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FAA FORECAST CONFERENCE PROCEEDINGS (6TH) HELD AT WASHINGTON, D--ETC(U)
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U.S. Department
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October 1968

Sixth Annual

FAA

Forecast Conference Proceedings (64)

AD A099170

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SERIALS
MAY 20 1969

EXEMPTION STATEMENT
Approved for public release
Distribution Unlimited

UIC FILE

(4) Sixth Annual rept.

(6) FAA

Forecast Conference

Proceedings (6th)

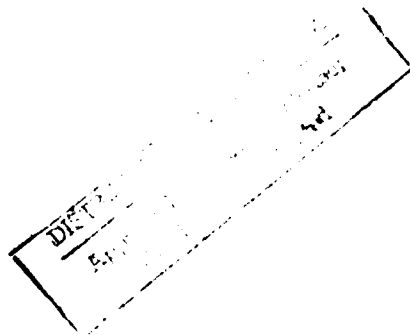
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Table of Contents

(12) 53

Part I: Introduction	2
Proceedings Overview	3
Conference Opening	4
Bill Wilkins	
Keynote Address	5
Langhorne Bond	
Introduction by Bill Wilkins	
Questions and Answers	6
FAA Overview	10
Harvey B. Saffer	
Introduction by Bill Wilkins	
Part II: Air Carrier Panel Discussion	14
William B. Johnston, Moderator	
Introduction	15
William B. Johnston	
(Reasonably) Great Expectations	17
Neil M. Effman	
Airlines in the 1980's: A World View	20
Duane W. Freer	
Fundamentals of Airline Growth: A Manufacturer's Perspective	24
John E. Steiner	
Questions and Answers	31
Part III: Luncheon Address	34
Long-term Traffic Growth and Deregulation	36
George A. Dalley	
Introduction by Bill Wilkins	
Questions and Answers	39
Part IV: Commuter and General Aviation Panel Discussion	40
Bill Wilkins, Moderator	
Introduction	41
Bill Wilkins	
Flying into the Sunset	42
Jack Shaffer	
Aviation Forecasting is Tough	45
Lawrence McCabe	
Future Energy Resources for Civil Aviation	47
Robert A. Cooke	
Questions and Answers	51



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Part I: Introduction



Proceedings Overview

The Sixth Annual Aviation Forecast Conference was held on October 21, 1980, in Washington, D.C. The general theme of the presentations was "The 1980's—A Decade of Transition for Aviation." All of the speakers addressed both the problems and the expectations for the decade. It was generally agreed that the key problem areas will be rising cost—particularly fuel costs—and the need to improve, modernize and expand the basic infrastructure of the Airport and Airway System to accommodate the expected growth. There was a general consensus that the industry would continue to grow, albeit at a slower rate than during the past decade. Despite slower rates of growth, the level of aviation activity is expected to grow by a greater absolute amount over the next 12 years than during the past decade.

The keynote address was delivered by Langhorne Bond, Administrator of the Federal Aviation Administration. He was introduced by Dr. Bill Wilkins, Associate Administrator for Policy and International Aviation, FAA. Harvey B. Safeer, Director of Aviation Policy and Plans, FAA, presented an overview of the forecasts.

Following the overview presentation there was a panel discussion of the 1980's with respect to the air carrier sector. William B. Johnston, Assistant Secretary of the Department of Transportation for Policy and International Affairs was the panel moderator. The panel members were:

Neil M. Effman, Senior Vice President for Airline Planning, Trans World Airlines;
Duane W. Freer, Director, Air Navigation Bureau, International Civil Aviation Organization; and,
John E. Steiner, Vice President for Corporate Product Development, The Boeing Corporation.

George A. Dalley, Board Member of the Civil Aeronautics Board, was the luncheon speaker. He addressed the issue of long-term traffic growth and deregulation.

The second panel, moderated by Dr. Bill Wilkins, FAA, addressed the issues of the 1980's as they might impact commuter airline and general aviation users of the national aviation system. The panel members were:

Jack Shaffer, Member, Board of Directors, Beech Aircraft Corporation;
Lawrence McCabe, Assistant Commissioner, Aeronautics Division, Minnesota Department of Transportation; and
Robert A. Cooke, Assistant to the President, Government Relations and Energy, National Business Aircraft Association.

The following sections of this report contain the presentations of the aforementioned speakers and the questions and answers which followed the presentations.

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Conference Opening



Dr. Bill Wilkins
Associate Administrator
for Policy and
International Aviation
Federal Aviation
Administration

We live in a time of interesting and challenging aviation events. Our general economy is working its way through the changes which are associated with the rapidly increased price of energy and the reevaluation of financial markets at a time of continuing inflation. Aviation is also in transition. The air carriers are working their way through the newness of deregulation—the freedom to respond to the market place. The commuter industry has emerged and is doing a great job of serving the smaller communities of our country. Finally, general aviation has come more into its own. It too, has become increasingly complex.

Aviation planning in this kind of environment is increasingly important, doubly so I would say. That's why we are here today. We at FAA, in particular in Policy and International Aviation, believe that the forecasts that are being released today provide the broad outlines of what will be a fruitful discussion.

It is my pleasure to introduce the first speaker of the conference, the Administrator of the Federal Aviation Administration. One of the rewards of public service is the opportunity for responsibility. Few posts in this Government, or perhaps anywhere in the world, match the responsibility that falls on the Administrator of the Federal Aviation Administration. Administrator Bond has accepted and discharged those responsibilities with style and grace, wit and wisdom.

Keynote Address



Langhorne Bond
Administrator
Federal Aviation
Administration

Administrator Bond portrays American aviation as an industry that is overcoming the problems of inflation, fuel as well as "restless economics both here and abroad." Aviation activity is expected to grow during the next decade. In order to meet that growth, greater and more cohesive support for capital systems improvements will be needed. The alternative to expanding the system in order to accommodate growth will be constraints on demand to assure continued system safety.

We are here today to review Agency forecasts of aviation activity for the ten-year period 1981 through 1991. More importantly, we are here to share with you the implications of these forecasts as we see them.

All in all, the aviation business this past year hasn't been too bad but, it certainly could have been a lot better. There is every indication that the demand for air transportation is going to continue to grow, but the surge that manifested in the late seventies has moderated due to a number of factors. These include the spiraling costs of petroleum products and a generally restive economic situation both here and abroad, to name but two.

One barometer, perhaps the simplest to read, is the number of aircraft operations at FAA-towered airports. By year-end, we expect them to total about 68.6 million—down some 400,000 operations from last year's 69 million. However, a final accounting will show that total revenue passenger enplanements for the certificated carriers for FY 1980 are within 1 percent of the total for 1979 which, of course, was a year of extraordinary growth.

Despite the fact that rising fuel costs have hit general aviation hardest with curtailment of aircraft sales and local and sports flying, the number of hours flown by general aviation has increased by about 2.4 percent in the fiscal year past.

The business use of aircraft is continuing to grow, although the fleet mix is undergoing considerable change. The emphasis now is on higher performance, better equipped, multi-engined aircraft. Indeed, they

are beginning to enter the civil fleet at a rate double that of single-engine aircraft. And, I might add, one out of every four of the new single-engined equipment entering the fleet is intended for business use.

While I'm on the subject of new equipment, and indicative of the continuing evolution of our industry, the jet age is only slightly more than 20 years old. Yet, we are already beginning to see entry of third generation turbojet carriers into airline fleet inventories. A fact, I might add, that means red ink for the air carrier industry still undergoing a period of adjustment. This adjustment is due not only to deregulation but also to higher fuel prices, environmental regulations, changing relationships within the industry, realignments in schedules and shifting market patterns.

The commuter airline industry, on the other hand, is growing rapidly and strongly. In fact, it's the 1 percent of the air transportation industry that is expected to show an increase in both revenues and traffic this year. As for the decade ahead, we expect a near tripling in commuter traffic. However, the current number of commuter carriers—some 260—will probably dwindle somewhat as financial demands of growth and route competition force some consolidation among their ranks.

The growth of the commuter industry has been particularly interesting and gratifying. Interesting, because it's virtually an "instant replay" of the early days of commercial air travel. Gratifying to me, because in the past the safety record of commuters, to say the least, left something to be desired. As you know, last January we held a major commuter safety symposium. At that time, the industry delivered a clear message that it accepted the challenge to provide a level of safety comparable to that of the larger scheduled carriers. Thus far, I think the commuter industry, as a whole, has done a commendable job. We will be holding our second commuter safety symposium in January to review the record and the reasons for it.

Generally, the outlook is for moderate growth during the decade ahead. Total operations at airports with FAA control towers are forecast to increase, if they are able to, by 43 percent between 1981 and 1992.

Air carrier operations will increase steadily but not dramatically by 21 percent.

General aviation itinerant operations are expected to grow by about 49 percent, although local operations—leisure and sports—are plateauing and will likely show little growth during the decade.

Air taxi operations, however, are on the increase and are expected to increase by almost 98 percent—nearly double the current volume. And, as I mentioned earlier, commuter carrier operations are expected to triple during the decade ahead.

So despite the inflationary spiral, increasing fuel costs and restless economics both here and abroad, the U.S. aviation industry continues to grow on almost all fronts. But despite the apparent strength of our industry

and the outlook for business ahead, aviation is at a crossroad that threatens disaster, born perhaps because of the increasing acceptance and dependence of people everywhere on air transportation and fueled, certainly, by increasing economic pressures on industry and government. The well-being of the entire industry is threatened.

Trade association lobby deviously.

Aviation unions, private and federal, do the same.

Accusations are hurled back and forth between public and private interests concerning aviation investment strategies and proposed solutions to national economic problems.

Some special interest groups exploit aviation's visibility as a means of increasing their own.

The entire aviation community has become unhealthily fractious. In pursuit of narrow interests, too many of us ignore the general health of aviation. Unless we can get together, and soon, on the issues confronting us; unless we manifest a working belief that our professional intentions are truly mutual—one with another's—we may soon find ourselves squarely in the midst of irrevocable restraints that may irreparably constrain aviation's growth.

Many of our airports, including some of our largest, no longer can accommodate all of the aircraft and all of the people that want to use them—or all of the noise resulting from that use. I don't think I need to remind anyone here of the difficulties in seeking new airport construction, even airport improvements. On the airside, add-on automation and computerization are improving air traffic capacity. The establishment of TCAs, more TRSAs, ILSs, VASIs and so on, are helping to improve procedural safety. And studies of airspace usage with the view of decreasing vertical and lateral separations, under way at this time, may also help improve airspace capacity. But at best, they are interim solutions.

As to Federal resources, there is specific and general agreement that there is a requirement for significant capital investment in the System during this and the next decade. However, there are substantive disagreements as to how, where, and when such investments should be made. The funding levels which we have proposed (approximately \$700 million) for airport development and investment in facilities and equipment (some \$350 million) is a growth budget. At the same time, we are operating in an environment of fiscal restraints at all levels of government. The critical question is whether the Federal budget for aviation capital investment can grow fast enough to accommodate the demands we foresee.

This conference is one avenue for exploring the means to meet the demand. Since my appointment as Administrator, I have observed a growing interest by participants at these annual forecast meetings in discussions dealing with systems planning and development rather than in technical details of forecasting. Our

agenda this year reflects this trend. Certainly the key questions deal less with the numbers themselves than with the implication of their magnitude in terms of System growth and structure as well as the responsibilities placed on the decision makers.

In recognition of your shifting interests, I have directed my staff to broaden the scope of the Aviation Forecast Conference in 1981. It seems to me that an issue-oriented, two-day meeting, addressing both our forecast along with key policy, planning and developmental issues, would be more helpful to you and to us. Such a program, I believe, will enable us to mutually examine key issues, share ideas on problem solving and, importantly, develop an integrated plan for System development in both industry and government.

Moreover, it signals my firm belief that FAA's professional intentions are truly mutual with those of you who comprise the aviation community. I intend that the dialogues developing in this meeting, as well as those planned next year, will resolve mutual problems—not simply give voice to them.

In this way, I believe, we can get a good handle on critical issues of common interest in air transportation, rather than in crisis reaction.

In conclusion, I would remind us all that air travel in the United States is unmatched anywhere, or by any other public mode of travel, in safety, convenience and in flexibility. In no other country do citizens have the freedom to travel as far and as quickly as we can. It is imperative that we find the means of protecting and furthering that freedom.

Thank you.

Questions and Answers

Question: How much weight is the FAA placing on the constraining effects of noise regulation on aviation?

Mr. Bond:

Our planning mechanism is predictive. Therefore, I believe there is a self correcting factor. Whatever has happened in the past as a constraint is factored into the growth expected in the future. More specifically, noise at the source is a regulatory issue for us and we are working very hard on it. Noise abatement as an air traffic control procedural technique has been used in Los Angeles and Boston and many other places. In Washington, D.C., as I know well, we pursue the best balance between non-restraint on growth of aviation and legitimate easing of citizens' concerns about noise. I want to tell you I have yet to find the Golden Mean, an acceptable mean.

Now turning to a more personal analysis of it, I think that it is imperative for all of us to continue to work on noise abatement as a technological and procedural flight operations technique. If we do not, local governments—which do have a noise abatement role, especially in communities where it is such an intense

political issue: New York, Los Angeles, San Francisco, and so on—are going to take away all of our responsibility in this field.

It is imperative for all of us to keep making progress on the noise abatement front so that it can honestly be said that the industry is doing everything that is technologically and practically feasible to reduce noise, without adding unnecessary artificial, locally induced, constraints.

Questions: Could you comment on the financial implications of American noise regulations on other countries, particularly, third world countries?

Mr. Bond:

I explained this point at the Annual Assembly of ICAO not long ago. The international carriers have now fallen under the sweep of noise regulatory statutes. It's very difficult for an American to explain to a third world country with the problems of starvation, alternative capital investment, and so on, that noise control is something that they really ought to put their money into. But of course, the best answer is simply that if we do not do it in the United States now, someone will do it and do it in a punitive way for us. So we really have to redouble our efforts. Thank you.

Question: Would you please explain your famous "constraint" statement?

Mr. Bond:

I would be delighted to comment on that. The statement that Secretary Goldschmidt and I made during the ADAP hearing was made in a calculated and deliberate way, cleared by the OST and the OMB. Not only was it fully within Administration guidelines on what is legitimate to say about the future of any industry, but also it reflected what I think is a prudent view of the industry's best interest as well—though phrased in an alarming way.

Let me tell you first what we did not say because we are accused of saying this—occasionally, by some of the best commentators in the industry. That is, we are accused of saying that we want to constrain growth; that this was a decision on our part to deliberately add growth constraints. Not so. What we have said, in effect, is that unless more money for research, technology and capital investment is put into the Aviation System, especially on the air traffic control and runway capacity side, we will come to a point where we will be forced to ration airspace capacity in the years ahead. We do not choose to do so. However, the System will become so saturated with growth—especially business aviation growth—that we will be forced to come up with capacity constraints. Now it isn't that we want to do that, but unless something is done to expand System capacity we will have to do that.

Question: Can you provide a timetable for when the System will be constrained?

Mr. Bond:

I cannot predict when this will happen. But any of us who understands the growth of the System and the

additional difficulties we see in getting slots at National Airport, flying into the Philadelphia TCA and flying in the southern California basin, understands that there is immense congestion out there today. Our System is operating at a very high peak of efficiency. At some point in the future there will be that 5 percent switch from high capacity to saturation and grid-lock.

Question: What would happen if the System becomes saturated?

Mr. Bond:

It happened to us in 1968. I was working in this town when all of a sudden the Air Traffic Control System simply went from marginally OK to totally unacceptable. Planes going from Los Angeles to New York were being held over Denver. That happened overnight and everybody was surprised about it. I hope and pray that that will not happen again. But, let us not kid ourselves—unless we really have more money and more effort put into this System, it can happen again.

I feel a little less radical about the statement today. In fact it has already occurred in our System in many ways and we are accommodating demand that exceeds capacity in an extremely crude fashion. It happens at National, O'Hare and LaGuardia Airports because of the slot allocation, high density rule. The effect is that the available capacity is divided up by the airlines in a legalized cartel. Recently, however, the system has broken down at National Airport.

Furthermore, we have that kind of congestion everytime weather hits the United States. The System goes critical and we do not dispatch aircraft. We are allocating airspace capacity through our flow control mechanisms on the sixth floor of the FAA right now whenever the weather gets bad, or whenever a runway at O'Hare is covered with snow, or a weather front goes through the Northeast or something like that. We are doing it right now using a mechanism which no one has seriously examined or considered. For example, what happens in the Northeast as a whole, even in good weather, if demand goes up? It can happen in the state of Florida. That is another critically strained air capacity area. It can happen in southern California which is already badly saturated. I have mentioned those three areas as particular candidates for airspace saturation. Unless something is done to expand System capacity we are going to face that problem pretty soon.

Question: Please comment on the state of FAA-industry relations?

Mr. Bond:

I have been uncomplimentary on occasion about the various interest groups here in Washington that spend most of their time, it seems to me, criticizing their Agency, the FAA. They are entitled to criticize, but the loss in that single-minded policy is that they have failed to go out and support, as a political measure, the capital investment in the Air Traffic Control System which is a capital investment in their, in your, future.

The appropriations committees and the money aspects of our program are totally neglected by the aviation interests in this town and throughout the country. There is no parallel to that and I simply cannot understand it. I have been here almost four years now and not once, that I can think of, has an industry group called on the Secretary of Transportation or the Office of Management and Budget, insisting upon more money for the Air Traffic Control System. At the same time they are inundated by highway, transit, and other interest groups who want more for their programs. They get it.

Question: What has FAA done to encourage people to readjust scheduling rather than go to capital investments in the System to meet demand?

Mr. Bond:

First of all, it is already happening. Peak hour congestion is causing shifts in operations which are flattening the peaks. We are seeing secondary hubs develop. Memphis, St. Louis and Dallas are coming up very fast as saturation points in the system.

Secretary Goldschmidt's and my statement on this subject, to which I alluded a moment ago, was a warning and the warning was: If you don't look out, the Government will have to get back in again and we will probably do a very poor job at it. In fact, we said that we do not believe that the Government now has the regulatory authority, or suspect that it has the regulatory authority, to allocate this airspace capacity in an intelligent way. The Congress probably will have to be the one to decide if the System is saturated in a very serious way and how that scarce resource is allocated. We don't know how to do it. It will be no more effective, for example, than the CAB's regulation of the past 20 years and I would hate to shoot for that standard.

Those of you who think that standard is terrific should read Judge Friendly's analysis of the regulatory process as a whole delivered at the Rosco Pound Lectures in the late 1950's. The one single thread of consistency through it all, according to Judge Friendly, former Counsel of Pan Am I might add, was that there was no consistency whatsoever in any regulatory decision he could find anywhere.

Question: If constraints are anticipated, why has the Administration frozen ADAP funds?

Mr. Bond:

The Congress is ultimately the allocator of monies and it is wrong to say that the Administration has frozen it. The Administration does not allocate money. It suggests to the Congress what should be done. The Congress allocates funds and furthermore, since the Nixon Era, the Administrator cannot freeze money. If the Congress appropriates it, we have to spend it. So our Agency has spent every single nickel that has been given to us by the Congress for research and development and for facilities and equipment. Now that's a true answer, but it's not a fully complete answer. We have not suggested that much more be appropriated for this area. So the

Congress and the Executive Branch in effect have been in agreement on this subject. The point is that we have changed our investment policy.

The new ADAP Act, the 1981 appropriations bill which had its roots in decisions that this Administration made 18 months ago, has gone from \$250,000,000 to \$350,000,000 in the F&E account and will go up in the years to come. We have turned it around already. But the fact of the matter is that it did stay at \$250,000,000 for almost eight or nine years. That is the lost purchasing value in the capital account.

Finally, the question of surplus does deserve to be answered. It is one that has disturbed me because it has been repeatedly and inaccurately characterized. A lot of people in the aviation business misunderstand the reality of the surplus. The surplus cannot be spent by the FAA—the Congress must appropriate it. The Constitution of the United States says that we can only spend what is appropriated by the Congress. So, unless it is appropriated each year the difference between the appropriation and the income piles up in the Trust Fund as a surplus. It cannot be spent by us unless the Congress releases it. This Administration and all prior Administrations that I know of, have spent every penny of money that the Congress has chosen to give it. Now we need more. OK, that is what I am telling you. But we have not frozen it.

The consequence is that the Facilities and Equipment (F&E) budget of the FAA, since 1972, has received the worst treatment of any capital investment program in the Department of Transportation. Its purchasing value today is 40 percent of what it was in 1972. Our F&E program has done worse than any program in the Department of Transportation and probably worse than almost any program you can imagine in the Government as a whole.

I wasn't born yesterday. The squeaky wheel gets the grease. If the industry really cared about this and saw its interest in obtaining higher investment levels, it would do better. It is a real subject of disappointment to me that there has not been more push on that front. We will pay the price, all of us, if that persists.

Question: With declining service a reality at many communities, how can deregulation be termed a success?

Mr. Bond:

I think that small communities will benefit from deregulation. What is happening in the commuter area is a clear manifestation that service will ultimately be improved to small cities. It has fallen off some today, however. If that's the point that you're making, it is entirely correct. But I regard that as an absolutely inevitable consequence anyway of the deregulation movement.

Deregulation has been supported by Republicans and Democrats. There is really very little choice from a conceptual point of view between Republicans and Democrats in the field of transportation policy.

As John Robson, a very good personal friend of mine and a very distinguished former CAB Chairman, pointed out when he was pushing deregulation as Chairman of the Board, there were more than 150 cities that lost service under the old regulatory regime, under the old CAB mechanism. That trend has continued under deregulation. It may have become a little quicker in its pace, but the point is that large jets just cannot efficiently service small markets in a time of rising fuel prices and rising personnel and equipment costs. So, I regard the possible downside effects of deregulation as coming anyway. We might as well provide a framework in which the readjustment can be done really efficiently without the Government's deadhand.

Thank you for your patience for a long answer. I am optimistic about service to small communities and, if I can recall some of the worries that I had four years ago, I think many of them have been answered successfully. My main concern was that a generation of small commuter type aircraft would have to be developed. Well clearly it has been developed: the SD-330 and -360 from Shorts, the Brasilia from Embreair, the Dash 8 from De Havilland. Beech is going to build some and has restarted its 99 line. So the equipment to provide high flying, modern, fully equipped, safe aircraft for that service is coming into being. I think that is the key to solving the problem. Along with that, I know the airport system and the ATC System will grow to meet those requirements.

Question: Are FAA forecasts accurate?

Mr. Bond:

The answer to that is unquestionably yes. I would like to speak up for a little bit on FAA forecasting. I think somebody ought to. Our prediction of the future in terms of the indices that we predict has been one of the most accurate predictive undertakings in the Federal Government or, for that matter, of any public or private institution that I know. And, while it isn't exact all the time, it is constantly corrected. We corrected it this year, for this temporary downturn. Even though we can't know what the price of fuel is going to do, what is going to happen to interest rates or to politics in the Middle East, or how many people are going to live in Washington, D.C. two years from now, we are doing pretty well in predicting aviation.

FAA Overview



Harvey B. Safeer
Director, Office of
Aviation Policy
Federal Aviation
Administration

Beginning with a review of the economic assumptions that are the base for FAA forecasting, Mr. Safeer presents an overview of the 1980 FAA aviation forecasts. Of particular note is the conclusion that absent any catastrophic long-term degradation of the general economy, aviation activity is expected to grow throughout the coming decade.

Good morning ladies and gentlemen. Welcome to the FAA's annual forecasting conference. Before I discuss this year's forecast, I would like to introduce the members of my staff who have worked on its development:

Gene Mercer — responsible for overall direction
Tom Henry — general aviation and the Terminal Area Forecast
Janice Hartwill — air carrier, FAA workload measures, and the Terminal Area Forecast
Arnold Schwartz — general aviation
Regina Vanduzee — commuters
Geraldine Bolden and Barbara Turner — text preparation.

Forecasting, as we all know, is still as much an art as it is a science. I know of no model or set of models, however sophisticated, that can "predict" future socioeconomic events. Most models of socioeconomic events merely state what we expect to happen if certain other events take place, the so-called exogenous variables, and if the relationship between the exogenous variables and what we are trying to forecast is as we have postulated it to be.

Forecasts of aviation activity are based upon other forecasts of general economic activity and relationships between what we expect to happen in the general economy and how these events will affect aviation. Thus, it is important to discuss not only the results of our forecasting efforts, but also the assumptions which we have either accepted, based upon the work of others, or those which we have made ourselves.

The key structural assumption which we have made with respect to the air transportation industry is

that the basic relationship between the Federal Government and the industry will continue to be one of economic deregulation.

Based upon the Wharton Long Term Industry and Economic Forecasting Model, we are using the following economic assumptions for the period 1980-1992:

1. Real gross national product is forecast to grow at an annual compound rate of 2.7 percent;
2. Employment is expected to grow at an annual compound rate of 1.3 percent;
3. Consumer price index is expected to rise some 11.7 percent in 1981, but by 1982, the rate of increase is expected to slow down to 7.3 percent, with a compound annual rate of growth of 8.2 percent;
4. Real disposable personal income is expected to grow at a compound annual rate of 2.8 percent;
5. Fuel prices, based on the Wharton projection of the oil and gas deflator, are forecast to grow by 225 percent between 1980 and 1992. The forecast assumes, however, that fuel will be available for aviation; and
6. The unemployment rate is forecast to peak in 1981, and then decline to 5.0 percent by 1992.

In addition to these general economic assumptions, we have made a series of assumptions specific to aviation:

1. General aviation fuel costs will increase at an average annual rate of 10.4 percent;
2. The average annual fixed cost of owning and operating a general aviation aircraft will increase at an annual rate of about 6 percent;
3. The overall certificated air carrier average passenger trip length is expected to grow at the historical rate of 3 miles per year; and
4. Average seats per aircraft are expected to increase about 4 seats per year.

Key Economic Assumptions

Variable	Annual Growth Rate 1980 - 1992 (%)
● Real Gross National Product	+2.7
● Employment	+1.3
● Consumer Price Index	+8.2
● Real Disposable Personal Income	+2.8
● Oil and Gas Deflator	+10.4

Aviation Specific Assumptions

<u>Variable</u>	<u>Annual Growth 1980 - 1992</u>
● General Aviation Fuel Costs	+10.4%
● Average Annual Fixed Cost of Owning and Operating a General Aviation Aircraft	+6.0%
● Average Air Carrier Passenger Trip Length	+3 Miles
● Average Revenue Per Passenger Mile	+5%
● Average Seats Per Aircraft	+4 Seats

Two additional assumptions are: load factors are expected to increase from about 61 percent in 1980 to 63 percent in 1984 and beyond, and revenue per passenger mile will increase in current dollars about 5 percent per year, but will decrease in constant dollars from the current 4.5 cents to 3.7 cents.

A change in any of these assumptions will, of course, affect our forecasts. Thus, we have continued our past practice of developing a set of forecasts based upon alternative future scenarios. When you read the descriptions of these alternative scenarios, don't be put off by the postulated events that lead to the alternative assumptions. Just remember that what seemed to be far out and improbable to some in the early 1960's—deregulation, high fuel prices—are facts of life today. The important use of these scenarios is to postulate the possible changes in the exogenous variables and, in turn, to see how these changes impact our forecast of aviation activity.

Turning now to the forecasts, let me briefly summarize the key ones which are expected to affect FAA policy and investment decisions which must be made in the next few years.

The air carrier industry is still undergoing a period of adjustment—not only to deregulation but also to higher fuel prices, environmental regulations, changing relationships within the industry and the introduction of new equipment. The jet age is slightly more than 20 years old and we will be seeing the third generation of new aircraft entering the fleet. General aviation is also experiencing more subtle, but nevertheless critical changes. In addition to having to cope with higher fuel prices and other costs, general aviation is being called upon to serve an increasing role in providing transportation which is essential to economic growth and development.

Domestic air carrier revenue passenger enplanements are expected to resume their growth in 1981

concurrent with recovery from the current recession. Over the 12-year period, we expect domestic revenue passenger enplanements to grow by an average 4.3 percent per year, while revenue passenger miles are expected to grow by some 4.8 percent per year.

Commuter carriers are expected to sustain a higher average annual growth rate, particularly as new equipment enters the fleet over the next few years.

We expect the general aviation fleet and total hours flown to increase at modest rates over the next 12 years. These growth rates, however, tend to mask the expected growth in the use of higher performance, better equipped, multi-engine aircraft which are entering the fleet at a rate which is double that of single-engine aircraft.

Aviation Activity Forecast

	<u>1980</u>	<u>1992</u>	<u>Annual Growth Rate (%)</u>
<u>Air Carrier Domestic</u>			
Revenue Passenger Enplanements (M)	290.5	481.1	4.3
Revenue Passenger Miles (B)	201.9	352.7	4.8
<u>Commuter Carriers</u>			
Revenue Passenger Enplanements (M)	13.8	35.0	8.1
Revenue Passenger Miles (B)	1.7	4.4	8.2

Aviation Activity Forecast

	<u>1980</u>	<u>1992</u>	<u>Annual Growth Rate (%)</u>
<u>General Aviation</u>			
Fleet (000)	208.0	315.5	3.5
Hours Flown (M)	42.1	64.3	3.6

Given these general forecasts of aviation activity, we expect a moderate rate of growth in FAA workload over the next 12 years, on the order of 3 percent per year for tower and center activities, approximately 4 percent for flight service station activities.

Total operations at airports with FAA traffic control service are forecast to increase by 43 percent between 1980 and 1992. However, this expected increase is only

part of the story. We expect to see a continuation of the trend toward increased participation in the System of air taxi (including commuters) and general aviation itinerant flying. Thus, air carrier operations are expected to increase by only 21 percent over this time period while air taxi and general aviation itinerant operations are expected to grow by 98 percent and 49 percent respectively. General aviation local operations are forecast to grow by 39 percent.

The net effect of these differential growth rates is a redistribution in the mix of operations in the System. This shift in the mix of aircraft types using towered airports has its implications for the operation of the Air Traffic Control System. The more heterogeneous the mix of traffic, the greater the problems associated with local flow control management.

Instrument operations at towered airports are expected to increase at a slightly faster rate than total operations. This represents a continuation of the trend toward more sophisticated equipment of general aviation aircraft and their increased use for business and commercial purposes, as well as the effect of additional TCA's and TRSA's.

This trend is also reflected in the number of IFR aircraft handled by our Air Route Traffic Control Centers. While total activity is expected to increase by 46 percent, air carrier aircraft handled are expected to increase by only 22 percent. Air taxi (commuter) and general aviation aircraft handled are expected to increase by 124 percent and 86 percent respectively. Once again, these differential growth rates will result in a redistribution of the relative share of the workload. By 1992, the Centers will be handling almost as many general aviation aircraft as air carrier aircraft.

FAA Workload Forecast

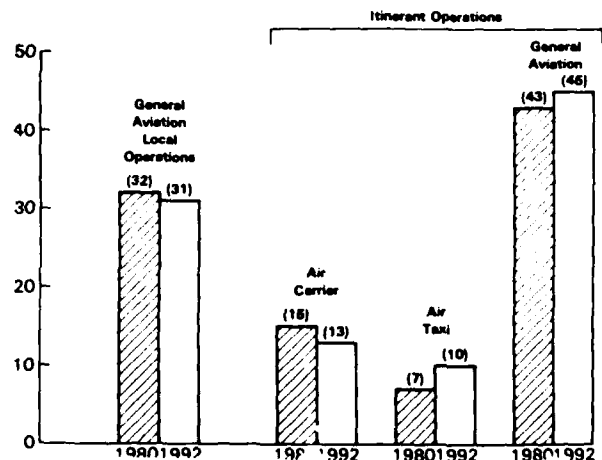
	1980	1992	Annual Growth Rate (%)
Total Tower Operations (M)	68.6	98.4	3.1
Instrument Operations (M)	38.7	56.6	3.2
IFR Aircraft Handled (M)	30.1	44.0	3.2
Flight Services (M)	65.4	103.4	3.9

As I indicated earlier, these forecasts are based upon a set of assumptions and forecasts of general economic activity. We also generated a series of forecasts based upon alternative sets of assumptions.

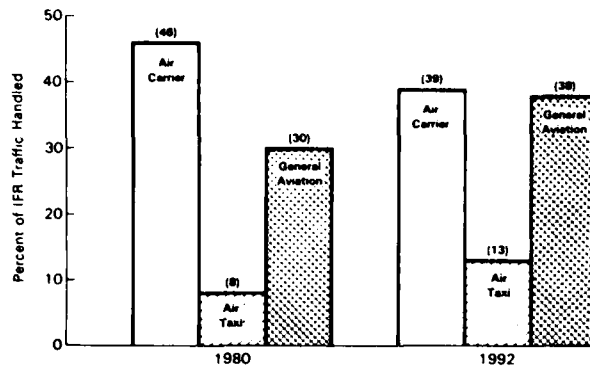
While you can read the details of the scenarios and the resultant forecasts in the report, I think that it is important to focus on the implications of these alternative forecasts for 1992. Two of the scenarios, "Economic Expansion" and "Energy Conservation" tend to bracket the baseline forecast. In fact, if you look at the numbers carefully, you will observe that the general trend of the baseline forecast is closer to the "Energy Conservation" scenario. The general trend for the baseline and these first two alternative scenarios is, however, economic growth and concurrent aviation growth, albeit at differing rates. It is only under the third alternative scenario, "Stagflation," where we see a significant departure from a growth trend.

The implications are significant. If we truly believe that our economy is going to grow at all over the next decade, we must accept the logical extension of that belief, which is that aviation will grow. To not accept the strong interdependence between the economy and aviation's future is to assume that the very structure of our Air Transportation System will change over the next 12 years. I do not foresee any technological, social, or economic changes which will be strong enough, in and of themselves, to either change these relationships significantly or reverse the long term trends which we are forecasting. There may be cyclical perturbations about this trend, such as the recessions of 1975 and 1980, but so long as we continue to provide an adequate infrastructure for the Air Transportation System, the trend for all types of aviation activity is growth.

Distribution of Operations at Airports With FAA Traffic Control Service



***Distribution of IFR Traffic Handled by
FAA Air Route Traffic Control Centers***



***Forecasts of FAA Workload
Measures — Baseline
and Alternative Scenarios***

FAA Workload (Millions)	FY 1980 Base	FY 1992 Forecast			
		Economic Expansion	Baseline	Energy Conservation	Stagflation
Total Tower Operations	68.6	116.8	98.4	83.5	62.1
Total Instrument Operations	38.7	79.5	56.6	59.3	45.4
IFR Aircraft Handled	30.1	58.8	44.0	42.0	33.5
Flight Services	65.4	120.4	103.4	99.9	76.8

In conclusion, let me restate my initial premise: forecasting is, at best, an inexact science. Over the long term, we can generate probable trends and identify both the forces underlying those trends and the forces which can cause deviations. If we can agree that the trends have been correctly identified, then we have developed a mutual framework for future planning and policy development. If we view the forecasts in this perspective, I think that we in aviation have both a challenge and an opportunity in the coming years.

Part II: Air Carrier Panel Discussion

Moderator:

William B. Johnston

Assistant Secretary for Policy and International Affairs
Department of Transportation



Introduction



William B. Johnston
Assistant Secretary
for Policy and
International Affairs
U.S. Department of
Transportation

In general, as I look at my job and try to plan transportation change, it's fair to say that almost everything we do involves a look at the past and extrapolation. It's not a very effective mechanism because one thing that is always certain is that change is going to be in many respects unforeseen. Certainly if you look back at the history of the last decade in aviation you would have to say that the changes, in many respects, have been revolutionary and that most of them have been quite unforeseen.

I think the first, perhaps most critical, change that dominates our current thinking and that is likely to dominate the change in the 1980's is the change in the cost of fuel. The 1973-1974 fuel shock caused the aviation industry to drastically alter its attitudes toward the way airplanes were operated. A lot of the ways of operation in the era of 12 cent fuel are obviously outmoded now when fuel costs 90 cents a gallon and is something like 31 percent of total operating costs.

Furthermore, at the beginning of the 1970's, few people were seriously concerned about landside congestion problems. In that year there were something like 170 million airline passengers. That issue is becoming much more important today. In 1979 the airlines moved 320 million people.

Airline marketing, ten years ago, seemed to be somewhat incidental to the running of the airlines. That is, it was much more important to have the most sophisticated lawyers in order to convince the CAB of the merit of applications for service. But obviously, all of that is changing now with multiple permissive entry that the CAB is currently pursuing. This is a new era.

I think it's clear that the name of the game in the 1980's is going to be marketing. It's going to be discounting, it's going to be designing short-term promotional efforts in order to penetrate markets. Whatever the marketing techniques that are pursued, I think it's going to represent a fundamental shift in airline philosophy from the previous decade. Of course, at the beginning of the last decade, no one was seriously talking about regulatory change. But, again, that has also

changed fundamentally with the passage of the Deregulation Act of 1978 and the International Transportation Competition Act of 1979.

Hopefully, change in the 1980's will be less revolutionary than that which has happened in the 1970's, but certainly there will be change. We should not be surprised if there are more interruptions of our oil supply. We should not be surprised if the price of fuel continues to rise steeply. Change in regulations is also going to continue.

Many of you have called for the abolition of the CAB before its scheduled expiration date in 1985. We also have been looking at that issue and will be discussing it in the future with the CAB staff. I think our conclusion, tentative conclusion, is that perhaps the phase out of the CAB could be accelerated to as early as 1982.

As I have said, I think we could also expect fuel prices to increase. The limitation on that natural resource is going to force aircraft manufacturers, engine manufacturers and operators of aircraft to change the way business is done.

History has already shown some fairly dramatic responses to increases in the price of fuel. Since the jet engine was introduced in 1956, technological improvements have reduced specific fuel consumption by 30 percent. Another 30 percent is expected in the future through the introduction of more advanced engine technology. The first steps toward this goal have already been taken. For example, improvements in the Pratt & Whitney JT8D engine—which as you know powers most of the current generation two and three engine aircraft—will produce a 5.5 percent improvement in fuel consumption. At today's fuel prices, that's worth about \$200,000 a year for each 727 in service. That's not an insignificant improvement. The new technology JT8C-200 to be used in the DC-9 Super 80 will be 20 percent more fuel efficient than the engine from which it was derived.

As I think we will hear this morning, airframe manufacturers are also paying significant attention to these fuel costs in their new designs. I'll mention just the Lockheed L1011-500 which was recently introduced in service. It has wingspan extension, improved load distribution and automatically activated control surface; aerodynamic changes producing an 8 percent improvement in fuel consumption. In addition, the introduction of automatic flight management systems which select the most efficient power setting on the L1011 for takeoff, landing and cruise has demonstrated about 2 percent in fuel consumption savings. I think there are more changes likely and possible in that area.

I also think that we are going to see some significant changes in the domestic route system in the 1980's. Hub and spoke development has increased in the most recent years since entry has been relaxed. Exactly how far that will extend is a little difficult as yet to judge.

What does all this add up to? I only venture my guess and that is, again, by looking back at the past, despite all the revolutionary changes, despite the dramatic increase in the price of fuel that some predicted was going to have a serious impact on airline traffic, I think that it's fairly safe to guess that the 1980's are going to be more of the same. At least in the area of traffic growth, we are going to see steady upward improvement.

We've all come to rely on the aviation system that we have in place now. Despite the argument of some of those who see fuel prices as leading us off the edge of a cliff, I think that is highly unlikely. In fact, this industry is going to show a great capacity to adapt to these changes and to continue to grow and to serve the markets.

With us this morning are three people who are very knowledgeable and distinguished in each of their fields. The first speaker is Neil Effman, Senior Vice President for Airline Planning at Trans World Airlines. He is responsible for long range airline planning and the allocation of resources through traffic and revenue planning, pricing, scheduling and government affairs.

A native of Brooklyn, New York, Mr. Effman joined TWA in 1958 in the Sales and Market Forecasting Department. His subsequent assignments included Manager of Traffic and Revenue Analysis, Director of Passenger Strategic Planning, Staff Vice President for Marketing Planning and Forecasting and Staff Vice President in Reservations Marketing. He is a graduate of City College of New York.

Neil's going to talk to us this morning on a subject which is either taken from Dickens or, perhaps, from TWA's recent earnings report. I'm not sure which. It's called "(Reasonably) Great Expectations".

(Reasonably) Great Expectations



Neil Effman
Senior Vice President,
Airline Planning
Trans World Airlines

The major issue to be resolved by airline management today is how to finance the next generation of aircraft, according to Mr. Effman. He sees the freedoms of deregulation as an essential step in the process. The airlines will have to become more profit oriented, not market share oriented, to meet their capital needs.

The letter which invited me to take part in this discussion noted that speakers should address the subject of "an industry in transition." I think that's exactly the right starting point for any meaningful discussion of this industry's outlook for the future. Only with the background of a proper understanding of the profoundly changed conditions we've faced, and will continue to face, can we shape a reasonable picture of what might lie ahead for us.

There's no question as to what various interested parties would like to hear in terms of forecasts regarding the future of the airline industry. The airframe manufacturers would like to hear that the airlines will have the resources to place large orders for new types of aircraft. The government, on behalf of the public, would like to hear that the industry will be vigorously competitive and highly efficient private enterprises, offering more services, more convenience, at lower fares—without any need for government assistance. Airline managements would like to hear that they'll be able to buy new aircraft in great quantity and variety, serve all the markets they aspire to, and earn larger and more consistent profits. The financial community would certainly like to hear that all those things will come to pass, too—as would the nation's airport operators.

Well, I hate to be the one to dampen such hopes, but it seems to me that if a serious attempt is made to realize all of these objectives, our industry may fall far short of adequately achieving any of them. Unpleasant as it may be to speak in terms of placing bounds on our expectations, I'm convinced that a candid recognition of the reality which confronts us makes prudence in

our planning inescapable. Otherwise, the future we produce will be one we find even less satisfactory than at that lowered level of expectation. As bitter a pill as it may be for some of us to swallow, I think the most dangerous enemy we're up against in the remainder of this decade is unchecked, irresponsible optimism in the face of the realistic constraints of our situation.

The choices each of the airlines faces in the immediate future can have the most profound consequences on the totality of its operations for years to come. Unless they act wisely, with full awareness of the fundamental changes that have occurred in our industry, as well as the monumental task they face in renewing their fleets, their ability to function as profitable private enterprises will be seriously—if not fatally, in some cases—impaired. Let's focus first on the dimensions of the task ahead of us.

In 1978, the ATA made a study of the industry's capital requirements and potential sources of funds for the 10-year period from 1979 to 1989. The ATA estimated that the airlines' total 10-year capital requirement—for fleet replacement, debt repayment, stockholder dividends and additional working capital—would come to \$122 billion. Where would those funds come from? The ATA estimated that \$34 billion would come from depreciation, \$43 billion would come from new debt, and the remaining \$45 billion would be derived from airline earnings.

Regarding that last item—\$45 billion in earnings over a 10-year period—you might say there was a certain amount of unwarranted optimism in the forecast, at least if you go by the record of the previous 10 years. In the 10 years prior to 1979, the industry's total earnings averaged only \$500 million a year. At that rate, it would take not one decade, but nine decades, to earn \$45 billion.

Now, let's look at what's happened since that projection was made. In 1979 the industry earned \$400 million. In 1980, we're most certainly headed for a loss of close to \$500 million. In 1981, the most cheerful Wall Street industry analysts say we might earn \$500 million. In other words, during the first three years covered by the ATA's projection, the industry's total earnings will not even reach \$1 billion—much less the \$4½ billion a year we were supposed to earn. That means that, to make the ATA's projection come true, in the next seven years, we'll have to make up a gap of \$44 billion—at a rate of nearly \$6.3 billion a year. What's more, every year we miss that target will add to what we'll have to earn in the remaining years of the decade.

If we're looking for the major reality that's going to shape the future structure of our industry, I would nominate the task of meeting our enormous capital requirements by the end of this decade as being the leading contender.

Now, do I think we'll make it? Certainly, in the absence of deregulation, I would be far less sanguine

than I am. With deregulation, we at least have what we didn't have under the old rules—the opportunity to reshape our system operations so as to improve profitability. The key question is going to be how wisely we use that opportunity.

In deciding which markets to serve under this new freedom, airline managements cannot afford to act as though deregulation had wiped the slate clean. All during the 40 years prior to deregulation, an air transportation system evolved in which the various carriers carved out for themselves respective niches which had varying degrees of strength and weakness. With regulatory controls removed, we can now make changes aimed at enhancing some of those strengths and minimizing some of those weaknesses. Nevertheless, the basic historical structure of strengths and weaknesses remains as the framework within which these relatively minor changes are occurring.

No airline I know of, given the current period of economical constraint can afford to build on its own historic areas of strength and at the same time try to become equal with its competitors in their areas of strength, after 40 years of route awards that have placed it at a structural disadvantage. For a long time to come, I believe that financial constraints, if not sound judgment, will demand that carriers focus their assets on market opportunities where they enjoy at least structural parity with their competitors—rather than try to take on all comers, in a profusion of markets, on an equal footing. Of course, without deregulation, they couldn't even have done that.

Already, we've seen these natural competitive forces begin to influence service decisions, and I think this kind of shifting of resources is likely to accelerate in the light of the industry's capital limitations. At Atlanta, for example, the combined share of traffic boarded by the two leading carriers has increased from just 37 percent four years ago to 92 percent in the second quarter of this year. The same thing has happened at Chicago, where the two top carriers have gone from 49 percent to 53 percent of the total traffic. Even at Dallas, where a number of new carriers have entered the market, the two leaders carried about two-thirds of the traffic in the second quarter—slightly more than they did back in 1976. We see the same pattern at other hubs like JFK, Pittsburgh and St. Louis—and with the current traffic and earnings situation it's inevitable that we're going to see more of this kind of concentration generally, as carriers drop services to their weaker markets and shift resources toward their strengths.

I'm aware that "concentration" is not a popular word in some circles, but I would nevertheless contend that for the airlines, the current competitive pursuit of improved profitability, rather than increased shares of someone else's traffic, is evidence of the kind of sound, prudent management decision-making which today's extraordinary circumstances demand. In fact, I would

even go beyond that, to state that it is this kind of intelligent resource allocation that offers the industry's best—perhaps its only—hope of providing this nation with an air transportation system for the remainder of this century that can operate profitably as well as competitively under the private enterprise system. The alternative, I believe, would involve an excess of waste and duplication that could prove ruinous to all the participants. The only conceivable outcome of such a scenario would be a call upon government to come to the rescue—which I'm sure no one, least of all the taxpayer, would welcome.

Inevitably, the emergence of a profitability-oriented, as opposed to share-oriented, airline industry focus has significant implications for other sectors of the economy as well. The financial community, for example, cannot but applaud such a trend, if it represents a genuine and lasting commitment.

The new realities of airline economics will also have an impact on local airport management. Let's see why. A DC9-80 delivered in 1983 is expected to cost about \$25 million. That's far more than the original cost of a Boeing 747. In turn, a 747 delivered in 1983 will have a price tag close to \$100 million. At those prices, no airline can afford to operate with fleet utilization of six, seven or even eight hours a day. They'll have to move up to something like 10, or more likely 11 or 12, hours a day. As a consequence, that means we'll have to plan schedules that operate well beyond the hours that are considered acceptable today. There's no other choice, because the airlines will simply not be able to raise the capital needed to increase their capacity at today's standard utilization rates.

The airlines will have to fly all their aircraft more hours, with greater seating density and higher load factors, simply to achieve their financial goals. As a consequence, that means communities will also have to get greater utilization of their existing airport facilities—an important consideration when one looks at the comparable rise in the costs of developing new facilities.

But with a trend toward widebodies, operating with denser seating configurations, I see little growth in the total number of daily aircraft departures in the coming decade—even though I basically agree with the FAA's forecast for traffic growth. We'll see a continuation of the pattern of the last decade, when departures actually declined 10 percent at the same time the industry's traffic doubled. The real challenge for airport operators will be one of getting tomorrow's growing traffic to, through and away from their facilities efficiently, so as not to choke off future demand.

The implications of the current trend are also clear for the airframe manufacturers. Smaller aircraft will play a lesser role, and future emphasis will be on far larger and more efficient aircraft to replace existing ones as soon as possible.

Given the major investment needed to develop a new model, I can understand the manufacturers' misgivings about the financial prospects of the industry. They would like, in addition to a sufficient quantity of orders for their new designs, some assurance that the industry will be viable enough to pay for the aircraft they order—maybe as much as five years prior to their delivery date. But without a firm commitment to consistent profitability as a priority, there's no way the airlines can ever offer such reassurance.

As I've indicated, the shape our industry will have to take in light of its stern realities may not be one that's universally pleasing. It will involve the kind of limited expectations that a historically buoyant, optimistic and expansive people are not yet fully accustomed to.

Some in government may be disappointed at the forms which competitive activity may take in response to the disciplines of the marketplace—but the professed aim of deregulation was to replace regulatory control with those very market forces, and that's exactly what has happened.

Some airline managements may find it hard to accept that they're not really free to buy all the types and quantities of planes they'd like to have, in order to serve the many new markets they'd like to enter—but the fact is that they can't afford either level of aspiration.

The traveling public may feel disappointed that many of the much-heralded consumer benefits of deregulation have evaporated, and they find instead they have fewer rather than more schedule and carrier choices available to them, on planes that seem more crowded than ever, at fares that more realistically reflect what's been happening to airline costs.

None of these prospects may be especially satisfying, or in keeping with our historical tendency to expect "more of everything and better"—but these phenomena are only one facet of a general reassessment of the future which our society has had to face up to across the board. Everybody knows the reasons by now. They involve the great unsolved problems of our time: our nation's energy dependence and resultant vulnerability to unilateral foreign pricing actions . . . our economy's ongoing battle against inflation . . . the growing complexity and cost of virtually every aspect of contemporary life. In area after area, unfortunately, we have no rational or responsible course available but to scale down our level of expectations to what reality tells us we can reasonably and efficiently afford.

Unless we in the airline industry do likewise, the expectations of our air transportation system will be at a level all of us will find even less to our liking than the one I've described. I'm confident, however, that this industry is intelligent and responsible enough not to let that happen. Our early experience with our new freedom to act under deregulation has been exhilarating—but also instructive and, in the end, sobering.

I am hopeful that, having flexed our competitive muscles and demonstrated our talent for innovation in

an industry that was strapped for 40 years into a strait-jacket, we have gotten the pent-up beans out of our system and are ready to settle down to the less spectacular, but far more satisfying, job of building a more stable and prosperous industry. Only by demonstrating our ability to operate the airlines on a solidly profitable basis will we meet successfully the great responsibilities we face to the public and our own destinies.

Thank you.

William B. Johnston:

Our next panelist is somebody we were extremely reluctant to lose from the Department not long ago. He was a career FAA employee who rose on the basis of merit to the very top of the organization. His last job before he left FAA was the head of the Policy Office, capping a career of almost 30 years in the Department. At present, he is the Director of the Air Navigation Bureau of the International Civil Aviation Organization (ICAO). He's going to talk to us today about the forecast for aviation from the world viewpoint in the 1980's.

That's a short speech singing his praises, but I probably also ought to give you his name. It is Duane Freer.

Airlines in the 1980's— A World View



Duane W. Freer
Director, Air Navigation
Bureau
International Civil
Aviation Organization

Because of the presence of a majority of the world's aviation activity in the United States, this country will continue to play the leading role in international aviation. However, Mr. Freer expects aviation growth rates to be much higher in the lesser developed regions of the world as existing opportunities in these areas are exercised.

The International Civil Aviation Organization is delighted to participate in the Sixth Annual Aviation Forecast Conference. It's the first time we have done so and, since we issue world forecasts, we think we have something both to offer and receive from this conference. For me, personally, of course it's especially warm and pleasurable opportunity to come back and to meet old friends and compatriots as well as to see how the Office is running.

I would like to start out with a brief word about ICAO. I am always struck in any audience that not everyone is familiar with the ICAO organization, its size, missions, programmes, etc. I'll do it very briefly.

ICAO's flight plan was filed in 1944 at the so-called Chicago Convention that was an international initiative of the United States at the end of World War II. ICAO took off on schedule one year later in 1945 and has been in continuous flight ever since it first became airborne. Its fuel tanks have ample "reserve" and they are replenished each three years at the Triennial World Assembly meeting. 1980 is such a year. As I believe Bill Wilkins mentioned, just this very month we ended the three week Assembly meeting at which FAA was a major participant. The three-week long, twenty-third ICAO Assembly meeting will come up again in three years in the absence of any special ones. There were 134 member States in Montreal at our headquarters for this meeting and 17 international organizations.

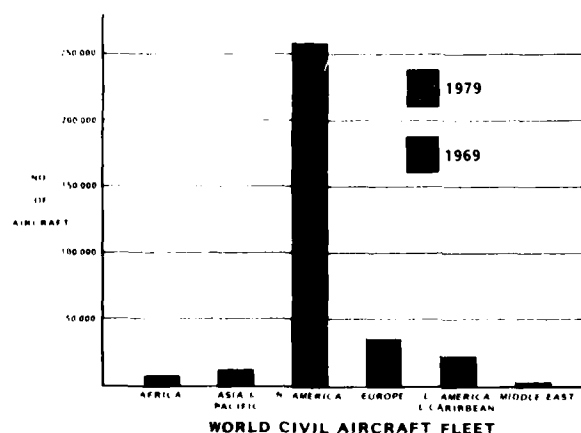
ICAO is an inter-governmental organization with the status of a "specialized agency" of the United Nations system even though its existence predates that of the U.N. itself. Its mandate covers all fields of avia-

tion: technical, economic and legal. Its relationship with the U.N. system was foreseen at the time of the Chicago Convention. Also, it works in close collaboration with the many other specialized agencies of the U.N. system. It is headquartered in Montreal and has six regional offices in Mexico City, Lima, Paris, Dakar, Cairo and Bangkok. My position at ICAO is that of Director of the Bureau that is responsible for all technical aspects of international aviation. It includes air traffic control, flight operations, airports, communications, meteorology, aviation medicine, security, search and rescue, airworthiness, licensing and training. It is a job similar to what used to be the Associate Administrator for Operations at FAA without line operations.

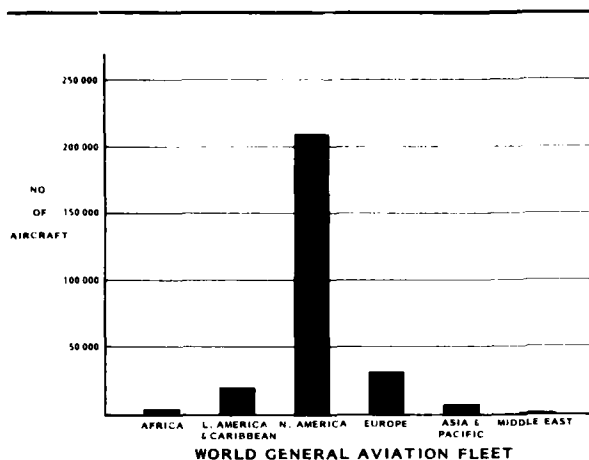
Today, ICAO has 146 member States. It has one of the largest memberships of all the United Nations specialized agencies. It includes virtually every country in the world that contributes services or facilities to international aviation.

Let me move on to the subject of this conference: "Aviation in the 1980's: An Industry in Transition." I would like to give you some highlights of ICAO's just released review of *Economic Situation of Air Transport 1969-1979*. I think you will agree that the record depicts a world-wide industry that has been evolving, that is in transition.

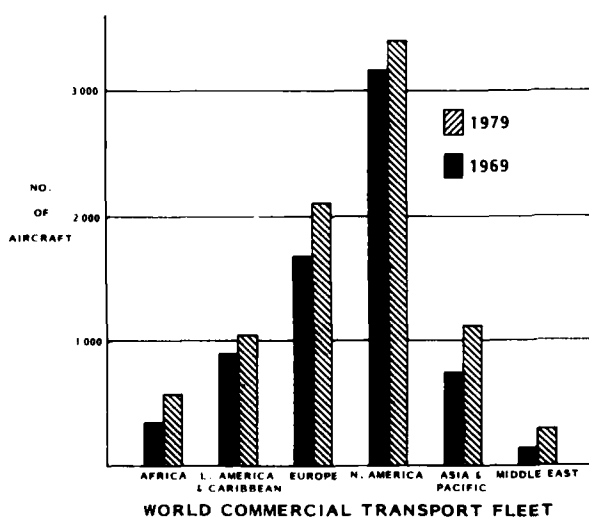
Following a look at the past decade, I'll spend a few minutes on the ICAO forecast for the next 10 years, that's to 1989. Let me set the stage at the start here by first covering the world civil aviation fleet in its entirety, including all general aviation and all air carrier aircraft of all types. In total, ICAO lists 336,450 aircraft on world registries at the end of 1979. By region of the world, the breakdown looks like this (Figure 1).



The next chart I would like to show you breaks it down a little further. The general aviation fleet is a big part of that tall spike in the North American region. This is what it looks like (Figure 2). The figures are very close to what are listed in the forecast you received today. General aviation accounts for better than 97 percent of the entire civil aviation fleet. Again, there are many times as many general aviation aircraft in the North American region than in any other region except Europe. It's 6½ times larger than Europe.



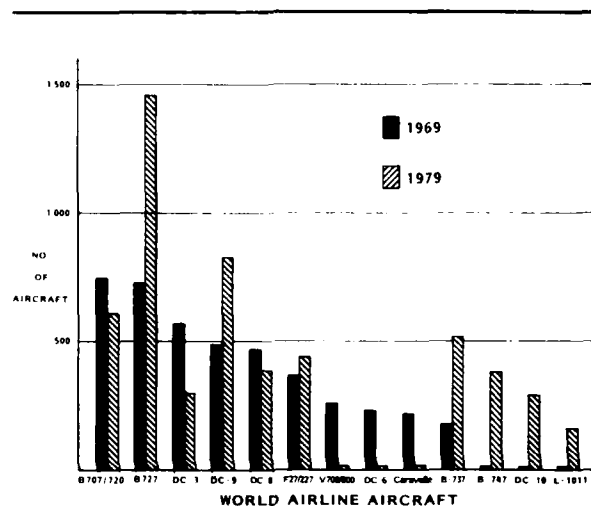
Of particular interest to this panel would be the breakout by region of the remaining 2½ percent of the world fleet, the 8,590 aircraft in the world's commercial transport fleet (Figure 3).



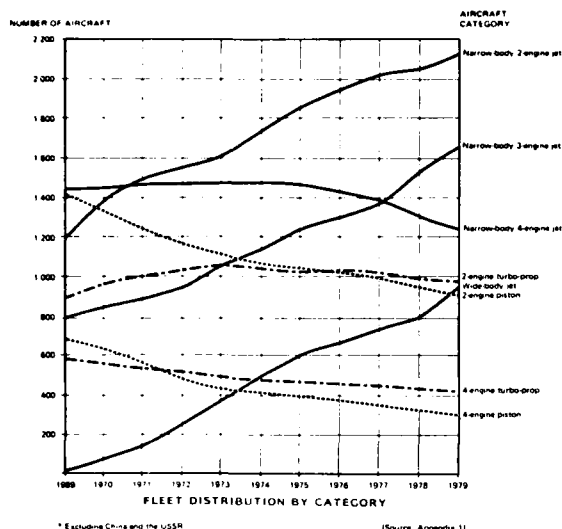
In ICAO's commercial transport fleet statistics, we include all aircraft of more than 9,000 kilograms (20,000 pounds) take-off weight. This includes aircraft in both scheduled and non-scheduled air transport service.

Note the changing profile of the fleet as you read the graph (Figure 4) from left to right and compare 1969 with 1979 ending up with the obvious market penetration of the widebodies. In the next viewgraph, the changing fleet profile is even more apparent.

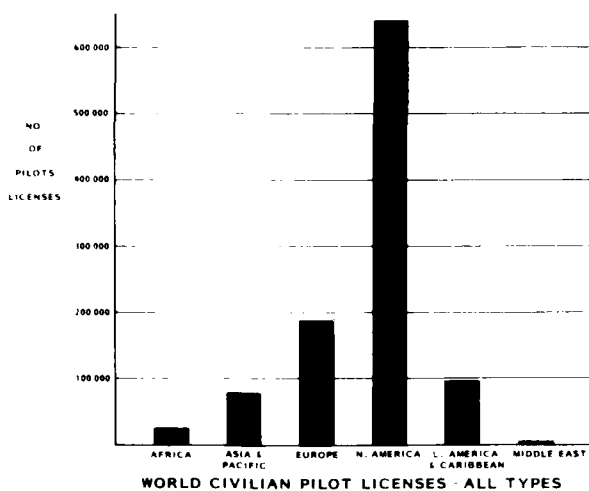
If we were to put together such a chart in 1980, obviously the A-300 would be on it. I think the A-300 sales numbers, if I am not mistaken, are now somewhere around 170. That would move it to somewhere in the middle, I think, of the widebodies.



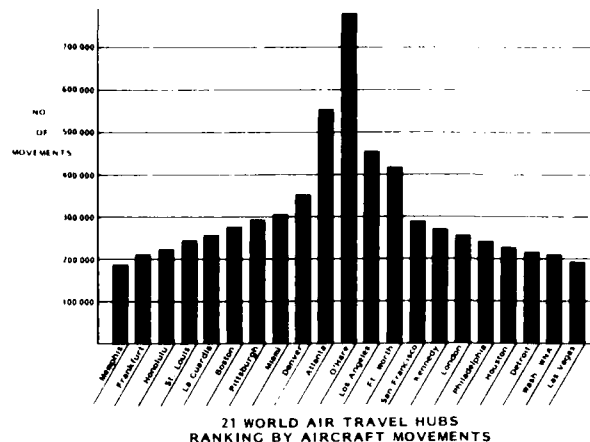
The next chart (Figure 5), is another version of the changing profile that was shown on the last chart. It may be more graphic. You will see the lines that increase across the chart from low on the left and high on the right are the jets. The ones that decrease or have a generally downward trend obviously are the props. The only exception is the four engine jet.



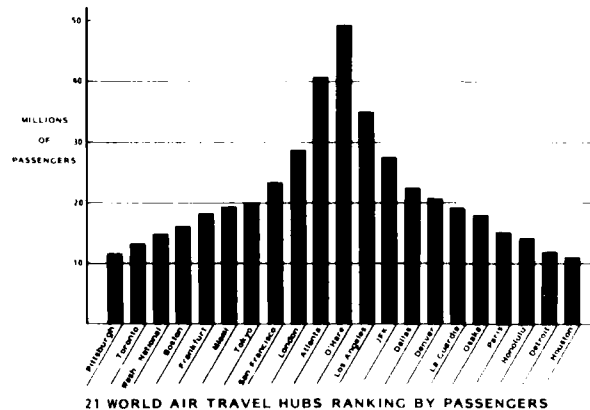
Now, let's take a look at who's flying these airplanes by region (Figure 6).



Here are the top 21 airports in the world, air travel hubs, air carrier airports to use FAA terminology (Figure 7). Of the top 21 there are 2 foreign: London and Frankfurt. You can see they are well down the line in terms of movement. O'Hare is about 2½ times busier than its nearest foreign rival, which is London.



Finally, passengers embarked and disembarked or, to use FAA terminology, revenue passenger enplanements (Figure 8). It is a very similar chart. There are a few airports that were on the first chart that are not on this one. It reflects the fact that a lot of the traffic at foreign airports is purely air carrier. Now, if you were to put the top 48 or 50 or 100 airports on one graph you would find essentially the same thing. I think if you took the top 100 airports in the world by movement you might get 5 or 6 world airports outside of the North American region.



The size of the U.S. fleet is the reason why I think when the Civil Aeronautics Board of the U.S. or the Federal Aviation Administration makes a pronouncement, announces an action or puts out a Notice of Proposed Rulemaking, the rest of the world listens. I think that's an important part of the message I wanted to portray with these graphs. The fact is, for better or worse, the rest of the world pays very, very close attention because of this country's position.

Now, I would like to add a couple of other matters of data that are not on the charts. The size of the world commercial transport fleet grew from about 7,000 in 1969 to 8,590 in 1979. That's a 22 percent growth in numbers of aircraft in the commercial transport fleet. But the number of passengers is 2½ times greater than it was in 1969.

In 1979 the commercial transport fleet was operated by 560 carriers, worldwide, of which 160 were domestic and the remaining 400 were international. There were 344 scheduled airlines flying domestic and international routes. They operated 86 percent of the world air carrier fleet and 92 percent of the jets. The remaining 216 airlines in the world are the so-called charter carriers who operated 14 percent of the fleet and 8 percent of the jets.

The annual average growth rate has varied considerably from one sector and region to another during the past decade. The 10 year average annual increase in internationally scheduled traffic was 11.9 percent. It reached 19.6 percent per year in the Asia-Pacific region as compared to 7.3 percent in North America.

Let me now shift to ICAO's forecast for the 10 year period 1979-1989. ICAO is forecasting an average annual increase of 7 percent per year in passenger traffic carried by the world air transport fleet. This compares with an overall average of 9.7 percent for the past 10 years. This 7 percent per year projection by ICAO compares with FAA's 4.3 percent that Mr. Safeer showed a few minutes ago. Looking just at North America, ICAO's forecast is very close to FAA's. We're showing 5 percent, you're showing 4.3 percent. I think we are not far apart at all there.

ICAO sees considerable fluctuation from year to year with a below average rate of increase for the first year or two, as in the FAA forecast. This below average start is associated with fuel related tariff increases and slower world economic growth in the short term. We see the highest yearly growth rates in passengers carried — from 10 to 12 percent — occurring in the Middle-East, Asia-Pacific, Latin America and Caribbean regions. For North America, we forecast only a 5 percent per year growth rate, less than one-half of the high growth regions.

In freight traffic, ICAO forecasts an average 8 percent annual world increase over the next 10 years. This is made up of 5 percent domestic and 10 percent international. Here, again, we see the African, Asia-Pacific,

Middle-East, Latin America and Caribbean regions with higher growth rates: from 10 to 13 percent per year.

Our rationale for the relatively higher growth rates in both passenger and freight traffic in regions other than North America and Europe is based on three premises. They are, first, the other regions predominantly consist of developing countries which are expected to have relatively higher economic growth rates; second, the relative efficiencies of the air transport fleets in these same developing countries are low and, therefore, it is possible, through fleet modernizations, already underway, for them to achieve correspondingly larger reductions in fares and rates; and finally, there is a distinct probability of significant traffic growth resulting from new routes and improved service frequencies in these areas over the next decade.

I will conclude by saying that ICAO forecasts do not begin to cover the wide spectrum of activities and aspects that are covered in the FAA forecast that we all received this morning. We are grateful to the FAA for its pioneering, astute and, I think, comprehensive aviation forecasting efforts. On behalf of ICAO I wish to thank the FAA and its Office of Aviation Policy for the report they have given us this morning and to assure them and you that it will be a welcome and much read volume in the library at ICAO in Montreal.

William B. Johnston:

Our next panelist is somebody that's probably so well known to all of you in this audience that if I did not mention his name, it would hardly matter. He is a graduate of MIT. He's been with the Boeing Aircraft Company for almost four decades. During that time he has been involved in or chiefly responsible for the product development programs of virtually every aircraft that company has produced. In particular, he was the head of the teams that brought out the 727, the 737 and the 747 aircraft. He's been Aviation Week's *Man of the Year* twice. He's been recognized around the world for his contributions, he's really a man that need no introduction: John E. Steiner.

Fundamentals of Aviation Growth: A Manufacturer's Perspective



John E. Steiner
Vice President,
Corporate Product
Development
The Boeing Company

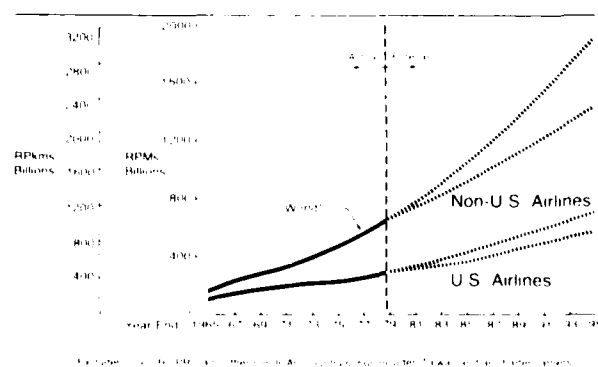
While his forecast of airline activity is a little more optimistic than that of the FAA, Mr. Steiner does not consider the difference to be significant. Realization of the activity levels forecasted will require, he maintains, a change in the adversarial relationship existing between elements of government and industry.

Good morning—

My subject this morning deals with the ten year commercial aviation forecast, an aircraft manufacturer's view of the present situation, the next ten years, and finally, a look at the period beyond.

First, let's start with the familiar revenue passenger mile growth curve, as viewed by The Boeing Company.

World Revenue Passenger Travel



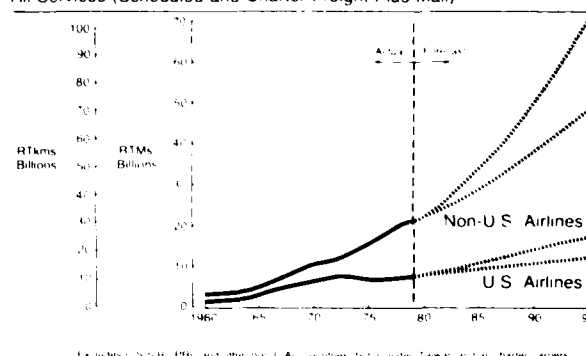
Our assumptions are not significantly different than the economic assumptions used by the FAA in their current forecast. We normally use a low and a high line as shown in the figure with a "baseline" that is halfway

in between. The last two decades have seen about a 12 percent average annual growth and we expect the average annual growth over the next two decades to be about 7 percent. This baseline is a little higher than that of the FAA, and would yield about a 5 percent higher number by 1985, and perhaps a 10 percent higher one by 1990. I don't consider this difference to be very significant. We can all agree there will be substantial future growth, but over the short term, it can often be turbulent and difficult to predict with precision.

Air freight has been much more difficult to estimate, and while our experience with passenger side forecasts has been one of reasonably consistent accuracy, our experience with forecasts on the freight side has been the reverse. Figure 2 shows historical actuals and our Boeing predictions for the next fifteen years.

World Airfreight Traffic

All Services (Scheduled and Charter Freight Plus Mail)



We, as well as the FAA, predict a rapid world growth for the future as shown. However, for the U.S. domestic, our estimates tend to be somewhat lower than those of the FAA.

The degree of stimulation to the freight system in the United States is an important growth factor, and this involves the total national intermodal freight system, and might possibly even involve some similar stimulation from the military side of the house. I would say that of the four areas, passenger and freight, U.S. and non-U.S., that the U.S. freight growth is probably the most difficult to forecast, due to the unknowns in its stimulation elements.

The Present Situation

The economics imperative is the force that will govern the industry's skies through this decade and well beyond into the next century. And, of course, fuel efficiency is the principle forcing function contained in the 1980's economic equation. Figure 3 lists some components of the economics imperative.

The Economics Imperative

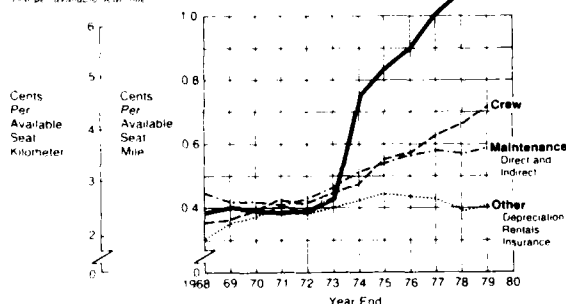
- Fuel Efficiency
- Productivity and Cost (Aircraft Price)
- Airline Profitability and Capital Formation
- ROI Optimization Through Equipment Selection
- Economics of Obsolescence

I will touch briefly on all five of these major elements. It was not too long ago that direct operating cost was neatly composed of about four equal size parts: depreciation, maintenance, crew and fuel. What has happened in the last seven years has to be viewed as extraordinary and is illustrated by Figure 4.

Influence of Fuel Price

Direct Operating Cost Elements (Current Dollars)

U.S. Domestic Trunk Airlines - Initial Services
COST per available seat mile



Source: CAB Form 41, Schedule P5

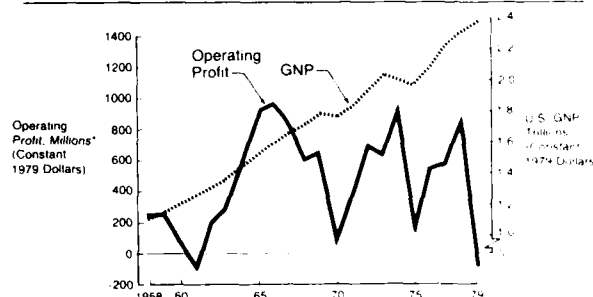
Fuel costs have increased by a factor of four or more, while other elements of operating costs have escalated at rates equal to or less than inflation. There is an economic fundamental out of this ... that is, from a direct operating cost standpoint, the airlines can pay for later and more efficient equipment that will save fuel. The cost of operating less efficient equipment will continue to rise and offset the impact of depreciation. However, new airplane acquisition is frustrated by the airlines' inability to capitalize at a rate consistent with that of the combination of traffic growth and fuel costs.

The fuel imperative, of course, comes on the heels of the noise imperative. Regulation which will make hundreds of airplanes obsolete and unusable is now in the process of promulgation. Fortunately, the same power plant changes that produce fuel efficiency also

produce lower community noise, and there is a degree of synergism between the two. Nonetheless, the airplane obsolescence situation will place an additional capitalization requirement on the U.S. and the world airlines during the first half of the 1980's.

Airline capitalization capability is more or less directly related to operating profits. When profits are high, the airlines can buy, when profits are low, they can't. Recent highs and lows have been drastic on about a 5-year cycle, as shown in Figure 5.

U.S. Trunk Airline Operating Profit and U.S. Gross National Product



Sources: CAB Form 41, Survey of Current Business, U.S. Dept. of Commerce, Domestic Airline Operations.

The present situation is perhaps as extreme as any in recent years, with the combination of fuel pressures from the fuel cost and noise imperatives, an economic recession, increased competition; all combining to produce the lowest earnings in airline history and a desperate need for productivity and cost improvements from all fronts.

Faced with this combination of circumstances, the airlines were quick to enact fuel conservation measures. Items such as the ones shown in Figure 6 are typical.

Typical Fuel Conservation Items

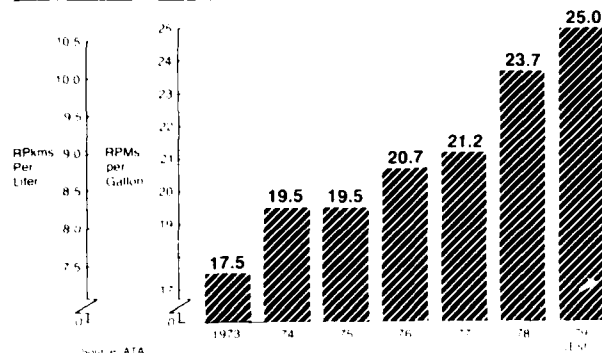
- Cruise speed reduction
- Optimum altitude
- Optimum climb and descent schedules
- Landing weight reduction
- Engine idle fuel flow
- APU fuel flow
- Delayed flap and gear extension
- Aft CG shift
- Aerodynamic cleanliness
- Engine TSFC recovery
- Instrument calibration

The record of revenue passenger miles per gallon of fuel burned by the U.S. trunk airlines is a good one, as shown in Figure 7

The results shown have been due to many factors including the typical fuel conservation items shown on the previous chart, but also to alterations in airlines' basic scheduling and aircraft application patterns. U.S. trunk airlines should be given a great deal of credit for the progress that they have made.

Airline Fuel Utilization

U.S. Trunk Airlines



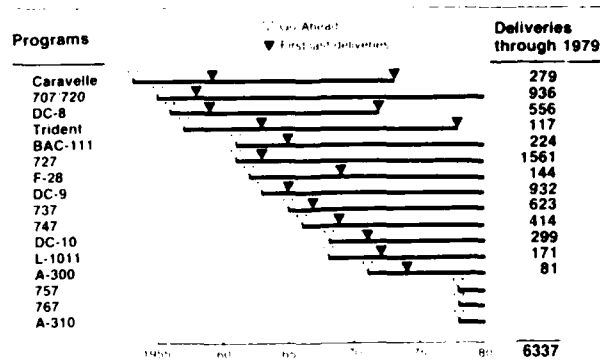
New and Improved Airplanes

The airplane manufacturers' contribution to airline growth has not been a small one, and the sustained improvement of older aircraft and the appearance of new models has kept pace with, and resonated to, the cyclical nature of airline growth. New airplane programs are not that easy to start, and I have personally collected a good deal of "scar tissue" in the process of some of the starts. Since the beginning of the jet era, there have been about twenty programs committed to production. Most of the major programs are shown in Figure 8.

Each of the programs shown represented an enormous investment for the manufacturer and risks, which in several cases, were large enough to affect the manufacturer's future existence. The breakeven point is always several years into the future and seems to move to the right with the passage of time. Of the twenty shown, only three or four ever really passed the breakeven point and provided a reasonable return on investment for the manufacturer. Some were terminated with enormous losses.

The only reason for the manufacturer to offer a new airplane, or for the airline to accept one, is that it would offer sufficient competitive advantages to offset the investment risks by both parties. Once this is determined, and a program is launched, there is a substantial negative cash flow. The developmental costs today

Major Commercial Jet Transport Programs



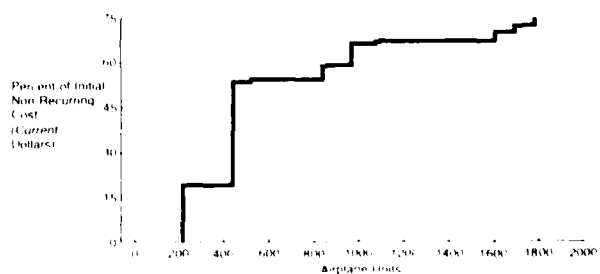
will run a billion dollars or more, and the initial inventory is another billion. Improvements and derivatives will add sizable increments of negative cash flow, but they are always necessary to expand the customer base and to improve the overall program's competitive life.

The prize does not go to the manufacturer who gets his airplane there first. It goes to the manufacturer whose airplane is still there last.

The attainment of this situation requires repetitive and more or less continuous investment. An example is the 727 program which has now sold over 1800 units. In the course of its production, gross weight has been increased by 37 percent, thrust has been increased by 31 percent and fuel capacity has been increased by 6.2 percent. The financial history of the 727's improvement program as a percent of initial non-recurring cost is shown in Figure 9.

Cost of Non-Recurring Product Improvements As a Percent of Initial Non-Recurring Cost

727 Program



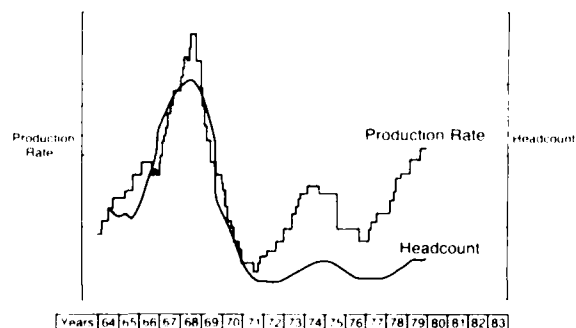
The 727 has also had a continuous emphasis on fuel efficiency and noise reduction as part of its improvement and this emphasis is still continuing.

However, another whole subject affecting continued sales and potential profit is the maintenance of competitive price levels. As we know, the prices of many items have been escalating at rates higher than that of inflation. The cost of aircraft production might similarly escalate if a major effort had not been made in our manufacturing efficiency. In Boeing's case, the major productivity improvement effort had its start in 1968 with studies and planning. The key elements, computerized capabilities, became quite apparent in the early 1970's. These have been followed, one after another, by improvements in manufacturing management, inventory control, reduced shortages, improved quality and many other fields. The total result, of course, is evidenced by the number of aircraft that can be produced per headcount of the total operation. It is sometimes difficult to get "apples and apples" in such comparisons because different airplanes have different subcontracting bases and there can be other extraneous influences. Figure 10 is about as close as we have come to depicting the "apple and apple" results from the improvements that have been made.

The influence of the computer-based systems and attention to productivity improvement equipment and tools is plainly evident and the product mix was not dissimilar enough to significantly affect the result.

Manufacturing Efficiency History

707-727-737 Programs

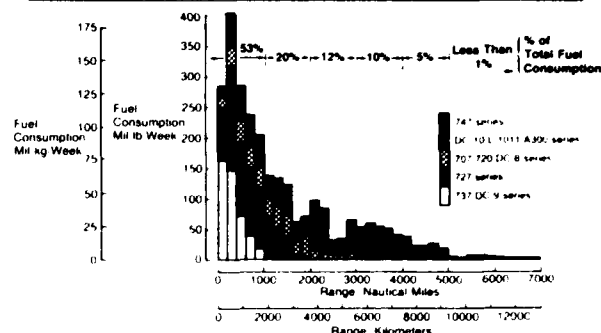


When learning curve adjustments are made, one still finds productivity improvements well over two to one. As a result, the 727 price per seat in constant dollars has been essentially constant for the entire life of the program and it now sells at a lower price per seat than any of its competitors while still maintaining an adequate profit margin.

Building airplanes to meet the fuel efficiency imperative must consider how major fuel is used, and Figure 11 diagrams this situation.

World Jet Fuel Consumption Distribution

1979 Third Quarter Commercial Scheduled Operation



For the world's scheduled airlines, 53 percent of the total fuel is used at ranges below 1,000 miles and 73 percent at ranges below 2,000 miles. This is why Boeing in its major 757 and 767 investments concentrated on the medium-size, short to medium range market. That is where most of the fuel is burned. Savings in the very long range market are of great interest, but they would not do much to improve overall fuel consumption by the world's air transportation system.

All of this contributes to a fairly firm list of available equipment for the next decade. In most cases, such equipment is already in production and their derivatives will not only dominate the 1980's, but will spill over into the 1990's as well. A list of "probables" for the next two decades is shown in Figure 12.

I'm sure that the right-hand column will be proven to be inaccurate. Some that are not identified will appear and some that are identified will fail to. But with few exceptions, they will be of a derivative nature.

Airplanes for the Next Two Decades

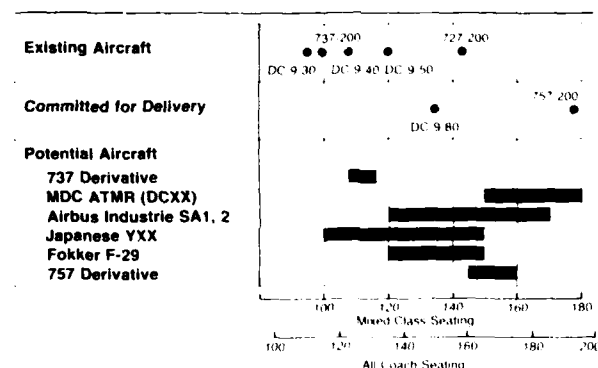
Category	Current and Committed	Possible Additions
Short Range	737-200 DC-9-30 80 747SR BAC-111 F-28	737 Derivative 757 Derivative JET ATMR YXX F-29
Medium Range	727-200 A300-2 4 A310 DC-10-10 L-1011 767-200 757-200	A300 Stretch DC-10 Derivative L-1011-400 767 Stretch
Long Range	707-320C DC-10-30 40 747-100-200 747SP L-1011-500	777 747 Derivative A300-11 707-700 DC-10 Derivative
Freighter	747F C DC-10C F	A300F C 767 F C

From the standpoint of new airplanes, there are really only two regions that could be expected to generate a new airplane program in the next 10 years. The first is on the low end of the jet transport trunk airlines spectrum—below the 757 and 767. The second is the commuter market, which is the U.S.'s fastest growing market. Figure 13 illustrates the first of these two areas.

All manufacturers see opportunities for fuel efficient new or derivative equipment, and those that can act, will. Surely more than one of the potential aircraft programs shown will be launched, but certainly not all of them.

A similar chart could be drawn for the commuter market. Many of its elements would be from non-U.S. sources. Competition in the commuter market will be severe—and success for both builder and airline becomes difficult to predict in this highly turbulent market.

80 to 180 Seat Jet Transports

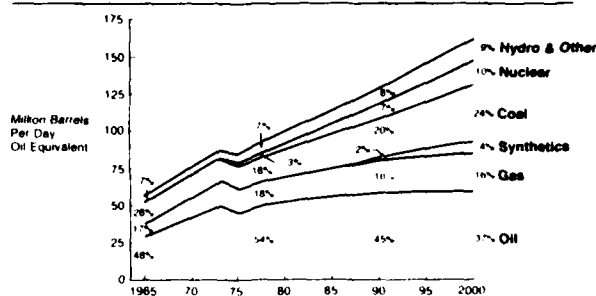


Some Energy Considerations

Since fuel costs have such a profound effect upon airline economics, and since airline economics in turn, have a large effect upon airline growth, a few additional considerations are worthy of note. The first one concerns the availability of the fuel used for air transportation. Up to this point, the subject has had infrequent challenge, because airline fuel has only amounted to 4 percent or so of the nation's total fuel requirements. This is still the case and, although shortages may occur, pressure on the airline sector will be reduced by reason of the relatively small percent of the total it represents. Such may not be true in the future. Figure 14 presents an estimate by Exxon International through the year 2000.

If this estimate is correct, then fuel conservation in areas other than air transportation will be far greater than reductions that can be accomplished in a growing

World Energy Supply



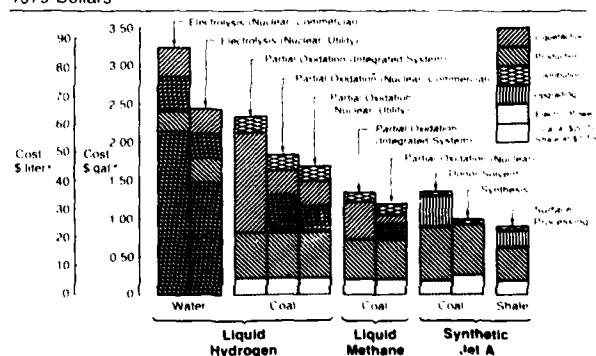
Note: Excludes centrally planned economies.
Source: Exxon Int.

air transportation environment, regardless of the infusion of more efficient equipment. We can expect a number like 10 to 12 percent of national fuel usage by the end of the century and this, indeed, will be enough to produce significant visibility. It should be enough to spur the manufacturers of engines and airplanes, as well as the airlines, to do everything within their power to reduce fuel usage.

The second subject is the possible use of alternative fuels. A great deal of study has been made on the use of various liquified gases, and certain experiments are being considered, or even in process. There are, of course, logistics problems inherent to the use of cryogenic fuels. However, there is, in my opinion, a more serious problem, which is the cost of such fuels. Figure 15 shows comparisons of the various alternatives to present petroleum products.

Alternative Fuel Cost

1979 Dollars



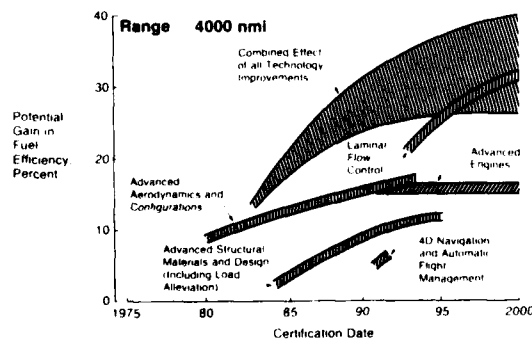
What this information leads to is a belief that synthetic fuels derived from shale and coal will be used in the air transportation system by the end of the decade, and certainly far more by the end of the century. I believe the cost situation will moderate against the use of cryogenic fuels in this time period.

We should not assume that there will be no problems with the use of synthetic fuels. Their composition is significantly different from fuels in use today, and inadequate basic research has yet been done to show that changes required in engine burners and other elements will be insignificant. This investigation is certainly a subject for the next decade.

Far Term Efficiency Expectations

This forecast conference is based on the decade of the 1980's. However, it would be wrong to close a manufacturer's presentation without a brief look at the constructive technology which can affect airline growth patterns and the industry in the decades to follow. The 1980's will be the "decade of the derivative" and that situation will extend well into the 1990's. However, a combination of technologies, having both civil and military application, can now be identified which will eventually have very significant effects on the industry. Figure 16 is one summation of the technologies we can expect before the year 2000.

Technology Improvement



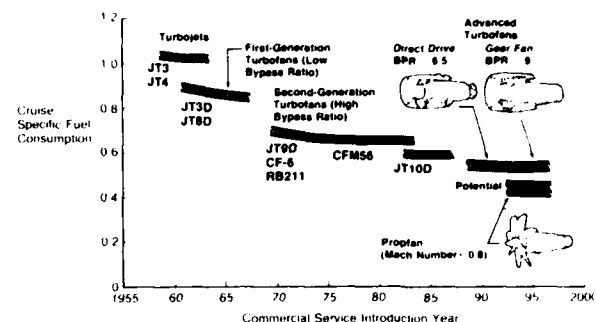
Many of the names are not new, but the situation must be explained in a little more detail to give a true perspective of the potentials and their likelihood of occurrence.

Much of our improvement in the last 20 years has been attributable to propulsive efficiency improvement, and we might look at that situation first, as shown in Figure 17.

There is the potential for some improvement within our basic turbofan concept. However, performance deterioration with time, and maintenance costs, must

Fuel Consumption Improvements

Far-Term



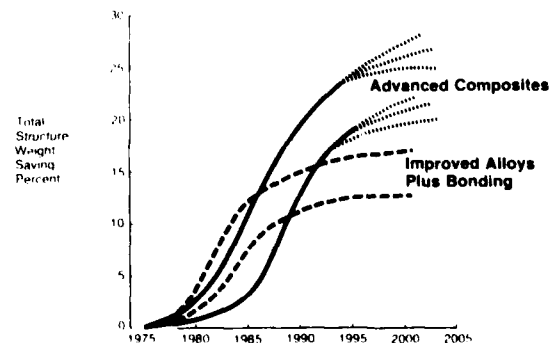
be improved at the same time so that we must be careful we do not exaggerate the net average performance improvement to be obtained.

It is true that relatively high Mach number propfans may come into usage and have the potential of 20 to 30 percent fuel savings if their development matures. However, we must be careful that we do not set our Mach number goal so high that production readiness is delayed.

I consider laminar flow control from mechanical means to be a somewhat similar technological situation. Again, the improvement is large (in the 25 to 30 percent bracket), but again, the production readiness may be delayed unless large amounts of research and technology resources are applied in a timely manner.

A technology program that is gaining momentum on a continuous basis is the use of advanced structural composite materials, and this improvement, as well as that from improved metallic structural elements, is summarized in Figure 18.

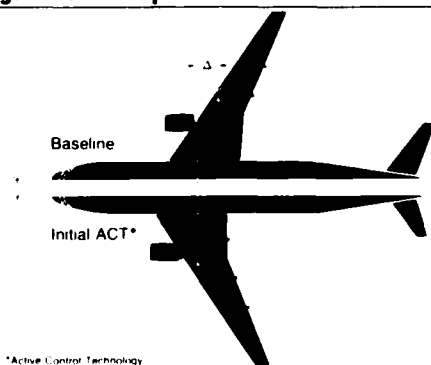
Advanced Composites Structure



Our new airplanes are using graphite composites for much of their secondary structure, with attendant weight savings. However, the real goal must be in the use of such composites for primary structures, such as the wing torque box. There are already a few military applications, but the "body of technology" necessary to permit major commercial incorporation is far from complete. We must have better knowledge of the filaments and the resins themselves, and better knowledge of the basic properties of the bond and its change with time and environment. We must develop new knowledge of aeroelasticity in this medium. We need to know more about the permeability of the structural system to both moisture and fuel and its long-term integrity under both natural and other environmental situations. Nonetheless, advanced composites for primary structure appears to be one of the technological elements that we can master well before the turn of the century.

A technology of similar importance is that of active controls. They have been in use for some years, of course, but the real payoff comes with artificially stabilized aircraft having smaller horizontal tails, wing moved forward and smaller wings, and carrying either a zero load or an upload on the horizontal tail instead of the current download which increases wing size. This is illustrated in Figure 19.

Conventional Baseline/Initial ACT Configuration Comparison



Again, this technology appears to be within our grasp, if we can work hard enough in our government and industrial research and development programs.

Another example is that of the distributed electrical system and its potential for replacing today's control cables and distributed hydraulic systems as indicated in Figure 20.

While the development of samarium-cobalt magnet motors and high-current solid state switching devices has the potential of replacing primary

All-Electric Systems Technology

Recent Developments

- High-torque samarium-cobalt magnet motors
- High-current, solid state switching devices

Eliminates requirement for primary hydraulic systems

- Highly reliable digital electronics
- High-capacity data buses
- Distributed power buses

Allows low-cost, multichannel, fly-by-wire flight control system

hydraulics, the distributed electrical system is not dependent on these developments for affecting major changes in aircraft efficiencies.

With these concepts comes a whole new airplane systems concept which abandons control cables for flight and power plant control entirely, and relies upon multiple redundant electrical and electronic systems. With this will come an entire on-board information system change that could constructively affect the relationship between the crew and the air vehicle. The sort of cockpit that we could envision is shown in Figure 21.

Advanced Cockpit Design



Some of these developments are applicable to both civil and military application to an extent which has not occurred for perhaps 30 years or so. The development of such a body of technology could proceed in a manner somewhat similar to that of the swept wing and axial flow compressor in which NASA, military, and industrial elements combined in a national program that in 10 to 15 years developed a base of technology which was to revolutionize air transportation.

Everything affects everything else in aerospace, as we all know, and when such technology advances are applied, the design must be recycled many times. It is this recycling process that produces the major changes that we can expect. The improvement numbers that they will contain are somewhat elusive, but something like a 50 percent improvement in fuel efficiency on the commercial side, or a 50 percent reduction in weight or size for many military missions can be anticipated—thus completely superseding the aircraft designs of today. When it occurs will be dependent on the integration of level of effort from all sources in accomplishing the difficult transformation between visibility in research form and assembly of the required body of technology to permit production readiness from a military and then a civil standpoint.

Conclusions

We find ourselves in a complex position at the start of the decade, with airline profitability and capital formation in poor shape, and with a fuel imperative affecting both and also increasing the need to purchase more efficient aircraft. Added to this, the noise imperative is forcing the obsolescence of significant aircraft types.

The total situation is not one leading to great optimism. While the historic cyclical pattern of airline earnings would indicate a return to airline profitability and to a continuation of the upgrading of airline fleets, such a cyclical pattern is not necessarily going to repeat simply because it has done so in the past.

From an airline standpoint, the improvements in operation during the last few years have led to fuel utilization and productivity improvements that are laudable. From a manufacturing standpoint, it would appear that the industry has done well in both starting new derivatives and new products offering improved efficiencies and in investing capital for improved productivity to restrain the escalation of aircraft prices. Nonetheless, the infusion of new equipment into the airline fleet has always been a very long process and, under the present circumstances, it tends to extend, rather than to contract. Figure 22 summarizes our expectations for the 1980 decade.

1980 Decade Summary

- Trends in Growth to Continue
- Fuel Efficiency is the Common Imperative for Airline and Manufacturer
- Decade of Improved Derivatives
- Decade of Technological Readiness
- Significant Efficiencies in the Further Term

Airline growth trends will continue; fuel efficiency will dominate; but it will be a decade largely of current programs and their derivatives, with very few new airplane starts.

Nonetheless, for the farther term, major improvements are visible. The 1980 decade will be one of technological readiness attainment, and we can face an exciting new century, providing that we (government and industry) adequately invest over these next ten years or more to attain technological readiness that will permit the application of the new technology to the world fleet of the next century.

I would like to close on a comment that is relative to the decade's outcome. In my opinion, we need to improve the relationships between elements of government and industry. For the U.S. to survive as a leader in the world economic community will, I believe, require a major change in the adversarial situation that exists today. We see and compete against more positive examples throughout the world. We do not have to copy these examples, but we do have to recognize the seriousness of the problem in this country and take actions that may be uniquely American to preserve the health and competitiveness of our industries. I believe that the exchange that this meeting fosters is a constructive step. I look forward to the future with a determination that our problems can be ameliorated and that constructive growth can occur, not only for the next decade, but far into the next century.

Thank you.

Questions and Answers

Question: I would like to ask a question that relates to the FAA's forecast. They have predicted that fuel prices will go up about 10 percent per year in the next decade; that the consumer price index will go up about 8 percent and that airline fares will go up about 5 percent. This doesn't jive with my view of the world. Although, I will caution that fuel is the number one imperative, it is still a lesser part of total operating cost than labor. Labor costs have been going up recently at double digit rates. So I would like to ask Mr. Effman, Mr. Steiner and Mr. Freer to comment on whether they agree that the real price of air travel is going to go down this coming decade as suggested by the FAA forecast?

Neil Effman:

I regret to take that first. I don't believe airline prices are going to decline relative to other prices as they have in the past decade. I think to talk about 5 percent growth in airfares in current dollars is far too low. Although we would like to get the benefits from these new aircraft that are coming off the drawing boards, we can't afford to buy them. The airlines, like any business, are no different from your own personal life. It's a decision you make every day. There are many new cars on the market that probably get twice the efficiency that you get in your car, and yet, you don't trade

it in. In the end, you probably pay more for keeping the current car but you can never raise sufficient capital to make the trade. Well, that's about where we are.

We're looking at the 727-100's which are clearly inefficient aircraft. Two years ago I had all those planes out of our fleet by 1985/86. This year we're out to make a commitment to spend multi-millions of dollars adding seats, changing the design and the interior of that aircraft because I can't afford to replace it. And I don't think we are alone in that. I'm finding other airlines who are taking similar actions. We're maintaining this aircraft because it is the only one we can afford. That would suggest you won't get those efficiencies. Therefore, you can't really cut down the cost of your operation. Therefore fares go up, probably higher than 5 percent a year.

John Steiner:

My comment would be that I only addressed the direct operating cost side of the picture in my discussion. The indirect side of the picture is more labor intensive than the direct side of the picture. What I said, for instance, was that the best we could do was to hold the price per seat in constant dollars the same. But that only affects a little part of operating cost. Fuel is much more than that, labor is more than that, etc. My belief is that the fares structure will go up.

Now there's a whole other subject that was not addressed by any of us. That is, is there a way to get the benefits of scale, that is of size of aircraft? The 747 wasn't that efficient an airplane, it was just bigger. There is an economy of scale and there will be an economy of scale for any level of technology, whether at the 1970 level, the 1980 level or the year 2000 level. There's going to be an economy of scale. I would like sometime to see someone tell me whether the deregulated environment aids the economy of scale or detracts from the economy of scale. My own opinion is the former.

Duane Freer:

My feeling about it is that it will be higher than it is forecast in the book for a couple reasons. First, the airline industry is peculiar in its dependence upon high usage of fuel to transport people. It uses more fuel than any other public form of transport.

Therefore, the effect of increased fuel prices impacts them more severely. Aviation fuel, as a matter of fact, is increasing faster than other types of fuel, whether you compare it with automobiles, buses or whatever. The other thing is that efficiency, as John Steiner just said, is very, very expensive.

Prices will go up. My reading is that last year airline ticket prices rose disproportionately faster and higher than prices in other areas of the economy. Now, deregulation had a slight countering effect and, I think, a very positive effect upon it. But I think we are in for a new life style. I think most of the people in this room and their children will become so accustomed to flying on airlines that they are going to be willing to fly at a

much higher cost. So, I'm not so sure there will be fewer people traveling, but they are going to be paying a lot more to travel.

Question: I would just like to ask Mr. Freer a question concerning the ICAO historical reporting of data. What definition does ICAO use for an air traffic hub?

Duane Freer:

We don't have such definition. I was borrowing an FAA term for the busiest air carrier airports. We don't call them hubs, but you do. The graph was keyed to international travel. Kennedy is the big generator for international travel in the N.Y. area. So when I use the term New York hub, I mean Kennedy.

Question: Mr. Steiner, there seems to be a similarity between what you were saying and Mr. Bond. Mr. Bond was saying that groups and organizations in aviation should stop squabbling among themselves and get together and lobby for more money for FAA and capital investment in the System. You also said we need a major change in the adversary relationship between government and industry if the U.S. is to maintain its dominance. I wonder if you could comment on this.

John Steiner:

I guess I'd have to answer that by looking at it from my perspective as a long-term technologist. The well of technology is nowhere near dry. In fact, it seems to have a deeper bottom every time we search. However, the sort of thing that has to be done as a nation to develop a body of technology is the sort of thing we did on the swept wing and the axial flow compressor. In that case, NASA, the Air Force and the industry, all worked in a constructive and in a relatively planned (I don't want to overdo that) manner to develop a body of technology that took about 10 or maybe 12, 15 years to develop. That produced the travel revolution that we have all participated in. Now, it's very frustrating to see pieces of technology, the collection of which would represent probably just as big a technological breakthrough, get almost lost.

The nation's future from the standpoint of jobs and the nation's future from the standpoint of security is desperately threatened and if we can't bring ourselves as a government and as an industry into a constructive mold more nearly similar to that we practiced 30 years ago and less adversarial in nature, we may fail. It's just that simple.

Question: Mr. Effman, I was interested in your remarks describing the current strategy of retrenching away from market share and toward profitability. I might add I noticed an article in the *Wall Street Journal* this morning, in which your Chairman outlined basically that philosophy in more detail. I wondered if I might ask: In your opinion, is that likely to be an industry-wide trend, and if it is over any long-term, is it likely to significantly affect competition in different markets? Finally, will it have any effect, in your view, on fares and traffic?

Neil Effman:

To begin, I think it is an industry trend that's

already developed. You can cite a number of examples. I'll try to cite all those that don't affect us so I don't look like I'm partial. United Airlines dropped 18 flights out of the Atlanta airport. I think they did that because they weren't making money there and they didn't see how they could compete against the two giants, Delta and Eastern. I see it in Chicago. Continental is out of the Chicago west coast market. I think that it's a natural force, not one that's been planned. Yet, we started planning three years ago and we realized where we had our strengths, where we had our weaknesses. We have spent a lot of money going to our strengths. It all gets down to capital constraints. An example I might give: United goes to their Board of Directors and asks for \$100,000,000 to double the size of their capacity in Chicago. Given their history of profitability at Chicago, I suspect it took their Board about two minutes to say that's a worthwhile investment. Given our history of profitability at Chicago, I think we would have a tough time going in and asking for \$100,000,000 in a capital constrained environment to build additional gates at Chicago so that we can compete equally with United. I think my Board of Directors would wonder why they ever made me a Senior Vice President. But I don't think we are alone. I think there are places where other carriers are making those same decisions. I think United probably could have made the same decision in Atlanta. They could build up a structure, but there is only so much money.

United decided to invest in Chicago and we invested in St. Louis. It took us two minutes to decide to go up to 15 gates, and next year, up to 18 gates in St. Louis. I suspect another carrier looking at that decision, would come to a different conclusion. I don't think we are smarter than anybody else, but I think the dynamics of time and capital constraints are going to force that to happen.

Now, what does that mean in terms of fares? One of the big things is load factor. If you operate at 65 percent or 70 percent load factor, you can charge less than if you operate at 55 percent load factor. That causes some more crowded conditions. However, I notice no one goes to the theatre and looks for empty seats. If half of the seats are empty you begin to wonder if you made the right decision. I think we have a job to do in air transportation so the public does not feel uncomfortable when what they get is the seat they paid for and not the seat next to them as well. But that will come over time. I think that's one of the ways that we will keep our costs down.

Seating density is another problem. I am talking about a technology, one of the greatest things I've seen. You would have never thought of seating technology five years ago. No one ever worried about seat technology. But we look at seats today.

Seats will be far more comfortable than the seats we are using today, far more comfortable. But I think, we have to lower our expectations. You can't expect the same things you always had before and expect the system to continue to grow. You have to make some choices. Mr. Bond talked about a system approach. I don't think we have a system approach yet. Each one doing its own thing. It's a major problem: the airports go their way, the airlines go their way, and I guess the FAA goes its way. That should stop.

Part III: Luncheon Address



Introduction by Dr. Bill Wilkins

Our luncheon speaker is a Member of the Civil Aeronautics Board. Mr. George Dalley is the next to the newest member of the CAB, having been appointed to the Board in March of 1980. He is serving in and will complete the term which was previously held by Fred Kahn. Thus, he will be a Member of the CAB until December 31, 1982, assuming it's not sunsetted prior to that date.

Prior to his service on the Board he was Deputy Assistant Secretary for Human Rights and Social Affairs at the Department of State. In that position he was responsible for the formation of policy for the United States on human rights and social issues which arise in the United Nation system. From 1973 to 1977, Mr. Dalley was an administrative assistant to Congressman Charles Rangel of New York. Prior to that, Mr. Dalley was the Assistant Counsel to the Judiciary Committee of the United States House of Representatives. He is a graduate of Columbia College and of Columbia University's law and business schools. It's with great pleasure that I introduce to you George Dalley.

Long Term Traffic Growth and Deregulation



George A. Dalley
Member
Civil Aeronautics Board

Beginning with the consensus that United States aviation will not grow at the rates it has enjoyed in the past, Mr. Dalley develops the thesis of opportunity at a time of economic hard times. As one of several travel modes, aviation has to find opportunity where it is a cost-effective tool for the traveler.

In the election campaign 12 years ago, Gene McCarthy was asked in a television interview whether he agreed with the rapidly developing consensus among reporters concerning his prospects. He replied that reporters are like blackbirds on the telephone wire: first one flies up to perch, then a few more, finally all are on the same wire.

As early as 1974, the year of the OPEC embargo, the CAB staff put forward a 10 year forecast, to 1985, predicting that the annual growth rate for domestic airline traffic would average only about one half the rate experienced in the three decades following World War II, 7 percent instead of 13 percent.¹ Numerous other studies followed, all reaching approximately the same conclusion. A recent Douglas projection sees a long-term traffic growth averaging 6.4 percent, world wide.² The FAA domestic forecast this year, as in the recent past, is pessimistic—only more so—while it is projected that traffic will spurt up to over 6 percent in 1980 and over 7 percent in 1982, reflecting a rebound from the current recession; it will thereafter trend generally downward all the way out to 1992. From that time, growth rate will not exceed 4 percent—less than one third the post-war rate.

Today, we will seek to talk to you about the validity of these projections, and about their implications for the growth of the airlines, the aircraft, and engine manufacturers, and airports.

Let us first acknowledge the truism that forecasts of the future are inevitably influenced by the assumptions of the time in which they are made. There have been economic up and downs since the early 1930s, the depths of the current recession and more

important, the American people recognize the existence of fundamental, seemingly intractable problems that portend worse to come. For the airline business, the CAB staff estimates that in calendar 1980 (the FAA uses fiscal years) overall domestic traffic measured in revenue passenger miles (RPM) will decline by 3.5 percent, with trunk traffic declining by 5.4 percent. This would make 1980 by far the worst year in the history of commercial aviation in this country.

Given that current conditions influence how one appraises the future, there are nevertheless strong objective reasons for believing that bleak prospects are ahead. It now seems clear that the very large energy and petroleum real price increases since 1973—OPEC oil has increased 10 fold—have reversed a fundamental driving force of the post-war boom, a steady decline in real energy prices. Continuing real price increases combined with the investments necessary to develop petroleum substitutes, and to assure environmental integrity, will keep the growth of real disposable income well below the post-war rate, and at times negative. These considerations are embedded in the most uniformly pessimistic econometric models, such as Wharton, the one used by the FAA, which form the foundation for air travel demand forecasts.

Is there any rebuttal to these forecasts, or must we join Wharton, Chase, Hanover and the rest on the wire? I see none, except to register a caveat: the great unknown revolves around innovation, specifically the huge incentives for developing substitutes for petroleum. These literally involve trillions of decisions and initiatives, if we include, as we should, conservation measures which each of us takes every day, right down to the decision to walk rather than drive to the Post Office. Collectively these could pay off sooner rather than later. And if we are able to restore declining real energy prices, we might—*I stress "might"*—because a large number of forces are at work—restore the post-war boom.

But let us accept that this crossover point—a return to declining energy prices in real terms—is distant for the economy generally, and that the pessimistic econometric projections are correct. Are we then justified in forecasting very low long-run growth rates for air travel?

Yes and No.

Yes, because air transportation is highly sensitive to the general economy—broadly speaking, if the economy is down, then air travel is down and vice versa.

No, because there are always countercyclical elements, both in the economy in general, and in particular sectors or submarkets of sectors. This was true even in the depths of the great depression—movies, radio, and small appliance manufacturing, among others, enjoyed strong growth and prosperity. The conditions that are peculiar to the present decline and prospective slow growth rate—higher real energy prices

and high inflation — make the identification of counter-cyclical growth sectors and subsectors relatively easy in principle: growth sectors will be those which offer the prospect of more efficient energy use. Today, costs, and therefore output prices, are decisively influenced by higher real energy input prices. Obviously, the demand for anything will increase, compared to the demand for other goods and services, if it becomes relatively cheaper; in inflationary times this means that the favored product or service will increase in price at a lesser rate than the average. Hence, goods and services which can be produced with less energy compared to the average of all goods and services, or require less energy to use, will have a growing advantage. Equally or more obvious, the demand for anything can increase at a very high rate if it becomes relatively cheaper than a direct substitute, and comparative energy costs play an even more important role here.

It is on these questions that the airlines, the airframe and engine manufacturers and all of those who influence or determine airport and airways development should focus. The new, more fuel efficient aircraft and engines now in development are clearly a correct response. But the questions involve much more, and I should like to explore the most promising prospect with you. In a nutshell, it may well be that demand in all of the various air travel submarkets will not "follow the economy" in a downward or slow growth direction. Let's begin by looking at what is happening in a sister transportation industry — surface cargo transportation.

What conclusion would you draw if I were to tell you that railroad long-haul freight costs and rates for a growing group of products were increasing at a slower rate than for trucking, the principal competing mode? Firstly, you would say that if these trends continue, railroad traffic will go up, and truck traffic down. If you were further told that the improving cost and price advantage of railroads resulted from the increase in real petroleum input prices, you would also readily allow that OPEC is having the effect of favoring railroads over trucks. In fact, this is the case, and the stock market knows it.

In the airline business there is a similar phenomenon in the short haul passenger market. Here, as in the case of the railroads, real petroleum price increases stimulate demand. Why? Chiefly, because petroleum price increases cause the cost of automobile travel, the modal alternative, to increase at a faster rate. Put another way, increases in real energy prices, the driving force of the lower growth rate for the general economy, and which therefore adversely affects air traffic generally, is also the driving force of short haul air travel growth.

Proof? First, common sense: air and surface are in some degree direct substitutes. This degree is very small, as a proportion of the overall automobile travel market, but it is large and potentially very large as a

proportion of the short-haul air travel market. Second, that same CAB forecast for calendar 1980 predicting the worst year in history — a 5.4 percent decline for the long haul trunk carriers — indicates that non-trunk traffic will increase by 8.3 percent. And because commuter traffic measured by RPM is very small, well under one percent, it is clear that the great bulk of this increase derives from the performance of the local service and former intrastate carriers. Taken together these airlines serve about 15 percent of the overall domestic market; and perhaps as much as 25 percent, taking into account the short-haul traffic of Delta and Eastern.

The most difficult questions are how long this change in cost relationships favoring air will continue, and whether the improving comparative advantage of air over surface will continue to grow. Late this summer short-haul air travel growth began to soften, and it continues soft, compared to earlier in the year. It is noteworthy that this softening coincided with stable gasoline prices in nominal dollars, which is to say declining real gasoline prices. But if we accept Wharton and the rest, continued real price increases for petroleum are predicted for some years to come. If true, we are looking at a sector of the overall air travel market which has very high growth potential not only despite but because of the particular kind of long run doldrums being forecast by all.

Assuming all this is correct, are there any constraints that would inhibit growth?

I am happy to say that my agency will not stand in the way. Beginning in early 1979 we opened entry in domestic markets to all carriers that are "fit, willing and able" to provide air transportation. Until quite recently, however, very little happened, although what did happen was portentous. The commuters continued their rapid expansion, but this group had never been regulated. The locals added some new points, and dropped a few old ones, but most important, they have enjoyed healthy traffic growth on the bulk of their prederegulation short-haul routes.

The biggest part of the story so far involves the former intrastate carriers which are now gradually moving into interstate markets. Significantly, this group — Southwest, PSA, Air California and Air Florida — have expanded largely into short-haul and medium-haul markets on the basis of prices that undercut, in some cases by a wide margin, interstate short-haul fares. And the only entirely new entrant to come on the scene and operate jet aircraft, Midway Airlines, is similarly specializing in low price, short-haul transportation focusing on Chicago. In sharp contrast to most of the long-haul trunk carriers, all are prosperous or becoming prosperous.

However, the impact of these new airlines, relative to the size of the overall interstate market, has been negligible so far; and up until recently the older group, including the locals, have not shown any tendency to

evolve in the direction of the price and cost characteristics of the former intrastate carriers. But the recent initiative by Texas International in forming a separate corporation known as New York Air to provide low priced air transportation in high density northeast short-haul markets is highly significant—it would permit a very rapid startup of a medium-sized, low price/low cost airline. Two other short-haul specialists proposing to operate in the northeast, People Express and Air International, also have applications pending before the Board, and a new carrier on the west coast, Sun Pacific, hopes to start up very soon.

These developments suggest that there may be a rapid expansion of short-haul travel throughout the country based on the economics and convenience of specialized operations designed to tap high density markets and compete directly against the large volume of travel now using the automobile. If this happens, many if not all of the older carriers serving short and medium stage length markets will adapt to these new, more efficient ways of doing business in order to be both cost and price competitive—or they will have to shrink in size and eventually go out of business. If these predictions prove to be accurate, a rapid and sustained increase in short-haul travel is likely in all markets except those in which airport congestion and saturation prevent entry or specialized operations.

A year ago the FAA projected that 25 air carrier airports would be saturated by 1990.⁵ It is noteworthy here that the most successful specialist, Southwest, does not serve, and apparently does not want to serve, any saturated or congested airport. You have all been reading about the problem of allocating slots at Washington National in recent days. Without commenting on the merits of the complex questions presented, it seems obvious that if short-haul travel grows rapidly there will be increasing allocation conflicts between short-haul and long-haul flights at such airports.

In the short run these must be resolved by developing improved methods of allocating or rationing slots; and it is likely that off-peak pricing will play an important ameliorating role. In the long run, however, airport capacity will have to be expanded. Because long runway airports take over a decade to build from scratch, it is clear that saturation at existing long runway airports will be an increasing constraint on air travel growth, particularly the short-haul sector. It therefore seems equally clear that demand pressure will create strong simultaneous incentives for the development of specialized short-haul aircraft and specialized airports and airways systems. As most of you know, the technological state of the art in aircraft and engine design would permit the construction now of large, economical aircraft that could use short runway facilities adjacent to or geographically independent of larger airports that are approaching unacceptable congestion levels or have reached saturation.

Here deregulation may temporarily confuse matters. For decades the main customers of the airframe manufacturers and airports have been a handful of large trunk airlines. These have always called the shots on the performance characteristics of airplanes, and it is airplanes that determine the design of airports. Today we face a period of rapid change. The trunks, as a group, are becoming smaller, and only two, Delta and Eastern, may be considered to have a sustained interest in short-haul markets at this time. Should these carriers, which may not be the only major buyers of aircraft in the years to come, continue to dictate basic performance characteristics? Certainly they should not do so for the submarkets that they no longer serve or want to serve.

How, then, should future designs be determined? Obviously, we cannot ask airlines that are not yet in existence, or airlines that have not determined their niche. Manufacturers in other industries manage to design products by studying the market, constructing products for that market, and then convincing customers, wholesalers and retailers, that the public wants the product. We should do the same, at least in part. We should continue to ask airlines what they want, but we should also undertake an objective appraisal of the demand characteristics of all air travel markets, including particularly, those that are to a high degree potentially competitive with automobile travel. It is essential that this be done if manufacturers and airports are to anticipate the dimensions of future markets and submarkets which many of the older carriers do not now see.

While specialized airplanes and airports are a long way off, the development of new or neglected short-haul markets at congestion free airports is not. In fact, it is happening now. Applicants for CAB authority are proposing, for example, to offer low fare, high frequency service between some of the main cities of upstate New York and the New York metropolitan area. Presumably, such services, depending on price and modal cross elasticities of demand, will divert some proportion of the large volume of travel now using the automobile and perhaps even the intercity bus. We should carefully analyze present and future demand and cost characteristics of surface travel. We should study the total costs of air vs. surface, including the value of time. In doing this, airport access can be critical. To continue with the example: if the new service proposals for New York depend on the use of uncongested Newark Airport, how do we attempt to improve ground access for the private cars, taxis and other forms of surface travel, both in terms of cost and time—and how do we do it quickly? It is quite possible that full systems studies, combined with comparative modal analyses, will allow us to see wholly new demand vistas in air travel, and that these will materialize soon.

New airlines and prospective airlines are now engaged in these kinds of analyses. I suggest that manufacturers and airport proprietors, including my friends in the FAA who are both airport proprietors and overseers of the nation's airports system, should do the same, and, in addition, give careful attention to the requirements for specialized aircraft and airports. And, of course, the CAB will do its part. We need to look squarely at the constantly changing character of the air travel submarkets to try to ascertain which are going down and which are going up and why. American automobile manufacturers failed to do this for their market. Let us not repeat that error in air transportation.

What I am saying, finally, is this: it is too easy, and probably a mistake, to perch on the wire with the rest. Bad times are ahead, but in bad times there is also opportunity, and the early bird will get the worm!

Questions and Answers

Question: Do you see a future for scheduled helicopter service? It appears to have been ignored here today.

George Dalley:

I'd agree that it is something that should be looked at. I assume there is a future for helicopter service because it fits within the criteria that we talked about. It moves people and it could do so efficiently. I don't know what the cost efficiencies are -- clearly the idea of moving people from airport to airport by helicopter has been tried in some instances. Unfortunate accidents and other environmental considerations might be playing a part. But I guess I would agree with you that it needs to be looked at as one of the possible modes for use. I don't know why it should be left out.

Bill Wilkins:

I might just add to that that the Agency is conscious of the growing utility and potential of helicopters. We have a helicopter task force at work within the Agency. We have work in our forecasting area to try to incorporate helicopters in our forecasting models.

Question: Could you relate how peak hour pricing might go together with allocation of slots with reference to Washington National Airport?

George Dalley:

First a disclaimer: I don't want to preempt in any way any suggested solutions to the current National


Airport crisis or to effect the decisionmaking processes now under way. We at the Board have been looking at various economic models. Furthermore, we have been getting filings from airlines which would indicate that one of the ways an airline or group of airlines might allocate slots might be through an access arrangement involving a purchase of slots. That purchase might be essentially paid for by differential pricing because of the convenience afforded by the slot. The concept is a simple one.

The linkage is that National has an asset because of its convenience. Five o'clock departures are an asset because of the need for business to leave at that time. A premium could be charged and there might be some economic allocation of slots and travel at that time. It is obviously the same concept as weekend fares. It's a way of having the traveling public allocate. Rather than jamming National Airport with everybody leaving on Friday night, there might be a greater incentive to leave on Saturday morning.

CAB, Bureau of Operating Rights, *The Domestic Route System*, October 1974, pp. 122-142. The forecast was 6.7 percent (rounded up to 7 percent). Actual traffic growth, 1974-80, inclusive (including the staff estimate for 1980) of 3.5 percent; was 6.8 percent.

FAA, 1980-1991, Kenneth D. Fairless, Douglas Aircraft Company, Report No. C-1804-6162-1, August 1980.

Federal Aviation Administration, Office of Aviation Policy, Terminal Area Forecasts, Fiscal Years 1980-1991, FAA-AVP-79-12, November 1979.



Part IV: Commuter and General Aviation Panel Discussion

Moderator:
Dr. Bill Wilkins
Associate Administrator for
Policy and International Affairs

Introduction



Dr. Bill Wilkins
Associate Administrator
for Policy and
International Affairs
Federal Aviation
Administration

This afternoon's panel will focus on another aspect of the aviation industry: Commuter Airlines and General Aviation. To review the 1980 FAA general aviation forecast: the general aviation fleet is at about 208,000 aircraft today. By 1992, it is expected to total 315,000 aircraft. That's an annual growth rate of about 3½ percent. Just as important, perhaps, the character of the fleet is changing. It is becoming more sophisticated. Flight operations are becoming more sophisticated. GA hours flown, some 42 million in 1980, should reach some 64 million by 1992 according to our forecast. That's an annual growth rate of 3.6 percent.

The commuter industry has experienced significant growth over the last few years. In the coming decade we expect this segment of the industry to grow at a faster rate than the larger air carriers. There has been a lot of talk about fuel today. Of course, fuel is a major factor in general aviation as well. Given the situation, one might ask: Who's going to do the flying? That raises all the questions about the motivations and the substitutions which have been raised earlier today. One of the things about which I'm concerned is that we have traditionally assumed, at least in the upward form of it, that aviation is price inelastic and that it is income elastic as income rises. Those are assumptions which in these times need more consideration.

One thing that is happening, I believe, is that as productivity rises and incomes rise with productivity, it will become increasingly possible that people will find substitutes for transportation. They will be motivated to substitute for transportation. We should be alert to that possibility. Nevertheless, those who fly and those who use general aviation aircraft will be those who value the time machine that is the general aviation aircraft.

This panel will provide a reading of these segments of aviation. General aviation is the largest segment of aviation and, as you saw on the charts this morning, heavily concentrated in the United States. It is the area upon which the least amount of data exists. That is something which we in FAA are trying to correct. There are a couple of exciting data collection experiments going on at the moment.

Our first speaker this afternoon is John Shaffer. Mr. Shaffer, as all of you know, was the Administrator of the Federal Aviation Administration. Since then he has been engaged in a distinguished aviation related career in consulting and in other business activities. Prior to becoming the Administrator of the Federal Aviation Administration, he had a distinguished career in business, including a term with a company called TRW. He is a graduate of the Military Academy at West Point. He flew a combat tour in the European theater in the B-26 aircraft. He holds a Masters Degree from Columbia University. And certainly not least, he was the 1972 recipient of the Wright Brother's Memorial Award and Trophy.

"Flying Into the Sunset"



Jack Shaffer
Member, Board of
Directors
Beech Aircraft
Corporation

Mr. Shaffer believes that although the commuter carriers have grown very rapidly in the recent past, they should exercise caution today. If they develop their markets too well the larger airlines might come back to those markets. Even if their development stays on course, he wonders how the commuters will be able to pay for the new generation of aircraft now coming on line.

I titled my remarks "Flying into the Sunset." That was nothing more than a direct reference to an event that is supposed to happen in 1985. I think we can look forward to that event with a lot of hope. I don't mean to say that they haven't done the job of protecting a fledgling industry. We now have a fully developed industry. I think now it can manage or somehow muddle through without all of the regulations.

I will try to give you my perspective of what deregulation has meant to the general aviation industry. It doesn't really affect the owner pilot or the corporate fleet. Those are both on the scene and will grow based on management decisions in the normal course of business events. Where I would really like to focus is on commuters and why we don't have the airplanes manufactured in America that the commuter group needs.

It's a very interesting coincidence that the capacity of the typical general aviation aircraft is less than the capacity of the DC-3. It happened when the industry was overly protected and when the DC-3 was the principal workhorse of the airlines. Anything smaller became a part of general aviation. As a consequence, there really isn't anything between the 20 passenger airplane and the 85 passenger airplane on the scene today that's built in America.

Deregulation came too fast for me. As a matter of fact, while I was preparing for this meeting, I reviewed my 1977 remarks when I was asked to express my views. I told them then that deregulation was something we needed. In fact, we need enlightened regulation but less of it. It ought to have been done in a scheduled way so that these events will allow the right

things to happen under the umbrella before it becomes a frantic free for all. Well, it didn't happen that way. One consequence: there are no manufacturers in America who are building the airplane that the commuters want.

The commuters will make do with what they have and I hope they'll manage the transition from today to the time that they really have the type of service the trunks have led their passengers to believe they ought to have—that is, a comfortable, pressurized cabin with standup head-room.

I don't believe that they are going to get all of that in the short-term. There is a reason for it. It's simply the cost of acquisition of the aircraft. I would remind you that the DC-3 was produced for about \$21,000 per seat, as I recall. That isn't possible any longer with any kind of airplane. Those that will come on the scene such as the Swearingen Metros, the Bandeirantes, the Shorts Brothers, and so on, will cost considerably more than that per seat. As a consequence, the debt that these people are going to have to struggle with is going to be a matter of considerable consequence.

You can do the mathematics if you choose. The new Beech 1900 that I'm familiar with will cost about \$1,800,000 and it will have 19 seats. Those of you who are quick with numbers will find out that it will require about \$500 a day just to service the debt. There aren't very many people out there who have the capital laid aside to buy these airplanes for cash or even to qualify for a bank loan without the backing of the loan guarantee program which is part of the Deregulation Act of 1978.

It's going to be very difficult for the commuters to acquire the aircraft they need. It would be my advice to have them take it slow and easy at this point while they develop their markets and replace the service that has been abandoned by the trunks. The trunks are withdrawing service from less productive or less profitable routes, just to stop their bleeding.

The idea that there is a big void out there, a growing market, is a misconception. There isn't any question that the number of passengers that have been dropped by the trunks are still there. But whether or not they are going to become customers of the commuters is not quite all that clear. Some of them will, obviously. I think 70 percent of the people who will use the commuter airlines will be interline passengers. About 30 percent of those who use the system have an alternative as you heard about at lunch today. The automobile is that alternative.

We happen to believe there is a bigger market for the 19 seat and under airplane than there is for the 35 to 60 seat airplane. The 35 to 60 seat aircraft will cost considerably more at acquisition than the 19 passenger airplane will. As a matter of fact, you could probably produce the same capacity for a lot less money with two of the smaller airplanes. I'm not even trying to

make that point. I'm simply saying that we have decided that the market is big enough for more than one manufacturer. So, we will take our share of the 19 passenger and below market, and be happy with it. I don't want to scare anybody off or suggest that we know more than the other people who do market research. It's simply that we have made a cautious judgment to be in the 19 passenger and below market. Anybody else can have all of the bigger market that they want.

Now, I would also caution those of you who are tempted to jump into the commuter market. Once you have a profitable city pair, you may see the trunks come back. This is particularly true when they have an airplane that's quite capable of making a profit with less than 50 percent of the seats filled. There are some of those coming along. They will have to put those airplanes to bed someplace at night and they will use them as a mop. In other words they'll drag the last customers out of National Airport to Wilkes-Barre and put the airplane up there at night because National's likely to become a very crowded airport when they have the A-300 and the others in there without a lot of airport parking. National Airport is a very size-limited piece of property and crowded at best. So, there will be a constant threat to the commuter who manages to do a very good job of market development.

There is no question that there will be a lot of good commuters. There are some 260 of them now. And there are likely to be some new entries and there's certain to be some mortality. But, by and large, there will be a lot of commuters who decide that being a commuter is a worthwhile venture and who are happy to be just a commuter, rather than trying to repeat history. I would remind you that most of today's trunk airlines are in effect a combination of what could have been called commuter airlines. They were assembled by the C.R. Smiths and the Bill Pattersons. They did a good job of putting together the major trunks that we have.

I have complete confidence in my own conviction that it won't happen again. There won't be a rush to try to assemble a bunch of commuters into either a regional or a trunk. I think most will be happy to remain local service airlines. They can make a good living at it with the right piece of equipment and what I would call strongly motivated management—people who really want to do the job right. Later on, I'll have a thought for those people who would be happy to do that, they have a great challenge.

The speaker at lunch mentioned that there is room for innovation, particularly with the upward pressure of costs from almost every part of the system. It's not just cost of fuel, it's cost of labor and, of course, it's the cost of the acquisition of the airplane. There is real upward pressure. There are lots of ways to take a look at the expense side and decide there is a way of doing it that's different from the way we have done it up until now. We ought to do it. In spite of the drawbacks—and the

big drawback, of course is labor's attitude about it—we ought to try to do it. I will embark on what I think is the practical solution for the airlines.

When I was in the Administration, we funded a program to study four of the smaller airports with the idea of taking the load of the non-safety related ground handling chores away from the airlines and giving it to some competent hardnosed solid citizen who would run that part of it for them. This would include all of these things that are necessary because of airport terminal configuration, primarily, and the other non-safety related items like baggage handling that the airlines presently do by themselves. At every airport, Chicago's O'Hare being one of the great examples, there's a sea of idle equipment, representing a huge investment. More important than that, there are a lot of idle people for most of the day regardless of how busy that individual airline is at that airport.

The finding was that the airlines, without laying off one person at the beginning of the program could make more money than they made in aggregate in any year in the history of the airlines: \$345 million was what it was possible to save just by combining all of that equipment and manpower, and then having someone provide those services in an equitable and satisfactory way for each of the individual airlines. It is a fact that there's more money to be saved there than they are making in aggregate in most years.

I think that this would be the time for them to really take on the task of having the unions recognize the fact that it's almost upon us. The airlines will either do it some better way or there won't be as many jobs as there would be if they willingly gave up something and help the airlines restore themselves. Ever since 1957, when I became involved, I can't remember a time when the airlines enjoyed year-to-year profitability.

I'll tell you what kind of year-to-year profitability I'm talking about. I joined the Beech Board the same afternoon I left the Federal Aviation Administration. In every quarter of every year since then, Beech has had a record quarter, a record year in sales, earnings and backlog. That is not because I'm on the Board. I just want to use the example to let you know what I mean about doing something about profitability so they will have the staying power that's needed to fulfill their destiny. There isn't any doubt in my mind that air travel is the best of all the modes and if we operate the system properly we are going to have more and more of it.

I was glad to hear Administrator Bond explain the fact that he and the Secretary were not interested in constricting the System. They would like to expand it to meet whatever demand could be put on it. They were asking you to support them, to get the OMB and the Congress to support it and to make certain that funds are spent to create more capacity in this System. I would also like to see that.

I'm happy to see the current pattern of movement out of some of the principal hubs. I visited with Mr.

Dunn who used to run the airports of Chicago and then became the Commissioner of Aviation for the city. He suggested that they now need to start planning the second airport for Chicago to be created along the lines of another O'Hare. I do not believe that the airspace could cope with that much additional traffic in that small a volume. So, the idea that people are making hubs out of places like St. Louis and Memphis is encouraging. In other words, they are spreading out the air traffic and making it easier for the control system to handle it.

There are a great many things that I wanted to comment upon but the one that I really think I would like to leave with you is the need for capital formation.

I don't know how the commuters are going to buy airplanes that they need to pick up the load that they have been handed. Each city has its own numbers. There aren't enough airplanes around. People are making do with airplanes that should be sold by the pound rather than by the seat. They'll manage. The FAA will make sure that they are safe and maintainable, but that becomes increasingly hard for airplane like the Convair 580. They are old and spare parts are hard to come by. It is going to be increasingly difficult to keep them in what I call reliable dispatch condition. But they will do it and they are wise to do it, because they don't cost anywhere near what the current airplanes cost.

It's going to be a capital business. Again, the DC-3 originally cost \$225,000. You can't buy anything today for that. The Beech 99, the airplane most of these people made money with, originally cost \$350,000 and second-hand ones are selling for \$450,000 to \$500,000. It's 15 years old. So, that gives you some feel for how much capital it's going to take. Without any doubt in my mind that I'm right, it's \$15,000 a month just to service the debt on any new acquisitions. That's quite a nut to crack. These commuter airline operators had better learn accounting. They all know how to fly but the short side of their balance sheet is their ability to manage the business.

There are a lot of good commuters out there and those will survive. There will be a lot of new ventures and expanded air taxis. I think the mortality rate is enough to give the bankers a little bit of heartburn.

I think the commuters ought to be really careful about how they go about spending the limited capital they have. Take it slow and easy and you'll be one of those who survive. Rush into it and you will be one of those who is certain to belly up. It's clear. I can name a lot of guys that did this and didn't make it. It is a fact that there is a great opportunity to die out there. I would not like to discourage those who want to enjoy the challenge of running a little business. The guaranteed loan program is a beginning, but it isn't nearly enough. If you can qualify for a loan from most bankers you don't need the loan. You have to do that to qualify for the guaranteed loan.

So, I want to leave you with one final thought and I

need all the help I can get on this. If you really want to have low priced equipment available then I would suggest we all try to get the Congress to consider the idea of a tax credit—a tax credit for the development of a new airplane and the certification thereof and for the 5 years it takes to go from concept to certification. It may require an investment of up to 100 million dollars to build a twin engine, two crew, turboprop airplane suitable for this industry. The full 100 million should be written off over 5 years, 20 million dollars a year, against the actual tax bill for that corporation, whoever develops it. Now somebody is going to say that is a giveaway. It isn't.

If our country wants to create the jobs that are needed to keep this economy strong and expanding, then it ought to consider seriously a tax credit for the research and development cost of an airplane. If you capitalize the development cost, you are going to have to make that a part of the sales price of every airplane. That adds a considerable penalty or higher price to the product in order to make it available in our market. I happen to believe that creating jobs is worth the price. We would get a lower priced airplane and perhaps a better product because there won't be the reluctance to make the investment.

It is these kind of things that I would like to leave with you. I think they're serious enough to think about. And it's not that I'm opposed to having Europeans or whoever else participate in this market. The commuter market hardly exists anywhere else in the world. So if it is our market, then I think we ought to get in there with both feet. I think our government ought to help us do it. That's not a speech for the Beech Aircraft Company, it's a speech for all who want to make the judgment that they're going to go to work and build an airplane for the commuter segment of aviation.

Bill Wilkins:

Our next panelist comes to us from the State of Minnesota. His duties there are to supervise aeronautics within the state of Minnesota. He essentially has held that position since 1962, although the titles have changed. He came into the job in 1962 and has been reappointed to the position seven times by a host of different governors over the years. That suggests to me that he is an enormously able state administrator. In addition to his responsibilities and record there, he was educated at the universities of Washington, Idaho, and at St. Mary's College. He is a graduate of the naval cadet aviation program in my old home town Corpus Christi, Texas. As a matter of fact, after being in the Navy Reserve, he went back on active duty to fly night fighters in the Korean conflict.

It's a pleasure to have you here. Larry McCabe.

Aviation Forecasting is Tough



Lawrence McCabe
Assistant Commissioner,
Aeronautics Division
Minnesota Department
of Transportation

Presenting the views of state aviation officials, Mr. McCabe calls for strong action by government and industry to ensure the continued growth of aviation. An example of the issues he discusses is the future of 100 octane fuel. In a tight market, fuel for general aviation might be lost. Automobile gasoline sales in Minnesota alone over three months are equal to the total U.S. consumption of 100 octane fuel in a year.

Good afternoon Ladies and Gentlemen. . .

As one man's view from west of the Potomac on Aviation and Forecasting, I'd say *AVIATION FORECASTING IS TOUGH!* There are many variables which must be accurately assessed if we are going to have reliable forecasts, such as, the economy, fuel supplies, government policies and program impact, the responses of industry and the public to these policies and programs.

Users of forecasts must be aware of the purpose for which a forecast is made. The purpose often affects the basic assumption used by the preparer and the depth to which the many factors are evaluated.

In view of the complexities of aviation forecasting, I believe the FAA is doing an excellent job of forecasting, as compared to 10 years ago.

Let's discuss some of the policies and programs which are affecting aviation and aviation forecasts.

We have in the Aviation Trust Fund an unobligated balance of over \$4.4 billion. It just sits there, while the debate goes on as to whether airports should be defederalized and aviation trust fund revenues reduced. Meanwhile, inflation adds to the cost of airport improvement projects and the airport system deteriorates as does aviation safety.

A local service carrier serving communities on a route with a 48 to 125 passenger aircraft is allowed to terminate service. By law, the CAB is required to find a replacement carrier. Most often, these replacement carriers are air carriers using small 10 to 30 passenger aircraft. Now, you don't have to be a math major to realize that it will take more departures to provide the same number of seats or even 50% of the seats. More

departures in the smaller communities mean more arrivals and departures at the busy hub airports. As more and more communities are served in this fashion, the effects are magnified because it is necessary to make connections at peak times at the hub. It takes just as long to process a large aircraft as a small one.

Dawson Ransome, President of Ransome Airlines, summed it up something like this in a *Commuter Air* article: "We are victims of the fuel-wasting, time consuming daisy chain of traffic at the nation's busy hub airports—that long line of mixed jets, turboprops, and piston aircraft of all sizes queuing up in a string to land at one runway or two."

How do we weigh the effects of these counteracting factors in our forecast, in light of inadequate funding and more congestion? What will happen?

Deregulation has other effects also. People who must travel are finding it more costly and harder to get where they want to go, unless of course, you happen to want to go between long-haul big city markets.

The *Chicago Sun-Times* carried an article entitled "Deregulation Forces Business Into Private Planes." When decentralization of business was in vogue a few years ago, nobody had ever heard of deregulating airlines. To get in and out of field offices and plants in many smaller cities these days, you can't use a commercial airline. Gone too, is the passenger rail service that once served as a backup. Today, when the front office wants to see what is going on out in the field, they must take the company aircraft.

Forbes Magazine noted that, "As deregulated major airlines drop cities as sizeable as Bakersfield, California and Newport News, Virginia, the commuter airline industry is growing 10 to 13 percent per year. Business jets, more necessary than perk these days, will double in number to 6,000 by 1990."

In firsthand discussions with Minnesota businessmen, I find that there is a high interest in acquiring aircraft for corporate use. They are finding that schedule cutbacks, high air fares and circuitous routings are making the business aircraft a more viable alternative for them. However, backlogs are out to 18 months or more for turbo-fan equipment and it may take even longer for component parts. Gyration interest rates are making it difficult to obtain long-term capital.

The small FBO seems to be hit the hardest by the recession, fuel costs, and availability. Some report that business hasn't been this slow in 20 years.

The big FBO's seem to be expanding to all the major markets. I expect this could grow into the medium-sized cities by some type of franchise agreements.

One of the big problems in the next ten years will be availability of 100-octane gasoline. How do we keep the interest of the refining companies when the total usage is 500,000,000 gallons annually. The automobiles in Minnesota use, on the average, this much in just three months. We have to convince the oil industry to continue to provide aviation gasoline for at

least another 10 years. At the State and local level, we must work to increase fuel storage and do some educational work between the FBO's and the oil industry, so that the FBO will use this storage effectively to cope with the distribution problems.

We must also work with the small FBO's on some kind of an education (survival) program on how to deal with the changes that they are faced with now and in the future. We have always felt that after airports and navigational aids, a good healthy FBO was the next most important element in aviation growth.

Another problem is the cost of single engine aircraft to the beginning flyer. It appears that this area is being hit the hardest and it is driving these people into home-builts and powered hang gliders, or they just quit. This really impacts the small FBO and grass roots aviation which, I don't think we can afford to lose.

To get aviation back on track, we need to develop a system of runways at larger airports. Some of these runways should be short or STOL, which could handle GA and the commuters. Once the system of runways at the congested airports is improved, we can go to work on the air traffic system. The Microwave Landing System program should be accelerated. This technology could allow for some refinements in approach procedures at large airports, and precision approaches at many of our smaller busy airports.

In my opinion, it does little good to have the capability of flying over 500 miles per hour between airports and to be slowed down and vectored all over the countryside before being allowed to land. If the airport acceptance rate is increased, we can cut the time-consuming and fuel-wasting delays at the hubs. (75% of delays are taking place at the large hubs and we estimate that this costs \$2.2 billion annually).

Where will the money come from? There is over 4.4 billion dollars in the aviation trust fund. We must get Congress to authorize the use of these funds for their intended purpose. Let me outline what is being proposed.

We have heard many people today suggest that the aviation community should get its act together in support of airport development aid legislation. If we all get together and support a common position on this proposed legislation, we should be able to convince Congress and the Administration of the importance of this program for all the obvious reasons, and its relation to controlling inflation by increasing the productivity of aviation and other dependent industries.

The National Association of State Aviation Officials, (NASAO) at its annual meeting, October 6 in Orlando, went on record in support of a concerted effort to get together with all concerned aviation associations and other interested organizations to see if we could arrive at some mutual agreement on a common position dealing with airports and legislation that all could support.

NASAO has sent letters to all of the above organizations suggesting such a meeting should be schedul-

ed, and is now awaiting answers so they can set a date.

Many states are also planning meetings of their airport owners and operators with their Congressional delegation during the recess or are flying to Washington at the beginning of the next session. The subject of the meetings will be airport aid legislation, aviation taxes, and the trust fund.

We urge you to take a personal interest in this type of program so that we might present a united front before Congress and the Administration.

If we can solve some of our problems and regain some stability in aviation, forecasting may become somewhat easier, but nevertheless, at best, it's still the toughest game in town.

Bill Wilkins:

Our final panelist comes to us from the National Business Aircraft Association. He is Robert Cooke. Mr. Cooke is a graduate of the United States Naval Academy in Annapolis. Interesting—we have a full range of academy graduates here except for the Air Force Academy. He is Assistant to the President for government relations and energy. In that capacity, he acts as the primary spokesperson in aviation matters before the United States Congress and the Department of Energy. He is a commercial pilot. He has single engine, multi-engine and instrument ratings. He is a high time pilot and a very able spokesman for aviation. Bob Cooke.

Future Energy Resources for Civil Aviation



Robert A. Cooke
Assistant to the President
National Business
Aircraft Association

There is no alternative available for petroleum based aviation fuels over the next ten years. The likelihood of shortages and the history of allocation schemes lead Mr. Cooke to focus his presentation on the fuel needs of the business aircraft user. Business use of general aviation contributes significantly to the Nation's economy. Its contribution can only increase as a consequence of deregulation and economic dispersion.

The Background of The Seventies

It only seems logical that before one can set out to describe where we are going we should know where we are and perhaps even take a quick look back to see where we've been. Prior to the embargo of Middle East oil in 1973, U.S. transportation policy largely assumed growth and development with little common concern to energy use. As a general rule, energy requirements to meet transportation demands grew apace, with good performance in increasing efficiency. After a brief period in the late 1950's and early 1960's when fuel efficiency temporarily declined with the air carrier transition to turbine powered aircraft, air transportation efficiency improved as a result of greatly improved engine design.

It was business as usual for aviation, over the years, to strive to become more efficient. Every pound of fuel carried is one less pound of payload, an unrelenting incentive. In 1973, the need to become more efficient was greatly increased. There were precursors of a crisis in early 1973 when our Government warned of an anticipated shortage. During that summer, the Government established "guidelines" which were essentially nothing more than a voluntary allocation plan equal to 1972 distribution. There were no indications of a protracted shortage. In November 1973, however, the President of the United States declared a National Energy Emergency. By the sixteenth of the month the fuel situation had turned into a crisis. Aviation turbine fuel was placed under mandatory allocation and aviation gasoline under voluntary allocations. By the end of

that month, President Nixon had put forward new emergency energy actions which:

- Reduced allocation of jet fuel by 5% for December '73 and 15% for January '74
- Pending authority requested from Congress:
 - fuel for use by general aviation was to be treated as follows:
 - for air taxi and other alleged high priority uses, curtailed by 20%
 - for business flying including corporate jets, curtailed by 40%
 - for personal, pleasure and instructional flying, curtailed by 50%
- Other proposals included 50 miles per hour speed limit for automobiles, ban on ornamental lighting, prohibit weekend retail sales of motor fuel for autos, trucks, pleasure boats, private aircraft and recreational vehicles.

Of course, these measures were obviously products from transportation advisors who were either ignorant or malicious. Within one month, the formula had changed to:

- Emergency services, agricultural energy production flying: 100% of needs,
- Air Carriers: 100% of base period use (1972)
- Business flying: 90% of base period use
- Personal, non-business, instructional and air travel clubs: 85% of base period use.

By May of 1974 allocations had been erased to 100% when supplies were available and by July the embargo was definitely behind us. The continued interference by the Government was not behind us, however, and it was early 1979 before aviation fuels could be extricated from Government control.

The Government's response to the shortage was (and probably ever shall be) to ration the supply. The basic scheme was to proportionately reduce everyone's supply based upon some arbitrary benchmark. One should not expect bureaucrats to do any better than that, lacking the ability to see ahead but possessing absolute 20-20 hindsight. To a growing and changing industry, such a response is debilitating. Changes in user needs are not readily accommodated. Our bureaucrats decided upon calendar year 1972. One business operator, having operated a reciprocating engine aircraft in 1972 traded for a turbine powered Beechcraft King Air in 1973. He was subsequently refused an allocation for turbine fuel by a Government official who helpfully suggested that he had better see about getting that other airplane back! Governments (at least ours) also distort their allocation programs because of an inherent desire to reward "goodness" (and I suppose coincidentally punish evil). What is "good" is what seems to be beneficial to those in power, so under the guise of providing "essential"

service or "providing the most benefit for the greatest numbers", priority allocations are "set-aside" for certain uses. Needless to say, each special interest vies for recognition in such a situation. Each feels, appropriately, that it should have its own "set-aside". We in the United States, as you have seen, started out with a whole list of bureaucrat devised rank-ordered uses. And the list grew. It was, of course, not feasible to argue against "emergency aviation services, safety, and mercy missions" as top priority for access to available resources. And of course everyone who eats can agree to the necessity of "agricultural production flying" as an important member of the top-priority team, fully justified to receive special consideration. Then those engaged in energy production flying certainly deserve some special consideration, and of course telecommunications flying, whatever that is, had successful advocates for special consideration. Then there was business flying and flight crew training and proficiency flying and aircraft manufacturing and instructional flying and air travel club flying--there were as many advocates for special consideration as there were airplanes, almost!

We in business aviation strongly feel that no segment of the industry should be singled out for favorite treatment and none should be singled out to bear the brunt of shortage. We are painfully aware that the ICAO recently suggested that all members thereof adopt the position that air carriers have priority over all other users. We disagree strenuously with such shortsightedness. U.S. law now specifically precludes that allocation programs be based upon "... reasonable classification of, or unreasonable differentiation between, classes of users ..." and also requires that restrictions "... be carried out in such manner to be fair and to create a reasonable distribution of the burden of such restrictions on all sectors of the economy, without imposing an unreasonably disproportionate share of such burden on any specific class of industry, business or commercial enterprise, or any segment thereof ..." We worked very hard to be sure that our laws reflect those principles. Our greatest difficulties now come from ambitious administrators, ignorant of the past, who do not bother to read the law or, having read it, consider themselves above it or their own judgement superior to it. Such superior judgements have resulted in "set-asides," that is the preemptive reservation of certain quantities of fuel for worthy purposes. Set-asides exacerbate shortages. A slight supply shortage can be turned into a crisis by simply insisting that certain categories of users should have first call on available resources and setting aside those amounts. In the United States, during the first three quarters of 1979, we expected a motor gasoline shortage of crisis proportions which resulted from an approximate 5% shortfall in refinery runs of crude oil. Since motor gasoline was and still remains under Government allocation controls, it provided a textbook

case in the effects of such controls on supplies in a slight shortfall situation. Since price controls were also in force, normal market forces played only a nominal role.

The Department of Energy established a system of supply priorities that significantly reduced the supply of gasoline available at the retail pump. Before any gasoline can be allocated to retail outlets, DOE regulations provide that the needs of priority users be met. This amounts to approximately 3% of available supply. After those requirements are met, an additional 5% of the remaining supply is reserved to each of our 50 states under so called set-aside programs, forcing the industry to withhold 5% of available supplies for most of each month. Each state decides whether, when and how to allocate its own set-aside, and there are indeed fifty sets of standards, one of which consists of giving set-aside fuel to anyone who asks for it.

Contrastingly, aviation fuel supplies were never in serious jeopardy throughout the emergency. Of course, aviation fuels are not under controls and there were no set-asides to amplify the shortage to the end users. The free market functioned. To my knowledge, no flight was ever cancelled during this period strictly as a result of no fuel. There were several flights, especially in the highly competitive North Atlantic route structure, where cancellation was attributed to a fuel scarcity, but further inquiry showed that in most cases a distinct economic advantage lay in having a money-loser cancelled and the fuel shortage was a convenient and creditable excuse to use.

Our Current Situation

World-wide, petroleum now appears to be plentiful and aviation fuels are readily available. At a high price, of course. In the United States, we still enjoy relatively cheap petroleum since much of our domestic produced crude oil is still under price controls. As less and less petroleum is produced from sources still under controls, our prices are rising and should eventually, by October of next year, reach parity with the rest of the free world. Given sufficient crude oil, our U.S. refinery capacity is sufficient to keep our aircraft flying, although many refiners find aviation gasoline production troublesome and relatively unprofitable.

Aviation Fuels Prospects

Civil aviation accounts for only a very small proportion of total oil consumption, less than 4% world wide. In the United States, where per capita consumption of energy is the highest in the world and aviation now the major mode of long range intercity travel, 6.8% of total refinery output is kerosine, mostly for jet fuel. This is an average figure, since there are large regional variations. Such variations reflect differing market demand as well as access to different types of crude oil. California refineries yield 11.8% kerosine while eastern U.S. refineries yield about 3.2% of their total output as kerosine.

The lion's share of jet fuel goes to certificated air carriers, general aviation using a mere one gallon for each twenty consumed by the carriers. There is consequently a nearly direct relationship between the demand for passenger and freight capacity and total aviation fuel requirements.

Increased quantities of aviation kerosine can be produced from crude oil, but only if other refinery products are traded off, specifically distillate fuel oil and motor gasoline. While there are enormous variations in the composition of crude oils, catalytic cracking and other fractionate processing provides flexibility to refiners to adjust outputs. If kerosine production were to be maximized, it could be as high as 10 to 15 percent of the total production, depending upon the quality of the crude oil input. There would be a higher price to pay; however, it is reassuring to know that it is technically feasible to produce substantially higher yields of kerosine from crude oil.

The specifications to which aviation fuels are refined also influence availability of aviation turbine fuel from crude oil. In the United States we have, since 1976, permitted a slight broadening of the specifications with respect to smoke point, which is primarily an environmental concern, and aromatic content, which effects the burning characteristics. An increased yield of turbine fuel results. The specification for freeze point has also been relaxed for Jet A-1, but agreement to do so was not universal within the aviation community. Other specification changes can also be anticipated in the near future as refiners seek to increase the yield of turbine fuel.

As noted, the fuel needs of civil aviation are relatively small, but the possibility of a shortfall of supplies to those needs depends not only on the total crude oil production, but also on the proportion of refinery production which will be directed to meet aviation fuel specifications. We are thus interdependent with other petroleum uses and the availability of petroleum based aviation fuels will respond to changes in the use of non-petroleum substitutes such as coal and nuclear power for applications which more easily adapt to changes.

Politics of Change

In addition to being dependent upon the availability of crude oil, its quality, the specifications we insist upon for our fuel, and demands for other refined products, aviation fuel supplies will be influenced by the policies pursued by producing and consuming nations. For example, in the United States we currently enjoy abundance of relatively cheap natural gas, largely as a result of Government uneasiness about allowing some sectors of the electorate to suffer the full consequences of inflation. Only recently, the price of crude oil produced from wells within our borders has been allowed to rise, for much the same reasons. Both of these factors now create the incentive for many energy con-

sumers to convert from oil to natural gas for economic reasons. Similarly, the United States currently has a tax loophole for homeowners which permits them to credit up to certain amounts toward their annual income tax, money spent for solar heating and other fuel saving modifications such as insulation and storm windows. All government policies affect the aggregate petroleum demand directly, and as a consequence affect the availability of aviation fuels, indirectly.

On the production side, we need only look to the most recent meeting of the OPEC oil ministers to see political leverage used in a most sophisticated manner.

Near-Term Initiatives

For the near term, that is the next 10 years or so, there are no alternatives to petroleum based fuels for aviation, and, as we see, none are really needed. There are, however, many strategies for fuel savings, most of which modify operations in one manner or another to reduce costs. None promises more than incremental gains against total consumption. Some have already been implemented to the point where little additional can be wrung therefrom. I won't detail them, since I'm reasonably confident that this audience is well acquainted with them; but do suggest those interested in a more detailed look refer to the SAE paper referenced in the notes. For the operator of business jets, the National Business Aircraft Association has produced a booklet, appropriately entitled CONSERVE, of which we are quite proud. Many of the recommendations contained therein have broader application than just for business jets.

Developments in Alternative Fuels

While in the near-term, alternatives to petroleum based fuels do not appear practical, the constant upward spiraling price of petroleum will make alternatives more than attractive sometime near or past this century's end. Some research has already been accomplished toward the development of alternatives to petroleum, but before we look at them I'd like to examine briefly those characteristics of petroleum based fuels which make them so practical for aviation use.

Both jet fuel and aviation gasoline are amenable to safe and economic air transport, a very basic requirement. For example, jet fuel density and energy properties allow fuel tanks to be far removed from the passenger compartment. The physical properties of aviation fuels, such as boiling and freezing temperatures, make them useful over the full range of ambient atmospheric conditions likely to be encountered. Jet fuel is easily gotten through refining and avgas through reforming. Both are readily transportable by pipeline, railcar or motor truck. If you were to specify a design of fuel for air commerce, you would be hard pressed to do much better than our nearly universal specification for aviation turbine fuel. Future fuels

prospects—at least those which we've thought of so far—are not very attractive by comparison—and a practical choice among them is not easy.

The United States enjoys a tremendous supply of fossil fuel in the form of coal and oil shale—sufficient to satisfy our domestic demands for more than a century. Couple to that the great benefit which would derive with fuels compatible with our current aircraft inventory, fuel storage and fuel distribution system—and you can easily understand our enthusiasm for synthetic jet A or synjet.

Synthetic jet A contracted from coal, shale or tar sands could be mixed directly with petroleum-based fuels. Because of its compatibility with kerosene, some researchers believe that synthetic kerosene has the best potential to become a viable product. To call synthetic jet A an alternative may be to misuse the word slightly. The "alternative" in synjet is that it is produced from an alternative source to crude oil, not that it is an alternative in and of itself to kerosene jet as we know it.

Recently, the Congress of the United States approved the establishment of a Synthetic Fuels Corporation with authority to commit over 85 billion dollars between now and 1992 to generate a new industry. The goal is 500,000 barrels per day—or its equivalent, by 1987—and two million barrels per day by 1992, five years later. To keep that in context, the United States currently produces about 8.5 million barrels of crude oil per day and imports an additional six million barrels. The Synthetic Fuels Corporation is concrete evidence that nearly everyone connected with energy policy in the United States, from oil company executives to environmentalists, realizes that synthetics will play a major role in the United States energy future. Getting everyone on board has been a long arduous task, and there are still many difficult compromises in the way ahead.

Manufacture of liquids and gases from coal or synthesizing crude oil from shale was largely of only academic interest as long as oil and gas were cheap and plentiful. As the economics became more benign and the cost of synthetics more nearly equal to the cost of petroleum, agreement could not be reached on synthetics because of environmental concerns. Debate ended last year, however, largely as a result of the cutoff of Iranian oil which precipitated the motor fuels crisis of 1979. With Americans lined up at service stations to buy gasoline for their motor cars clamoring for action and the panicky Government administration unable to solve even the simplest of distribution problems because of its own serpentine regulations, synthetic fuels advocates grasped the opportunity to capture the day for action on energy.

As yet, there are no plants producing syntuels in the United States. But by the middle of this decade, we should be producing oil from shale in the west and methanol from coal in the east. Oil can now be produced from shale for about the same price as it can be im-

ported—\$30 plus per barrel. The Exxon Corporation estimates that in the U.S., the synthetics industry has the potential to deliver 8.0 million barrels per day of oil equivalent from shale and 7.0 million barrels per day from coal.

Not everyone is so optimistic. The production of syntuels could be adversely affected by environmental concerns. Nearly all synthetic fuels processing will generate wastes in quantity which will pollute both air and water. As a "new" industry in the United States, Environmental Protection Agency bureaucrats are right now licking their chops in anticipation of getting their teeth into the development of air, water and solid waste regulations. The development of such regulations will take several years.

There are other reasons to be skeptical. Writing about our new Synthetic Fuels Corporation in *TIME* magazine, September 8, Peter Nulty noted:

Congress doesn't like Big Oil. Because of this bias, some of the companies with needed expertise may sack instead of throwing themselves into the national syntuels effort. He later concluded: "Congress's goal for synthetic fuels probably can't be met without the oil industry. But big as the oil industry is, there's still a chance it would build two million barrels a day of capacity in such an untested field as synthetics in just 12 years."

Other Alternative Prospects

If you accept the premise that an efficient air transportation system is dependent upon continued availability of jet fuel for—say—the next twenty-five years, then you should enthusiastically endorse efforts which would result in substitute fuels for other uses. In the United States, at least, the prospects of partially displacing petroleum as fuel for motor vehicles is quite promising and should be embraced with enthusiasm by aviation people. Americans used over seven million barrels of motor gasoline per day in 1979 and over 81% of the petroleum used in transportation was consumed on our highways. If ethyl alcohol, for example, could displace some part of that petroleum use, the demands of aviation for petroleum-based fuel would be more readily met. In a recent report, the Comptroller General of the United States told the Congress that "...it appears entirely feasible that the Nation's vehicle fleet could be operating on a blend of ten percent ethanol (ethyl alcohol), ninety percent unleaded gasoline—a blend commonly known as 'gasohol'—by the year 2000. Thus, ethanol represents an important partial solution which, in conjunction with methyl alcohol, methanol and other synthetic fuels, merits a key role in the Nation's overall strategy for solving its liquid fuel supply problems." Ten percent of the highway needs equals 100% of the aviation needs, so even though the alcohols have little or no promise for use in aircraft because of their very low heat content per unit weight, their development is indirectly important to us. The

obverse of the coin, however, is that Americans are getting interested in diesel-powered autos, and increasing demand for diesel fuel competes directly for the same cut—as jet fuel.

Looking to the more distant future, the practical choices appear to be dominated by two very different types—liquid hydrogen and nuclear reaction. Liquid methane is also an attractive possibility on a performance and cost basis, but restrictions concerning storage and handling of large quantities in populated areas make it a difficult choice for aircraft.

Hydrogen can be produced directly from water, so it's both universally available and renewable. Its major disadvantage is that hydrogen is not interchangeable with petroleum-based fuels and requires new airplane and engine designs and vastly different and unique supply, storage, and distribution systems. Airport plant capital requirements would be substantial. Moreover, the relatively inefficient hydrogen manufacturing process would consume about three times as much energy as it would deliver in the form of fuel—not a very bright prospect unless new, more efficient techniques for manufacture are developed.

Nuclear power needs to be mentioned, even though it would seem to be politically unfeasible. Nuclear power, because of the concentrated weight of the reactor and its shielding, would be restricted to transport of at most a million pounds gross weight.

These are the options that are presently in different stages of research and development, but all indications are that their probability of success is only poor to fair in the next twenty-five years. Thus a continued efficient air transportation system may eventually require a great reduction in aircraft utilization of crude oil supplies and of fuel.

Would you like to have with you some of the thoughts expressed by the United States National Transportation Policy Study Commission, the Commission, as expressed by Commission Chairman Robert Carmichael, Chairman of the Commission's Special Subcommittee on Advanced Technology. The Commission was created by the U.S. Congress under the Federal Aid Highway Act of 1976 to "study the U.S. transportation needs and institutions, and to recommend new transport policies for the country, considering the fact that their genesis was with highway traffic assessment of new aviation technologies is sought."

Aviation over the years has continually striven to become more efficient due to economic pressures to increase payload and range, and to reduce fuel costs. The escalating price of fuel since 1973 is apparently continuing to provide the incentive needed by the engine and aircraft manufacturers to pursue the use of advanced technologies that improve any aspect of operating cost—be it reliability, maintenance, or fuel load—and are constantly incorporated into succeeding aircraft and engines when added costs can be covered by such savings.

...In the immediate future we see an increased use of composite materials in both engines and airframe, the use of microchip technology which will allow more control over smaller surfaces, and an increased use of electrical systems to replace heavy mechanical linkages. These changes, among others, all provide evolutionary efficiency improvements to commercial aircraft. In the longer run such technological breakthrough as laminar flow control and advanced turboprop propulsion could generate additional significant fuel efficiencies."

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Questions and Answers

Comment from audience:

Too many people in the aviation community feel that those of us who are working for noise abatement are anti aviation. We are not. All we are asking is that we all live as good neighbors—there's a lot that could be done in that area. Quieter airplanes are not the whole answer, they're part of the answer. Another part of the answer is education programs for pilots.

Jack Shaffer:

I was there when we promulgated FAR 36. I think I must have made a thousand speeches during that period of time which effectively said that aviation sound is now designing the airplane. But you don't take anything that is acceptable as aviation and clean it up overnight. The same thing is true of trucks and air conditioning systems. It is just not possible technically to

make an airplane quieter than 85 EPND—the signature level of an airplane falling through the sky without its engines running. There's a certain irreducible level below which airplane noise levels just won't go.

Bill Wilkins:

I might just comment that our Environmental and Energy Office is a very active participant in the question of seeking quieter operations around our airports. As one who recently joined the Washington scene, I would second something which the Administrator said this morning: There's a lot of action out there of which the aviation industry has to become conscious. Citizen groups are going to have to be part of this process and the aviation industry is going to have to learn how politics is played at the local level.

Question: Mr. Shaffer said that deregulation affected only one segment of something we call general aviation, commuters. I think that is somewhat of an awkward simplification of the situation. Isn't business aviation growing very rapidly as a consequence of deregulation?

Jack Shaffer:

I think it may have come out wrong. I didn't intend that. There's a great demand for the corporate airplane, there's a great demand for the owner-operator aircraft. I said both of those things. I said the commuter element is affected more than the majors or the trunk system only because they are about the same total size in number of aircraft. Six thousand is the forecasted number for the bigger airplanes and 5,800 is the forecasted number for the commuter type airplanes. But there's no question that the corporate fleet will grow and grow.

There's no question. As you decentralize industry, more small towns and more low population communities will get factories and the managers have to be there frequently. There's only one way to get there, perhaps, and that's either by corporate airplane or by owner flown airplane. I don't have a problem with it at all. I'm happy with deregulation.

Question: The basic premises of the FAA forecast with respect to general aviation are: (1) That there will be fuel available for GA; (2) That the price will go up significantly—an average 10 percent per year and, based on today's forecast, it may even be greater; and, (3) That the private flying sector would be the sector that would show the least growth. If we talk to some other forecasters, it may even show a decline by 1992. Would you care to comment on the three premises?

Bob Cooke:

We looked at price in our energy committee meeting last month. We are looking for an average nationwide

price of \$1.84 next year, \$2.03 in 1982, \$2.36 in 1983, and then climbing at about 10 percent a year. Don't quote me to the penny. So our estimates, I guess, are a little higher than the FAA's, but I think they track pretty well. Furthermore, we assume fuel will be available if the price is paid. That's an interesting question, however.

I can't speak for all the major oil companies but I know, as a matter of fact, that at the NBAA meeting in Kansas City two executives of Phillips Petroleum, said that they not only are determined to be a factor in this business, but they are committed to providing all of the fuel that's needed where they can reach through their distribution system. I think that the biggest problem that people like Mr. McCabe have are that storage facilities are just not there at some of the smaller places and that it's costly to distribute fuel to a lot of the more remote and smaller user facilities.

Larry McCabe:

The pipelines only go to certain areas in the country. It would be nice to be at the end of the pipeline. One state, for example, is working now on developing a kind of fuel dump system in cooperation with some of their counties. They are building a tank farm where they store this fuel and where the local fixed base operators can draw their needs. They will buy it when the fuel is available and stockpile it. In Minnesota, what we have tried to do throughout the state is to encourage communities to take a tanker load and share it. Two or three of the smaller airports could pool their resources together and buy a tanker load, put it in the ground in the most convenient location and then draw from it.

Bill Wilkins:

I think that you have heard today a series of very articulate spokesmen for various aspects of our industry. The forecast conference has been a yearly event. It is not going away but we do expect next year's conference to be expanded. It will give us a chance to talk about policy and planning as well as forecasting. On behalf of the Federal Aviation Administration and Administrator Bond, let me thank you for coming and wish you a pleasant day.

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