in which things are moving. Nevertheless, the forecasts coming out of Washington still have limita-

tions when we look at what actual airport sponsors and state-level decisionmakers need.

The Battelle general aviation model will be a useful tool for generating state-level forecasts. It provides us with a variety of national scenarios that can be shifted upward or downward as a result of local social, political, or economic nuances. However, it presupposes some sort of state numbers for comparison, and it says little or nothing about whether a state should assume a fixed or variable proportion of national activity. If the FAA were to refine this work by developing state-level models, it would be much more useful. Massachusetts has already volunteered itself as a test case for this next step. We always manage to put our foot into it, because, like every other state, we want to do our job correctly.

### **State Level Forecasts for General Aviation**

The Transportation Systems Center has developed a state-level model for general aviation. Unfortunately, it only relates to towered airports. We have 57 public use airports in Massachusetts, and I believe 10 of them have towers. We have airports in the system with over 100,000 operations annually that do not have towers. We have airports that qualify for a tower under criteria established by the Federal Government for 4 or 5 months in the summer, but they do not generate any traffic the rest of the year. We badly need a methodology for estimating current operations at nontowered airports. There is not much use in making forecasts when we do not even know the existing situation. Unfortunately, the FAA tells us this GA model is not suitable for individual airports, only for the statewide level or above.

### **Primary State Forecasting Needs**

We would like three things from the FAA. First, we need either a reliable statewide methodology for forecasting air carrier, commuter, and general aviation activities or we need federally produced numbers with which we can tinker. Secondly, we need 3 or 4 tested methodologies that forecast activity at small airports for input to master plans. Consultants must be saved from consuming their limited budget to reinventing what so far has been a very bumpy wheel. Third, we need a reliable and simple method for estimating activity at nontowered airports. Although doubtful about the estimation technique, we are very excited about the acoustic counting gadget developed by the FAA.

### **The Forecasting Process in Massachusetts**

In the absence of an easily adapted methodology, we are developing state forecasts for each of the 13 regional planning areas in the state. The allocation of activity between the airports within any region is flexible and based on judgment, common sense, and political reality. The allocation of activity between regions can be altered by changing assumptions in the models. Although the state total will always equal the sum of the regions, the models themselves are flexible. They rest on a number of variables such as income, population, gross state product, investment, cost of fuel, and level of service. The first run of numbers assumes that historical trends will continue into the future. Another run will look at the high, medium, and low values for all assumptions. The computer package will be set up to be interactive; that is, one or more assumptions can easily be altered or changed at any time by someone who then gets a new set of numbers. Every time a major development occurs in regulation, the environment, fuel cost, or other event, we can produce a new set of numbers. Over the years, we plan to monitor our favorite forecast versus actual developments so that we can make appropriate changes.

### **Optimizing Airport Facilities**

An essential part of any forecasting process is to look at demand and supply together to determine if forecasted growth can be accommodated. Traditionally, rules of thumb have been employed. From hard numbers and forecasts, we have looked to see if a mismatch between facilities and needs was developing so that we can decide what to build. An alternative means of accommodating forecast activity would be to make better use of existing facilities. We might spread the peaks. Common sense tells us some room for maneuver must exist. We would like to see more quantitative analysis from the FAA that would indicate the capacity that specific airport operating improvements would buy. We may still need to build new airport facilities, but they will probably be less costly, less environmentally threatening, and cheaper to operate. We in Massachusetts can do this on a trial and error basis, but we would like the FAA to help by undertaking more general research.

### **Master Planning**

I believe master plans began coming into play as we know them about 13 or 14 years ago. My first experience with a master plan was at Logan Airport, a very large international airport that was operating at only about 25 percent capacity. We were willing to do anything to increase the revenue of that facility because all the forecasts were for naught. My next

experience with master planning occurred when I was manager at Hyannis, a deceptively busy airport with about 170,000 operations annually. Unfortunately, about 165,000 of these operations were conducted over one weekend in the middle of the summer. I ended up with a document I could not decipher. I had little or no idea what the thing said, and it ended up on the shelf. The only useful portion of that master plan was the airport layout plan. I think this example could probably represent the experience of 95 percent of the airport managers across the country.

The ultimate consumer of your master plan is the airport manager. He is the Chief Executive Officer, and he strongly influences the decisions that will be made. You must tell him exactly what you want, and in terms he can understand. I prefer executive summaries that are clean of all the buzz words.

### **Major Areas of Need**

In Summary, there are four major areas in which we would like FAA help. First, we need a policy sensitive model that generates statewide forecasts for use as a check on our own work. Second, we need several good methodologies for forecasting activity at individual small airports. Third, we need a simple and cheap counting gadget for nontowered airports. Fourth, we need some tested methods for getting more use out of existing facilities.

I both sympathize and envy people in aviation planning. I sympathize because when very expensive international terminals are put up too darn early, you people must bear the criticism. But, I also envy you because you will probably have more positive impact on aviation than any other professional group.



## Regional Transportation Authorities



Mr. I. H. Carr  
Dade County, Florida  
Aviation Department

Mr. Carr first describes the Dade County Airport System and how forecasts are generated for the system. He requests that the FAA include foreign carrier activity in its international aviation forecasts, and that it differentiate between widebody and non-widebody in the fleet mix projections.

Dade County is a system of airports consisting of one air carrier airport and 5 reliever airports, all of which handle in the vicinity of 1, 250,000 operations annually. The largest of these is Miami International, the primary air carrier airport south of Atlanta. It handles about 350,000 operations and between 16 and 17 billion passengers a year. Approximately 75 percent are commercial operations and the remaining are transient general aviation. Approximately 35-40 percent of our commercial operations involve international passengers.

The next airport in our system is the FAA-towered Opa Locka Airport located at the north end of Dade County. Its primary role is to relieve Miami International of general aviation, and it handles about 415,000 operations annually, about half of which are itinerant and the other half local and transit flights. Tamiami, the next airport in our system, is also a tower-controlled general aviation airport. Located in South Dade County, its primary role is to relieve Miami International. Tamiami handles 315,000 operations annually, about 35 percent of which are itinerant operations. The remaining are local and transit. The next airport is Opa Locka West, a nontowered, 2-runway airport in the extreme north end of Dade County. We have no count of annual operations, and its primary function is to provide training and to relieve Opa Locka Airport. Homestead Airport, a 2-runway general aviation airport located in extreme South Dade County, serves the agricultural industry and provides training. In this function, it relieves Tamiami. The sixth airport is the Dade-Collier Transition and Training Airport. It is tower-controlled and has an ILS on its 10,500-foot runway. Located in far west Dade County, it provides commercial and instrument training and relieves Miami International Airport.

### The Dade County Forecasting Process

This system of airports is one of the largest in the country, and it provides unique opportunities for forecasting. Our forecasting needs are these:

- Passengers, including deplaned, enplaned, domestic, and international.
- Number of commercial operations, broken down by domestic and international.
- General aviation operations, in terms of itinerant and local.
- Fleet mix, particularly the commercial fleet.

Our general approach is to develop forecasts using trend-analysis and extrapolation. We then compare results to other forecasts such as those by the FAA and the Florida airport systems forecast. We find that this approach frequently misses in the short-term (0 to 5 years), but it is quite accurate in the long run (5 years and more).

Let me now describe briefly the specific airport forecasts that we undertake. At Miami, we use trend extrapolation based on the historic number of passengers, load factor, and fleet mix. Fleet mix and load factor are obtained from airline intelligence. From this extrapolation, we develop the number of commercial operations anticipated over time. We then constrain Miami International to accommodate commercial growth, while restricting general aviation growth to equal airport capacity. We force general aviation to Opa Locka, Tamiami, and other general aviation airports in Dade County. At Opa Locka and Tamiami, we baseload their forecasts with the general aviation overflow from Miami International Airport, and we use trend analysis and extrapolation to establish total number of anticipated operations. As the forecast approaches capacity, we constrain forecasted growth by providing for itinerant and local and shift training to other relievers where they can be contained. By that, I mean we ship training in our forecast to our other general aviation airports that can support it. We do not worry about capacity at these other airports as we have sufficient capacity. We do not have good historical data from which to project future trends, so we really do not worry about them.

The FAA aviation forecast provides us with a comparison baseline for our growth rate and percent of total national volume. If either our rate of growth or percent of national volume forecast is substantially different from the FAA forecast, we must either justify our own forecast or we must adjust them to be more in accordance with the national forecast. The FAA also forecasts commercial air carrier opera-

tions, but it does not provide a good international/ domestic mix. The FAA forecast also includes air cargo tons, general aviation operations at airports with control towers, commuter operations, and fleet mix. Moreover, it defines the forecast scenario which allows judgments to be made when our forecasts are at variance with the FAA's, and they frequently are.

#### **Comments on the 1978 FAA Forecast Document**

I will now comment on the forecast document from my own personal viewpoint. I have no argument with the FAA's basic approach and the fact that the FAA forecasts on an aggregate basis. But I do wish the FAA would include foreign carriers in their international activity forecasts. We anticipate an increase in international passengers at Miami International from our present 35 percent of total operations to 50 percent by the year 2000. Consequently, the international activity forecast is important to us. We also desire that the FAA differentiate between the widebody aircraft and between widebody and non-widebody aircraft in the fleet mix projections. This is because the aircraft body width is a key to terminal apron design. Our gates must accommodate a fleet having a growing percentage of wide bodies, and we must have insight into how this growth will occur.

I personally feel that the slow-growth scenario for the national economy will evolve rather than the baseline. However, DCAD reflects, in fact, a higher growth than the FAA baseline. Another comment, Appendix C in the FAA forecast document concerns seasonal forecasting models. Such forecasts are beneficial to a regional authority. It provides a basis of comparison for our assumption and for our projected growth rates. In total, we conclude that the FAA aviation forecast document is useful.



#### **Concluding Remarks**

Let me conclude by telling a story that I read in a magazine recently. I think it is germane to what we are talking about. The story is about a subject who appeared before the king in medieval times. In this appearance, the subject fell into extreme disfavor and the king told his people to take the man out and behead him. The subject said, "Well, your majesty, it is indeed unfortunate that you would pick this particular time to have me beheaded. It just so happens I am at a breakthrough point in teaching my donkey to talk." The king was intrigued by the fact the man was teaching a donkey to talk, and the subject said, "Your majesty, if you will give me another year, I'll come back at that time and my donkey will plead my case." The king was so taken with this talk that he gave the man a year. As they stepped outside, his friends said, "Why in the world did you do that? You know you can't teach a donkey how to talk." The subject said, "Well, that is true, but in a year the donkey may be dead, or I may be dead, or the king may be dead, or there may be a revolution. It is better for me to have a year to consider those things than it is for me to terminate things right now." I think this, in a sense is forecasting. Forecasting is at best an uncertain science, and we should always remember that. And although a number of things can happen that will make our forecasting wrong, it at least gives us the opportunity to intelligently consider the future.



## Federal Government



**Mr. Hal Becker**  
The Futures Group,  
Incorporated

Mr. Becker stresses the limitations of current aviation forecasting techniques because of their inability to accommodate potential major events which have no historical precedent. He feels such events will be important in the future, and that their impact on aviation will be substantial. He advocates analysis of "what if" events to pinpoint their potential impact on aviation should these events take place.

The "outreach" program instituted by the FAA to obtain viewpoints from local or field personnel as input to its forecasting programs (described earlier this morning by Ms. Anderson) is indeed a worthwhile endeavor. Historically, the forecaster, more often than not, sat detached in his ivory tower and largely ignored the real world. The current FAA approach to obtaining insights from persons involved with real world problems of the National Aviation System (NAS), can only benefit the forecasting which the FAA is accomplishing.

Indeed, you have heard a great deal this morning about making forecasts based upon economic and demographic patterns. Unfortunately, forecasts based solely upon historic precedent seem to be proving increasingly wrong. You heard this morning that forecasts have in the past usually been 40, 60, and in some cases, 100 percent wrong. We also have heard that demand will grow as the Nation grows. But, the United States grows in many ways that can create different and sometimes conflicting pressures on the demand for air travel and on the NAS. In other words, the United States does not grow unilaterally. It grows or changes legislatively, technologically, and indeed in terms of social values. And these various forces for change are not always consistent.

### Limitations of Current Forecasts

In that regard, I find myself somewhat frustrated when I hear us talking of "forecasts," since that terminology connotes that the data presented (or asked for) depicts what the future will be. If we have learned one thing in recent years, it seems that we are faced increasingly with uncertainty and with developments that have little or no connection to the past — and which can importantly change historic trends. Discussions we have heard this morning include descriptions of upper and lower limits being applied to forecasts in an attempt to come to grips with uncertainty. The question I would like to address is whether our present techniques can adequately forecast — especially in light of the unprecedented events that may take place. For example, if we had used the same techniques several years ago that we currently are employing, would they have predicted such an event as the OPEC oil embargo? That event was largely unprecedented until that time. Can the techniques that we are using adequately forecast and then predict the impact of a prolonged strike in a major industry such as the railroad industry or a major strike in the electric or other public utilities. Clearly, both of these eventualities could have significant effects on demand for air travel — and many in our society believe that they are situations with which the United States is likely to be faced in the foreseeable future. What about the impact of a California Proposition 13 propagating throughout the country — the so-called consumer tax revolt? When it happened in California, it was referred to as a surprise — it was called an unprecedented occurrence. But, the signals were clearly there and those who consciously attempt to seek out and benefit in forecasting from spotlighting the possibilities of such unprecedented possibilities were not surprised. Indeed, I know of many who were talking of such a situation in California even before it was entered on the ballot.

What about the implications of terrorism in terms of its impact on the National Aviation System? Technology has advanced to the point where people now have the ability to bring down a large aircraft with very small hand-held weapons without being detected. Indeed, such a possibility is no longer idle speculation. As I recall it, threats to destroy a large commercial aircraft upon either takeoff or landing already have been made by terrorist groups at one of the European airports.

How many of the forecasting techniques and the resulting forecasts with which we are working today predicted, or can adequately place in perspective, the implications of the devaluation of the U.S. dollar? There already has been an enormous impact on foreign travel to this country as a result of the dollar's devaluation. I'm not complaining about that; I think it is absolutely super. Maybe some of the gold will come back to the United States. But how many of our projections are considering the implications of that event?

It seems our forecasts almost always ignore or cannot accommodate these kinds of eventualities. Forecasts largely depict the future in terms of smooth, continuous trends or curves. They typically do not show or include variations in our institutions. Most of the forecasting techniques we use — even in depicting alternative scenarios — show variations on a theme. They largely depict perturbations on the same basic socioeconomic institution that currently exists. In other words, the forecasts are predicated on no basic change in institutions, legislation, tax laws, and now the social values of people. But change has occurred and will continue to occur in all those areas.

#### **The Need for a "What If List?"**

We must seek and use ways of depicting future possibilities or forecasts that embody important — and possible — institutional interruptions and changes. In other words, we need to become more proficient in using alternative scenarios in planning and policy analysis that are based upon other than just extrapolations of historic trends. I believe the FAA should maintain a "What If" list, that is, a list of future possibilities that could be different from past events and that could, if they occurred, be important to the future of air travel in the United States. The "What If" list should cover demographics, economics, legislation, politics, social values and attitudes, technologies, etc. For example, the post-World-War II baby-boom children have now largely moved into young adulthood. The percentage of the population between 25 and 44 will increase enormously in the 1980s, and the implication for changes in the dependency rate and unemployment is large for the coming decade. These changes forbode significant effects on demand for air travel in the United States.

But, in generating such lists, there seems to be a human tendency to avoid eventualities that could be, or which often are viewed as being, damaging. If someone were to walk through the door and say, "Wow, California is going to have an earthquake and half of it is going to slide into the ocean," we generally would discount such an input. But, what are we going to do with our airports and that portion of the National Aviation System out there if California does have a major earthquake, a possibility many say is highly likely in the next few years? Typically, we do not seem to be able to assimilate such possibilities as they are threatening to us, so we turn our back on them. But more often than we would like, undesirable possibilities come to pass.

I propose that we define these "What ifs," and ask about their potential impact on our institutions. In other words, let's generate possibilities that could be important in a positive or negative sense and then assess them in terms of their likely impact on the aviation system. If the impact is large and could importantly change our forecast and if the "What If" event is reasonably likely, then we should step back and ask how we can deal with it. But to do that really requires a way of thinking that can allow us to break away from the historic way of forecasting, a way which has its roots in deterministic thinking. Clearly it seems appropriate to now consider forecasting approaches that are grounded in probabilistic ways of thinking of the future, and which are directed at minimizing surprises for those involved in designing and selecting policy for us.



## National Economic Forecasts and Their Impact on the Outlook for Aviation



**Dr. Lawrence R. Klein**  
Econometric Forecasting  
Associates, Inc.  
Luncheon Speaker

Dr. Klein presents an overview on the process of economic forecasting. He comments favorably on the FAA practice of providing alternative scenarios in its forecasts. The implications for industry and the economy in general of the alternative Wharton forecasts are discussed in relation to Dr. Allan Greenspan's most optimistic predictions. He closes by demonstrating the impact policy can have on the future and therefore current forecasts.

Today we will be discussing the forecasts for the next decade, what might be called the medium-term economic environment, and I thought it might be useful if I developed the rationale and interpretations, from my own point of view about what that environment is. I'm not going to have too much to say about transportation as such, but what I do want to try to do is to set that particular sector of the economy in the overall economic perspective. There are two ways at looking at the future, (there are probably more than two), but I want to emphasize two in this presentation. One deals with the immediate problems, the problems of 1978, 1979 and 1980. And then there is the problem of the decade of the 80's; indeed, the document to which I shall refer is mainly based on the long-run development of the 1980's. In a growth industry, that certainly is the one that we will want to look at. However, our long-run perspective evolves from our short-term perspectives, and that's the way we actually use our models. We maintain a short-term business cycle model on very fine grained analysis of the economy, quarter-by-quarter, and put that back-to-back with an annual model that stretches out for a decade. Although I want to emphasize the decade of the 1980's, there

are many occasions where we have projected to the year 2000 or beyond, to take a look at the longer-term developments, not so much for your industry as for a related industry, namely energy. Most of the energy problems are longer-run problems.

Now, for the next couple of years the working forecast is one that I would call a somewhat optimistic stance when we put it up against the perspectives of other forecasts. This is not a booming economy, in any sense, but we (Wharton) are at the high end of the forecast range. Our forecast for 1978, the year we are just completing is, looking at the figures year over year, about 3.8 or 3.9 percent in overall growth rate. There is a heating up of inflation this year to a figure between 7 and 8 percent. We have seen the unemployment rate come down to about 6 percent, and we expect it to hold in that general range. We expect the inflation rate to be pressing above 7 percent unless we get a very very strong anti-inflation program, which might lead us to bring down our estimates of price increase. Our projection for next year's growth is for a reduction to about 3.4-3.5 percent. That's at the higher end of the range; most other forecasters are at 2 percent or below. In addition, we have a rather slow forecast for 1980, around 2 percent, and we reach 2 percent only by introducing, on our own initiative, another assumed fiscal injection in 1980. The Administration has brought down the unemployment rate about 2 percent in this country, from about 8 percent to about 6 percent, and we've said all along although one should attack both problems simultaneously — the unemployment problem and the inflation problem — the principal interest in the last two years has been the unemployment problem. Given that it was more or less, either/or, a single-minded approach, there isn't any doubt at all that the focus of attention has to be on the inflation rate during the next year or two. The trick is to bring down the inflation rate while not losing any ground on the unemployment problem and that, of course, is what the President's speech tonight is all about. Given that this Administration has taken a position, quite correctly, I believe, that you don't fight inflation with unemployment, there must be some other way of doing it. We are certainly getting a lot of advice to do it that way — i.e., to fight it with unemployment — but I think that would be a disaster if it were to occur. The principal moves that are being taken at this time on the anti-inflation front are to try other techniques, other approaches that attempt to hold the gains on unemployment. Another gain that has been realized so far is a reduction in the budget deficit. This has been a direct objective of the Administration and they feel rightly proud of the fact that the deficit has come down from about \$60 billion to about \$40 billion. The projection is to get to about \$30 billion next year. That is not the final objective, but the policy must be to hold the line on that as well as the unemployment rate in order to deal with the inflation problem.

When we make longer-term projections, let's say for a decade, what we do is to tune our long-term model, so that on a year-by-year basis, it follows the same annual pattern of the quarterly model. We have the same kind of business cycle interpretation as the short-run model; so our projection for the 1980's is based on a slowing economy in the next two years, with an underlying rate of inflation of about 7 percent, one that doesn't show any signs of correcting itself, except moderately in 1981. The unemployment rate holds firm, and from that point on (1981) we try to build our longer-range projection. We have a very definite point of view, one we've held for a long time, and you might want to question it at the end of this presentation, namely, that in the next decade, the United States is going to drop from basically a 4 percent economy, all around, to a 3 percent economy on growth, with some slippage in the opposite direction on unemployment and inflation. That is to say, since the end of World War II, the average growth rate of the American economy has been about 4 percent, and we have generally accepted in that period a 4 percent unemployment rate as a full employment rate, we have also generally accepted about a 4 percent inflation rate as a pretty good performance. There was a time when we looked at even lower rates, but we'd give our right arm now for 4 percent. Before 1973, we could take our long-term model and find a set of policy inputs from the side of fiscal, monetary, and commercial trade policy that would put us on the 4 percent projection, with 4 percent unemployment, 4 percent inflation, and 4 percent growth rate. After 1973, our experience has been that if we try to drive the economy toward that kind of growth trend, we generate a high rate of inflation and trade deficit. On the other hand, if we relax a bit on the growth rate, we settle for a second-best position of about 3 percent growth (down from 4), and about 5 percent inflation in the longer run. Of course, 5 percent would look good today, but we are talking about 5 percent during the 1980's and about 5 percent unemployment. Associated with that unemployment rate is the idea that the labor force is slowing down significantly because of the demographic structure. Particularly in the 1980's, a slower rate of growth in the labor force makes a lower rate of unemployment more attainable. The picture of America's growing somewhat more slowly and somewhat less performance-oriented, as far as inflation and unemployment are concerned, is not unlike the picture that is being painted for Western Europe

and in a certain respect for Japan. These are our major partner countries among the industrial nations. The European rate is downgraded by about the same amount as the U.S. rate; that is, the European perspective of the 80's is based on about 3 percent growth; the Japanese rate has fallen from about 10 percent to 6 percent, and these are more or less accepted in planning circles as the numbers that people are quite prepared to deal with. It may seem that is a rather small thing to go from 4 percent to 3 percent, but by the laws of compound interest, in 20 years that amounts to quite a bit. It isn't only the energy problem, the high price of energy or the relative shortage of energy that is causing this decline, it is also a question of what we call the initial conditions. That is to say, the tax system that we have today, the system of government expenditures, our position in productivity, all the other things that we enter into the 80's with, together with the energy and food situation, contribute to this picture of more moderate growth, a little more inflation, and the giving up of some of our other long-term goals such as those for unemployment. Now in this kind of picture, one of the principal areas of deterioration in the economy has been in productivity. Productivity has fallen from a growth rate that was associated with the old Kennedy guidelines of 3 percent down to numbers that are now about 1 or 1½ percent per year. This is a near disaster. That's one of the principal reasons why we are having inflation problems, and unless we pay some attention to raising productivity in the United States, as well as in other countries of the world, we are in for some trouble.

It is quite interesting in this respect to look at the kind of growth pictures that are painted for the aviation industry. Historically, it has grown faster than the national average. As we make our projection from the longer-term model into the future, we find that we get a higher growth rate for the transport sector, including the aviation sector, than for the economy as a whole. We get a higher rate of fixed capital formation in the aviation industry than in the economy as a whole.

In my opinion, the only way we are going to deal with inflation if you add to the measures that the President is going to speak about tonight is, through a higher rate of capital formation, one that leads to a higher rate of capital formation, one that leads to a higher rate of productivity. By and large, in our economy, you can count, more or less, on the relationship that says that the rate of change in prices equals the rate of change of wages minus rate of change of productivity. With a given pushfulness on the labor side, facing up to the collective bargaining agreements that are coming due in the next couple of years, the only way we are going to hold down the rate of price increase is to get a strong rate of growth of productivity. In the short run, measures are going to be introduced, I am sure, to deal with

wages. But in the long run, we must assume that the rate of growth of wages more or less follows accepted growth in the standard of living, and we have to have bursts of productivity from time to time in order to hold down the rate of growth of prices. We could not afford the kind of wage increases that are bound to arise unless we increase productivity.

Now, what are the alternatives for faster or slower growth? We've become used to in the last couple of years to looking at the scenario in which we and our partner countries come to a slower growth rate and settle, in some sense, for less. In the last couple of weeks I've become interested in a proposition that has been put forward by no other than Alan Greenspan. I call this the Greenspan hypothesis, an optimistic scenario. It provides another way of looking at the next decade. Alan Greenspan says that maybe we have downplayed the rate of growth of capital formation. Maybe the world, and in particular the United States, is in for a very strong burst of capital expansion in high technology that is not unlike the kind of expansion that we had in the 1950's and the 1960's. There is a political element in that argument because underlying it is the assumption that lower taxes could raise the rate of return of capital and get capital expanding fast enough to produce this optimistic growth scenario. The interesting thing is to ask ourselves whether there is a basis for capital expansion, whether there is a basis for a high scenario. I noticed in the forecast that the FAA handed out, in addition to the baseline scenario, in the back of the document there is a high case and a low case. This would be very standard forecast practice to give some boundaries to the central position. But there is not enough content in that kind of presentation, for my tastes, to say why we might expect the high scenario. What might give more rise to more optimism about the future?

It is my opinion that the anti-inflation programs ought to come in two phases. I guess it probably will. There ought to be a phase that deals with things that can be done this month, next month, and the next few months setting guidelines, and imposing sanctions, dealing with the regulatory process, and breaking some restrictive practices. All of these are largely techniques that are not associated with fresh legislation. But in the longer run, we are not going to deal effectively with inflation unless we increase productivity and unless we increase capital formation. To increase capital formation, I would say that first we ought to encourage more R&D; we ought to increase more energy related investment; and we ought to encourage more legislative action so that we can shift the proportions in this country from a present relatively high fraction of the GNP devoted to consumption to a somewhat higher fraction devoted to capital formation.

The twist of mix between investment and consumption in the GNP could be approached in various ways. Probably the best way to twist the mix in our fiscal policy is our tax policy; toward tax rules that are more in favor of capital formation. The issue is to make the tax climate more receptive to business investment than to consumer spending. It may seem in some sense an anti-consumer point of view, but it really is being suggested in order to produce more for the future. In order to produce more for the future — thinking of the decade of the 1980's — we are probably going to have to make some immediate sacrifices. It is not a real sacrifice, but we must have somewhat slower consumer growth in the next few years and somewhat more capital growth. By that I mean, we should raise the share of investment in the GNP by 1 percent or 2 percent and lower the share of consumption. Correspondingly, we wouldn't be moving toward poverty, but we would be moving toward a much stronger capital base for the high growth scenario of the 1980's.

By running through alternative Wharton model calculations, particularly the same model that was used as the baseline for the FAA forecast, we discovered that by shifting to a 20 percent investment tax credit from a 10 percent tax credit, the projections added about 25 or 30 base points to the overall growth rate, took about 20 or 30 base points from the unemployment rate and added about 40 to the rate of growth of productivity. Those are our very encouraging moves, and we looked at it through the point of view of offering only one policy, simply the investment tax credit. We could have many more possibilities such as accelerated depreciation, spreading the investment tax credit to facilities as well as equipment, and having a differential investment tax credit among key industries as compared with industries that don't figure so importantly in the expansion of the economy and the increase of productivity. I would say, given the proper policy initiatives and given the sort of imagination about what kind of policy would promote growth in this country, what I would call the Greenspan hypothesis, is capable of being realized. It is capable of being realized as the basis of the high growth scenario and this would, a bit further in time, get us back to the old 4 percent economy. I don't think we should write off that possibility. This is not asking for wild growth or outlandish growth, but is asking for some kind of reasonable policy to help us return to where we have been.

In order to carry this out, we would have to do much more on the side of energy; that is to say, the energy bill that was passed last week should be only the first step. There would have to be a good deal more in the way of increasing supply and cutting back on use (a push for conservation) of energy in order to make this a viable projection.

The primary reason why we slipped in the longer-term growth rate can be traced to lack of availability of energy on a scale which we thought was usable in the 50's and 60's, with the very cheap prices of energy that prevailed in that particular period.



## Counting Activity at Nontowered Airports



**Ms. Marjorie Sorensen**  
Century West Engineering  
Corporation

Ms. Sorensen presents an audio counter device being developed to record aviation activity at nontowered airports. She first describes the concept and operation of the device, and then presents test results from an on-going evaluation program. Throughout her presentation, Ms. Sorensen emphasizes the great promise of the audio counter for inexpensively generating reliable operational data at nontowered airports.

I was particularly interested in a statement made this morning by Mr. Carr of the Florida Aviation Division about the cargo forecaster who got so confused when he was validating his forecasts as to be unsure whether his forecast was accurate or the actual cargo count was accurate. That is an absurd thing, and yet those of us who deal in the forecasting of nontowered airport activity are in exactly that position. We make our forecasts and then we have to compare them with what are really guestimates. Every day we are faced with the problem of determining if our forecast is accurate or inaccurate or if somebody's guestimate is accurate or inaccurate. Because of this, we and the State of Oregon came up with a fairly long list of data required for adequate forecasting, and top on this list was operations data for nontowered airports by type of aircraft. However, attaining such data on a daily, hourly, or monthly basis is very difficult.

So with that in mind, about 2½ to 3 years ago we went to a small company in Oregon called RENS Manufacturing. This company manufactures metal-detecting devices for the wood products and food processing industries, and also has about a thousand weapons-detection units at various air carrier airports. We discussed with them the problem of determining activity levels at nontowered airports. They put this problem on the back burner, and worked on it whenever they were not busy.

### Audio Counter for Operations at Nontowered Airports

RENS has come up with a very simple and relatively inexpensive device that records aircraft activity automatically. We are testing the device at three general aviation airports in Oregon: One is a very low activity airport on the coast; another is a medium activity airport; and the third is a high activity airport. Our contract is to operate these counters for one year; to come up with a final methodology that will provide annualized operations without having to operate the counter over the full year; to compare the results with the nontower airport forecasting approach now recommended by the FAA; and to troubleshoot the equipment itself for proposed changes. We are now about three months into this process. The first counter was put up in July, and we are very pleased with the results thus far.

The counter is contained in a Samsonite briefcase, and it operates on two 12-volt batteries. There is a circuitry system, the only proprietary portion of this equipment, and a tape recorder. The only other component is a regular microphone that has to be set up somewhere near the runway.

#### Operation of the Audio Counter

The counter can be placed anywhere, depending on how long a cord you want to deal with. We usually set it up near the windsock, which is usually on the non-taxiway side of the runway, with the microphone about 50 to 100 feet from the center of the runway. The sensitivity of the counter is adjusted to respond to the takeoff noise from the quietest aircraft operating from that airport. For us, it is usually the Cessna 150. There are decibel measurement mechanisms to help set this. We usually had the fixed base operator (FBO) run some aircraft touch-and-gos to find out just where to set the sensitivity. When set properly, the counter will not pick up taxiing aircraft, overflights, or anything else except takeoff of aircraft from the runway.

When an aircraft begins its liftoff, usually at or close to max power, the count mechanism is triggered as is the tape recorder. You get a 4-second recording of the actual takeoff, and you can hear the doppler effect as the sound of the aircraft fades into the distance. The tape recorder then closes off for a period of 15 seconds during which time it cannot be activated. Otherwise, it might pick up a slow, noisy aircraft twice. The tape recorder is of great value because it identifies things you do not want triggering the counter; for example, a barking dog or

a siren. The tape recorder can be run to make sure that all the counts are triggered by aircraft and not some extraneous noise. The tape recorder is a typical commercial recorder. We use 90-minute tapes; however, you could use longer tapes at busy airports.

The busiest airport at which we are testing the counter is the Bend Airport. It has 110 based aircraft. Using the nontower method of estimation that the FAA recommends, we estimated about 80,000 operations a year in our recently completed master plan. However, after almost 3 months of using the audio counter and accounting for the fact that most was during peak season, we have come up with an estimate of about 130,000 operations annually.

I am now going to run the tape to give you an idea of what we hear when we check back to see if aircraft were triggering the counter. A trained ear can readily discern a single engine from a twin engine, a jet, or a helicopter. You may not be able to differentiate between a light twin and a heavier twin, but I have been told that a person who works with aircraft engines could probably do that. So, you not only get total operations, but generally the type of aircraft as well.

The tape also has a time signal. Every 24 hours there is a tone that activates the tape recorder. The person puts in the tape, indicates the airport, date, time of day, and that sort of thing so you can actually determine your daily counts from the 24-hour chime. For special applications, the time tone can be calibrated for 1-hour intervals. We are going to change to an hourly tone at Bend Airport next summer so peak-hour activity can be analyzed. One thing I neglected to mention is that jets will activate the counter both on takeoff and landing. That is not a problem, however, because when the recorder is monitored these can be backed out of the count.

### Remaining Problems

I will spend a minute or two on some of the problems we have encountered thus far. One is wind gusts. The counter made Portland's news one day by recording that Florence was the busiest airport in the state with 3,000 daily operations because wind gusts activated the counter. Our company in Creswell came up with a typically simple way to solve that. They took one of those bank deposit bags, the kind with the little metal tips on the end, and pulled it tight over the microphone. It probably costs nothing, and it solved the problem.

The other problem is going to take a little longer to solve. The batteries wear out too soon at busy airports. At an airport that has over 100,000 operations a year, the batteries need replacement every two weeks or so and that is both expensive and time consuming. The manufacturer is looking for an easy way to run the counter off runway lights or have it operated remotely from the FBO's office.

### Conclusion

We feel the audio counter is a new and exciting way of finding out what is happening at the non-towered airports of this country. It is expected to cost in the neighborhood of \$1,000 to \$1,500, depending upon the number of orders.



## Aviaton Master Plans and Forecasting



**Mr. Don Cress**  
Cress, Bandy and  
Associates, Inc.

Mr. Cress presents a consultant's view of aviation forecasting, particularly as it relates to airport master plans. He feels that accurate forecasts can be generated using locally derived economic and demographic data. While applauding the FAA initiative to improve the data base of general aviation, Mr. Cress warns that perhaps the forecast effort is consuming too great a portion of planning resources at the expense of such other aspects of planning as the analysis of alternatives.

At the risk of alienating my friends in the FAA, I must say that, for the most part, the FAA forecasting activities are certainly necessary, but just not very useful. Remember, I say that from the perspective of an airport master planning consultant. On a national basis, forecasts of such aviation activities as air carrier revenue passenger-miles, air cargo revenue ton-miles, total national aircraft operations, of general aviation hours flown may be of value to an agency in Washington, but for someone producing master plan forecasts, they are a waste of time. We do, however, use some of the forecasts, such as air carrier passenger enplanements, cargo tonnage, and the general aviation fleet, to prepare share-of-the-market forecasts for master plans or system plans.

### **Terminal Area Forecasts Provide Questionable Baseline**

Another FAA forecast document we use is the Terminal Area Forecasts (TAFs). We use TAFs as a baseline forecast for comparison with the master plan forecast we develop. In most cases, I would rather not have to make the comparison because we rarely agree completely, and it requires greater explanation from us as to why our forecast does not match that of the FAA. The fact that the TAF is an adjusted "top down" forecast that is developed from national data, while our effort is a "bottom up" forecast using locally acceptable data, is one of the things that must be explained to the concerned client. Since we cannot use the TAF for master plan

development except for comparison, I sometimes wish you did not even produce them. Even when our work tends to agree with the TAF, it does not assure agreement on the part of the client.

### **Timeframe Inconsistency with TAF**

Another issue that requires explanation is the inconsistency of the planning horizon. The TAF is being produced for a 12-year span of time, but the planning grant program requires us to produce 20-year forecasts. This means if we attempt to develop share-of-the-market forecasts, we must judgmentally extend the FAA forecasts another eight years or make our own national forecasts. It seems that since the FAA both produces and requires such forecasts, similar timeframes should be used.

### **TAFs Prepared for Few Airports**

The biggest limitation, however, is the TAFs are produced for only about 30 to 40 percent of the public airports that must be planned. Since there are over 3,100 publicly owned airports in the National Airport System Plan (NASP), about 500 to 600 master plans must be prepared annually. Of the 905 airports for which TAFs are prepared, some 200 to 250 are likely to be planned annually. This leaves another 200 to 250 airports for which there are no TAFs. The master plans for these airports must be produced without the benefit of any FAA forecasting assistance.

### **Problems of Incomplete Data Base**

As we all know, the quality of a forecast is only as good as the data input, and the most difficult aspect of work is the lack of a complete or consistent data base. Because of this, I am heartened that one of the FAA initiatives is to continue sponsoring research projects directed at improving data base deficiencies for general aviation forecasting. Since solid operations data is available only from towered airports, there are a large number of airports with reasonably high activity that must be estimated. That fact makes the utility and value of an instrument like Marjorie Sorenson's sound-activated counting device most substantial.



### **Forecasting Not a Precise Science**

These efforts to improve data base deficiencies should improve our forecasting accuracy. But, we must remember that forecasting is not a precise science. It is, at best, an educated guessing game. I am sure if any of us really felt capable of predicting the future, we would be at the race track or in some other business where we could make more money than we do in aviation consulting. One problem we have had in the past has been the client's preception that forecasts are a precise estimate of the demand that will occur. We have done such a good job of selling the client on our ability to produce accurate forecasts that he refuses to believe they can vary within some reasonable bounds. I am encouraged that the FAA has recognized this problem and has indicated that the demand projected in this year's forecasts could vary if the country experiences the conditions described in either their "High Prosperity Scenario" or their "Slow Growth Scenario." This provides us with some ammunition to argue that forecasts can vary depending on a lot of circumstances.

### **Forecasting is Not the Solution**

It really comes down to the realization that the forecasting exercise is not the solution everyone is seeking, but just one step in the series of tasks called the planning process. It may be heresy to mention that possibility at a forecasting conference, but let us be realistic. The client wants planning advice, and the forecasting effort is one of many tasks



in the process that enables us to reach a conclusion and make the required recommendation. Granted, the forecast scopes the magnitude of the development and deserves our very best efforts, but it should not dominate the study process. I am sorry to say we have almost allowed this to happen in many cases. Over the last 10 years or so, I have prepared or been responsible for the preparation of forecasts for over 25 airport master plans, ranging in size from Dallas-Fort Worth to a general aviation airport with 4 or 5 based aircraft. In the same period, we have prepared forecasts for a dozen aviation system plans, each containing individual airport forecasts for as few as 15 to as many as 130 airports. In all that work, the importance of the forecast effort has been increasingly emphasized to the point where it now dominates the whole planning process. In probably three-fourths of those planning assignments, the forecasting budget was exceeded. When it comes to making forecasts, we seem to have become intimidated by either the public, or the client, or the FAA, or all of the above, and we have compensated by "over-killing" the forecast effort. This, in itself, would not be that undesirable except we are working on a fixed-priced contract, and if the project is to come in on budget, we have to "short shift" the alternatives analysis and the development of recommendations. I think that is a serious mistake.

### **Forecasting Overemphasized**

As consultants, I think we have lost sight of the magnitude of the over-all planning process and the relative effort that must be placed on each part of the process. When we allow our zealous effort to "prepare the ultimately defensible forecast," that is, to change the relative importance of tasks in the planning process, we have blown it. I contend that the forecasting effort should be tailored to the complexity of the problem. I recall very few instances when the FAA has been critical of the forecasts that we have developed. Probably, the reason is that we did not simply tell the client and the FAA what time it was, so to speak, but we also told them how the watch was made, and we did it at our expense. The bottom line is that we, as consultants, need to be realistic about the value of forecasts and to place sufficient emphasis on their development, but not so much that we short-change the rest of the planning process.

### **Summary**

In summary, I feel the FAA is becoming more sensitive to the needs of the industry and is reflecting this in their 1979 forecast initiatives. The fact remains, however, the FAA will never be able to produce all the forecasts needed in day-to-day aviation planning and, in fact, should not be expected to. The forecasts required for day-to-day airport master planning and aviation system planning will always have to be developed on an individual basis and usually by a consultant. We need to improve our approach to aviation forecasting by recognizing the flexibility required and by understanding the relative value of the forecast to the planning process.

## State Transportation Department



Messrs. Harry Wolfe and Terry Johnson  
Arizona Department of Transportation

Mr. Wolfe presents the population-ratio approach used in forecasting aviation activity at Arizona airports. He asserts that the need for better data on based aircraft and operations at nontowered airports is far greater than the need for sophisticated forecasting techniques in low population density states like Arizona. Also strongly advocated is the involvement of local officials in the forecasting process.

I plan to discuss the role of forecasts in the aviation planning process, describe the methodology used in deriving forecasts for the Arizona State Airport System Plan (SASP), and express the nature of local involvement in the state forecasting process. The necessity of maintaining a proper perspective on forecasting will be stressed throughout this analysis. One often becomes so immersed in methodological questions that the ultimate purpose and use of forecasts are overlooked. This is particularly important in an essentially rural state like Arizona where capacity problems outside the Phoenix and Tucson metropolitan areas are not major. Arizona has a number of unique characteristics which contribute to high aircraft ownership rates and high levels of operations per based aircraft, each of which has important implications for forecasting:

- Favorable climate makes general aviation a usable and reliable form of transportation.
- Aircraft are intensely utilized by Arizona agriculture.
- The state has a large area not easily accessible by modes of transportation other than air.

Another unique feature of Arizona is its very rapid growth rate. The population of Arizona is expected to nearly double between now and the year 2000.

### The Role of Aviation Forecasts in the Planning Process

Aviation activity forecasts are one of the criteria used in defining a primary system of airports in the State Airport System Plan. These airports are the most important and most heavily utilized, and are the focal point for state investment. Airports are included on the primary system if they meet any one of the following criteria:

- Ten or more based aircraft and/or 2,000 yearly operations
- Air carrier service
- Commuter air service on a regular basis
- Projected to meet these criteria within 10 years

The application of these criteria has resulted in a system of 56 airports, seven of which are privately owned. Three other airports were added to serve remote areas. The last criteria underscores the importance of reliable airport forecasts even at non-metropolitan airports. Five airports have been forecasted to exceed the operations and/or based aircraft threshold necessary to gain entry into the primary system. This has important implications since inclusion of the primary system means an airport should be developed to higher standards, and more funds will be allocated for that purpose. Forecasts are also needed to identify airport capacity requirements. In non-metropolitan areas, where activity is generally quite low, forecasts of based aircraft and aircraft operations are used to help determine needs for apron expansions and new taxiways. In the Phoenix and Tucson metropolitan areas, forecasts are used not only to assist in these determinations, but also to ascertain the need for new runways and airports. However, in the metropolitan areas, the specific airports which are expanded are those where it is economically feasible and politically and environmentally acceptable, not necessarily where forecasted growth is the greatest.

Finally, forecasts are needed for other miscellaneous reasons; for example, to identify potential environmental problems arising from increased aviation activity, to determine where the installation of navigation aids will be cost effective, to anticipate possible airspace congestion problems, and to support other ongoing planning activities.

### Forecast Methodology

General aviation based aircraft and operations, military operations, and selected air carrier characteristics were forecasted in the SASP. I will focus on the method used for forecasting general aviation aircraft based at individual airports. This forecasting process consists of:

- Collecting the necessary 1977 base year data
- Projecting base year data to the year 2000 for population growth and rising per capita aircraft ownership
- Making adjustments for airports in metropolitan areas



Aircraft counts for individual airports were largely obtained by contacting airport operators. The number of active aircraft based in each county was derived from available FAA data. Discrepancies between these data sources were apparent. For example, in one Arizona county, FAA data identified 25 based aircraft, while local information from three airports in the same county identified a total of 61 aircraft. Inaccurate base year data are a major problem and were one of the primary reasons for differences between airport master plans and the SASP forecasts.

Problems in obtaining reliable small-area aircraft counts stem to a large extent from definitional problems and efforts to avoid Arizona's tax on aircraft. To avoid double counting, Federal and state counts are for permanently based aircraft. Airport operators, however, frequently include some temporary aircraft, especially in vacation, recreation, and construction areas. There are also problems in excluding balloons, gliders, and inactive aircraft from the totals. In addition, Arizona has an "ad valorem" aircraft tax of one percent. This tax discourages new arrivals, short-term residents (construction workers), and part-time residents (winter visitors) from reporting Arizona as the usual place for basing their aircraft. Additional data reporting problems are associated with the fact that Indian-owned aircraft are not subject to state taxes unless the aircraft is flown off the reservation.

After establishing base-year estimates, the rate of population growth between 1977 and 2000 was applied to 1977 aircraft counts at individual airports to obtain initial forecasts of based aircraft for the year 2000. Official state population forecasts were available for counties, and regional planning organizations had allocated this growth to most communities with airports. Where community growth rates were not available, county growth rates were utilized.

These initial forecasts were too low because the per capita rate of aircraft ownership is rising, principally as a result of increasing real per capita income. Recent FAA forecasts call for national per capita aircraft ownership rates to increase from .88 per 1,000 persons in 1977 to 1.12 in 1987. In Arizona, per capita aircraft ownership is nearly twice as high as the national average. The information was projected to obtain an estimate of 2.35 aircraft per 1,000 people in Arizona in the year 2000.

This ratio was applied to a state population forecast of 4.03 million to obtain a projection of 9,500 Arizona aircraft in the year 2000. County-based aircraft forecasts were increased proportionately so that their sum equalled the state control total, and individual airport forecasts were similarly adjusted to correspond to the county control total.

This approach produced acceptable results in rural areas where community growth is tied to only one airport. However, it was not appropriate for individual airports in the Phoenix and Tucson metropolitan areas where increased demand does not necessarily occur in proportion to changes in surrounding populations. Acceptable SASP forecasts for urban airports were obtained by adjusting RASP airport forecasts so that they totalled SASP county-based aircraft projections. RASP and SASP forecasts displayed a high degree of comparability in Arizona. The Phoenix RASP, for example, was three percent higher and the Tucson RASP was four percent higher. Outside of the metropolitan areas, master plans were on the average three percent higher. The annual growth rate foreseen by the National Airport System Plan for Arizona aircraft ownership is more than twice that foreseen by the SASP.

Operations at Arizona airports were also projected for the year 2000. General aviation operations were estimated by multiplying the forecasted number of based aircraft by the ratio of operations per based aircraft for each airport in 1977. Military operations were held constant, and local forecasts with minor adjustments were used for air carrier operations. The resulting forecast was 6.8 million operations in Arizona in the year 2000. Ten percent was estimated to be military, four percent air carrier, while the remaining 86 percent was estimated to be general aviation.

#### **Local Involvement**

Local involvement was valuable in the forecasting efforts. It helped gain acceptance of the final forecasts and contributed to the correction of several data problems. Local input was incorporated into the forecasts in several ways:

- Population forecasts containing local input were used
- Aviation forecasts were reviewed by a technical advisory committee
- Master planning efforts were considered
- RASP and SASP planning efforts were coordinated

As was previously noted, the State of Arizona makes official population forecasts for counties, and local council of governments allocate county totals to individual communities. Since population growth is the key element in these aviation forecasts, this gives a high degree of credibility to the forecasts.

A technical advisory committee, consisting of ADOT personnel, COG representatives, airport operators, and military representatives reviewed SASP assumptions and methodology. The committee accepted the forecasting approach, and insight of the members corrected several data problems.

A close relationship exists between SASP and airport master plan forecasts. During the SASP planning effort, several consultants were simultaneously preparing master plans for Arizona airports. They were particularly concerned that the two sets of forecasts be in agreement. In light of shared information, both sets of forecasts became closer and better. Judging from past experience, the SASP forecasts will continue to be referenced in new master plans.

During the SASP effort, the Phoenix area Council of Governments was formulating a RASP and the Tucson area Council of Governments was completing one. As was previously noted, the population-ratio approach was not appropriate in urban areas, thus RASP individual airport forecasts were utilized after slight adjustments to coincide with SASP county control totals. Also, as the SASP effort was concluding, the Phoenix RASP development alternative had not yet been selected. As a result, Phoenix metropolitan area forecasts in the SASP show ranges for individual airports which correspond to alternative development scenarios.

### Conclusions

Elaborate forecasting techniques were not cost-effective or appropriate in the Arizona aviation system planning process. Few airports anticipate capacity problems, and activity levels at many airports are sufficiently low to be unpredictable by any technique due to the small numbers involved.

The population-ratio approach fulfilled the need for a simple and understandable forecasting approach. The use of widely accepted population projections as a basis for the forecasts greatly contributed to agreement on the forecasts themselves and, perhaps more importantly, the recommendations derived from them. This experience demonstrated that the need for better data on based aircraft and operations at nontowered airports is greater than the need for more sophisticated forecasting techniques.



## Environmental Impact Statements



**Mr. Tom Darmody**  
Greiner Engineering  
Sciences, Incorporated

Mr. Darmody points out that the American judicial system now very closely links forecasting with the environmental process. Additionally, the National Environment Policy Act requires that all alternatives to a project be considered to the same degree as the project itself, including a "no project" alternative and the "environmentally preferable" alternative. He then discusses the various types of forecasts that will be required to meet these new environmental requirements, and closes by suggesting several opportunities for constructive FAA action.

### Forecasting and the Environment

The new regulations on environmental quality, which may be coming out shortly, stress and require that environmental issues be considered at the earliest stages of project planning, and the courts have ruled that the earliest stage includes forecasting. The most recent victim was the FAA and their National Airport System Plan (NASP). Judge Sirica ruled in a court case that the FAA had to prepare an Environmental Impact Statement as part of producing the NASP. The FAA argues that environmental consequences could best be addressed at the stage when projects are to be developed since they would be better defined. But that argument did not impress the judge, and he ruled the FAA had to prepare an Environmental Impact Statement at the earliest stage. What is interesting and significant, was the Court's implication that the FAA forecasts used in the preparation of the NASP were subject to environmental analysis.

The Court felt that predictions are in fact blueprints of what is to happen and, therefore, are significant Federal actions in themselves and not simply statements or a wish list.

Another interesting example was the Civil Aeronautics Board (CAB) promulgation of a rule this summer to deregulate air fares. Usual business would have been to accept promulgation of the rule without complete consideration of the environment. In this instance, however, an airline not in favor of deregulation threatened to take the CAB to court over failure to comply with the National Environ-

mental Policy Act (NEPA). So we have a policy change by the CAB, and the airlines pointing out that these reduced fares and increased load factors were going to produce profound environmental consequences at certain airports. Needless to say, the CAB went ahead and prepared an environmental study. Their conclusion was that there may be changes, but they would not be as profound as the airline had predicted. The point is, we are seeing a profound change in environmental impact studies, from an emphasis on ecological protection to more of an economic consideration of alternatives at a very early state in the planning process.

A few years ago, I would have questioned what forecasting really had to do with the environment. The forecasts were made, and they were either a justification or damnation of what you were trying to do. But, there are interesting relationships between forecasts and the environmental process.

### Environmental Impact Statements

Today, I would like to explain where forecasts fit in the environmental process. Then, I will describe the very special forecasts you will need for an environmental study. And finally, I will suggest some additional studies that would be useful.

The relationship between the environmental process and forecasting is one of the chicken and the egg. Traditionally, forecasts served as the basis for the analysis contained in the Environmental Impact Statement (EIS). But some feel that the forecasts are blueprints of future actions and should be subject to the very environmental analysis that they cause; that is, forecasts do not just chart our future, but actually create it. But in essence, EISs are simply forecasts of what we think will happen as a result of some action.

In this sense, they are publicly airing our "guesstimates" as to the impact of future actions which we see as a developer, an agency, or an airport sponsor. It is a published legal process that we go through.

Environmental Impact Statements are public documents. At one time, they addressed such issues as the number of trees to be removed or the fate of the snail darter, and the public has become very proficient in attacking these issues. Now the more basic economic considerations are being attacked. But is this "good" in the big sense of the word? Often, I have seen forecasters attacked because the public does not understand aviation jargon. They feel they know what is going on in their community and that their guess is as good as the professional "hunch." Another problem is that a lot of airports planned back in the late 1970s are now at the point where something critical must be done. These airports may have been planned in the 1970s, but they were often based on forecasts that had their birth back in the high-growth 1960s. The very forecasts that were used to "sell" the need for a runway extension or a new wing to the terminal now have to go through an environmental process in which those very numbers are being used to stop the project because of aircraft noise or other environmental problems.

### The Consideration of Alternatives

Another issue, and perhaps the most important, is the consideration of alternatives. NEPA, the National Environmental Policy Act, says nothing about forecasts, but it says quite a bit about the consideration of alternatives. New Council of Environmental Quality (CEQ) regulations will require that all alternatives be considered to the same degree that the project is being considered. If you have forecasts for the project, you must have forecasts for the alternatives. The traditional "no project" alternative must be considered, and the temptation is to use a "no growth" forecast to go along with the "no project." But is growth going to stop? Is it realistic to not extend that runway or not build a new wing on the terminal? In any case, we need forecasts for that kind of activity.

The CEQ is also going to require consideration of an environmentally preferable alternative. Among all the alternatives that can be identified, they will require you to expose an alternative that may go against your best judgment but is, for some reason, the most environmentally preferable. If you go against that alternative, you must explain your rationale and reasoning. So, we will need forecasts on the impact of the environmentally most preferable alternative. Finally, we will have to consider the consequences of alternative modes of transportation. This was a basic contention in the EIS for the National Aviation System Plan. The court ordered the FAA to ascertain the relationship between investment in one mode of transportation versus investment in another mode. The CEQ very explicitly says we must consider alternatives that may be outside the scope of the implementing agency. Even though the FAA is interested only in airports, it cannot limit its consideration of alternatives simply to aviation alternatives, but must explore other alternatives outside its control.

### Total Travel Demand Forecast

In order to develop forecasts of this kind, we should start with a forecast of total travel demand in a community. We need a total pie to divide between mass transit, railroads, airplanes, and so on, and we simply do not yet have that. Currently, we take an aviation forecast produced by the FAA and perhaps a forecast produced for the Northeast Corridor for rail travel, and make some simple assumptions about what happens if we put investment in one form versus the other. The usual conclusion is that it is either very difficult to tell if there would be any change or, no matter how much money is put in rail some people are still going to fly. That seemed to work in the EIS for the NASP. Perhaps no one had any better data or really knew what was going on. Someday they will, and I would like to be the first to know.



### Consideration of Secondary Impacts

Forecasts are also becoming more important in the area of secondary or induced impacts. Of course, we no longer build airports that rape the landscape. We do not build airports in the Everglades as in years past. However, aviation does continue to develop, and there still is opposition. The opposition often stems from the feeling that there will be secondary impacts that the community does not want. I have seen Environmental Impact Statements in which a runway or new airport has been sold to a community for economic development, and then see the surrounding community argue they do not want that very kind of secondary development. The industrial park you hope to attract, which was used to sell the airport, is now simply ignored. So, we must start thinking more in terms of real consequences, not in terms of general consequences. Such consequences may often seem trivial and mundane until they are reviewed by different agencies. Probably no one from the Fish and Wildlife Service knows anything about the National Airport System Plan. They probably do not care, nor do they have any responsibility in any case. But, they do know what taking an acre of marsh means. They do know what overflights over a wetland may mean. They will come back and attack, not the grand picture, but the little details. So, we do need the little picture as well as the big picture when formulating Environmental Impact Statements.

In essence, the FAA is charged by NEPA to have an impartial stand when reviewing Environmental Impact Statements. But as a consultant, I would be foolish to not champion the cause of my sponsor and, to that end, we use forecasts to justify a project. If I am going to argue effectively that the project should go ahead in spite of some real or imagined environmental hardship, I must know what good is going to come from the project, who is going to benefit, and why. So we also need the big picture.



### **Forecasts Required for the Environmental Process**

But getting back to the concerns of the Fish and Wildlife Service, we must produce forecasts that have very short timeframes. For instance, noise calculations are based on an average or typical day. So we must take a national forecast provided by the FAA and come up with a typical day, which may not even exist, at some little airport on the outer banks of North Carolina. Although the real traffic is rather obscure, we need such forecasts because that is the requirement.

It is even more restrictive for air quality. We need forecasts of peak day, peak hour, and such things as an 8-hour average because environmental regulations are geared to these timeframes. The EPA publishes air quality standards that are not related to annual operations or annual amounts of pollution, but simply to 8-hour concentrations, 1-hour concentrations, and peak-day concentrations. When you really get down to it, airport terminal and runway designs are not based on annual numbers, they also are based on some measure of peak hour activity. We invest money not to meet annual demand, but to meet some special peaking characteristic. So, whereas we need these numbers to justify a project from an environmental standpoint, we also need it for airport planning and design.

I realize these are very special forecasts and may never be available directly from the FAA. However, the latest FAA forecast is a vast improvement, and it does provide a range of forecasts that we can deal with in the consideration of alternatives.

### **Suggestions for FAA Action**

In conclusion, there are a few things I would like to see the FAA do. First, forecasts themselves may, in the future, require an environmental analysis. They will be viewed by more and more people as policy statements of what we intend to do, and not as what we think will happen. Our forecasts are based on the assumption that a system of airports will exist in the future to meet demand, and it is logical that we will do everything necessary to accom-

modate these forecasts. So, I can agree to a certain extent with the court's decision by Judge Sirica. From a purely environmental standpoint, we need forecasts that relate to alternatives and their consequences, and we need to know the consequences of the "no project" alternative. The day is gone when you can say terrible things are going to happen at this airport if we do not build that runway extension. People are sophisticated enough to realize that life will go on. So we need to know the real implications of not extending that runway or not adding that extra parking position on the apron. Right now, it is very difficult to say what those implications are.

We need some ideas about what environmentally preferable alternatives exist in terms of the national viewpoint. The real essence of the plaintiff's request in the EIS for the National Airport System Plan was that they wanted the FAA to decide what environmentally preferable alternatives existed and to shape their airport system around the best one.

We also need the big picture about total travel demand in the United States if we are to consider alternative modes of transportation. I have never been in a public hearing on an airport issue where somebody said, "You are wasting your money, we are all going to travel by method X in ten years which is much quicker, safer, and more efficient than air travel." They all speculate, sure, but they feel, as we all do, that we need a better picture of total travel demand in the United States.

We need forecasts that are site and time-specific in order to predict such things as air and noise pollution. Finally, we need forecasts that consider policy—CAB policy or airline policy. From investigating the impact of fare regulation at the national level, I have found that forecasts prepared at an airport as recently as one year ago have no meaning when four or five airlines request and are awarded new routes. Obviously, we need forecasts that consider alternative policies.

Rather than have the FAA make forecasts and then be blamed for the consequences, I would like the opportunity to have the tools to prepare my own forecasts. If the techniques and procedures were taught rather than just giving out the numbers, we each could adjust them to our own particular circumstances. Identify the relationships for me, tell me who flies and why, and how much income is needed. Then, maybe, I can come up with some realistic alternatives. To this end, the FAA should consider teaching a course at their Academy in Oklahoma City on aviation forecasting. It is a very specialized science, and I do not know if it is taught in any school.

Finally, every forecast is going to have its roughest time at the public hearing in the EIS process where everybody has an opportunity to take a crack at it. And this is going to get worse in the future as people and environmental groups become more sophisticated. So, as a word of warning, I would prepare my forecasts with the knowledge that they will be looked at very closely and by a lot of people.

## Conference Wrap-Up



**Mr. Duane Freer**  
Director  
Office of Aviation Policy,  
FAA

Mr. Freer closes the Fourth FAA Aviation Forecast Conference by high-lighting several issues of major concern to the aviation community. These include a possible future FAA emphasis on near term forecasting, the need for applying judgment to forecasts rather than simply accepting "actual" computer projections, the necessity of precluding catastrophic events from alternative forecasts, the plight of reliever airports, and the forecasting implications of an austere FAA budget.

This has been a good conference. We are getting better participation each year. I feel strongly that if we are to do a better job of forecasting, we literally have to hold hands with you. It cannot be done sitting behind a desk in Washington. It cannot be done simply by visits of Washington people to the field. We hope that, as time goes by, there will be more and more involvement of consultants, representatives of state and local government, and of industry, so that many individuals can get hands-on experience in helping us with the forecasting effort.

### **Possible Near Term Emphasis in FAA Forecasting**

Some of today's speakers were critical of our forecasts and their "blindness" to potential unexpected events. Each year forecasted beyond the first year is riskier to forecast and the product less dependable. At 10 years out, a forecast is, at best, a hip-pocket shot by an educated and skilled person. Long-range forecasts should not be the basis for great plans or investments without some hedging, some provisions for alternative social and economic scenarios. Indeed, as Bud Carr said this morning, he cannot afford to look much further out than a year or two. He sees forecasting beyond 3 to 5 years as a questionable expenditure of resources. I tend to agree with that — especially when operating under stringent budgets. We are experimenting with the possibility of publishing a dual forecast in which a separation would be made between the very short-range forecast and the longer term. We may devote relatively more of our resources to developing the very short-range version — one to 3 years. The longer-term forecast would be somewhat more

general with less concern over precision and detail. I would appreciate any thoughts you may have about such a change in emphasis.

### **"Actual" Versus "Constrained" Forecasting**

We get caught in a "demand versus actual" bind every year in our forecasting. We feel it most notably this year with the flight service stations and in our high-density areas. Should the FAA forecast what it perceives to be the raw demand or should it forecast constrained demand? That is, instead of forecasting uninhibited pure demand, should we acknowledge and build-in constraints. And, if we acknowledge constraints, how far should we go? Let me use the example of the Arapaho Airport near Denver. Originally, there was much discussion about whether that airport should even be built. And then there was a matter of whether we should put an instrument landing system (ILS) on its runway. It was found that they did not qualify for an ILS because they had no instrument approaches. Yet, the airport needed to meet a threshold value for annual instrument approaches in order to qualify for an ILS. It was a catch-22 system. We needed a means of projecting potential real demand. Perhaps we needed a poet rather than a forecaster. Someone had to say, "This is what the demand will be, and that an ILS is the incentive that will induce people in the Denver area to base their aircraft at Arapaho and use the new ILS facility." Well, we strained a bit and put in an ILS. In a few years aircraft owners flooded to Arapaho County. It was a great benefit as a reliever to Denver Stapleton Airport which already was congested. The point of this example is that there was no good way to forecast the future or, put another way, to make Arapaho competitive with airports with a "current" need. We are still learning how to do this kind of forecasting for high-density areas. I would appreciate your thoughts on this matter.



### **"What If" Alternatives**

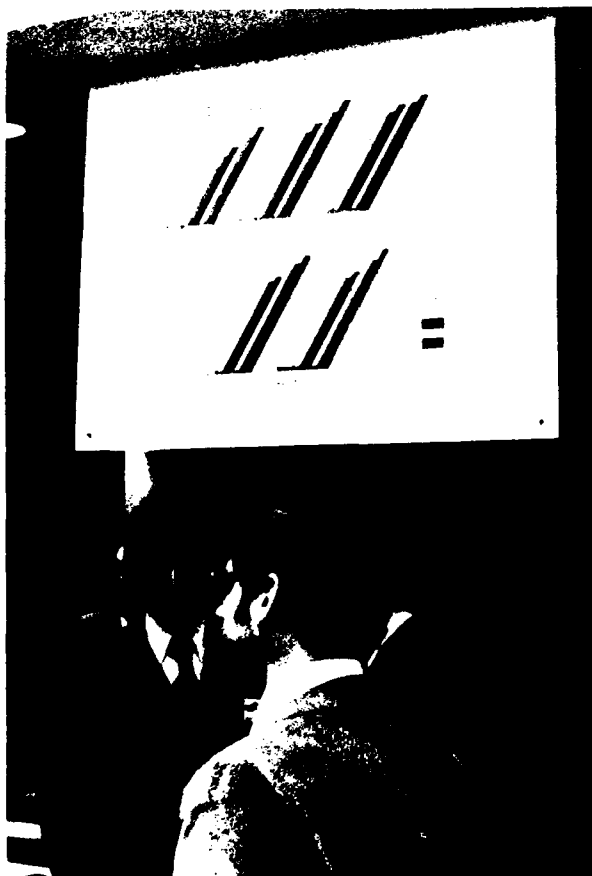
Hal Becker commented this morning on the need to put some "what ifs" into forecasts. That is not an easy task — especially if you are a Government agency. Here, too, I would like to hear your thoughts — both pro and con and how it might be done if it were done.

At the noon luncheon, Dr. Klein commented that some things must be left to judgment. They cannot be put into print without the risk of them being so misinterpreted as to become useless.

One of the more interesting topics mentioned by both Dr. Klein and Hal Becker is the matter of population and demographics. The birth rate has changed dramatically in recent years. The World War II baby boom is over, and the impact on inflation and populations shifts will loom very large in the next few years. No one has thought out the associated implications very well.

### **Saving Commuter and Reliever Airports**

One of the FAA's biggest concerns is the array of problems associated with commuter and reliever airports. Wherever I go in the country, I am told that FAA must do something to save reliever and satellite airports so that they will be available as relief valves when high-density airports become saturated. It is an enormously difficult problem that will be addressed in the post-1980 airport and airways legislation.



### **Impact of an Austere Budget**

Last year, Mr. Bond challenged and encouraged local and state officials to get more involved in forecasting and policy matters. He suggested that if they could demonstrate expertise and excellence they could and should take far greater responsibilities. The FAA, as you all know, now is in the midst of reorganization and is trimming back considerably on the number of people in the Washington office. So, I must warn you that your thoughts about how FAA could do more or better forecasting may run smack into a situation in which we will be doing less forecasting. What we want to be certain of is that what we continue to do is important to you and that it is done well. We simply cannot tolerate a situation in which FAA does a lot of forecasting in a slipshod or less than first-rate fashion. We are going to have to decide what we can continue doing well, and do it well. It will mean doing less in some areas. I hope state and local people and industry can pick up some of the unique forecasting needs they have. Certainly, we will share all the available data that we have. We are most anxious to talk to you about this. The reduction in Washington staff may continue for some time. Thus, though I caught today a flavor of "let Big Brother do it," Big Brother may not be able to do it. I encourage you to do more of what you can. We may be bringing some people from state and local government into our Washington office this year to provide them with experience on how we forecast. The thought expressed today that we should offer a forecasting course at Oklahoma City is a good one that we will pursue.

Let me say, it has been a delight to be here. It was our best conference yet. I am very impressed with the audience. Mary Anderson was thrilled over the conference. Dr. Klein was very complimentary. Quentin Taylor was impressed at your attendance and spirit. Thank you for coming.

## Part Three Questions and Discussions

### **David Bluestone, Consultant:**

I think many or most of us would agree with Mr. Becker. A little while ago, the FAA put out a publication on possible futures, and the range of forecasts was roughly 4 or 5 to 1. I had a problem with how to use such ranges in planning. How do you actually commit funds or make specific plans when you have a range of 4 or 5 to 1, using upper and lower limits?

### **Panelist:**

There should be extensive dialog once those kinds of forecasts are prepared. The discussion should incorporate the whole spectrum of viewpoints and include people in the field. Budgets must be distributed against some set of numbers. You can presume that one of those alternative futures is most likely, or you can assess the likelihood of each and use that criteria to help distribute the budget. In any event, you would at least have an early warning system. And as alternative events start to occur or not occur, you would have a much better chance of readjusting the budget since you would have thought out the implications of those events beforehand. As I perceive it, the objective relating to policy analysis is not to be clairvoyant, but to minimize surprises.

**Question:** Will forecasts ever become absolute predictors of future activity?

### **Panelist:**

As forecasters, we need to keep reality and what we are trying to do in mind. We are trying to gain some insight into the future so that our planning actions over the next 2 years can be taken intelligently. I would question the intelligence of trying to refine a forecast to include all major future contingencies. I think it is an exercise in futility. In the first place, we cannot foresee all major contingencies that may occur. Secondly, such exercises do not provide insight into the problem we need to solve; that being, where are we going in 10 or 20 years? What should we plan for in 10 years, and what should our program be over the next 5 years relative to directing us toward that 10-year goal? If we have a forecast that examines the extreme contingency, or all contingencies, we simply have a nice intellectual exercise because if we get an extreme contingency everything goes out the window. I am reminded of a situation that occurred when I was speaking to a neighbor of mine one day. He is a forecaster of cargo for one of the airlines. He was monitoring on a daily basis the forecast versus the actual life, and he was beside himself. He could not understand the variance between the actual and his forecast, and he said to me, "Bud, I don't know which is wrong. I don't know whether my forecast is wrong or whether actual is wrong." Now if that happens, the forecaster has lost sight of what he must do. So, I urge you to develop forecasts that are reasonable, that project

what we think can happen, and that are tools for our future actions. But, please recognize that we cannot put all contingencies into them. If we do, it is only an exercise in intelligent creativity.

### **Bob Monroe, AOPA:**

I am happy to hear Mr. Becker's remarks about inclusion of "what ifs." I made a similar recommendation at the Boston General Aviation Forecast Conference. I would like to point out that forecasts not only can be useful in planning, but they also can reveal opportunities for new enterprise, new directions, and new initiatives. I am extremely interested in seeing what can be done to reveal to management and decisionmakers where the new opportunities for progress lie.

### **Panelist:**

I think that is a super point. If we look at society historically, those people who change society, who contribute to it or become entrepreneurs, are the ones who spot the "what ifs" and cause the right "what ifs" to come about.

### **Paul Gray, University of Southern California:**

I would like to explain a little about how those alternative scenarios were put together. We took great care not to destroy the aviation system; that is, we came up with a set of conditions that are plausible to a wide range of people. We also considered what we thought the system could or should respond to.

### **Bill Nesbit, United Airlines:**

Speaking for the airline industry, we welcome the FAA emphasis on state and local forecasts and a more "bottoms up" approach. But that brings up the question of FAA role in trying to devise forecast methodologies for state, local, and regional forecasting authorities. Our experience in airport forecasting, which is necessarily regional and local, is that each situation is unique. What is an important variable for Chicago may not be important for Seattle.

I suggest that the FAA has a major contribution to make in producing good, reasonable, and plausible national forecasts and assumptions. Secondly, the FAA certainly has a responsibility for attaining better data, particularly for the unregulated part of aviation. Everybody talks about traffic growth at the airlines, but we have a huge data void and we need to correct this. Thirdly, we are very critical of some forecasts, but this is because they are so important to us. We are very happy to see the FAA's constructive response.

The concerns of the military in the late 1930s and 1940s in Massachusetts were such that they estab-

lished a number of perimeter airports around Boston and Logan Airports. While these airports were originally intended for air defense, they have ended up being reliever airports for the Boston Airport and together they function as the major hub in northern New England. But there is a built-in problem. Many times we have been frustrated by large hub airports which, when operated under an authority independent of the state, elect to develop studies and plans without consultation with the state. This might occur as a result of survival because many states do not seem to understand the concept of major hub airports. I am not saying that the authorities should give up their position; however, it would be nice to be brought into the planning process. If the military had not provided us with those reliever airports around Boston, we would be in a very serious pickle at this particular time.

**Panelist:**

I will make one brief comment about the subject of data and lack of data. When you think about the future, you must understand the past and the present. Unless you understand what your current institutional and technological relationships are, you cannot forecast very well even if you have a list of "what ifs." In many regards, lack of data itself is very damaging and very detrimental to the development of forecasts.

**Al Brown, Consultant:**

Forecasting, of course, is not an end in itself. It is usually a basis for spending money and dealing with the future. Most planning, however, is done using a mass of artifacts about how things were in the past, then taking those same institutions and projecting them into the future. Yet, it is almost certain that using this technique, you will not be where you should be when the future gets here.

When you look at alternative scenarios, you certainly want to consider those that have the greatest

probable impact on the future of aviation activity. A key question is how many plausible events are invariant to all or a very large number of these different scenarios. Instead of generating a set of numbers and assuming that will be the future, try to ascertain how many of your planning needs are invariant to a wide range of possibilities. Work particularly hard on those needs that are not invariant or try to find some kind of "fail-safe" approach.

**Panelist:**

The question is: are we planning and building toward a set of numbers or are we planning toward a set of pragmatic conditions that will occur because of what is going on in the world around us? It is probably more of the latter. We are going to have growth. It will tend to increase more in the international areas than in domestic areas, and we are building our facilities to accommodate these conditions. However, what we do is more a function of our ability to finance than some level of capacity we want to achieve at a certain time in the future. Our approach is very pragmatic. We build what we can build. Our priorities dictate what is built as we go from day-to-day and from year-to-year.

**Omer Benn, The University of Illinois:**

I think that personnel requirements could have a severe impact on the general aviation system. There is a severe cash shortage at the present time, yet the aviation industry is building equipment and large airports that will require an increase in personnel. Where will the resources come from? Another thing that could have a severe impact on the future of aviation is the current trend of throwing programs out of big airports and metropolitan centers. Training is becoming very costly and very hazardous, as indicated by the PSA crash in San Diego. Has any effort been made to determine if qualified personnel will be available to provide this training?

**Panelist:**

We have not formally considered the lack of qualified personnel in the general aviation community. I am sure there will be an investigation into where qualified personnel are going to come from.

**Mike Chasin, Consultant:**

Forecasting is basically concerned with the impact of the community on aviation and aviation activities. I think some attention must be paid to the reverse position; that is, the impact of aviation activity on the population and demographics of an area. The local town managers and everyone else are not asking what we need at the airport, per se. They want to know if the airport is something they want to keep, or do they need a supermarket more. Unless we can



show them the beneficial impact of aviation activity on their community, we are going to wind up with a lot more supermarkets and a lot fewer general aviation airports.

**Panelist:**

We recognize that this is a most valid point. We have spent considerable time in our airport planning process developing the economics of particular airports. It is a public relations job for us and the airport operator. In many instances, the airport operator is not overly concerned until it is too late. It is actually necessary, in some instances, to brow-beat operators into getting their act in gear. We attempt to evaluate the economic effect of the airport on the community. If a study demonstrates that an airport is not contributing to the community, we have to accept that position and be ready to accept the consequences. We have very serious community relationship problems in Massachusetts at five of our airports. For the most part, people just do not want the airport.

A great many of our problems are created by unconstrained forecasting that comes through in master plans. As you know, master plans require public hearings. Can you imagine a community that is opposed to an airport in principle, regardless of its economic or social value? Can you imagine a group of irate citizens who are concerned about the noise? Can you imagine a room full of folks who do not want the airport there in the first place seeing what is now one major and one minor runway in a crossing configuration projected as two parallel runways with a proposed additional 8,000-foot runway? Talk about trying to sell a bill of goods. There is just not way you can do it. If it is not palatable and is unrealistic, leave it out. We have enough difficulty maintaining the airport in the system right now.

**Question:**

Can you predict the future impact of deregulation?

**Panelist:**

Deregulation is a fact. Under a slow-growth scenario, the airlines will grow slowly and will have difficulty coping with deregulation. There will be great problems if we do not have rapid growth in a fully competitive environment. Therefore, deregulation in a period of slow growth is likely to cause some restructuring in the aviation industry.

Under the high-growth scenario, the airlines will be experiencing high rates of growth and making good profits. They will have the capital to purchase new equipment, and deregulation will proceed smoothly.

**Question:**

The Navy has done considerable analysis of sound spectrums for their own applications. I wonder if there would be any advantage to running the tapes from the audio counter described by Ms. Sorensen to a sound spectrum to determine automatically the type of aircraft?

**Panelist:**

They are doing some of that. Right now they want to keep it as simple a piece of equipment as possible. They are looking into a great many more complex ideas as to how it can be utilized on three or four runway systems, using remote sensors, and coming up with specific aircraft based on sound levels and characteristics. That is in the future though, and it is also liable to cost a lot more money.

**Ms. Anderson:**

The whole aviation community faces an unprecedented time in history. We in this office could not be more ardent in our efforts to deal with the problems of the total community. We want policy made at the national level to be consistent with the real world, and this requires concerted input from the local, state, and regional levels, and from the total aviation community as well. We applaud your participation in this meeting.