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The Future of Aviation

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CONTENTS

	<u>Page</u>
INTRODUCTION	3
MAJOR FINDINGS	4
PRESENTATIONS	
FAA Programs for Improving Aviation Albert W. Blackburn, Federal Aviation Administration	9
The U.S. Economy: A Look Back and a Look Ahead David Rolley, Wharton Econometrics Forecasting Associates	19
The Changing U.S. Airline Picture Lee R. Howard, Airline Economics, Inc.	33
PANEL DISCUSSIONS	
Market Forces in the Deregulated Environment - William R. Nesbit, Moderator	61
International Ramifications of Deregulation - Gerard Pronk, Moderator	68
Airline Aircraft Manufacturing Developments - Peter Ivory, Moderator	73
The Effects of Economics on Aviation Safety - Edward C. Wood, Moderator	77
The Future of Light Aircraft and General Aviation - Regional/Commuters: Fred R. Dibble, Moderator	82
- Business Aviation: Ronald L. Swanda, Moderator	85
- Helicopters: Lawrence P. Peduzzi, Moderator	91
ATTENDANCE	97

INTRODUCTION

The Fifth International Workshop on the Future of Aviation conducted by the Transportation Research Board (TRB) was held at the National Academy of Sciences in Washington, D.C. on October 6-8, 1987. It was sponsored by the Federal Aviation Administration (FAA), the TRB Committee on Aviation Economics and Forecasting (A1J02), and the TRB Committee on Light Commercial and General Aviation (A1J03). The General Chairman of the Workshop was James E. Gorham, Chairman of the A1J02 Committee. He was assisted by John W. Fischer (Congressional Research Service), and Paul Steggerda (Honeywell-Sperry Flight Systems Group), both members of A1J02, and by Karl Zaeske (Rockwell International, Collins Division), chairman of the A1J03. Liaison with the Federal Aviation Administration was provided by Gene S. Mercer, and Robert Bowles. In addition, Ms. Ellen Kranidas, Director of the FAA Office of Aviation Policy and Plans, addressed the Workshop on important aspects of FAA/TRB working relationships. Thomas B. Deen, TRB Executive Director, welcomed the participants, and TRB Aviation Specialist E. Thomas Burnard coordinated Workshop arrangements and compilation of the Circular.

The Workshop was attended by more than 90 invited participants, including representatives of all segments of the U.S. aviation community and aviation experts from Canada, France, Italy, Japan, Netherlands, Spain, Switzerland, West Germany, and U.S.-based representatives of interests in Singapore, Sweden and Switzerland. A list of the participants will be found at the end of this Circular.

The Workshop was divided into three segments: an opening plenary session, with presentations by distinguished speakers on the broad economic outlook and that of the aviation community, seven concurrent panel discussions for one and a half days on various aspects of aviation development, and a concluding plenary session at which each of the Panel Moderators summarized the conclusions of their workshops.

The reports of the Panel Moderators represent the views of the panel participants and not necessarily those of the moderator, his organization, the Transportation Research Board, or the Federal Aviation Administration.

MAJOR FINDINGS

U.S. Economic Outlook. Gross National Product (GNP) was forecast to grow, in real terms, at an annual rate of 3.2 percent through 1988. The growth of GNP is expected to slow to 2 percent in 1989 and perhaps 1.2 percent in 1990, thus creating a growth recession (continued growth but at a declining rate). Although the federal debt was reduced in 1987 and additional exports have improved the trade balance, the United States still spends more than it earns. Exports would have to grow three times as fast as imports to bring our external debt under control. Also, to control a continuing high external debt, tighter fiscal policies and higher interest rates would be required. This would have a recessionary influence.

The effect of these factors on U.S. airline revenue passenger miles is not expected to be severe. Fuel costs are expected to remain relatively stable until about 1991-92, when they will begin to rise. Labor costs may increase by 2.5 percent to 4 percent in the next few years, and financing costs will increase with rising interest rates.

Air Transportation. Worldwide passenger traffic growth has averaged about 8 percent from 1967 to 1986. Estimates to the year 2000 are in the 5.0 to 5.2 percent range. The growth rate of traffic outside the United States is estimated by the International Civil Aviation Organization at 7 percent. In the Pacific Rim area rate of growth is expected to be nearer 12 percent. U.S. domestic traffic growth in this period may be closer to 4 percent.

The faster growth of international traffic was attributed to the globalization of the airline industry and to changed market forces in the United States. Growth factors that have accounted for past rapid U.S. air travel growth have changed in several ways. The steady decline in real (inflation adjusted) cost of air travel has reached the point where unit costs in the next decade will remain steady or slowly rise in real terms. The increased quality of service from improvements in speed, comfort, convenience, and safety of air travel have been largely realized. Past demographic and cultural factors, such as the baby-boom, are declining and are not clearly a plus or a minus. The rise in discretionary income of two-earner families has leveled off, and the use of discretionary income for air travel is meeting more competition from mortgages, savings, and luxury goods. Further, foreign travel by U.S. citizens will be adversely affected by the decline in the exchange value of the dollar. Conversely, this will encourage travel to the United States by foreign nationals.

Average load factors rose from about 55 percent in 1978 to nearly 65 percent in 1987. By the year 2000, the world load factor was forecast to be 67 percent. Some Workshop participants expect airline yields to level off or decline, but others expect higher fares and higher yields for the rest of the decade. U.S. carriers are expected to show a 1987 operating profit of approximately \$2.5 billion and a net of \$1 billion. A higher operating profit is expected in 1988, but this will be offset by higher interest expense thus producing another year with about \$1 billion net profit. Although fuel, labor, and capital costs are somewhat predictable, increased costs resulting from government consumer regulations and restraints on airport capacity are not, and they could be substantial.

Airline Consolidation. As projected in previous Workshops, airline consolidations have proceeded rapidly in the United States. Over 60 mergers or acquisitions have occurred since deregulation. In 1987, only 25 carriers remained in the 48 contiguous states, and eight of these carriers accounted for 95 percent of the traffic. The hub-and-spoke route pattern that has been followed by the larger carriers has resulted in single carriers controlling more than two-thirds of the traffic at 14 major hub airports. Consolidation is expected to continue, but at a much slower pace. New entrants will be very rare. A similar consolidation also appears to be under way in the travel agency industry.

The airlines that survive in the continued period of consolidation will have the following characteristics: (1) a strong nationwide hub-and-spoke system; (2) strong, sophisticated, yield management; (3) good capacity management; (4) low labor costs; (5) ownership or participation in a computer-based reservation system; and (6) marketing programs that allow them to take advantage of size. Although mergers have generally improved survivability of all carriers, Texas Air and Northwest have each benefited the most as measured by a rating system based upon the above factors.

- Regional Carriers. The emerging oligopolistic situation will lead to more vertical integration between majors and regionals in order to strengthen hubs and capture passengers at the start of a trip. Ownership and effective control of regional carriers is now dominated by the major airlines who ticket 95 percent of all regional passengers. Of the top 50 regional carriers, only three are nonaligned. Traffic for the regionals is growing at an annual rate of 8 to 9 percent and is expected to continue for some time. However, once a regional/commuter carrier comes into the fold of a major carrier, its identity is lost as marketing, scheduling, and other management functions are assumed by the major carrier. The development of "fourth-tier" carriers will not be significant. They will provide point-to-point service between small communities in the Mid-West and West with small (19 to 30-seat) aircraft.

- International Ramifications. Major U.S. carriers are also expanding internationally. Predominantly U.S. domestic carriers, such as American, United, Delta and Texas Air, served only four foreign gateways in 1978; by 1986 they had expanded to 48 gateways. Increasing penetration of foreign markets by deregulated major carriers of the United States and Canada provides strong incentive for European and other carriers to compete on a like basis. The development of strong multinational carriers in Europe is considered quite possible. Contributing to this development is the denationalization and privatization of government-owned carriers in major European countries and increasing pressure for the formation of a multinational economic system to take advantage of the European market with 350 million people. Crossnational mergers and acquisitions may develop from existing maintenance pooling arrangements, and the European charter industry may be absorbed by the scheduled carriers.

Once started, such consolidations are expected to move rapidly, as they have in the United States. These multinational carriers may also seek intercontinental mergers or consolidations with North-American or Pacific-Basin carriers thereby forming megacarriers that will compete for traffic on a worldwide scale. Until this consolidation process is complete, European carriers, followed by carriers from other parts of the world, are expected to experience a turbulent period.

Business Aviation. During the next five years, the use of business aircraft will continue to grow at approximately the same rate as the GNP. Because the size of the business aircraft fleet will stay relatively constant in the next few years, aircraft utilization rates will gradually increase. As this happens, firms owning aircraft will be less likely to want to sell them unless appropriate replacements or additional aircraft are available. Aircraft manufacturer's inventory, already low for many models, will dry up. Used aircraft prices will rise, and some increase in demand for new aircraft could result. As the U.S. dollar continues to drop, U.S. industries with foreign markets find themselves more internationally competitive and more profitable so may once again become business aircraft buyers and users. A more profitable oil industry could also mean their return as aircraft buyers. And, the lower dollar also leads to increased exports of U.S. aircraft.

Beyond five years, business aviation's share of the market is expected to increase as a result of increased airline fares, increased air traffic delays, possible favorable tax incentives, and better control of product liability.

Helicopter Outlook. Market conditions indicate that the civil helicopter industry will experience slow, but steady, growth over the next decade. The offshore oil market will remain low until about 1990, when an upswing is anticipated. Use of helicopters for business and corporate purposes could show stable to modest growth although inhibited by lack of downtown heliports. The market potential for helicopters in commuter intercity travel is considered to be significant, but unrealized. Law enforcement and medical emergency use is one of the fastest growing sectors of helicopter use.

There are significant roadblocks to growth, particularly in the use of rotorcraft for business and intercity commuter services. These include problems of airspace procedures, lack of heliports, noise, and other environmental and zoning considerations. It was also found that a greater sharing of technology by Dod, NASA, and FAA for civil applications as well as an enhanced government-industry communication process will advance the use of helicopters. The tilt-rotor concept is considered by many to offer real promise for short-haul intercity service, provided suitable landing areas are available and noise reduction measures are accomplished.

Aircraft Manufacturing: - Airline Aircraft. The underlying factors for this forecast of airline aircraft needs include the following: (1) an average annual free-world revenue passenger mile rate of growth to the year 2000 of 5.2 percent; (2) a world load factor of 67 percent; (3) fuel prices remaining steady until the early 1990s, then increasing toward the year 2000; and (4) retirement of existing aircraft at approximately 200 per year - down from 225 per year in previous forecasts. Evaluation of these factors resulted in forecast of 430 new units per year, up from 400 in the 1985 Workshop forecast.

For the period 1988 - 2000, worldwide deliveries of commercial aircraft with 80 seats or more are forecast to be about 5,500, of which 56 percent are in the short-range class with 80 to 145 seats. Aircraft retirements in the same period are estimated to be about 2,500, of which nearly three-quarters are in the short-range class. The net change in the world fleet is expected to be just over 2,800 aircraft -- including an additional 822 long-range, 727 medium-range, 1,409 short-range 145-seat aircraft, and a reduction of 130 aircraft with less than 145 seats. Although many production lines are near

full capacity and there are high backlogs of deliveries, manufacturers are uneasy about the future. Lease arrangements and options to buy are becoming more popular than outright purchases. Most new products are in the development stage. Before they reach the market, research and development cost and reduced cash flow will put heavy pressure on the manufacturers.

- Regional Carrier, Business and Helicopter Aircraft. The regional carrier segment of the industry is now in a reequipment phase. About 1,000 aircraft are on order worldwide for delivery in the next five to six years. These are 19-passenger aircraft, costing about \$3.5 million each and 30-to-40-passenger planes carrying a \$7 million price tag. The trend toward lease instead of purchase of these aircraft is also increasing, as are the terms of the leases. In the past, lease of 10 to 12 years were normal; they are now increasing to 14 to 16 years with some talk of up to 20 years.

Business aircraft sales peaked in 1981 and have declined since. There were 350 new aircraft shipments in 1987, shipments are expected to increase to 535 by 1992. Deliveries of civil helicopters in 1988 are expected to be about 375 worldwide (100 in the U.S.). According to some forecasts, 14,000 helicopters will be produced worldwide in the next decade, 6,000 of which will be for civil use.

Airport Congestion and Delay. Airport and airway constraints continue to be a major limitation on the efficient and economical development of the air transportation system, particularly in the United States. FAA statistics for the first three quarters of 1987 indicate that continued consolidation of U.S. carriers and their use of hub-and-spoke route patterns have resulted in a 7 percent increase in air carrier operations at air traffic control towers. This trend is expected to continue. Although FAA has taken measures to speed up the flow of air traffic (particularly in the East Coast and West Coast corridors), the carriers have adjusted some of their schedules, and airport improvements have been made, these steps alone are not adequate to resolve delay problems. Delays will continue as long as there are airport capacity limitations and FAA forecasts indicate serious long-term concerns in this area. In 1986, 11 major airports experienced an average delay of more than 8 minutes per operation. This number is expected to increase to 16 by 1991, and to 26 by 1996. New airports are needed to provide the necessary capacity. Since planning and constructing new airports requires a decade or more, it is already very late in the process to prevent significant additional delays.

Aviation Safety. The effects on safety brought about by the economic deregulation of the airlines can be grouped as those associated with the federal government and those associated with the airline operators.

The increased number of reported near mid-air collisions can be attributed to the increase in traffic resulting from deregulation and the reduced number of qualified air traffic controllers since the 1981 controllers strike. In addition, there are shortages of qualified FAA air carrier operations inspectors, maintenance inspectors and technicians, and navigational aid technicians. To a large extent these shortages reflect budgetary restraints imposed on FAA by Congress and the Administration.

With regard to airline operations, a recent survey of its members by the Air Line Pilots Association indicated that about two thirds of them believe that safety has declined with airline deregulation - particularly in the maintenance and air worthiness of the equipment. Economic pressures may have encouraged extended operation of presently owned aircraft, and reduction of some engineering and safety staffs. Proper surveillance of operations and maintenance is essential to assuring compliance with FAA safety standards and regulations.

PRESENTATIONS

FAA PROGRAMS FOR IMPROVING AVIATION

The Honorable Albert W. Blackburn, Associate Administrator for Policy and International Aviation, Federal Aviation Administration

I appreciate the opportunity to join this discussion of the future of aviation. FAA Forecasts rely upon a large data base, but many changes are reshaping modern aviation. To provide accurate forecasts for the future of aviation, we need the best possible understanding of the many variables that will change, often unpredictably, in the coming months. Beyond the unpredictable variables that deserve our attention, I'd like to focus part of my discussion today on programs that the FAA will emphasize to promote changes during the next sixteen months.

Forecasting in Perspective

I'd like to start by urging a word of caution in approaching all forecasts -- and forecasters. It is often tempting to blame the messenger for the message. Even children understand this principle at an early age. I'm reminded of a second grader who was asked to report on Socrates. She got all of the essential details in three sentences, which I quote:

"Socrates was a philosopher. He went around giving advice. They killed him."

Aviation forecasters have not been subjected to that punishment, yet; but our industry has changed rapidly during the past year. Many observers believe that the industry could plan better if it had more precise information about Air Traffic Operations, the size of air carriers' fleets, the price of aviation fuels, the growth rate of the economy, or a host of other variables that just might, in someone's mind's eye, provide a critical edge on the competition.

I think that the beginning of maturity in analyzing forecasts is recognizing that they are highly dependent upon the responses they evoke from people. Where one manager might look at a forecast of 4% growth in air traffic control tower operations and say, "We'd better get more than our share of that, or we won't make money," another manager will say, "Well, if it's only going to be 4% growth, we'd better not buy another airplane."

In either case, the response affects whether forecast growth rates are matched, exceeded, or underachieved. Of course, I'd encourage everyone using forecasts to plan rationally, and never let personal hopes overtake good judgment, as much as that is tempting at times.

That thought was reinforced last week when the head of the Postal Service reported that this year's \$200 million deficit was, and I quote, "due to inaccurate mail volume projections, unexpected expenses, and budget overruns."

Now, it's relatively easy to summarize those factors as "forecasting error," but, really, even the Postal Service forecast that it would lose money this year, the only question was whether it would be \$1 million, the prediction, or \$200 million. For good decisions, we have to get the magnitude of the prediction right, as well as its direction. In general, FAA's forecasters have gotten the directions right, and the magnitude of our errors have not been on the order of 200 to 1.

Forecasts always depend upon the best available data, and we have been doing our best to improve the data we have, while seeking the data that we don't have in usable form. Our data files on the major air carriers -- operations, passenger enplanements, rates, routes, and other matters -- are good. We need better information about some of the other forms of aviation activities, especially helicopter operations, even in busy places like the New York Metropolitan area.

Outside of the United States, the International Civil Aviation Organization predicts an average annual growth rate for passenger enplanements of 7% over the next 10 years. In the Pacific Rim, their forecast is 12%, with air cargo operations in the region increasing 22%. During a recent trip to the People's Republic of China, I learned that their passenger enplanements this year are up 34% over last year.

Since deregulation of rates and routes in 1978, industry observers have devoted great attention to growth and consolidation among U.S. air carriers. We've seen many changes in the industry, including hub-and-spoke route systems, the internationalization of both manufacturing and maintenance, the air traffic controllers' strike and rebuilding of the system, and equipment changes affecting airports and aircraft.

The changes aren't going to stop. In fact, the long-term health of aviation depends upon entrepreneurs reshaping their operations to take advantage of changes in market conditions initiated by others. Perhaps even more, industry success depends upon inventing new goods and services to reshape market forces--naturally to the benefit of the consumers who ultimately bear all the price tags.

Market Forces Changes

What do I mean by changes in market forces? Let me offer a few examples.

Following the oil price shocks of 1974 and 1979, nearly all economic forecasts built upon an assumption of a steady increase in fuel prices. When President Reagan deregulated oil prices in January, 1981, most forecasters sustained those assumptions.

In fact, if it weren't for the reductions in fuel prices, the savings consumers have realized under deregulation would be considerably less. In other words, the reduction in fuel prices provided an unanticipated cushion enabling aviation to reduce costs--and prices--with smaller cuts in other budget items than might have been necessary otherwise. In the FAA's Third Quarter Industry Review, we estimate fuel savings during the current fiscal year at \$3.3 billion.

It now appears that fuel prices are rising again, in part because of uncertainties in the Persian Gulf, and in part because of the increased demand reflected as people respond to lower prices. Overall, air carrier jet fuel consumption increased 6.4% during the first three quarters of fiscal 1987, compared to the same period a year ago. We should expect that continued rising price trends would slow rates of increase in fuel consumption, but that might be offset by a variety of factors.

One leading factor that will affect the trend is the tendency toward consolidation among air carriers. The mergers combining Continental, Eastern, Texas Air, New York Air, and People Express are completed, as are the unifications of Northwest and Republic, TWA and Ozark, and Delta and Western. The Department of Transportation is considering rejection of a proposed merger of US Air and Piedmont--on Anti-Trust Grounds. It appears safe to predict a limit to further consolidation, just as it seems safe to forecast that there are no major new entrants on the horizon.

Just as the expansion of air carriers to compete in new markets had consequences for air traffic operations, the consolidation of rates and routes (an economist might call this "rationalization of systems and equipment") is having its own air traffic control consequences.

At an aggregate level, air carrier operations at FAA air traffic control towers grew 7% during the first three quarters of Fiscal 1987. That growth rate exceeds our previous expectations, and was a factor in the Department of Transportation's decision to seek additional increases in the air traffic control workforce earlier this year.

That aggregate hides several interesting particulars, however. For example, as more carriers shifted operations from Washington National Airport to Dulles, air traffic operations at DCA declined by 1.8%, while Dulles became the fastest growing airport in the country, with a 128.5% increase in activity over a year ago.

The consolidation of People Express substantially influenced the 8% reduction in operations at Newark, leading to an overall 1.3% decrease in air traffic operations in the New York area during the first three quarters of Fiscal 1987. Similarly, the combination of TWA and Ozark was a major factor in reducing air traffic operations at St. Louis by 5.7% compared to the previous year. The combination of Northwest and Republic contributed to the 1.8% decrease in air carrier operations at Minneapolis-St. Paul.

Not surprisingly, with operations at these major hubs reduced in the face of overall system growth, we experienced fewer delays than anticipated. Changes in air traffic operations at these facilities undoubtedly contributed to the major reductions in air traffic control system delays during the summer of 1987 -- another point where predictions of excessive congestion, even our own, were wrong.

Naturally, reducing congestion in the national airspace system in the face of a 7% increase in tower operations required changes in air carrier operations as well as FAA procedures. Earlier this year, the FAA implemented its Enhanced East Coast Plan, increasing routes into, and out of the New York area to move air traffic more efficiently. The FAA also enhanced its central flow control

facility with improved aircraft situation display technology, and strengthened central flow's hand monitoring movements in the national airspace.

In addition to these changes in air traffic control technology and procedures, the Department of Transportation conducted scheduling negotiations with major air carriers regarding operations at particularly congested hubs. As is always the case, efficient national airspace system operations required close cooperation among all system users. Once again, when it was needed, the spirit of cooperation was there.

I'd like to take full credit for the improvement in system performance, but I must also acknowledge that good weather during August and September had something to do with the 40% reduction in delays achieved during those months compared to a year ago. Of course, I'm not aware that there's anyone in this room I should thank for good weather--but if any of you have closer connections than I do, pass along my appreciation.

Air Traffic Control Procedures

Let me emphasize that changes in air traffic control procedures to improve safety and efficiency in the system are constantly under consideration at the FAA. These will take several forms in the foreseeable future.

As part of the National Airspace System Plan, the FAA is beginning operations with the new host computer. Installments are coming on line at the rate of two new centers per month. This equipment has five times the storage capacity and ten times the processing speed of the computers being replaced. It will enable En Route Centers to monitor more air traffic, while providing the capacity to install programs such as the Mode C Intruder Alert, which will reduce the chances of mid-air collisions.

We are also analyzing airspace procedures to strengthen FAA's services. Within his first month in office, Administrator Allan McArtor issued a special Federal Air Regulation revising Terminal Control Area procedures in the Los Angeles basin, and proposed new regulations to establish 9 additional terminal control areas, bringing nearly all hubs under stricter air traffic control procedures.

The agency is also reviewing West Coast air traffic operations, with the intention of developing a West Coast plan to replicate the success achieved on the East Coast.

These air traffic control procedural changes are not adequate to resolve the nation's continuing concerns about delays in the national airspace system. The delay issues will remain as long as there are airport capacity limits, and our forecasts indicate that we have serious, long-term concerns in this area.

Need For New Airports

We need new airports. The United States has not opened a new major airport since Dallas-Fort Worth, in 1973. Denver is now considering another airport, and major expansion plans are being developed at DFW. A look at some of our forecasts of future delays, however, demonstrates that further expansion

planning is absolutely essential. Given the planning time required for major airports, it is already very late in the process to get the construction done before significant additional delays confront the system.

Last year, 1986, of the 50 major airports whose operations are closely monitored by the FAA, 11 reported an average delay of greater than eight minutes per operation. These include the three New York airports, Boston, Atlanta, Chicago, DFW, Denver, San Francisco, and Los Angeles. (See Figure 1.) We have found that when average delays (and here we are talking only of weather and airtraffic delays, not including air carrier maintenance and equipment delays) exceed eight minutes per operation, the travelling public gets very unhappy.

By 1991, we forecast that an additional eight airports will reach this category--giving the nation a total of 19 airports where the average delay per operation is more than eight minutes. (See Figure 2.) The concerns will continue along the East Coast, increase in a midwestern cluster which includes St. Louis, Detroit, and Nashville, and intensify considerably along the West Coast, with San Jose, Ontario, and Phoenix joining the current congested airports.

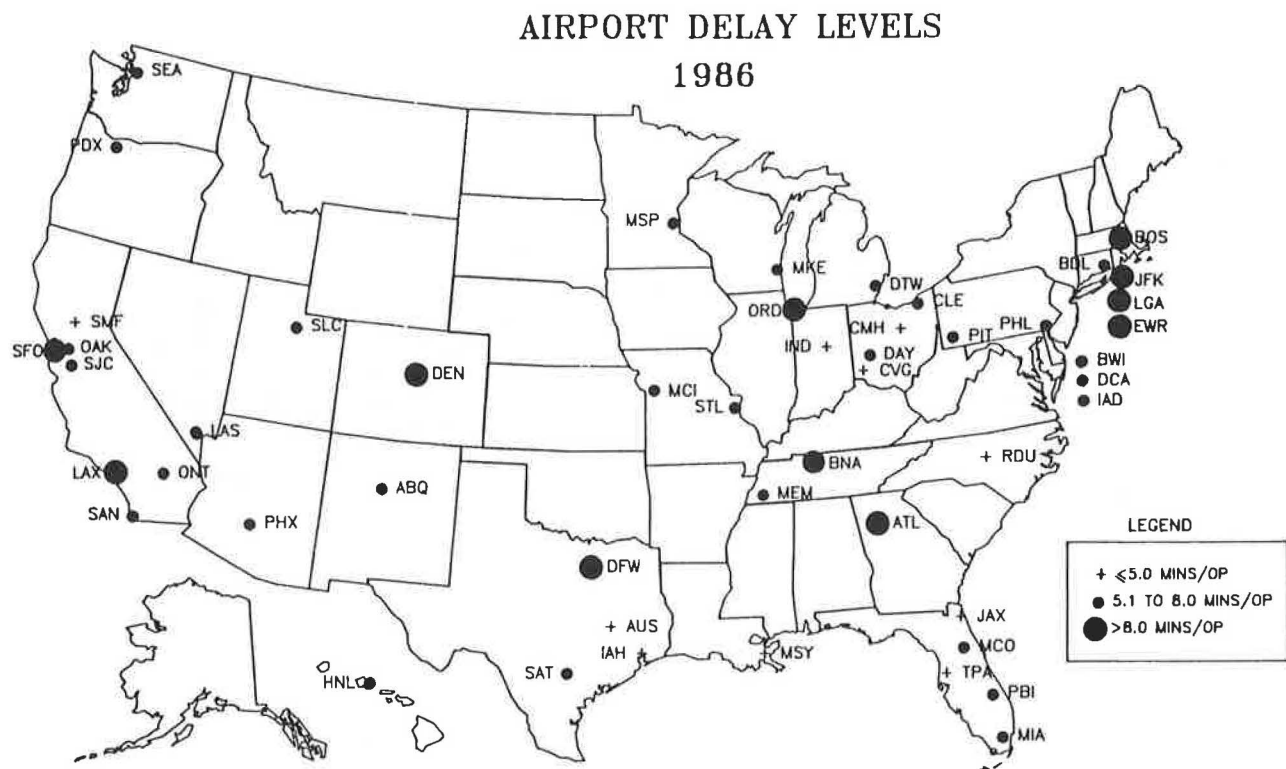


Figure 1. 1986 Average Delay at 50 U.S. Airports
Source: Federal Aviation Administration

AIRPORT DELAY LEVELS 1991

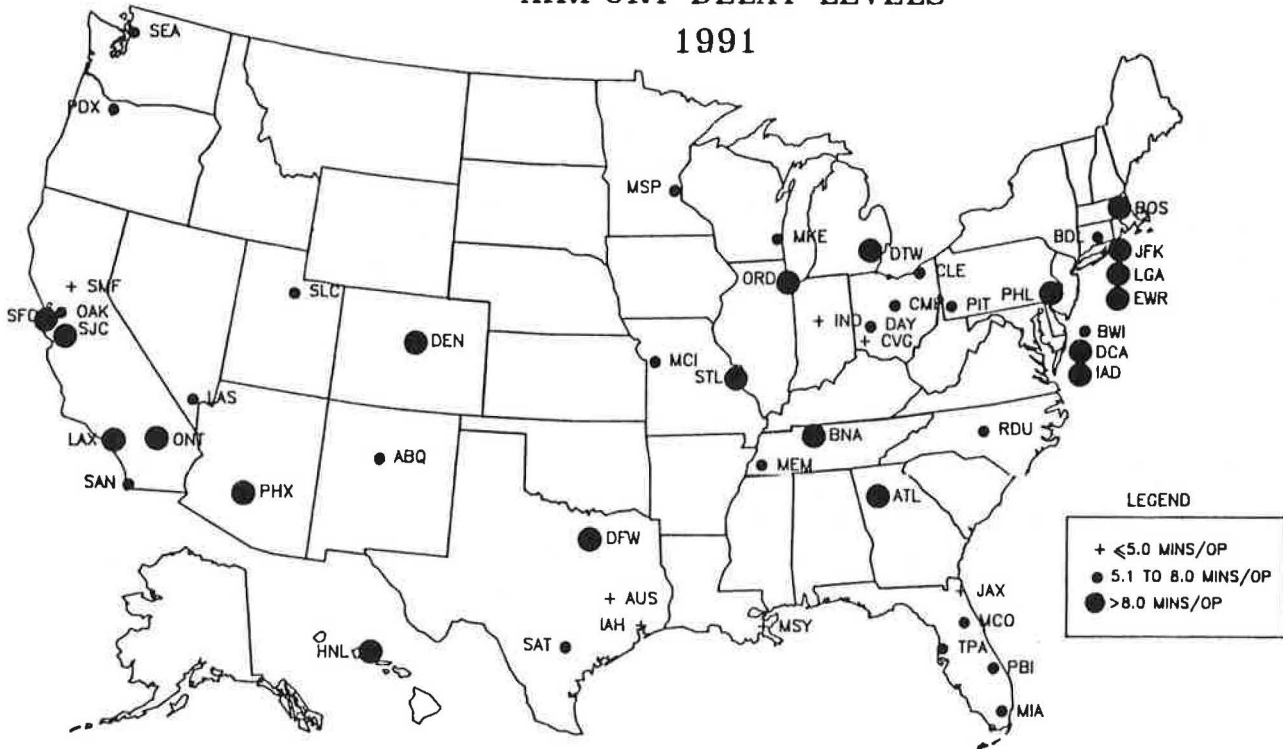


Figure 2. 1991 Estimated Average Delay at 50 U.S Airports
Source: Federal Aviation Administration

AIRPORT DELAY LEVELS 1996

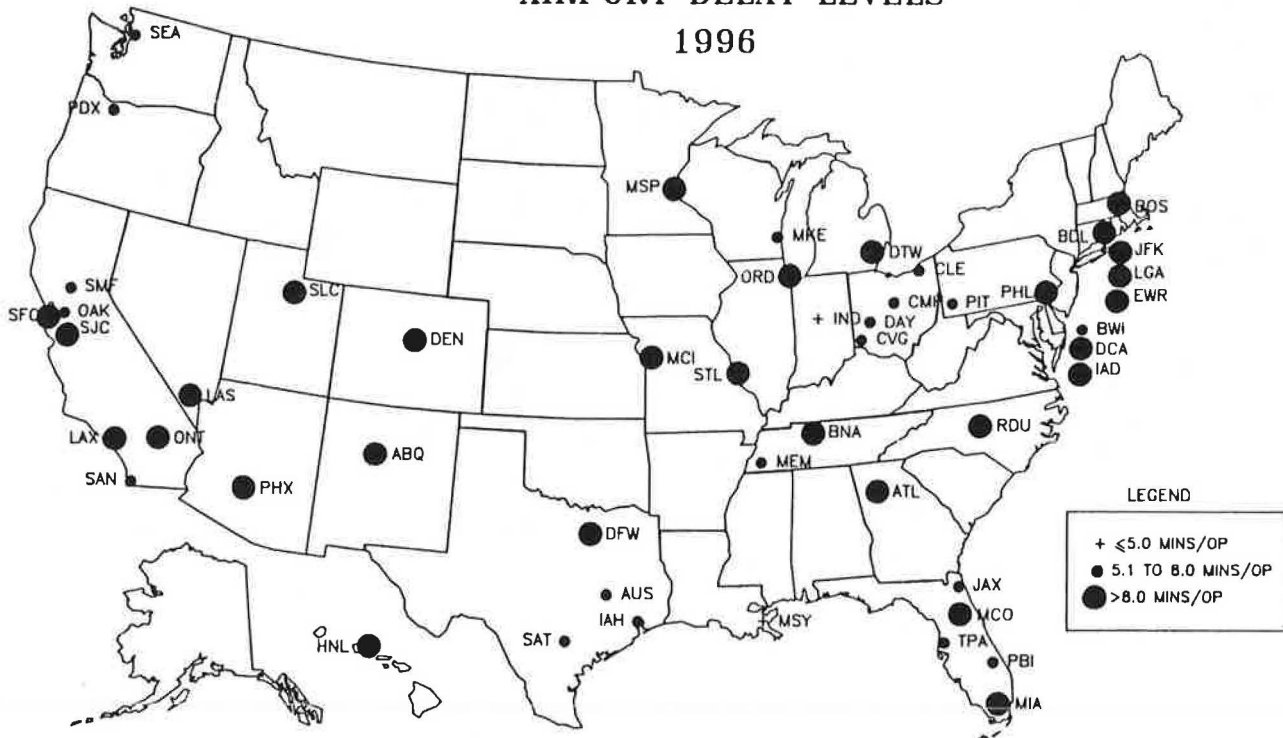


Figure 3. 1996 Estimated Average Delay at 50 U.S Airports
Source: Federal Aviation Administration

By 1996, we forecast that 29 airports will be experiencing average delays of eight minutes or more per operation. (See Figure 3.) What appears as relatively localized concerns for today's short term becomes a national concern in less than ten years, with significant needs for new capacity essential to provide adequate service for the 650 million passengers who will rely upon air carriers by then.

Improvements in equipment and procedures are not restricted to large elements of the system. The FAA has long recognized the importance of developing additional airport capacity, and Administrator McArtor has emphasized the need for community involvement to make the cast for additional runways. However, until additional runways and airports move from the talking stages to concrete, we have to examine opportunities to improve efficiency at all existing facilities.

Accordingly, we are accelerating experiments with simultaneous approach procedures on closely-spaced parallel runways. These appear to afford opportunities for additional operations at Raleigh-Durham, which experienced a 24% increase in operations during the first nine months of Fiscal 1987. We'll examine additional opportunities wherever they present themselves.

Benefits to Air Carriers

With the increase in operations and reduction in delays, the increase in passenger enplanements had to be reflected somewhere--and that appears most notably in the load factor of the commercial air carriers. Last week, Aviation Daily's monthly compilation of statistics showed 19 air carriers with load factors exceeding 60% for the first eight months of the Calendar Year.

Accordingly, the FAA's review of the first nine months of the Fiscal Year reflects strong performance among the air carriers. The 33 carriers included in our reports made an aggregate profit of \$1.5 billion. Their 6.5% increase in operating expenses was more than offset by a 13.1% gain in operating revenues.

Again, the aggregate data varied widely among particular air carriers. Although major carriers showed substantial gains in profits, the ten regional carriers in our statistics lost \$9.9 million. Their 8.1% gain in revenues did not offset a 12.2% cost increase.

The increase in load factor is undoubtedly among the forces encouraging air carriers to keep aircraft in operation where they might have been phased out more quickly. In February, FAA forecasters projected an increase of 1.7 million aircraft operations by 1998. This forecast anticipated the retirement of 437 Stage 2 aircraft by 1991.

Given the load factors achieved in 1987, and anticipated to drop off only slightly in the near future, air carriers are not retiring equipment that is flying full--and there is no reason to expect that they will do so. Thus, we now project that those aircraft might fly those additional 1.7 million operations per year by 1991, moving our air traffic operations measures ahead seven years.

Incidentally, this anticipated activity will compound our noise problems, because implicit in this rate of growth is a delay in retirement of Stage 2 Aircraft. Designs for converting these noisier models to comply with Stage 3 standards might well become more attractive.

Changes Anticipated

I believe that this is the point to stress the traditional economic assumption, "other things being equal." Since other things rarely respect our predictions, let me alert you to some of the changes we anticipate.

First, we expect recent increases in air fares to remain relatively stable. In the past few months, air carriers have raised fares, on average, 15% to 20%. We have already seen some flexibility on these increases on competitive routes, but high load factors and rising fuel prices will keep fares up to cover increased expenses.

Second, increased expenditures will be prompted from a variety of sources. This summer, the Department of Transportation issued consumer protection regulations that require increased reporting. These costs will be added to administrative expenditures. Several carriers have added staff to respond to well-publicized consumer complaints.

Nearly all air carriers are devoting increased resources to marketing their services--those with good performances telling the public how good they are, and those that appear to need improvement telling the public how good they're going to be. It's nice to keep the message upbeat in either version. Whatever the message, it costs money to deliver, and increasing public confidence is vital to the continued success of the industry.

Finally, the FAA will require additional expenditures to keep pace with advances in equipment. Administrator McArtor has announced his commitment to certification of TCAS-II, and accelerated development of TCAS-III, during this fiscal year. Let me urge every air carrier to send observers to the flight tests of TCAS-III that the FAA will conduct at the Technical Center near Atlantic City. It will convince you beyond a doubt that responsible executives will require that equipment on their aircraft as soon as it is available.

As the National Airspace Plan moves along, aircraft will require new equipment for Mode S Data-Link communications, for microwave landing systems, and other equipment advances that will be developed in the coming years. Better equipment will improve safety along with service, but it will also be expensive.

The expenditures are predictable, many of them even enhance training and operations -- such as expenditures on more simulators that enable greater use of aircraft in revenue, rather than training, flights. Training, of course, will also be a heavy portion of continuing expenditures for flight crews as older pilots retire, for airport security as it is upgraded to address more sophisticated threats, and for aircraft maintenance which is becoming as advanced as the technology supporting manufacturing.

Summary

In summary, the aviation industry today is healthy, and well-positioned for future advances. Nonetheless, it faces substantial challenges to modernize equipment at all stages of operations, to improve service to retain public confidence, and to sustain the foundations for future development that are essential to long-term health.

The FAA recognizes the need to improve, because changes are needed to enhance public confidence. As Administrator McArtor frequently observes, aviation is a complex blend of people, equipment, and procedures, and the parts must advance together to make the best use of achievements in each of them.

Change in aviation, therefore, requires coordination throughout the system -- the cooperation of manufacturing and maintenance, air carrier operations and air traffic operations -- with administrative support across the board.

For its part, the FAA will do its best to strengthen its own services, and to implement advances throughout the industry in a reasonable fashion. We'll continue to forecast on the best information available, and revise our forecasts as improvements in the industry -- and changes in the economy -- provide the data essential for more accurate forecasts.

Discussion:

Frank Spencer (Northwestern University): How are the delays on your chart determined?

Mr. Blackburn: These are system-induced delays that are measured from the time you call for pushback until the time you get back to the gate. If you have a maintenance problem, that is not in these figures. The things that really most irritate the customers, equipment failure or cancellation, are not in those numbers. We are trying to get a better handle, on those delays that are the creatures of the airlines. That is a little more difficult to come by.

Mr. Powell (Bell Helicopter): Do you see anything taking place to respond to the need for better helicopter industry data?

Mr. Blackburn: Yes, we have a proposal from the Helicopter Association International, HAI, which has a foundation, and they have proposed to put this data together for us. Under government procurement procedures we must go competitive on it and it may take a year to get it through the system. We are very anxious to get that information and would be happy if Bell Helicopter wanted to fund that study.

Frank Spencer (Northwestern University): Regarding the possibility of either the tilt-rotor or a high-speed rail as a method of relief of these delays, have any studies been made to evaluate whether the costs would be more than the benefits; whether by the time you got off the airplane and got on a tilt-rotor or a high-speed rail to get to your destination you would be there any sooner than you would if you took the delay in the air?

Mr. Blackburn: FAA has initiated a study that is now in progress under our Office of Policy and Plans to do exactly that. It includes the kinds of heliports, vertiports you would need, where they should be located, what kind of facilities they should have and how it fits into the overall air traffic control system so that it relieves the system and doesn't add further congestion. The tilt-rotor isn't going to happen until people perceive that there is a system there ready to accept it and utilize it.

Mr. Wayne (International Aeroengines): A couple of years ago, the FAA was holding hearings of citizens groups and local aviation people with respect to noise regulation at airports. The implications were that there might be some increased regulations on noise coming out of these discussions. Today you indicated that noise regulations might be delayed or probably will be delayed. Obviously in the forecasting world this kind of thing is very important to us. Could you expand upon that a bit?

Mr. Blackburn: I think most of you are aware that we have just received the report of the Industry Task Force which brought together the airlines and the airports, leaders in both, including the Air Transport Association and AOCI. Don Riley of AOCI was chairman of that group, and did a very effective job. We have received the report, and the question being asked is when should all Stage 2 aircraft be eliminated from the system. That group has agreed that this should unequivocally occur by the year 2009.

The group, also, agrees that with certain incentives (undefined) it could happen by the end of 1999. We believe that with the right kinds of incentives, this can effectively happen by the start of 2000. At least 80 percent of my mail has to do with noise. We work very hard at trying to keep people from moving into and around and surrounding airports, and we have programs for compatible land use and so forth. It is a very, very serious problem. It will not go away, and the manufacturers are being challenged to build quieter airplanes.

In fact, there is a premium on it. As you may be aware, there is a certain aircraft built by our British cousins that is getting a very nice market mainly because it is much quieter than Stage 3 standards. It is beating other Stage 3 airplanes because the communities like it, and so, the challenge is up to the industry. The problem is going to get us better than Stage 3, but I don't anticipate Stage 4.

THE U.S. ECONOMY: A LOOK BACK AND A LOOK AHEAD

David Rolley, Wharton Econometrics Forecasting Associates

I would like to do three things this morning. First, I would like to see how our forecasts have been holding up since my colleague, Dr. Nariman Behravesh presented the outlook for the U.S. economy two years ago. At that time he promised this group that there would be no recession for at least 2 years. It's now two years later and we've made it thus far. Then we will move to how we think things look for 1988 and for 1989. I will confess that we are not as confident about making the same promise this morning. Lastly, we want to draw one or two tentative implications for the airline industry generally implied by the baseline forecast.

How Our 1985 Forecasts Are Holding Up

These are some of the things that we talked about in October 1985.

WEFA FORECAST OUTLOOK: 1985

- *No Recession For At Least 2 Years
- *Strong U.S. Domestic Demand Growth
- *An "Orderly" Dollar Decline
- *Insignificant Tax Reform
- *Low Inflation
- *The Risk Of An Oil Price Collapse To \$18

As you can see, I think our batting average wasn't too bad. I give us about a 75 percent on this.

No Recession For At Least Two Years. At that time the economy was shifting from a period of very rapid growth to a period of somewhat slower growth, and we said that the outlook was for no recession but we expected economic activity on the order of about 2.5 to 3 percent of GNP. That really wasn't such a bad call. In 1985, GNP growth was 3 percent; last year, the actual calendar year average GNP growth was 2.9 percent. This year it looks like we are headed for something like about 2.6 percent on the calendar year, certainly no recession.

Strong U.S. Domestic Demand Growth. We also said that growth was going to be characterized by fairly strong domestic demand.

Figure 1 shows a decomposition of some of the key components of the gross national product in 1982 constant dollars. We are looking at the year-over-year changes in level form. The GNP total is composed of several parts, two of which we have shown here. The third bar is what we call private final domestic demand. It does not include changes in inventories or of Federal Government purchases. It does include all consumer spending, all investment spending, all state and local government spending, and, as you can see, that has actually run well ahead of the GNP over the last few years. The principal drag on performance has been the trade balance. You can also see that we are moving from a regime where the trade balance has hurt us in GNP terms over the last 3 years to where we think it is going to help us this year and next year.

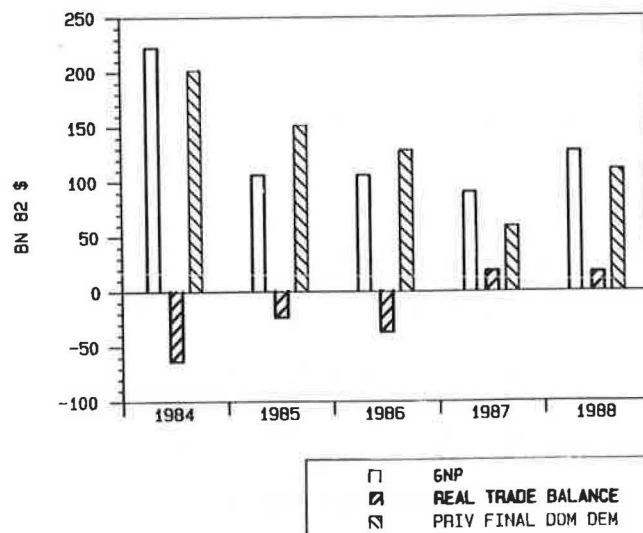


FIGURE 1 Composition of GNP Growth

An Orderly Dollar Decline. The third point that we talked about 2 years ago was the exchange rate. We promised a dollar decline, and we said that that decline would be orderly.

Figure 2 is a plot of the Federal Reserve Board's trade-weighted dollar index. It is a market basket of currencies dominated by the industrial currencies -- principally in Europe, Canada and Japan.

As you know, since February or March of 1985, our total decline against the Deutsche mark or the Japanese yen has been on the order of about 40 percent, -- 40 percent in 2 years, about 20 percent per year. I suppose it is really a matter of perspective as to whether this decline has been orderly or not. I know that in 1985, if you had threatened a 40 percent decline in the exchange rate, that might have been described as a dollar collapse.

My feeling is that, in the United States, this is regarded as an orderly decline, but in Frankfurt or in Tokyo there is a certain degree of skepticism. Fortunately, I don't have to adjudicate this dispute because the central banks have, and they have told us in no uncertain terms that this has been a very

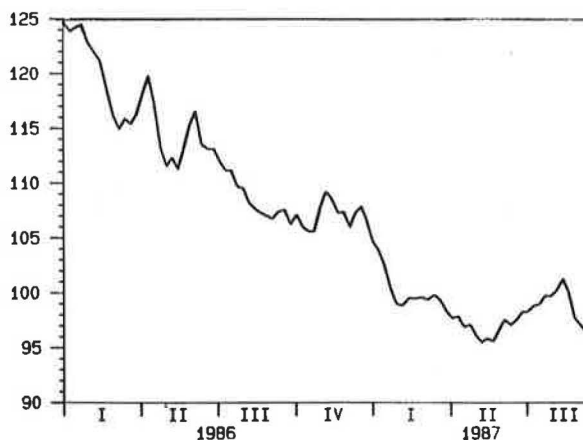


FIGURE 2 Federal Reserve Dollar Index.
March 1973 = 100

orderly movement and that everything is fine. Since that is the official word, I think that once again we called it right.

Insignificant Tax Reform. However, on the issue of tax reform forecasting, we did not do so well. In 1985, we really didn't think that Congress and the White House were going to be able to pull everything together, and, of course, that was wrong. We had some deathbed conversions last summer, and we have had the most significant tax reform since the Second World War. As an individual taxpayer, I am very grateful. With regard to the perspective of our company customers and the rather dramatic shift in incidence from households and individuals to companies, my enthusiasm is somewhat more moderate; but it has been quite significant, and you all know the details.

Low Inflation. Lastly, we described what was a very optimistic inflation outlook. Once again, I think we did very well there. We were, if anything, conservative, saying that there was no inflation acceleration in sight.

The Risk Of An Oil Price Collapse To \$18. We thought there was some small risk, 20 or 30 percent, of an oil price decline to about \$18 per barrel. As you know, oil prices collapsed. We managed about \$9 a barrel at one point and there was a tremendous windfall gain in terms of purchasing power for American consumers and not without note for the aviation industry as well. It was, of course, not an unmixed blessing; and bank economists at, say, Texas super regional banks have a somewhat different perspective on the relative attraction of that development.

Conclusion. So, the last 2 years has not been all that bad. We have had fairly strong activity growth. GNP has averaged only a trifle under 3 percent for the past 3 years, if I include 1987, which is nearly ended. Inflation has actually declined as a trend. Oil prices have declined substantially, and interest rates, at least until late last year, generally tended to decline.

Unfortunately, I am going to be in the position of starting with all of the good news and then shifting gears a bit.

The Next Two Years

We have some problems now, and we see the next 2 years as a little bit rockier. You all know that the outlook is not completely rosy, at least if any of you were bond market investors or bondholders this year. You know that the financial community is very concerned about the outlook. Interest rates have increased quite substantially over the last 12 months. In January or February of this year you could still get a lot of very highly paid Wall Street economists to talk about the possibility of another discount rate decline, and to talk about the very attractive prospects for interest rates. About the end of March that story dried up (See Figure 3). Interest rates have, in fact, increased by fully 2 percentage points at the long end of the market. Interest rates have increased by 150 basis points or 1.5 percentage points at the short end of the market. The prime is now 8.75 percent, and is, in our eyes, likely to move higher before it moves lower.

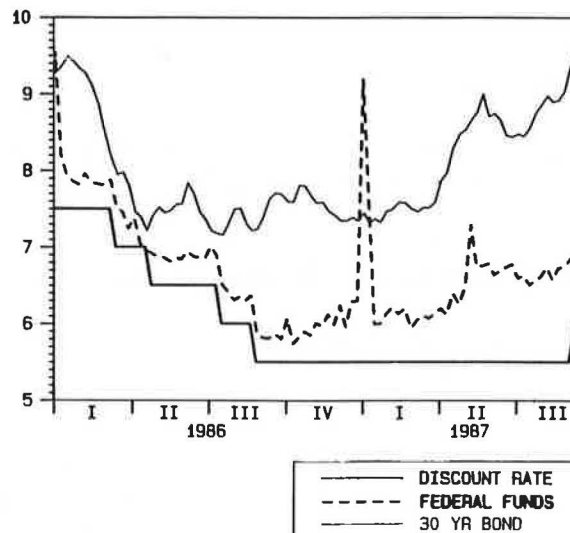


FIGURE 3 Recent Interest Rate Trends

Now, something must be upsetting financial markets. I think that what has upset the financial markets is the degree of orderliness that has overtaken the currency markets. The Federal Reserve Board since February of this year has collaborated quite actively with the German and Japanese central banks in trying to stabilize the dollar against the Deutsche mark and the yen. This is an ambitious undertaking because this year we are going to have to borrow something on the order of 150 or 160 billion dollars from the rest of the world. That is because as a country, as an economy, the United States is continuing to live somewhat beyond its means, to spend more than we actually earn.

In GNP terms, our current account deficit which is our broadest deficit, including both our trade in goods, our trade in services and our transfer payments, is forecast to come in at a little over 3 percent per year, or \$150 billion this year.

According to the Department of Commerce, the United States is already the world's largest debtor, with foreign liabilities exceeding assets by about \$260 billion. So, we can confidently forecast that by the end of this year, net U.S. foreign debt will be a number more like \$400 billion, and about \$550 billion at the end of 1988. The U.S. will owe the rest of the world one-half trillion dollars, and paying the interest on that is a little bit difficult. It is, by comparison, equal to the total outstanding debt of all of Latin America.

Fortunately, we pay in dollars so our situation is not quite a Latin American situation. Nonetheless, the foreign investment community has become concerned.

They are concerned on the one hand that our central banks may fail to support the exchange rate, thereby taking foreign currency losses on their holdings. On the other hand, they are concerned that the Federal Reserve might, in fact, support the exchange rate but via the mechanism of higher interest rates. So, it really didn't matter what you thought the Fed would do this year; if you were a foreign investor, you were probably somewhat bearish, and in fact, in the first 6 months of this year, the rest of the world was a net seller of U.S. Treasury securities. They sold more than they bought. Their inventories of our government bonds declined. Also, in the first 9 months of this year investing in "junk bonds" was better play than investing in U.S. Treasury debt. You lost less money.

This deficit problem is not unrelated to another deficit that the Washington community is perhaps even more familiar with (See Figure 4). What we would like to point out is not the widely known correlation -- the fact that the U.S. savings position has deteriorated with the rise in the budget deficit on trend -- but that we have actually had quite a good improvement in our federal budget situation over the last 12 months. If we compare Fiscal Year 1987 with Fiscal Year 1986, we have cut a budget deficit of \$220 billion and to \$150 billion. That is a \$70 billion improvement -- 1.5 percentage points of GNP. But, I would like to point out that it has really not helped our balance of payments very much. I can only speculate on what it might have looked like if we had not had that improvement.

One final point on trade. We have already argued that trade is going to be supporting the economy this year and next, and at the same time, I am suggesting that external accounts are not going to improve very much. That sounds like a contradiction. It isn't really. The problem is that trade forecasting is complicated, and the implications of deficits can be complex.

With respect to our foreign trade, we are experiencing an improvement in trade volumes which is quite substantial. (See Figure 5). On this bar chart the open bar represents our current account balance forecast. The other bar shows the forecast for the level of the national income accounts trade deficit

measured in constant dollars. The improvement in trade volumes is quite substantial and some of this really is no longer a forecast. It is a fact. The United States is currently enjoying an export boom. Export volumes are up by better than 10 percent over the past 12 months. Given the state of order books, the general level of sentiment out there, and our weak dollar forecast, we see no reason why we cannot have another year of double digit export growth as we look toward 1988.

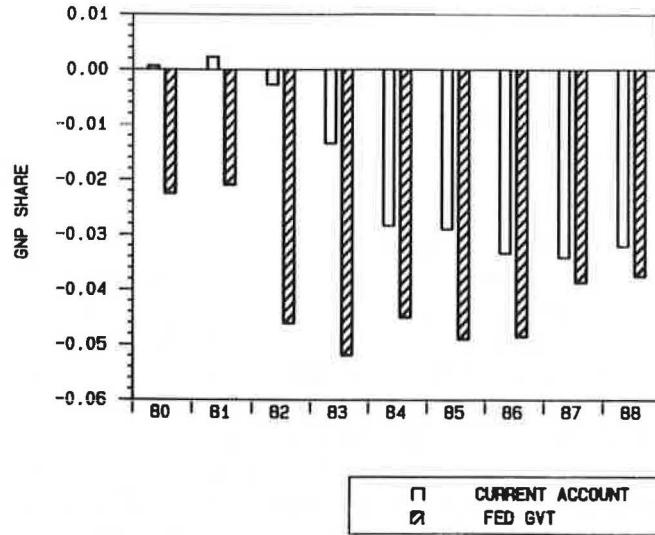


FIGURE 4 The "Twin" Deficits

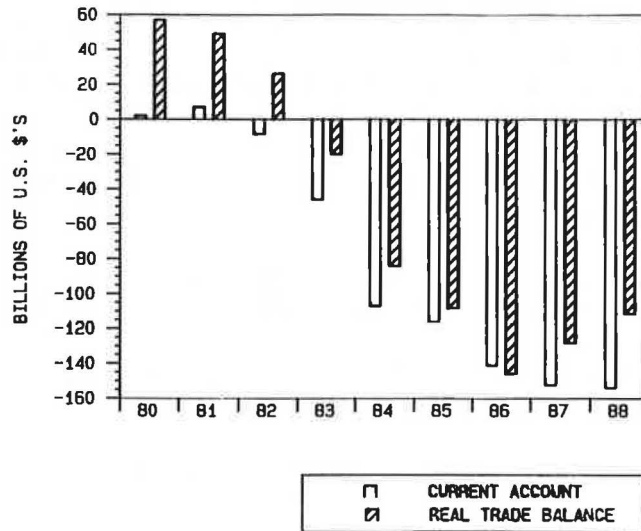


FIGURE 5 U.S. External Trade

The advantage of this for the GNP outlook is obvious. Trade movements are going to be a significant support for real GNP. Unfortunately, this is going to have a very limited impact on the recorded current account deficit and on our total financing requirements.

WHY IS THE TRADE DEFICIT STILL SO HIGH?

- Initial Imbalances In Non-Oil, Non-AG Merchandise Trade
- Structural Increases in Petroleum Imports
- Structural Weakness In Agricultural Exports
- Interest On The External Debt

Our trade pessimism has three elements:

First, when we look at merchandise trade, and at the non-agricultural and non-petroleum balance specifically, at the beginning of this year our imports of non-oil merchandise were approximately 1.7 times our non-agricultural exports. These imports are virtually twice exports at present, so it doesn't take a very sophisticated econometrician to conclude that if export volumes grow at only twice the rate of import volumes, you don't make very much improvement in your nominal trade deficit. That is just one of our problems -- our initial trade position is very adverse. Having exports grow at twice the rate of imports is not good enough. What we are going to have to do is get them to grow at three times the rate of imports to make some progress.

Secondly, our structural surplus in agriculture has not done us very much good recently. There is a global surplus of basic cereal grains. That looks likely to be with us for some time. We see only a limited contribution from the agricultural sector toward improving our trade picture.

A third commodity problem is that we are not a structural exporter of oil; we are a structural importer; and after 5 or 6 years of predicting that domestic production would peak and then decline it now looks like that is actually happening.

We are importing more oil. We will continue to import more oil, and that looks likely to be the case, even if actual petroleum consumption grows very slowly. It is also unlikely that we will have the kind of windfall gain that we got last year with petroleum prices falling by half. Our forecast for petroleum prices is basically flat over the next 12 months, so on a dollar basis, it looks as though the oil bill is going to be a difficulty, and one that the exchange rate is not going to be able to do very much about.

Lastly, if we move from the trade accounts to the current account (which includes what economists call factor payments or the return on assets), we are going to have another problem, namely, the cost of all that previous borrowing. We have to pay interest on all of those securities sold to the rest of the world over the last six years. We have been somewhat more successful as exporters of stocks and bonds than we have been as exporters of consumer

products. That is fine; but you do have to pay interest on those securities, and the interest burden is rising at the rate of 10 to 12 billion additional dollars per year.

Thus, the gap is widening between our trade performance and our actual current account balance performance. Putting all of these elements together, even with an export boom (and we do have one), the model will still throw out a rather unpleasant current account forecast. At this point it looks like we are in a period of virtually self-perpetuating current account deficits.

All of this has some implications for the outlook over the next two years. At present, what we have is an economy that is not doing too badly. GNP is growing at nearly 3 percent per year. This is healthy growth in the sense that it is export driven. We are having an export boom. We are hoping for a bit of an echo boomlet in business equipment forecasting as operating rates in important parts of U.S. industry increase, but the consumer outlook is not so good.

When we look at the implications of a weak exchange rate - export-oriented policy, one of the consequences of this is that import prices are probably going to rise faster than export prices, and that will soak up purchasing power. This, of course, is part of the solution. It is not really a problem.

Those big deficits indicate that as an economy, as a country, we have been living, or at least consuming, beyond our means for the last 5 years. As we look out over the next 5 years, it is quite clear to us that that process is going to have to be reversed. We are going to have to produce more than we can consume. That suggests an economy characterized by strength in selling abroad, strength in exports, strength in industrial production and manufacturing generally, weakness in consumer spending, rather sluggish growth rates for consumer durables and for high ticket consumer products. But none of that would necessarily suggest that a recession was imminent; in fact, we think there is a little more room to maneuver before we encounter serious difficulties.

As we see operating rates continue to move higher, we expect to see additional employment gains, particularly in industry. As you all know, the unemployment rate has fallen to about 6 percent or a bit below. This is a very good performance but it is a somewhat more worrying situation if you are looking at the economy from the perspective of employee costs.

Until recently, there has not been a wage problem in the United States. Over the last 12 months wage increases have run at approximately 2.6 percent year on year. This is not a problem. Industrial productivity has been nearly as high. Unit labor costs increases have been nearly zero. But, as we look forward to a year in which operating rate will remain high, to another year of very substantial export growth, and to a year in which companies will try to meet their capacity needs by accelerating their investment spending, we expect to see some pressure on wages. We think that the first signs of that can be gleaned in current data. We think it is very conservative to forecast an acceleration in wage costs from 2.5 percent to more like 4 percent over the next 12 months. Those of course, are economy-wide numbers and industry-by-industry performances will vary quite considerably, but it looks

like the inflation outlook for next year has to be taken somewhat more pessimistically than the inflation outlook presented 2 years ago. (See Figure 6)

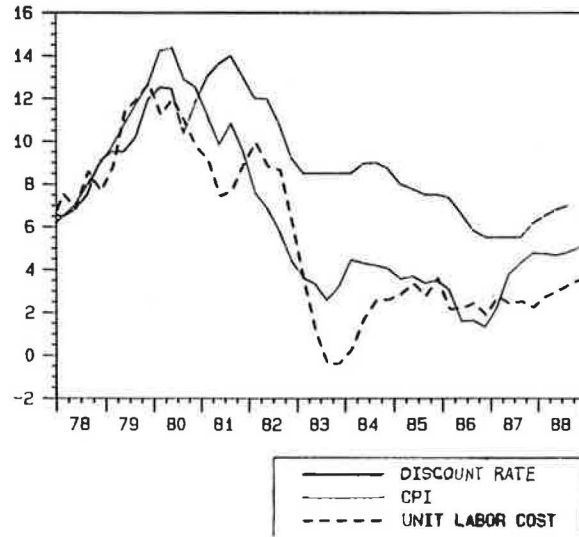


FIGURE 6 Unit Labor Costs, Inflation and the Discount Rate

At best, inflation will maintain its current plateau of between 4 and 5 percent. It is entirely possible that if oil prices move slightly higher or other commodity prices don't cooperate, we could move to a 5 to 6 percent inflation path.

This has some implications then, in turn, for the state of interest rates and for what happens in 1989. Our feeling is that in 1988 activity levels will be sufficiently strong and inflationary pressures sufficiently disturbing that the tendency of the Federal Reserve will continue to be to tighten interest rates. So, we are looking for a fairly aggressive Federal Reserve policy over the next 6 to 12 months, another discount rate increase by early 1988, perhaps a second discount rate increase by the middle of 1988. For the prime rate, this means we are probably looking at interest rate levels that on average next year will be more like 9.5 percent (or a trifle higher) than the under 9 percent numbers that we have been living with. For long-term bonds, we will probably go quite substantially over the 10 percent level.

This, in turn, has some implications about the longer-term outlook for the economy. As we move through the Presidential election and into 1989, it is our belief that with the external deficit still quite large and with interest rates quite high, the linkage between the two will be very well understood. We think the new Administration will be very likely to pursue a contractionary policy, and that will probably mean tax increases on the order of 20 to 25 billion in

the first year of the new Administration. I don't think they will be personal income taxes. I think that the largest component of them will be excise taxes. One obvious target would be the gasoline tax, and other sources of excise taxes are probably, also, very likely candidates.

But, as policy makers identify the link between high interest rates (required to continue to attract capital and those big external deficits that we are trying to finance) and the public sector deficit, interest rates are probably going to be taken more seriously. Ultimately, quite strong efforts may be made to tighten up fiscal policy. The risk is that by 1989 we could have a simultaneous tight fiscal and tight monetary policy environment. This suggests that we could tip the economy into a growth recession so that after something like 3.2 percent real growth in calendar year 1988, our growth rate will slow in 1989, to something like 2 percent and fall to more like 1.2 or 1.5 percent in 1990. So, we do think there is a growth recession out there. We think it is virtually inevitable. It is a necessary consequence of our current debtor position, and the only way that we can see of getting those external deficits back in place, given the policy choices about our exchange rates and tighter fiscal policies. We see every likelihood that that will probably produce at least a growth recession.

Our forecast for the next two years maybe summarized as follows:

WEFA FORECAST: 1987

- * Real GNP Will Expand By Over 3% In 1988
- * The Export Boom Will Be Sustained For Another Year
- * Export Strength Will Trigger An Echo Boomlet In Business Equipment Spending
- * Rising Employment Will Tighten Labor Markets Further
- * Tighter Labor Markets Will Trigger A Significant Rise In Wage Costs
- * External Deficits Will Remain Large, Requiring A Trend Rise In Real Interest Rates
- * High Interest Rate Plus Tighter Fiscal Policy Will Foster A Growth Recession In 1989-Early 1990

Implications For Aviation

Now, one or two comments about the implications of the outlook for aviation generally. On the cost side, I don't think the outlook is all that bad. On fuel prices, we are really very optimistic. No unpleasant upside surprises are anticipated for basic energy costs worldwide over the next 2 years. We just don't see the demand growth in the rest of the world or the OPEC discipline that would give us \$22 or \$24 per barrel oil prices at this point.

In terms of labor, I suppose we are guardedly optimistic, in that we are looking for a wage acceleration from about 2.5 percent to about 4 percent.

Finally, in terms of financing costs, we are very bearish. We have had a significant rise in interest rates. We think that is a cyclical rise, and we do not think it is over, and we are looking for at least another 100 basis points, and possibly more before the cycle turns.

On the activities side, I don't think that the kind of forecast that I have sketched (better than 3 percent real activity growth next year and a growth recession which really hits us in late 1989 or early 1990) is all that bad; and I don't think that the RPM implications are particularly severe.

One important caveat though. The forecast that I have described suggests that household purchasing power will come under pressure generally, that we are going to be a slow consuming country. The interest rate environment will be austere; and lastly, if you put these pieces together and threaten the Wall Street community with both higher interest rates and a significant business cycle slowdown in 1989 or 1990, then the stock market may not perform quite as briskly as it has over the last 2 or 3 years. We may be looking at a stock market downturn in the second half of 1988.

For what you might call the "consumer aircraft market" which is, I guess, a discretionary consumer durable, the implications are not so healthy. We would be somewhat conservative about forecasts for consumer aircraft purchases in the 1989 and 1990 period. Thank you.

Discussion

Mr. Drake (Purdue University): Could you clarify the time horizon for your optimism on fuel prices? Is it the next year or 18 months or is it further out?

Mr. Rolley: We are looking for flat oil prices for the next 12 months, and a sort of cautious and quite slow rise in nominal petroleum prices, but very little real price increase over the next couple of years. At this time we see no significant tightening in the supply/demand balance for petroleum until about 1991. The growth recession in 1989 to 1990, helps us buy a couple more years of relative price stability in the petroleum market.

Mr. Drake: Would you include general aviation aircraft in your pessimism about private aircraft purchases?

Mr. Rolley: Yes.

Mr. Drake: Would you comment on the pleasure airline travel market -- the vacation trip?

Mr. Rolley: I think that a lot of the same elements would apply to that market, as well; that the expensive vacation trip would be one of those things that could be postponed.

I think that next year still looks all right, despite relatively moderate wage and salary increase forecasts. Actual disposable income growth next year looks likely to come in at about 2.5 percent which is an okay year. Also, people seem to have gotten used to the weaker dollar. They are over the "sticker shock" that comes from the higher prices in the Far East and in Europe and our forecast additional dollar declines are fairly modest, so that I would think that we have a year or 18 months of good news followed by about an equivalent period of time of much less attractive prospects.

Mr. Nesbit: Can you be more specific about your moderate declines? Where do you see the exchange rate with the yen, the Deutsche mark and the British pound, say, at the end of 1988 and in 1989?

Mr. Rolley: Maybe the Federal Reserve Bank is the best operator to ask about the Deutsche mark and yen forecast because over the last 18 months or so the currency markets have done exactly what the Group of Seven have told them to.

In February they said that the dollar-mark and dollar-yen rates were going to be flat, and here we are 6 months later, and they look flat to me. But, in fact, we don't think this plateau can hold. We think that by either late this year or early next year we will have another test of the floor, and we are likely to see the deutsche mark-dollar rate move below that 1.80 bottom that we have seen this year and move into something on the order of 1.75 by, say, February or March.

We think that ultimately by the end of 1988 or early 1989, we could very easily see Deutsche mark-dollar rates of 1.60. For the Japanese yen, we think that there is every reason on a 6-month horizon to look for yen-dollar rates, spot rates of about 135, and moving that horizon a year forward after that, on an 18-month horizon to look for that market to trade at between 125 and 130.

Mr. Caplan (Pratt and Whitney): I am interested in your long-term forecast for fuel prices. You said that you expect them to be relatively flat into the early 1990's. Do you foresee at that time a rise in fuel prices of any significant shock like maybe 10 percent upwards per year, at that point in time or still a very gradual rise?

Mr. Rolley: I am afraid that our energy economists are somewhat pessimistic about the early Nineties outlook. They suggest that there is going to be a progressive increase in worldwide petroleum demand. It is slow, but the trend is there. That is going to be exacerbated a bit by declining production in the lower 48 states, and by declining production in some of the other older fields around the rest of the world.

One of the things that is going to help put OPEC in a more favorable position in 4 or 5 years down the road is the recent decline in worldwide drilling activity that set in a little over 18 months ago when oil prices fell from \$28. to \$18. per barrel.

As a consequence, we see a significant compression of that supply/demand balance and we could be looking at \$5 or \$6 per barrel price increases within a period of several months in 1991 or 1992.

Mr. Swanda (General Aviation Manufacturers Association): Given the tight fiscal and monetary policy that you suspect will happen in 1989, why do you think it will all be a growth recession instead of a full-fledged recession.

Mr. Rolley: A fair point. The principal reason that things don't get worse is because we know something about fighting recessions in the U.S. and we think that a couple of things will help us. The first and maybe most advantageous thing that will be of some benefit is that through the good part of our forecast, before the Biblical hard times, we really don't look for a major run-up in inventory stocks.

We think the companies have gotten very cautious about the kind of inventories that they carry. Stock building has been fairly moderate in the U.S. economy for this stage of a business cycle. We don't think a lot of product is going to pile up on the shelves. That means that the amount of destocking required in that business downturn will, also, be fairly moderate.

A big part of any business cycle is the inventory cycle, and it looks like inventories are being managed much less cyclically this time around. That is going to be one of the helps.

The other thing that I think will tend to help us a little bit is that the recession that we are expecting should not be as bad as the last couple. We are talking about fairly moderate interest rate increases rather than the kind of swinging contractions that we have had before; and one of the reasons is that the inflation forecast is not that terrible. We are talking about inflation peaking at a bit over 5 percent.

That doesn't suggest that we need a 13 percent prime. It doesn't suggest that we need 15 percent bond yields. So, the amount of damage that tight money will do to the economy will not be nearly as severe as it was in 1981. I think the amount of damage that is done to activity levels in the rest of the world will be fairly modest. What we really have here is not so much a boom/bust forecast as a forecast in which we have a lot of trouble with out trade deficits. The risk premium to the rest of the world that buys our securities continues to increase on trend. Interest rates inch higher and higher until the party stops.

At that point we have to bite the bullet and tighten up fiscal policy and cut that deficit the hard way; but while it is bitter medicine, I don't think that it is going to be the kind of contraction that we had in 1981 simply because the inflationary circumstances we carry into that situation just aren't as unpleasant.

Mr. Griffiths (Boeing): You mentioned that a large apart of the deficit is interest payments. Why not relax monetary policy and cut the deficit the easy way?

Mr. Rolley: Quite a number of economists have suggested that the right policy mix for our present situation is a fairly hefty tax increase matched with a very accommodating monetary policy. One of our principal competitors had an editorial to that effect in this week.end's newspaper. It is, I think, a broadly held view of a way to get through this problem.

The difficulty, I think, is going to be that it requires a degree of policy coordination in the government that has been notably absent over the last several years, and it is not clear to us the those prospects have improved very much.

Lastly, the U.S. is not at this point setting interest rate levels in isolation. We have adopted an exchange rate rule for our central banks, and one of the things that we know is that a central bank can either control its exchange rate or its level of interest rates, but not both. One of the things that would happen, if we went back to a low interest rate policy and say, cut the federal funds tomorrow by 100 basis points, is that the 1.60 Deutsche mark dollar rate forecast I suggested might be 18 months away would prove to be about 8 trading days away; we would solve our financing problems by seeing the dollar tumble to a point where the rest of the world could conclude that in fact, it was undervalued.

The Fed is not prepared to do that because they don't know what the financial community is prepared to accept. They just think that the inflationary risks of an unmanaged dollar are too great, given the very bearish attitude of the world investment community toward our currency, our bonds and our policy prospects.

Mr. Foley (Falcon Jet Corporation): Does your forecast of flat fuel prices during the next few years, take into account the tensions in the Persian Gulf; and should these tensions increase, how might that affect your forecast?

Mr. Rolley: Actually they do. This moves us out of the area of economics into the area of geopolitics and political science. Although, I don't pretend to be an expert in any of those arenas it still seems unlikely to us that we would see an increase in the level of hostility of the tanker war that would actually disrupt shipments through the Persian Gulf. That is because it does not seem to be in Iran's interest since it needs that oil flow to finance its government, its civilian economy and its ongoing land-front activities. So, between that self-interest on the part of Iran and the warships currently sitting in the Gulf, I really don't think that a serious disruption in the Persian Gulf supply is going to take place.

I think oil traders have more or less come to the same conclusion, and after running up the futures to \$22 this summer, they looked at whether this was going to be shut off and concluded it wasn't. Then they looked at inventories and thought we might have a problem; so, I think near term, over the next 3 months, the likelihood is that oil prices are more likely to move down than to move up.

THE CHANGING U.S. AIRLINE PICTURE

Lee R. Howard, Airline Economics, Inc.

I am going to talk about the airline industry since deregulation, where it stands at present, and what we foresee in the future.

Underlying Trends

First, let's look at some underlying trends. Back in 1977-78, there were those who said that, under deregulation, many smaller carriers would get certificates, provide service and compete with the incumbent carriers. That is what was envisioned in the deregulated environment by some.

They were right. But only for a while. Between 1978 and 1986, there were 198 certificated carriers providing interstate passenger service in the United States. (See Table 1). If we were to add the 36 carriers operating prior to deregulation, you would now have 234 carriers operating. This is the kind of utopia that some people had visualized for the deregulated environment.

TABLE 1 **NUMBER OF U.S. SCHEDULED AIRLINES**

(Operating Under Section 401 Certificate)
January 1987

Certificated Prior to 1987	36
Certificated 1978 - 1986	<u>198</u>
Total	234
Merged, Liquidated, Decertificated or Not Operating Under Certificate	<u>160</u>
Total Currently Operating	74

The expectation did not quite materialize because 160 of those carriers are either merged, liquidated, decertificated, were not operating, or never did operate under a certificate. Therefore, as of January of this year, instead of 234 operating carriers, there are only 74 remaining.

We can go beyond that because, if you take the 74 carriers currently operating and subtract the 36 carriers operating totally outside the 48 contiguous states (most of those in Alaska), and take out 13 carriers of the 74 that have feeder agreements with larger carriers, you have a better idea of the size of the present operation. Therefore, at present there are 25 carriers currently operating that do not have feeder agreements or do not operate totally outside the U.S. (See Table 2).

TABLE 2 TOTAL CARRIERS OPERATING¹

(Under Section 401 Certificate) January 1987	
Total Carriers Currently Operating	74
Carrier Operating Totally Outside 48 States (Alaska, Pacific, and Caribbean)	36
Carriers With Feeder Agreements	<u>13</u>
Total Operating in 48 States Without Feeder Agreement With Larger Carrier	25

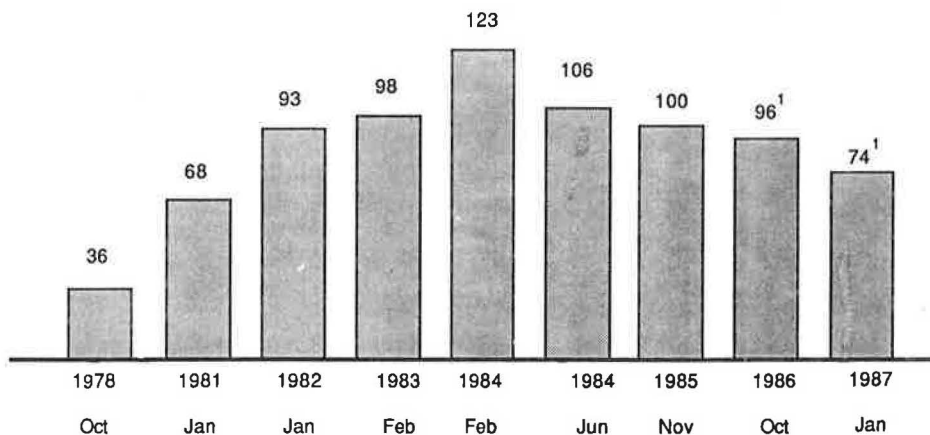
1 Not including carriers with operations totally outside the 48 contiguous states and carriers providing feeder services to larger carriers.

This indicates a contraction of the industry rather than the tremendous growth that some had foreseen.

Looking at it a different way, if you take the 36 original carriers and add at any point in time the total number of carriers actually operating, you can see that the number peaked at 123 carriers in February, 1984 (See Figure 1). That number has since declined to 74 carriers, as shown previously, and is reduced to 25, of course, when taking into account carriers operating totally outside the U.S, and carriers with feeder agreements.

Therefore, you really don't have the kind of competition that many foresaw. In fact, there has been a considerable amount of consolidation of the industry. Since deregulation in 1978, over 60 mergers and acquisitions have taken place, 30 of which involved major carriers in some way (See Table 3). That compares to about 4 or 5 that occurred in the 8 years prior to deregulation. So, you can see that there is probably more activity in that area than anyone had ever imagined.

As a result of all the consolidation, it appears that the medium and small carriers seem to be losing out (See Table 4). So far this year we have had 10 failures of small carriers and, although the industry made over \$1 billion in operating profit in the first half of 1987, five smaller carriers showed losses. In spite of a rather good first half for the industry as a whole, failures and lack of profitability plagued the smaller carriers.



1 / Assumes approval of proposed mergers/acquisitions

FIGURE 1 Number of U.S. Scheduled Airlines Operating Under Section 401 Certificate as of January 1987

TABLE 3 AIRLINE MERGERS AND ACQUISITIONS SINCE DEREGULATION

<u>Year</u>	<u>Carriers Involved</u>	<u>Year</u>	<u>Carriers Involved</u>	<u>Year</u>	<u>Carriers Involved</u>
1979	North Central/Southern	1986	Northwest/Republic People Express/PBA Texas Air/Eastern People Express/Britt TWA/Ozark Business Express/Pilgrim (80%) Texas Air/Rocky Mountain Pan Am/Ransome USAir/Suburban Jet Florida/Pocono Delta/Atlantic Southeast (20%) Delta/Comair (20%) Pan Am/NYAir "Shuttle" Piedmont/Jetstream Suncoast/Fleming Delta/Western Texas Air/People Express-Frontier Alaska/Jet America American/AirCal Alaska/Horizon USAir/PSA Presidential/Colgan Presidential/Key Midstate/Chicago Air Pan Am/Tempelhof (50%)	1987	States West/Golden State USAir/Piedmont ^{2/} Aloha/Princeville Airways Emery/Purolator World/Key Texas Air Corp./Bar Harbor (50%) Midway/Fischer Brothers Aviation Mesa/Centennial Metro/Chaparral Ansett/America West (20%) American (Discussed with Air Midwest acquiring aircraft & other assets)
1980	Pan Am/National Flying Tiger/Seaboard Republic/Hughes Airwest				
1981	Texas Air/Continental (50%)				
1983	Piedmont/Henson (20%) ^{1/}				
1984	Midway/Air Florida Republic/Simmons (10%) Northwest/Mesaba				
1985	Southwest/Muse (TranStar) USAir/Pennsylvania United/Pan Am Pacific Division Carl Icahn/TWA People Express/Frontier Piedmont/Empire Texas Air/Continental (19%) Jet America/Best Air Wisconsin/Mississippi Valley Pilgrim/NewAir Ransome/FordAire dba Susquehanna Metro/Sunair Holland Industries/Wright Daniel Lehner & Joseph Gall/Pilgrim USAir/Suburban KOA/MidPacific Royale/Metro (HOU Operation) Jet Florida/Southern Express				

1/ Agreement for Piedmont to buy 20% each year starting in 1983

2/ Subject to DOT approval

TABLE 4 THE MEDIUM/SMALL CARRIER IS LOSING OUT

Failing 1987:

- | | |
|-------------------|--------------------|
| o Air Atlanta | o McClain Airlines |
| o Air Puerto Rico | o Rio Airways |
| o Air South | o Royale Airlines |
| o Chicago Air | o Royal West |
| o Gull Air | o TranStar |

In The First Half Of 1987 The Industry Made Over \$1 Billion Operating Profit. Only Five Carriers, All Small, Showed Losses:

- o Alaska (with Jet America)
- o Aloha
- o America West
- o Braniff
- o Southwest

The six survival characteristics and the value of recent mergers in terms of these characteristics are shown in Table 5. These survival characteristics are: strong hub/spoke systems, nationwide with international tie-ins; a sophisticated yield management system; good capacity management; low labor costs; ownership or equity interest in a computerized reservations system; and taking full advantage of size.

The righthand column shows what each carrier's rating was in 1984, prior to any merger, and right below it the post-merger ranking in 1987.

This rating system shows that every merger involving a major carrier resulted in a gain of 3 points or more out of a maximum total of 18. But two of those carriers gained over 7 points as a result of mergers. One was Northwest with a gain of 7 points from its merger with Republic (and almost concurrent acquisition of 50% of PARS), and the other, Texas Air Corporation which gained 7 points when it acquired Eastern and People Express.

What this means is that size alone, or even a strong single hub and spoke system, is not the sole criterion for building survival strength in a merger. There are, in addition, four other very important areas in which carriers seek to gain survival strength.

Let's take a look at what is going on at hubs (See Figure 2). Fourteen of these major hubs have a single carrier garnering two-thirds of the market, an

TABLE 5 CHANGE IN SURVIVAL CHARACTERISTICS/STRENGTH

Pre-Merger (1984) vs Post-Merger (1987)								
Airline	Year	Hub/Spoke Systems	Yield Management	Capacity Management	Low Labor Costs	CRS	Advantage of Size	Total
AA	84	xx	xx	xxx	xx	xxx	xx	14
AA/AirCal	87	xxx	xxx	xxx	xx	xxx	xxx	17
CO	84	x	x	x	xxx	x	xx	9
TAC*	87	xxx	xxx	x	xxx	xxx	xxx	16
DL	84	xx	xx	xxx	x	xx	x	11
DL/WA	87	xxx	xxx	xxx	xx	xx	xxx	16
EA	84	xx	xx	x	x	xx	x	9
Merged with Texas Air Corp.	87	-	-	-	-	-	-	-
NW	84	x	x	xxx	x	x	x	8
NW/RC	87	xx	xxx	xxx	xx	xx	xxx	15
PA	84	x	x	x	x	x	x	6
	87	x	xx	x	xx	xx	x	9
PI	84	x	xx	xxx	xx	x	x	10
	87	xx	xxx	xxx	xx	x	xx	13
People Express	84	x	x	x	xxx	x	x	8
Merged with Texas Air Corp.	87	-	-	-	-	-	-	-
RC	84	xx	xx	xx	x	x	xx	10
Merged with Northwest	87	-	-	-	-	-	-	-
TW	84	x	x	x	x	xx	x	7
TW/OZ	87	x	xx	xx	xx	xxx	xx	12
UA	84	xx	xx	xx	x	xxx	xx	12
UA/ PA Pac	87	xxx	xx	xxx	xx	xxx	xxx	16
USAir	84	x	xx	xxx	x	x	x	9
USAir/PSA/PI	87	xx	xxx	xxx	xx	x	xx	13
WA	84	x	x	x	x	x	x	6
Merged with Delta	87	-	-	-	-	-	-	-

Source: Airline Economics Inc.

* CO / EA / NYAir / People Express / FL

x = Minimum Strength
 xx = Moderate Strength
 xxx = Unusually Strong

indication of the concentration and strength of the hub and spoke system in the airline industry today. Feeder agreements help strengthen those hubs. Prior to 1983, there were only one or two such agreements; nine in 1983. In 1987, there are 65 (See Figure 3). The 1987 figure reflects a reduction from the previous year due to purchase and integration of former feeder carriers -- a trend that will continue.

As you will recall, one of the six survival characteristics was equity or full ownership of a computerized reservations system. As of September 1986, American's Sabre system and United's Apollo had approximately two-thirds of the travel agent market. (See Figure 4). SystemOne, which is now owned by Texas Air Corporation, is being used by Eastern Air Lines and its software for the Amadeus system is being used by foreign carriers.

Yields

Let's talk about yields. There is a lot of activity in that area, and a lot has happened since deregulation. (See Figure 5). The upper left hand box

shows that the average amount of discount for domestic operations of major carriers in 1978 was about 34 percent. In other words, discount fares averaged about 1/3 off from full fares in 1978. Now, that average has

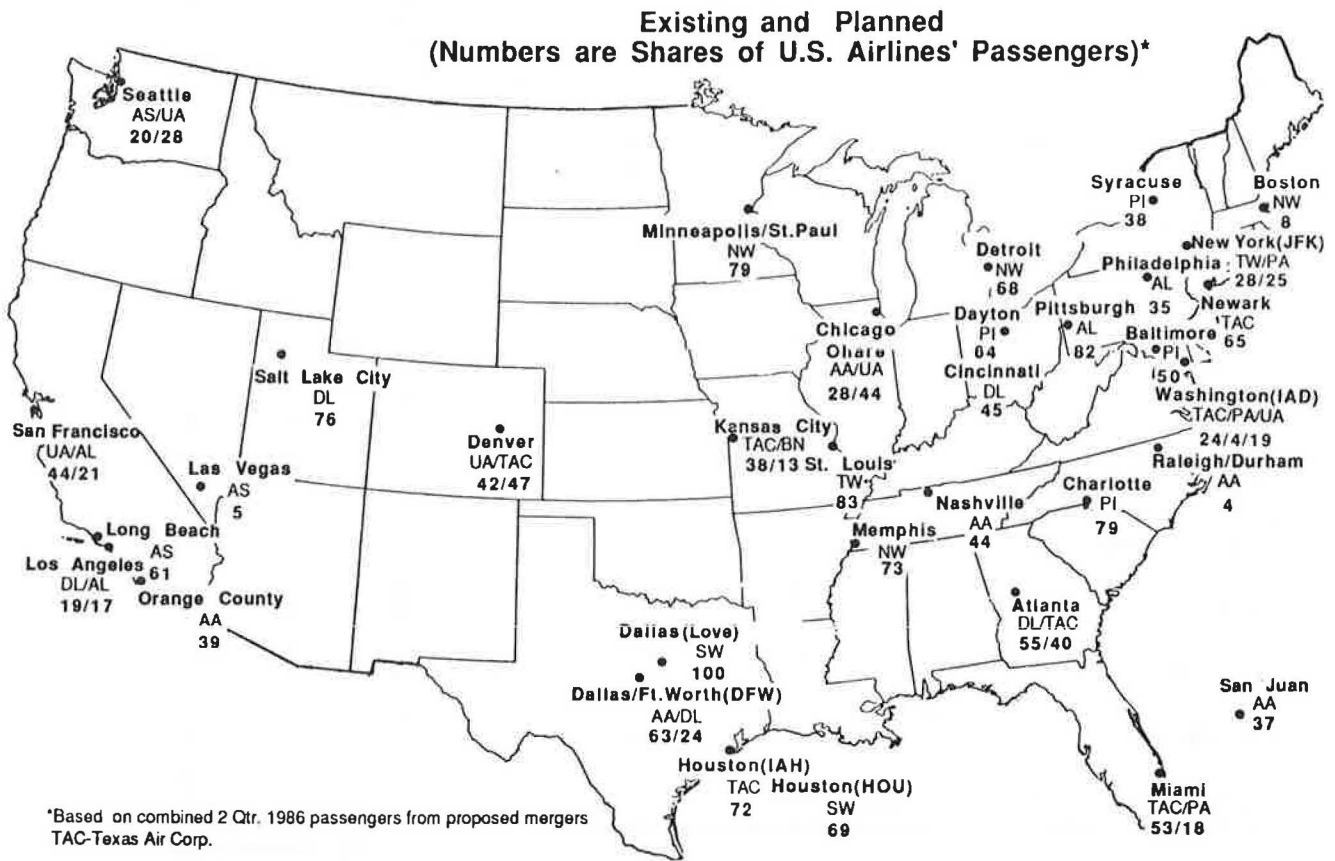
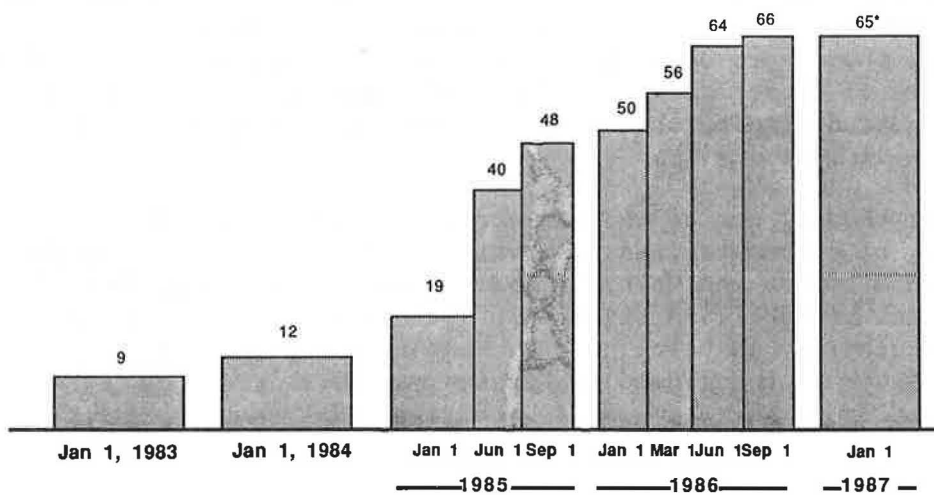
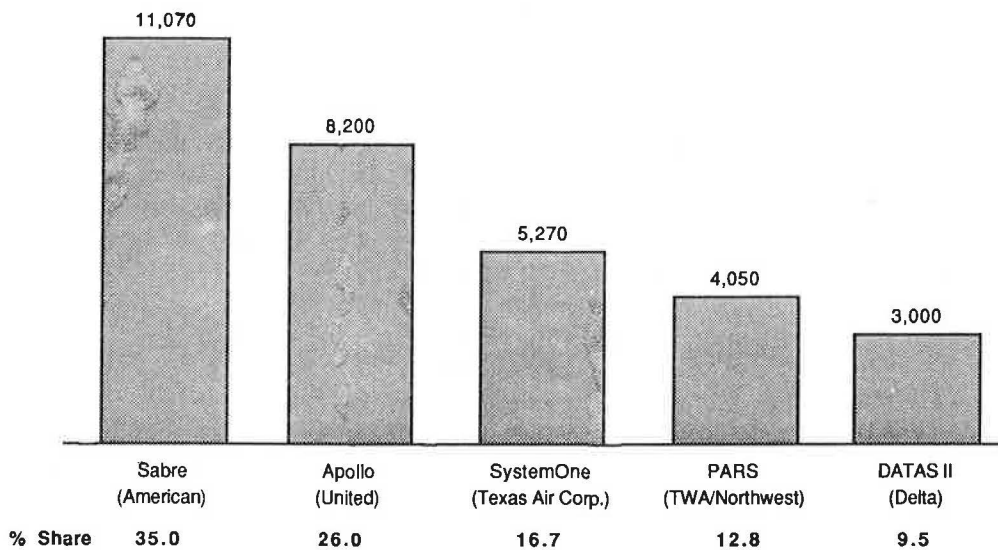


FIGURE 2 Major U.S. Hubs Existing and Planned
(Numbers are Shares of U.S. Airline Business)



* Reduction due to purchase and integration of former leader carriers.

FIGURE 3 Agreements with Major Carriers for Common Identification and Feed



Source: Travel Weekly, September 22, 1986

FIGURE 4 Computerized Reservations Systems: Numbers of Travel Agents as of September 1986

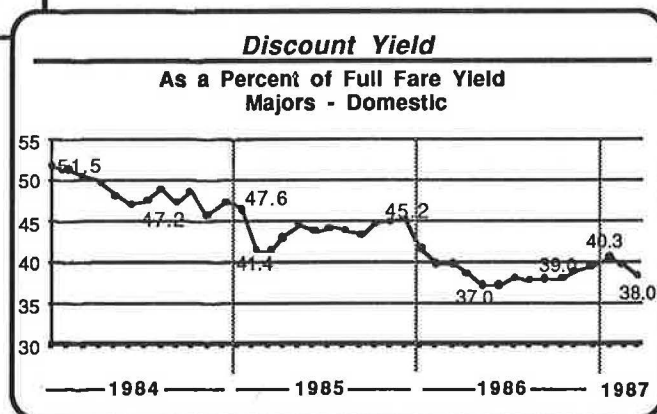
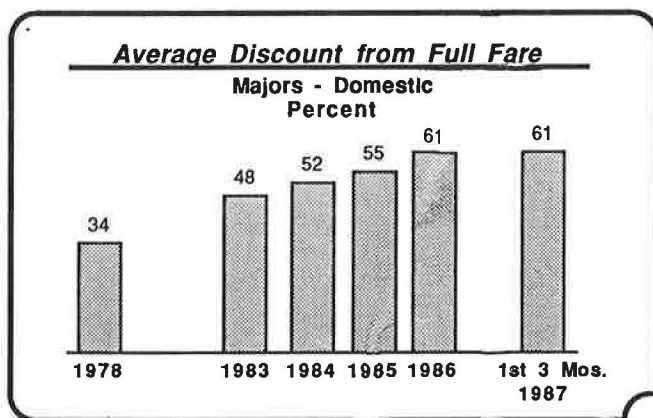


FIGURE 5 Discount Fares

leveled off at about 60 percent discount from full fare. This increased discount, of course, tends to bring average yields down.

Looking at the amount of discount fare usage in the first half of 1984, about 79-80 percent of U.S. domestic travel was on discount fares. That usage has now leveled off at about 91 to 92 percent. In other words, only about 8 to 10 percent of the people in domestic U.S. travel now are making use of the full fares. This travel is primarily by people who cannot abide by travel restrictions placed on discount fares. (See Figure 6)

This year has been a particularly interesting year with regard to fare proposals and attempts to increase yields (See Table 6). I want to illustrate the contest that is going on with regard to pricing leadership in the industry. So far this year one carrier (Texas Air Corp.) has been primarily the price leader. That company has maintained that position all year up until recently. But it is being severely challenged at this point in time.

The year started off with United taking a try at a 3-day advance purchase super coach fare. This proposal was very quickly matched by some of the other major carriers but not by Texas Air Corporation. The fares were withdrawn. Approximately two weeks later, Texas Air came out with a new fare structure, and the other carriers followed. That action was sustained. The same pattern generally has applied throughout the year. If a carrier made a fare proposal and it was followed by Texas Air Corporation, it succeeded. If not, it was withdrawn. This has been true almost throughout the year.

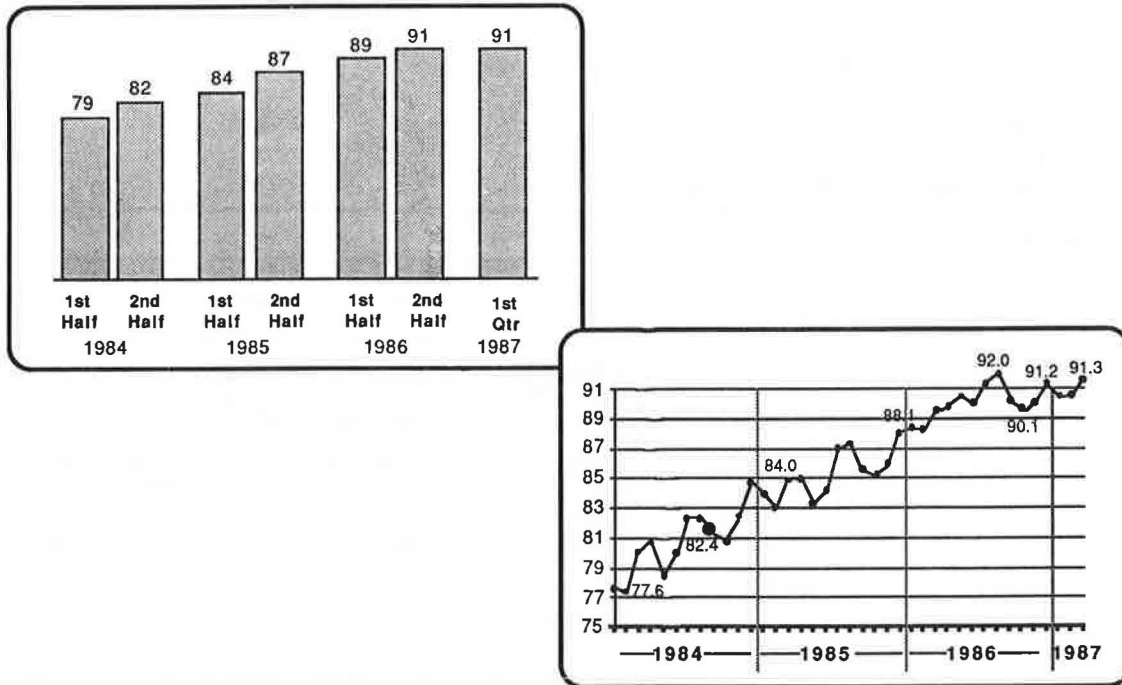


FIGURE 6 Discount RPMs as Percent of Total (Majors-Domestic)

TABLE 6 CHRONOLOGY OF MAJOR AIRLINE FARE PROPOSALS - 1987

1987						
Approx. Date	Introducing Airline	Proposal	Fare	Matched by	Not Matched by	General Outcome
Jan 6	UA	3-day advanced purchase	Super Coach (B Class)	AA, DL, NW, WA	TAC/CO	Withdrawn
Jan 14	TAC/CO	\$10 Increase for travel after May 20 \$10-\$30 Increase \$45 Increase 7-day advanced purchase	30-day advanced purchase Full Coach First Class QEOP - Unrestricted - Sat night stay = 45% reduction			Sustained
Jan 30	TAC	MaxSaver Fares = 80% Discount 2-day advanced purchase Sat night stay No refund	MaxSaver	Most Majors: AA, UA, DL, NW, PA, TW, PI, WA		Offered almost systemwide
Feb 6	AA	30-day advanced purchase	MaxSaver	Most Majors	TAC/CO	Withdrawn
Feb 18	AA	After May 20: Eliminate MaxSaver and other discount fares: Increase \$20 Increase discount: to 50% from 20% Increase cancellation to 25% from 10%	MaxSaver 14-day advanced purchase 21-day advanced purchase 30-day advanced purchase 7-day advanced purchase	Most Majors	TAC/CO	Withdrawn
Mar 9	NW	Increase \$20 RT ticketing after Mar-15	MaxSaver	UA*, PI, AL * not in TAC markets	TAC	Not implemented in most TAC markets
Apr 7	UA	Increase full fares	First Class OW - \$15 Full/Super Coach OW - \$10	TAC and most other Majors		Sustained
Apr 8	TAC/EA	New 2-day advanced purchase fare No stayover Atlanta markets	Business Savers	Delta		Sustained
Apr 21	TAC	Extend MaxSaver thru Summer Effective May 21: 7-day advanced purchase Sat night stay Non-refundable Increase \$19/99 to \$19/139	MaxSaver	Most Majors		Sustained
		Reduce advance purchase to 7 days	Super Saver & F/C (30-day advanced purchase) (25% cancellation penalty)	Most Majors		Sustained
May 19	UA	Increase full fares	Coach RT - \$20 First Class RT - \$30	Most Majors	TAC	Withdrawn
Jun 8	TW	Fare surcharge to account for increased fuel costs	Distance surcharge \$3 to \$8	TAC & most other Majors		Sustained with slight modifications
Jul 13	NW	Fare increase to account for increased fuel costs (effective Aug 1)	All- \$2 to \$8 depending on distance	Most Majors		Sustained
Aug 10	TAC/CO	Increase unrestricted Y-Class Impose 3-day advance purchase	Y-Class: \$2-\$20 each way depending on distance B-Class unrestricted discount	Most Majors		Sustained

TABLE 6 (Continued)

1987 (January 1 - September 24)						
Approx. Date	Introducing Airline	Proposal	Fare	Matched by	Not Matched by	General Outcome
Aug 24	DL	A three-tiered structure of discount fares: Adv. % Tier Purch. Penalty Disc 1 30 50% 60-70 2 14 25% 36-59 3 7 10% 24-55 Increase of \$10-\$20 OW All effective Sep 8	Most Restricted Discount Fares	See Below	TAC/CO/EA	See Below
	AA	A two-tiered structure of discount fares: Adv. % Tier Purch. Penalty Disc 1 14 100% 60-70 2 7 50% 40-50 \$10 above TAC 7-day advance purchase Effective Sep 15 Oct 15 (TAC Markets)	Most Restricted Discount Fares	UA, DL, NW	TAC/CO/EA	Sustained by AA, UA, DL & NW
Aug 31	TAC/EA	Reduce MaxSaver about \$40 RT & extend to Caribbean (for travel Sep 9-Dec 15)	MaxSaver	UA but later withdrawn	Most Majors	Sustained by TAC/EA
Sep 7	AA	Raise OW fares \$5-\$15 Effective Sep 15	Unrestricted Discount Fares (Super Coach)	TAC and other Majors		Sustained
Sep 14	DL	A three-tiered structure of discount fares: Adv. % Tier Purch. Penalty Disc 1 30 25% 60-70 2 14 35% 36-59 3 7 50% 24-55 Effective Dec 13	Most Restricted Discount Fares	(No responses as of Sep 24, 1987)		

Recently, Delta proposed a three-tiered fare structure. Without going into detail, let me say that it wasn't matched by Texas Air Corporation and it didn't get anywhere. At the same time or shortly thereafter, American proposed a two-tiered fare structure. At this point, for the first time one sees the price leadership being severely tested. American (and some others) are going ahead with fare increases not followed by Texas Air Corporation. American bluntly asserts that people will pay the additional price for (American's) better service. We shall see. The pattern for changes in fares in the future will depend heavily on the outcome of this battle for fare leadership.

One of the questions most asked of us at Airline Economics is whether fares have been up or down since deregulation and the answer, of course, is "yes."

Full fares were up 158 percent in November 1986 from 1978. During the same time period, discount fares were up 56%. So one could say "Yes, fares were up." However, if you take the average of those, you get average fares being up 38% percent since deregulation. (See Figure 7)

The reason for the apparent disparity there is simply this. If you take into account the shift that I showed you from usage of the higher full fares to the lower discount fares, that shift continually brings fares down, even if no decrease occurred in either fare. So it brings the overall average down. Therefore, average fares were only up 38 percent in that time period.

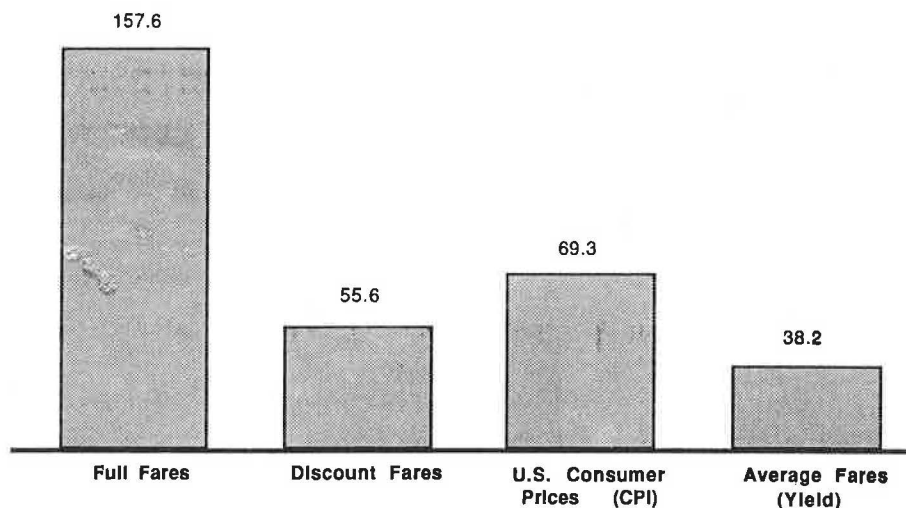


FIGURE 7 Airline Fares Versus Consumer Price Index (CPI)
Majors - Domestic 1978 Through November 1986
- Percent Change

Fares increased 38 percent but consumer prices for the same time period were up almost double that -- 69 percent. Consequently, if you adjust the average fares to "buying power dollars" in that time period using the Consumer Price Index, one would say that fares are down. In fact, we have done just that. Figure 8 shows constant 1967 dollar fares since 1950. If you took the dates off the chart, and took off that vertical line labeled deregulation, I doubt that one could tell where deregulation started. The point is, the trend in "buying power dollar fares" is no different now than it has been for the last 27 years. As a matter of fact, if one carried the analysis back to 1938, you would find the same trend.

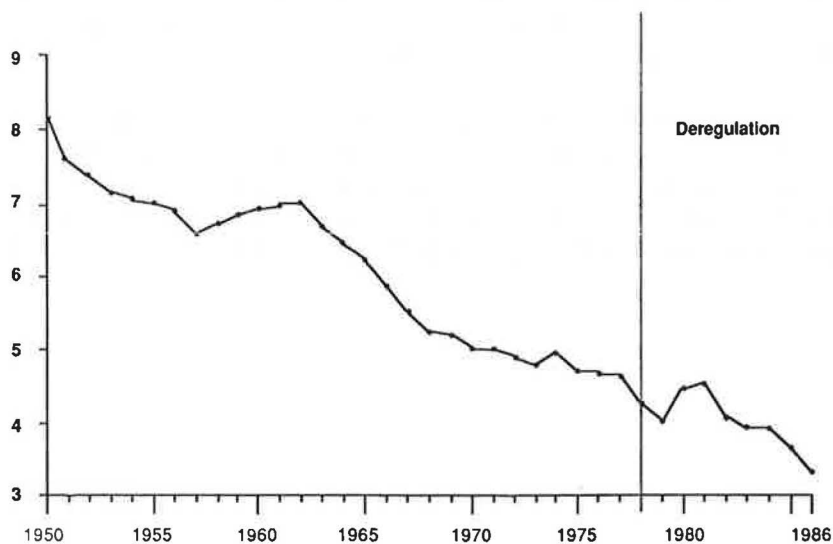


FIGURE 8 Average Fare Per Passenger: U.S. Scheduled Airlines
(In Constant 1967 Dollars)

In 1986, throughout the year, fares were down from 1985. In 1987, in the first part of the year, they were down again. But for the first time in June and again in July, fares were up. So, for the first time in a 2-1/2 year period we saw, in June and July, an increase in fares. Fuel prices had bottomed out and were increasing in that time period. Thus, much of the increase in fares was to offset those increased fuel prices. (See Figure 9)

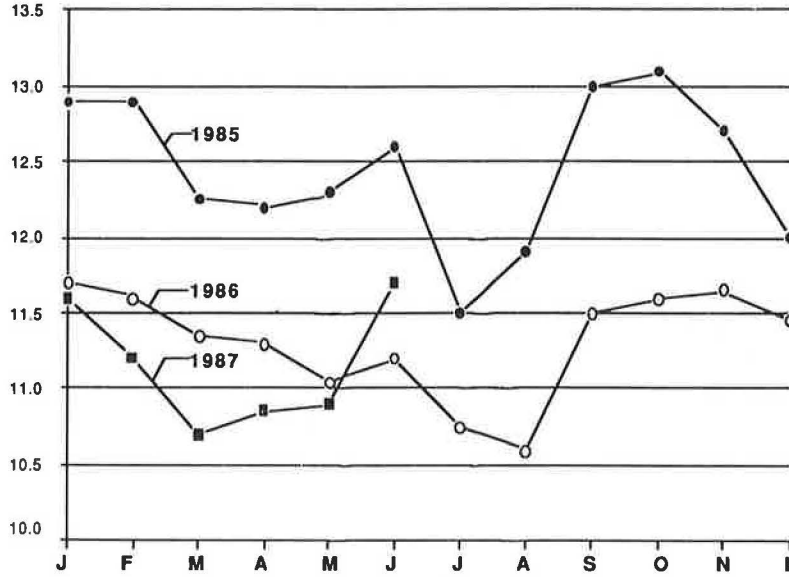
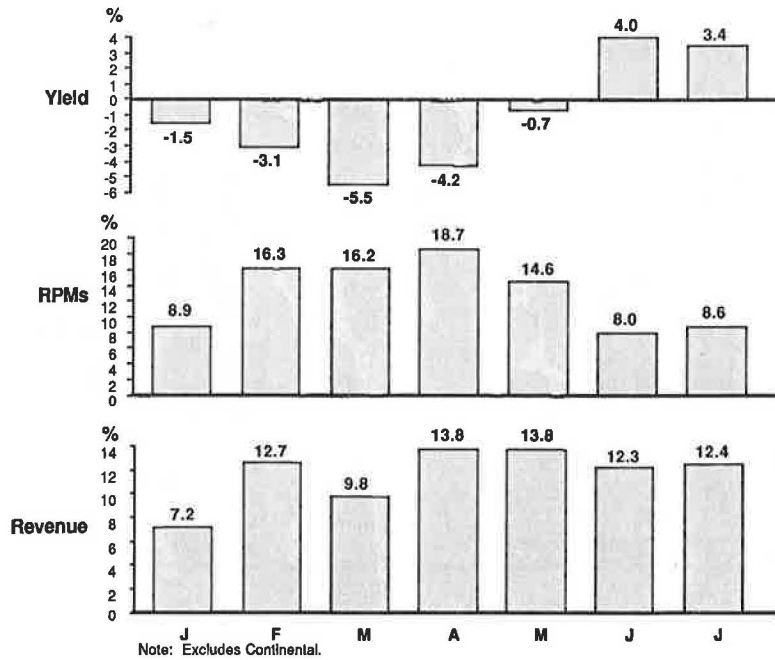


FIGURE 9 Yield: Cents per RPM; U.S. Majors -- Domestic



Source: Air Transport Association

FIGURE 10 Yields, RPMs and Revenue: U.S. Majors -- Domestic 1987 (%Change over Previous Year)

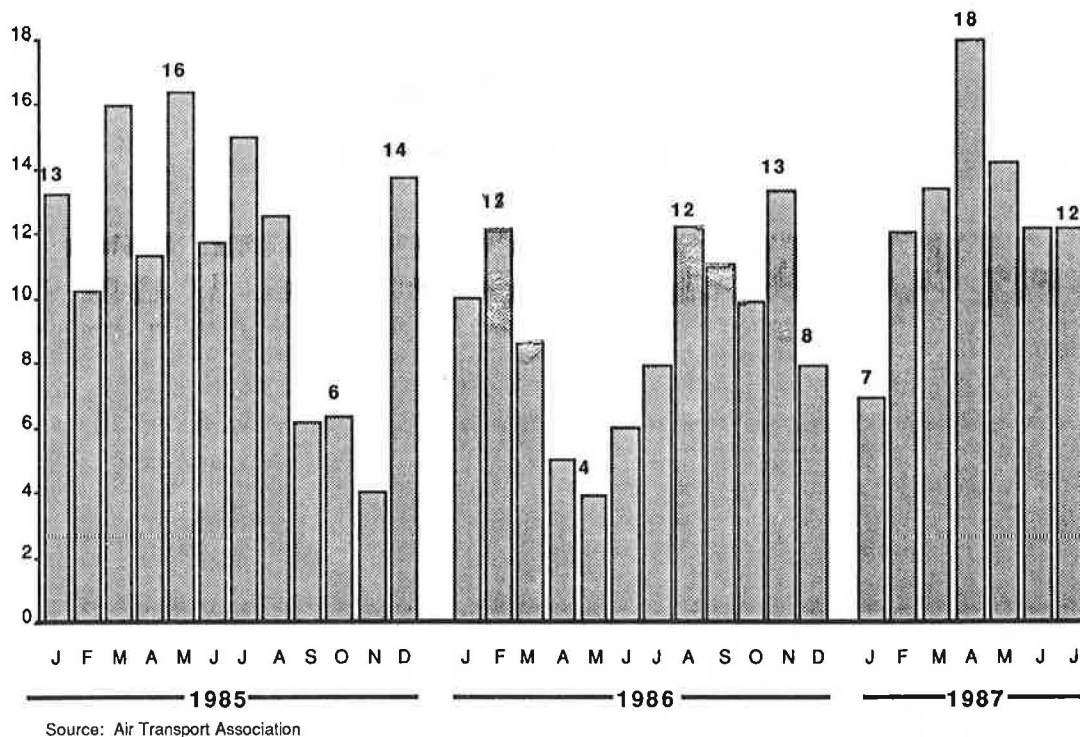
Traffic

What happens to traffic and revenues in that same time period I think is interesting. In the first half of 1987 yields were down, ranging from 1.5 to about 5.5 percent. But as you saw previously, in June, they were up 4 percent and in July 3.5 percent. (See Figure 10)

Now, what effect did these fare changes have on RPMs and traffic. Earlier in the year when fares were down, traffic increases ranging from 9 to 19 percent were recorded -- largely as a result of those decreases in fares and the introduction of new low MaxSaver fares. With fares up 3.5 to 4 percent, traffic was still at a fairly high level in June and July, at 8 to 8.5 percent. As a result, revenue increases were not a lot different in June or July when fares were up than in the first 5 months of the year in which fares were down.

Bear in mind that it costs a little more to handle added passengers. So, if the revenue happens to be the same, then it is a slight economic advantage to a carrier to have higher fares, lower traffic and get the same revenues.

In a 2-1/2 year period of year over year increases in system traffic, if you account for the depression of traffic in the international scene because of fear of terrorism and nuclear incidents, you have an unusually large growth in system-wide traffic. These data include international traffic. (See Figure 11)



Source: Air Transport Association

FIGURE 11 Change in Revenue Passenger Miles: U.S. Scheduled Airlines
(Percent Change Over Previous Years)

Capacity increases in 1987 are considerably less than traffic increases. Thus, there has been a significant increase in load factor so far this year. (See Figure 12)

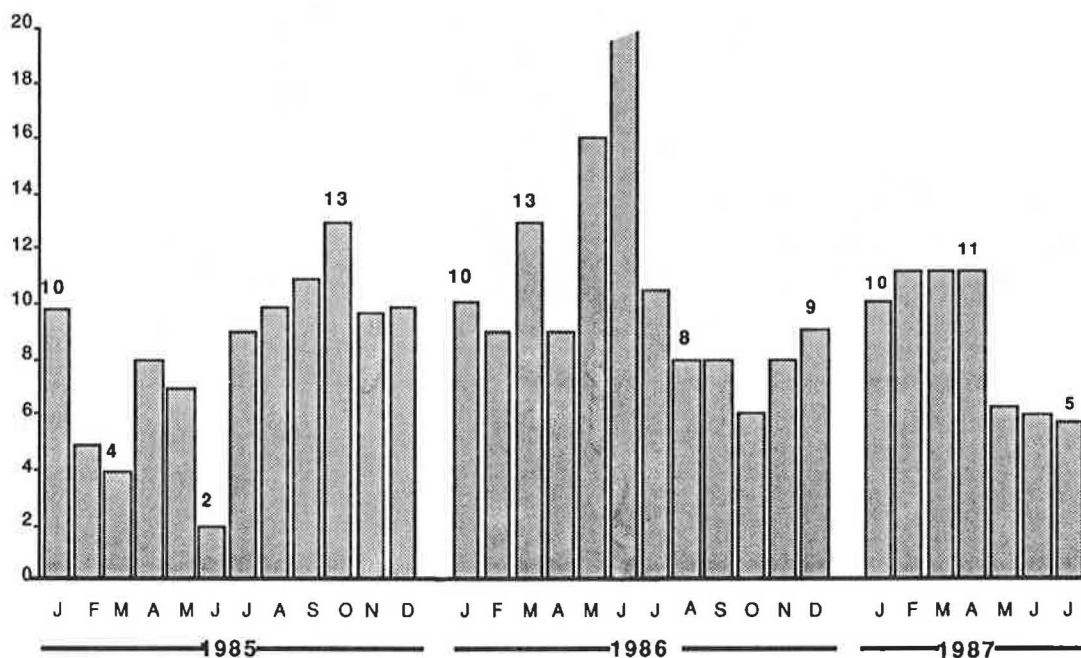
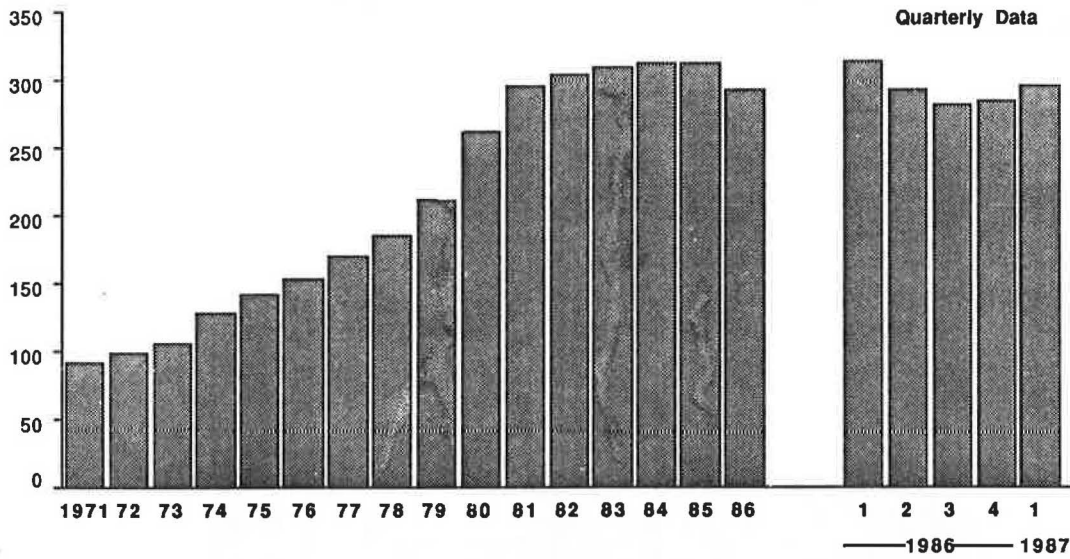


FIGURE 12 Change in Available Seat Miles: U.S. Scheduled Airlines (Percent Change Over Previous Years)

Cost Performance

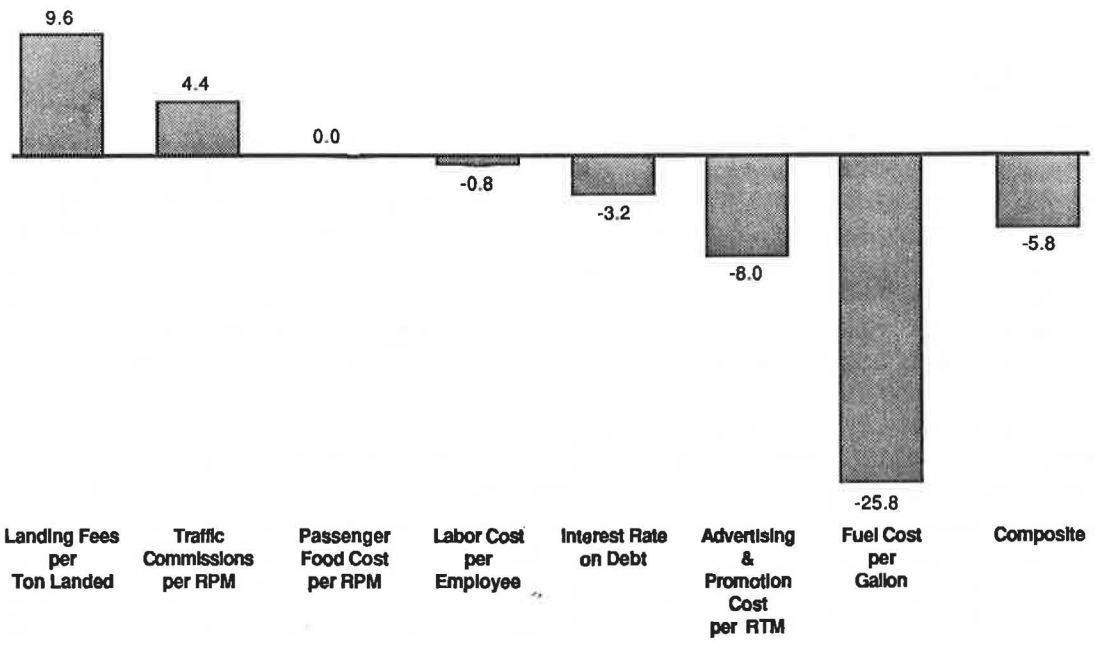
The Airline Cost Index that measures the composite change in the unit costs that a carrier incurs is a composite of fuel costs per gallon, of labor costs per employee, commission costs per passenger and the like. Therefore, the composite is somewhat like a cost-of-living index for the airlines. During the 1971-1981 period, large increases in overall unit costs were incurred by the industry. Costs began to level off shortly after 1981 and since then they have been declining. In 1986, overall unit costs were down; in the first quarter of 1987 that downward trend is still continuing. (See Figure 13)

The first quarter 1987 unit cost changes show quite a different pattern than we saw in the early 1980s. In fact, it is almost the inverse of that earlier pattern. (See Figure 14) The composite (shown on the right hand side) was down 5.8 percent. But fuel cost, which was roaring upward in the early '80s, was down 26 percent. Interest rates which were up most of that time period were down 3 percent and even labor costs, which were rapidly increasing in the early '80s, were down 1 percent in the first quarter of 1987. Insofar as unit costs for the industry are concerned, this is a whole new trend.



Source: Air Transport Association

FIGURE 13 Airline cost Index: Majors and Nationals
Composite Index of Airline Expenses. 1972=100



Source: Air Transport Association

FIGURE 14 Airline Cost Index: Majors and Nationals
Percent Change 1st Quarter 1987/1986

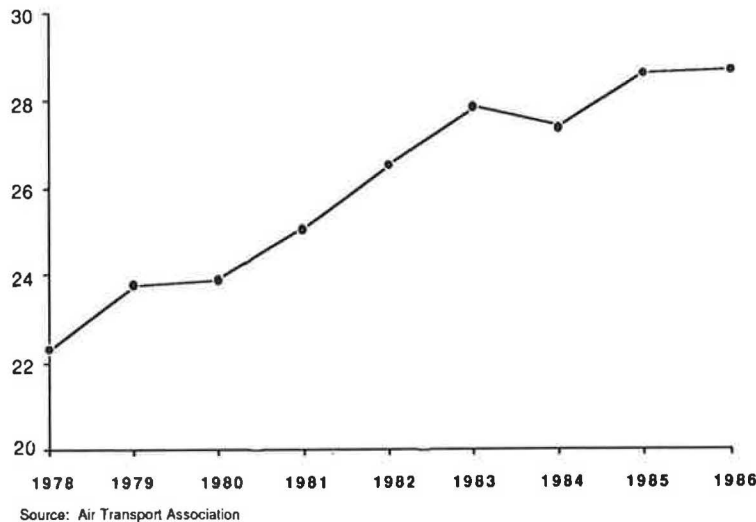


FIGURE 15 Fuel Efficiency: Majors and Nationals (RPMs/Dollars)

Some things that are now a bit annoying to airline managements include some of the productivity measures. Fuel efficiencies, in spite of the influx of new, very expensive fuel efficient aircraft, has leveled off and is no longer climbing like it was in the 1978 through 1983 time frame. Contributing to this is the effect of hubbing and fuel inefficiencies that result from that kind of operation. (See Figure 15)

We would expect two things to happen -- as hubbing matures and traffic growth puts heavier pressures on airports, there will be some move to bigger airplanes and more linear route systems -- not linear routes, but more linear than they are now. Both of those factors could put the fuel efficiency trend back more on the trends of the early '80s.

Employee productivity climbed steadily during the 1981 to 1984 period. But, it has now leveled off at a new high level. We believe this to be temporary. Since the leveling reflects interim labor inefficiencies that occur from mergers prior to full integration, we expect that labor productivity will again move upward in the near future. (See Figure 16)

International

Now, let us look at what is happening on the international scene. 1986 was a terrible year, as most of you know. We had Chernobyl, terrorism incidents, and the European currencies strengthened relative to the dollar. Even accounting for that low base year, one must say that 1987 is booming insofar as international traffic is concerned. The market has more than recovered from the lows recorded in 1986. Some people had thought earlier this year, including some international airlines, that 1986 might match 1985. In fact, 1987 international traffic will probably exceed 1985 levels. (See Figure 17)

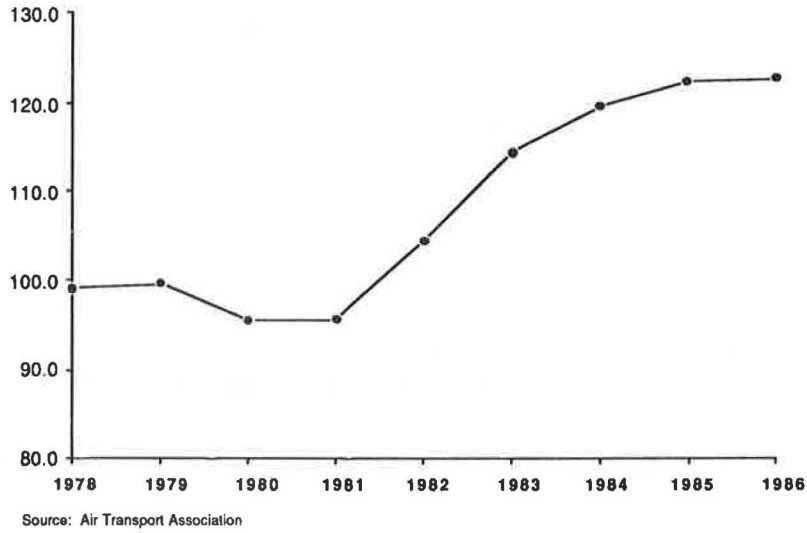


FIGURE 16 Employee Productivity: Majors and Nationals Revenue Ton Miles per Employee (000)

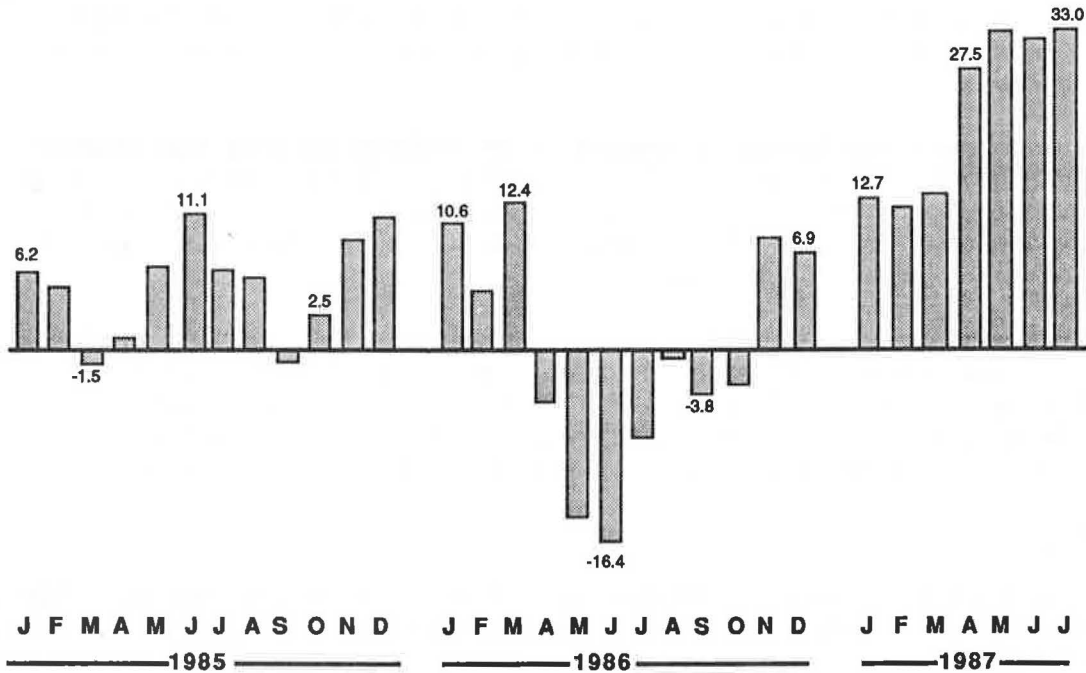


FIGURE 17 International RPMs: Majors and Nationals. Percent Change Over Previous Year

Source: Air Transport Association

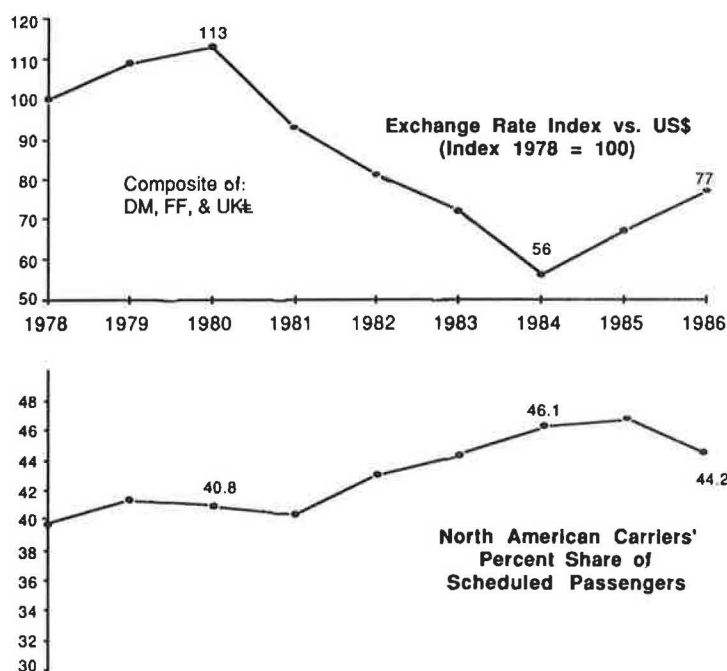


Figure 18 Currency Exchange Rates vs. Market Share
Percent Change Over Previous Year

I mentioned currency exchange rates. Although there is no conclusive correlation between currency exchange rates and market share there is some impact on traffic of changes in the strength of the U.S. dollar. (See Figure 18)

The upper plot is the dollar exchange rate -- a composite of Deutsch marks, French francs and British pounds -- from 1978 to the present. Below it is the North American carriers' percent share of the North Atlantic market. It can be seen that as those foreign currencies declined in the 1980 to 1984 time period, there was a strengthening of traffic and market share of the North American carriers. The converse was true as the dollar weakened.

Competition in some areas is very expensive. The Pacific is now one of the most competitive areas in the world. U.S. domestic passenger commissions as a percent of revenue were about 8.5 percent in the first quarter; Latin American commissions were 9.5 percent; and Atlantic commissions were 10.5 percent. But, commissions in the Pacific area averaged 25 percent. Pacific commissions, on average, moved from 17 percent in 1984 to 25 percent this year. (See Figure 19 and 20)

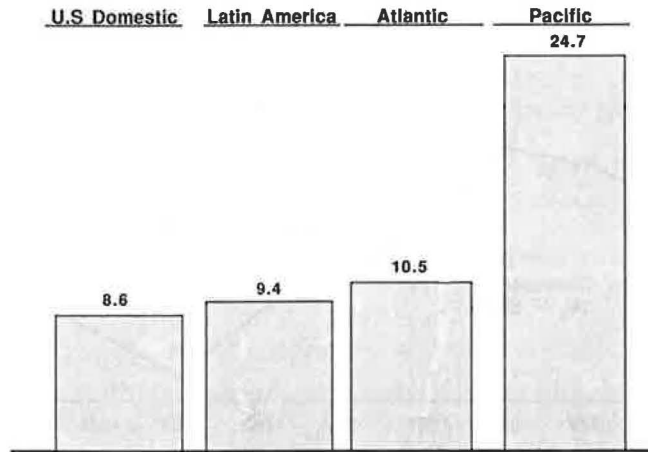


FIGURE 19 Passenger Commissions as Percent of Passenger Revenues:
U.S. Scheduled Airlines, 1st. Quarter 1987

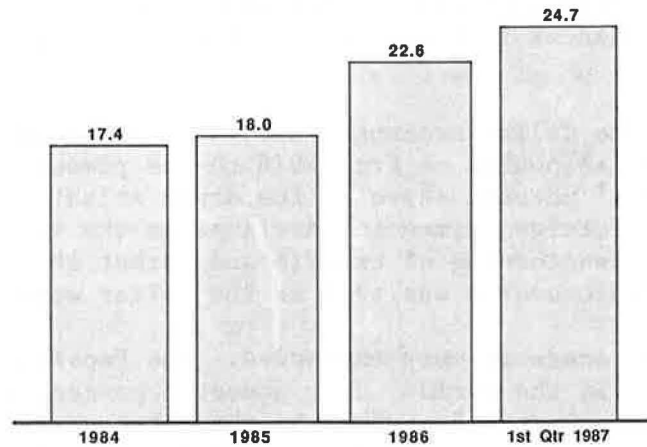


FIGURE 20 Passenger Commissions as Percent of Passenger Revenues:
U.S. Scheduled Airlines - Pacific

Our recent forecast for world airline traffic up to the year 2000 shows the estimated 1987 level of worldwide traffic at 1,000 billion (a trillion) revenue passenger miles (RPMs). We project that worldwide RPMs will double by the year 2000, reaching 2,000 billion (2 trillion) revenue passenger miles. International traffic will grow slightly faster than domestic because of the globalization process that is going on right now. (See Figure 21)

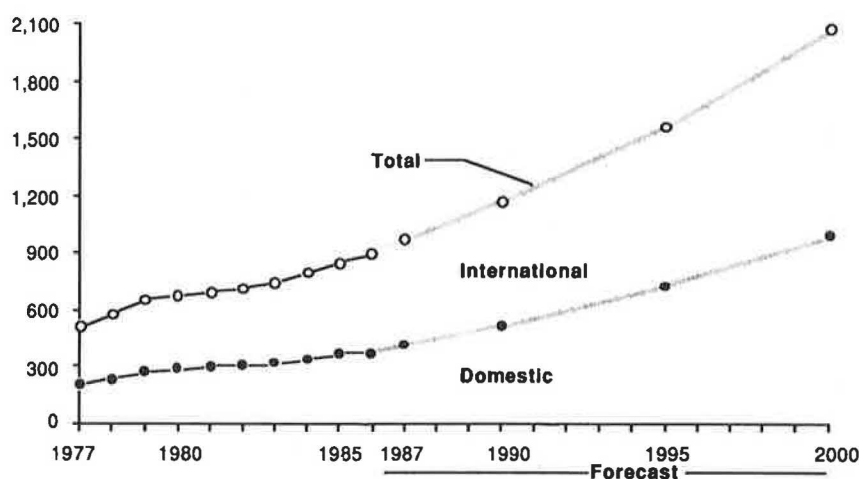


FIGURE 21 World Airline Traffic: Revenue Passenger Miles (RPMs) Scheduled Services (Billions)

It is interesting to note what has happened in the past few years with U.S. carrier international services. In 1978, American, United, Delta and Texas Air Corporation were predominantly domestic carriers. American served no foreign gateways in 1978 but served 8 in 1986; United, none in 1978, but 14 in 1986; Delta, one in 1978, and five in 1986; Texas Air Corporation three in 1978 compared to 21 in 1986. These four major carriers that served only four foreign gateways in 1978, by 1986, were serving a total of 48 gateways. Thus, predominantly domestic carriers are rapidly moving out of their traditional roles, and increasingly moving into international operations. (See Table 7)

TABLE 7 FOREIGN GATEWAYS SERVED NON-STOP

Selected U.S. Carriers					
1978			1986		
American	-	0	Dallas/ Ft. Worth Chicago	Frankfurt London Paris, Tokyo Dusseldorf Frankfurt, Paris Manchester	8
United	-	0	Honolulu Los Angeles New York Portland San Francisco Seattle	Auckland Hong Kong Sydney Tokyo Sydney Tokyo Tokyo Tokyo Hong Kong Osaka, Tokyo Taipei Hong Kong, Tokyo	14
Delta	Atlanta-London	1	Atlanta Portland	London Frankfurt Munich Paris Tokyo	5
Texas Air (CO,EA,PE)	Hon.-Johnston I Hon.-Marshall I Wash. DC-Guatemala	3	Honolulu Houston Los Angeles Miami New Orleans New York San Francisco	Auckland Guam, Nadi (Fiji) Johnston I Pago Pago Sydney London Papeete Barranquilla Bogota Buenos Aires Cali Guatemala Guayaquil London Panama City San Jose Panama City Brussels London Brussels	21

Airline Financial Performance

I would now like to discuss the current airline financial performance. The airline industry reported a \$1 billion operating profit in the first half of 1987 but only approximately \$100 million net profit. The bulk of the difference resulted from the high interest expense on the \$1.6 billion of industry debt. Each carrier's net income for the first half of 1987 shows that winners and losers were about evenly divided. (See Figure 22)

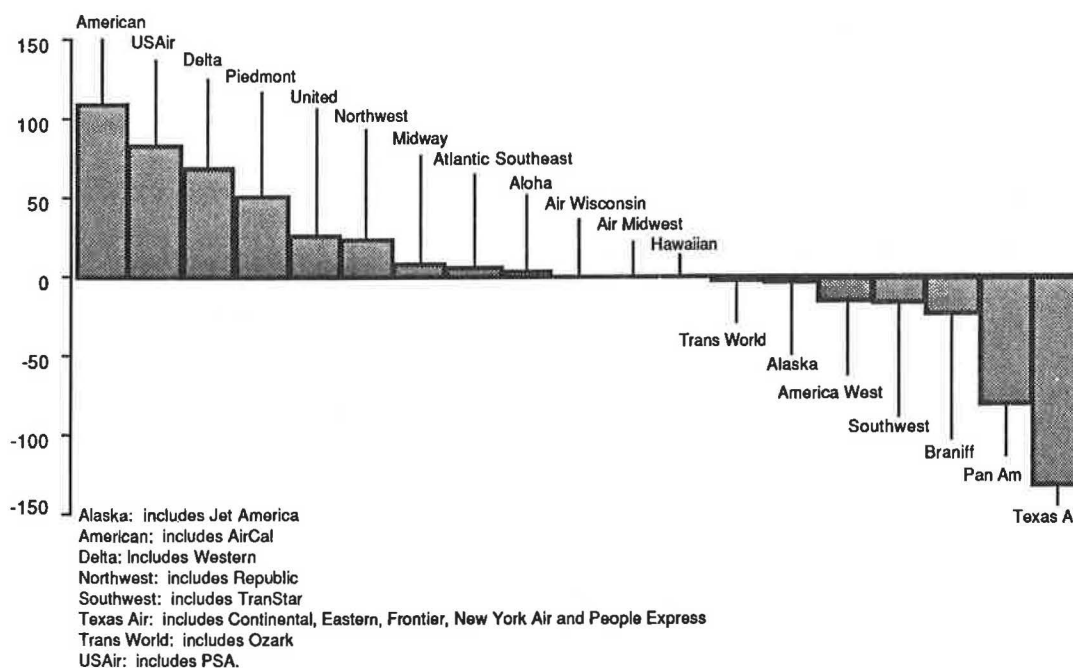


FIGURE 22 Net Income/Loss: U.S. Scheduled Airlines.
First Half 1987 (\$ Millions)

The Outlook - Near Term

How do we see things for the rest of this year and next year? In the first half of this year, traffic was up a very healthy 15 percent from the first half of 1986. Yields were down 2 percent. The combination produced operating revenues up 13 percent. Expenses were up by only 6 percent -- capacity was up 9 percent, but unit costs were down about 3 percent. The difference between the 13 percent increase in revenues and 6 percent increase in expenses gave the industry \$1 billion of operating profit in the first half. We do not anticipate traffic growth to be as high in the second half. But yields will be up. We expect the combination to increase operating revenues 13 percent -- the same as in the first half of the year. Because of the increase in fuel prices, unit costs will be up as well. With revenues and expenses both up 13 percent, we see close to a repeat of the 1986 second half -- about \$1.5 billion operating profit. For the year, then, we see a record operating profit of approximately \$2.5 to \$2.6 billion. But, as I mentioned previously, with the high debt cost of about \$1.6 to \$1.7 billion, the industry will be lucky to make \$1 billion in operating profit after interest or in net profit for the whole year. (See Table 8)

TABLE 8 AIRLINE FINANCIAL OUTLOOK*

U.S. Scheduled Airlines % Change over Previous Year 1987			
	<u>1st Half</u>	<u>2nd Half</u>	<u>Year</u>
RPMs	15	9	12
Yield	-2	4	1
Operating Revenues	13	13	13
ASMs	9	9	9
Unit Costs	-3	4	0
Operating Expenses	6	13	9
Operating Profit	\$1 Billion	\$1.5-1.6 Billion	\$2.5-2.6 Billion
Interest Expense			\$1.6-1.7 Billion
Operating Profit After Interest			\$900 Million to \$1 Billion

* Midpoints of Forecast Range

TABLE 9 AIRLINE FINANCIAL OUTLOOK*

U.S. Scheduled Airlines % Change over Previous Year 1988	
RPM	7
Yield	3
Operating Revenues	10
ASMs	6
Unit Costs	3
Operating Expenses	9
Operating Profit	\$2.5 to 3.0 Billion
Interest Expense	1.7 Billion
Operating Profit After Interest	1.0 Billion

*Midpoints of Forecast Range

For 1988, we see traffic growing at 6 to 8 percent -- about one-half the rate that it is growing this year. We see yields easing upward, but at a lower rate than the general inflation rate. We expect operating revenues to be up about 10 percent. Operating expense increase of 9 percent will nearly match the revenue increase. Thus, the operating profit for next year will be only slightly more than in 1987. Again, subtracting the \$1.7 billion in interest expenses brings profit after interest down to the \$1 billion range (See Table 9)

Outlook 1987-1990

Now for some observations about the future. Eight major carriers now have 95 percent of the market, indicating a good degree of consolidation. Consolidation is almost but not quite over and we expect there will be further consolidations involving the eight major carriers. At each of 14 hubs we see a single carrier having over two-thirds of those particular markets. So, entry at those hubs is going to be somewhat difficult. The capital of four major carriers consists of over 50 percent debt. This is the basis for the \$1.7 billion industry interest expense. Yet the industry's return on assets is less than the cost of capital. There are, and will be, increasing government airport capacity constraints. Recently, and House and Senate have both passed the consumer bills that will add to the airlines operating costs. To some degree, unit costs have bottomed out and will move upward in the future. Together, these observations mean that for the rest of the decade we are going to see higher fares and higher yields. (See Table 10)

TABLE 10 **OUTLOOK 1987 - 1990**

U.S. Scheduled Airlines

OBSERVATIONS:

- o 8 major carriers have 95% of the market
- o At each of 14 hubs a single carrier has over 2/3 of market
- o 4 major carriers have over 50% debt
- o Industry return on assets less than cost of capital
- o Increasing government airport capacity restraints
- o Increasing government consumer regulations
- o Unit costs have bottomed

MEANS:

Higher Fares & Higher Yields in Future

But, we think that there will be a close relationship between airline fare increases and the overall inflation rate, and that continuation of the downward trend in constant dollar yields is a distinct possibility. In addition, consolidation will result in some firming up of airline industry profits in the future.

Discussion

Mr. Nesbit: One of the numbers that is not on your chart is the denominator in all this, and roughly speaking it looks as though you are predicting 1988 revenues at about \$50 billion for U.S. airlines.

Mr. Howard: That would be about right, yes

Mr. Nesbit: Which means with net profit of under 1 billion you have a profit margin of less than 2 percent.

Mr. Howard: That is not very good.

Mr. Nesbit: That is miserable. Robert Crandall, American Airlines has said that he needs 10 percent operating and 5 percent net to survive.

Mr. Howard: Some people would look at the past and say, "It is a 2 percent industry." For those of you who may not know it, all US industry makes between 4 and 5 percent year after year in profit margin, and the airline industry has traditionally been in about the 2 percent range on an average basis. So, some people would look at that past and say, "It is a 2 percent industry," whether it is deregulated or not deregulated. I don't believe so. Although in the shorter term we do show about 2 percent in 1988, I think that in longer term, as the industry settles down, digests the recent mergers and acquisitions, and begins to (I don't want to scare you here) operate as an oligopoly, that you will see the industry moving out of that 2 percent area and begin to make on an overall margin well above that.

On the other hand, that may not come soon because you are talking about a very, very cyclical industry, as you all know. If we are hit after 1988 with a recession, then you will probably will not be seeing the industry moving above the 2 percent range in that time period.

Like any average, there are some very high and some very low numbers that make up the average, and indeed, those carriers that are well above 2 percent average level are having no problem securing the financing they need to go ahead.

The only thing new here since deregulation is the magnitude of the spread; and so, I am saying that once fully consolidated, the spread will probably decrease, as well.

Mr. Larkins (Allied Signal): I have two questions. One: do most industries focus on bottom line and then as a side issue look at how the operations did? I am curious as to how it has happened that the airlines have evolved a situation where people focus on the operating profits and then as a kind of

side issue say, "Oh, by the way, we had these other costs, and the net result is zero" Next, but related to the first one, is the question of the cost of the leasing. How is that accounted for; is that part of the interest payment or is that incurred in the operating costs?

Mr. Howard: That is part of the interest and the debt level. Capitalized leases are part of the debt ratios as we measure them, and they are also, a part of the of the interest, -- the amortization of the long term debt.

Mr. Larkins: Do you know any reason why the airlines and the airline commentators tend to focus on operating profit and not really on the overall results?

Mr. Howard: I think one reason is a very simple one, and it is one that is not completely logical, but I think it is true. It is that all of the reporting by a carrier makes that distinct separation. That has been traditional. CAB accounting reports have required that a carrier come down to the operating profit level and then take those non-operating items off to get down to the bottom line. CAB put heavy reliance on operating profit as a measure of the operations ability of the company, with regard to fare setting and the like. So, part of it is a carry-over from the old regulated days.

Mr. Larkins: I assumed that, but I just was not sure. A second fast question regarding your RPM growth projections. In general, are you assuming an increasing penetration of travelers in the population?

Mr. Howard: Oh, I think so.

Mr. Larkins: Is that then the trend in the general population?

Mr. Howard: Yes I think so. You know there is a tremendous variety of discount fares out there. Even if you go to the simplified two-tiered structure that is being proposed by American Airlines, you still have a wide variety of fares. They tend to cause the discretionary traveler to take advantage of them to a greater extent. How long that will last? I don't know but we think it will certainly last through 1988, to some extent.

Mr. Shenton (Avmark): I have a question on the 2 percent problem. Somehow in the airline industry we seem to be looking at the profits as relating to revenues, even net profits, whereas it is more customary in industry to think of profits as return on capital. I think one of the ways in which the airlines are taking care of the problem is by trying to reduce their capital as much as possible by leasing their aircraft. This, in turn, increases the operating costs which may be higher than they would otherwise have been. So, I guess maybe this is why they can live with 2 percent; and yet, in fact, become more profitable by other industry standards. I think that is what the industry is trying to do.

Mr. Howard: Yes, it certainly could be, but nonetheless, some of the carriers are making well above 2 percent and are doing quite well. So, you have both the spread and the nature of the business that you are relating there, Harold.

Mr. John Drake (Purdue): Could you amplify a little bit on the slide you showed concerning the commissions in the Pacific? What is the source of that

data, and to what extent does it really reflect the consolidators and other things which are depressing the actual yield to the carriers. Furthermore, are the yield figures (international yields) before or after these commissions? In other words, are true yields actually worse than reported?

Mr. Howard: First off, the yields we talk about are not net of commissions. They are straight out passenger revenue divided by revenue passenger miles, and so of course, do not reflect the commission costs. If you were to take them into account, net yields in the Pacific area would be diminished by about 25 percent to get to net revenue.

Secondly, the source of the material is as reported to the Department of transportation in the carrier reporting program.

One aside with regard to those commissions, not all of the business, of course, is done by travel agents. There is some, maybe 20 percent, that is done by the carriers themselves. So, in actual travel agents' commissions, the figure could be as high as 28 to 30 percent.

MARKET FORCES IN THE DEREGULATED AVIATION ENVIRONMENT

William R. Nesbit, Airline Forecast Forum, Inc.

This panel of experts was broadly based with representation from airlines, government, aerospace manufacturers, the financial community, academia and consultants. The panel first looked at the characteristics of the existing market for air travel. Next it examined the growth factors that may influence the future passenger air travel market. This was followed by an examination of airline marketing strategies and tactics, and then by an examination on the constraints imposed by the infrastructure. The panel concluded with some specific forecasts and suggested some research needs related to market forces.

Attention was focused on the demand for passenger travel through the year 2000 to test the hypothesis that traffic would double from today's level in this period. This limited period excludes possible effect of new technology such as a second generation SST or tilt rotor craft. It is also a period during which few, if any, new airports can be opened and operating capacity constraints will not be reduced significantly.

In general, the panel concluded that the primary market forces which caused rapid growth of air travel demand in the past are now largely exhausted. In addition, rate of growth will be constrained by the physical limits of the aviation infrastructure and the impact of industry concentration on the intensity of price competition. Thus, the rate of growth of world air travel probably will slow down significantly through the end of this century. Worldwide passenger traffic grew at a rate of 8% per year from 1967 through 1986. Most published forecasts expect this rate to decline to only 5% to the year 2000. The panel concluded that achieving this growth rate will be difficult.

Characteristics of the Existing Market for Air Travel.

Passenger travel is a derived demand based on the need or desire of people to be somewhere else. Air travel is used when it is more cost effective than other possible modes. Because of the many reasons for travel and the many individual decisions which are made with respect to timing, mode choice, destination, etc., the demand for air travel is extremely heterogeneous. This is easy to overlook because the product - a seat in an airplane - is quite homogenous. A single product serves many demands.

The best single description of the air travel market in the U.S. is provided by the annual ATA Gallup survey of the incidence of air travel taken since 1971. The latest report for the twelve months ended in June, 1987 shows that 30% of U.S. adults took at least one commercial air trip during the year and 72% have ever taken an air trip during their life. This compares with 21% and 49%, respectively, in 1971. An estimated 26% took personal or pleasure trips while only 9% took a business trip by air. The percentage of persons taking business trips has not risen significantly since 1971 but the percentage taking personal or pleasure trips has increased sharply. However, of all air trips taken, the proportion between business and personal/pleasure has remained about 50/50 with no clear trend.

Business travel is a concentrated market -- about 80% male, middle aged, upper income. Pleasure travel is a diverse market -- 55% female, all ages, all income categories. Business flyers fly frequently while pleasure flyers usually make only one or two trips per year. Frequent flyers are critical to airline marketing success. Five percent of those who flew last year (1.5% of all adults) produced 33% of airline passenger traffic and about 45% of airline passenger revenue. Only 4% of U.S. adults took an overseas air trip during the study period.

Growth Factors

The panel identified four major domestic U.S. factors and an international factor which generated the tremendous growth of air travel since the jet age began: 1) the steady decline in the real (inflation adjusted) cost of air travel; 2) large improvement in speed, comfort, convenience and safety of air travel compared with piston aircraft and with competing surface modes; 3) favorable cultural and demographic factors including a decline in the fear of flying, high population mobility, and early inoculation of the baby boom generation with the "flying bug."; 4) a rise in discretionary personal income which is partly due to the rise of the two income household; and 5) international factors such as dollar exchange rate.

The panel examined these factors in detail and speculated on possible new factors which may develop in order to assess the reasonability of the consensus forecast of 5% long term growth (i.e. a doubling by 2000).

1. "Real" Fares and Yield. There was no consensus on the level of future air fares in real terms. All agreed that fares would depend on what happens to unit costs per available seat mile and the achieved passenger load factor which determine cost per revenue passenger mile. Fares cannot deviate from costs over the long run. The various major elements of costs were discussed in depth.

Labor costs are a big question mark because of conflicting forces at work and the great disparity in labor costs within the airline industry. All agree that costs will tend to converge over time...but at what level? The need to improve the quality of airline services to meet new government reporting requirements will increase costs. There appear to be potential shortages of skilled labor - pilots and mechanics - which will put upward pressure on wage levels. However, if dual wage scale schemes continue to exist, the retirement of higher "A" scale workers and their replacement with "B" scale workers will bring down average wages. Airlines may purchase more services from outside sources in order to reduce costs. Labor productivity could improve with economies of scale from industry concentration. But the need to improve the quality of airline service to meet new government guidelines will increase costs. The panel could not agree on whether these diverse forces would cause unit labor costs to increase more or less rapidly than the Consumer Price Index.

Fuel prices are expected to rise over the long run because of an increase in the cost of crude oil and the probable imposition of additional fuel taxes. The big drop in jet fuel prices from \$1.04 in 1981 to 55 cents in 1986 will not be repeated. Fuel efficiency will show steady but gradual improvement as the

result of changes in the airline fleet mix and larger airplanes with more efficient engines. However, the very large efficiency improvements promised by propfans won't be economically justified unless fuel prices go well above \$1.00 per gallon. It is uncertain whether unit fuel costs will rise or fall during the forecast period but they certainly are not expected to repeat the dramatic decline of the last five years.

Airline capital costs for the acquisition of fleets and facilities are difficult to measure because of the diversity of financing methods being used. The cost of capital in general has risen because of tax law changes. Several economic studies, including those by aircraft manufacturers, have concluded that investment in new aircraft to replace existing fleets is difficult to justify economically at this time. Only market growth can clearly justify such investment. However, an environmental requirement to replace noisy aircraft may force airlines to invest in new aircraft which would have the net effect of increasing costs.

Other costs which seem to be headed higher or, at least, to remain level, include airport fees and commissions. On balance, the panel felt that total unit costs per ASM in the next decade will remain steady or slowly rise in real terms. Thus, the only strong hope for a continuation of the downtrend of unit cost per passenger mile and "real yield" is that the average passenger load factor can be increased.

Load factors on average have risen from the mid-fifties before deregulation to nearly 65% this year. This change has had the effect of dropping unit cost per RPM by about 15%. If load factor can be further increased to 75%, unit costs will go down another 14%. Whether this is possible was hotly debated. Success will depend on aggressive selling of off-peak capacity and sophisticated yield management.

Industry consolidation will tend to support a higher overall fare level in two important ways. First, it is deemed extremely improbable that a new "People Express" type airline will come into being in the U.S. to offer super bargain fares. Second, the reduction in direct multi-carrier route competition and the emergence of more stable route systems as a result of consolidation will make the outbreak of sporadic price wars much less likely.

In summary, the panel felt that real yields would either remain level or decline slowly...but definitely not repeat the dramatic decline of the past decade during which the real yield dropped by 3.5% per year on average.

2. Quality of Service. All agreed that improvements in speed, comfort, schedule convenience and safety have been important growth factors over the years. At present, consumers are complaining about a deterioration in these factors but there is no evidence that poorer service is resulting in less air travel. If the problems with on-time performance, schedule unreliability, lost baggage, etc. are reduced, there is little probability that demand will pick up as a result. Fixing these problems will be costly and could result in lower fleet utilization. Technological improvements in aircraft and the air traffic control system between now and 2000 will be barely perceptible to the passenger...marginal improvements in reliability

and ride comfort but no change in speed and, possibly, more crowding due to higher load factors. These historically positive growth forces have become neutral.

3. Cultural/Demographic Forces. Some observers believe that demographic trends favor the growth of air travel since the huge baby boom bulge is now moving into age brackets which are most likely to fly. Others point out, however, that as the baby boomers begin to have children at a later age than prior generations, they will be less inclined to travel. Also, there will be fewer young adults who are big leisure travelers and more "super senior" citizens who historically have done little flying. Demographic changes are not a clear plus or minus.

4. Discretionary Income. The conversion of the U.S. population from single to multiple earner households has gone about as far as it can go. In recent years, most of the personal income growth in the economy has taken place in the top 20% of the income strata - a group which already flies a lot. In fact, Gallup data show that lower air fares in recent years have not led to increased flying by lower income groups. These factors suggest that it will be difficult to increase the propensity of the U.S. population to spend on air travel. Some recent studies have shown that total spending on air travel as a percent of Disposable Personal Income has been declining in recent years. Furthermore, economists have pointed out that economic policies need to be changed to encourage a higher saving rate out of discretionary income - and lower discretionary consumption - to promote a more balanced economy.

Getting a bigger bite out of the discretionary dollar for air travel will depend to a great extent on changing consumer values and tastes. There is a trade-off between tangible values and experiential values...the BMW or the trip to Bavaria...the American vs. the European life style. Little hard data exist to permit generalization on spending habits and values of the "Yuppie" generation. Some recent experience with bargain weekend fare packages designed to appeal to "up-scale" consumers indicates that the actual buyers tended to be middle class instead.

On balance, it is expected that discretionary income will grow more slowly in the future, that a bigger slice will go into savings, and that American preferences for luxury goods will have to be overcome in order to achieve a major gain in discretionary spending on air travel.

5. International Factors. The foregoing applies primarily to the domestic U.S. market. The forces discussed will also apply to foreign travel but other factors will come into play as well. The decline in the exchange value of the dollar since early 1985 will eventually have a devastating impact on foreign travel by U.S. citizens, especially leisure travel. This impact in the past has hit with a lag of one or two years. Heavy travel in 1987 results from the pent-up demand from 1986 when people feared to go to Europe. A big drop is almost certain in 1988. Of course, more foreign visitors to the U.S. are expected but it is felt that the U.S. does a relatively poor job in promoting tourism and in handling foreign visitors. Few U.S. tourist destinations make much of an effort...there is a lot of room for improvement.

In the long run, the globalization of the airline industry and liberalization of regulated markets will be a strong growth stimulant. At present there is a lot of talk but little action. It also is clear that international leisure travel is highly sensitive to security problems. If terrorism is ever curtailed, travel could get a big boost. International business travel appears to be a strong growth sector for the foreseeable future.

Airline Marketing

A vast majority of airline tickets are dispensed through travel agents which have largely replaced direct airline distribution systems. The reason is simple; it costs less this way. Airlines have little interest in recapturing this function. The travel agency industry is going through a consolidation phase but is still not highly concentrated. Big gains in automation and streamlining of "back office" procedures are in prospect but the agent will remain in the picture because travel decisions are basically complex and the customer needs expert assistance.

Computerized reservations systems have enabled airlines to exert control of their product even though surrendering actual ticket distribution to travel agents. They enable airlines to engage in "yield management" -- i.e. optimization of the traffic mix and load factor -- which maximizes the revenue production of the system. If political forces should force airlines to divest their CRS's, there would be a net loss in efficiency which would hurt consumers in the long run. One possible consequence of the CRS systems is that travel agents will eventually become more like exclusive distributors for the airline which provides the CRS rather than independent agents for all the airlines. There is nothing inherently good or bad about such a development should it occur.

As noted above, the consolidation of the U.S. airline industry and the emergence of so-called "mega-carriers" will have an impact on the growth of air travel. In this changed environment, it will be very difficult for small carriers to find niches in which they can survive and it will be virtually impossible for new carriers to be created. The panel expects never to see the likes of People Express again. This means there will be less likelihood of fare wars and less pressure to hold fares down. Markets dominated by one carrier or shared by two carriers are not likely to have fares set below costs as was often the case in recent years. On balance, consolidation of the industry will tend to slow market growth.

Infrastructure Constraints

It may be that recent public concern with the safety of the aviation system, poor schedule performance and congested terminals is overdone, but there is no question that there is a severe problem facing the industry. The shortage of airport and airway capacity is not likely to be solved by the year 2000. FAA feels 10 more major airports are needed but won't be built by then. Congestion is not being caused by hub and spoke scheduling despite the popular impression to the contrary. More point to point schedules would make the situation worse rather than better because of the use of smaller airplanes and increased schedule frequency at major airports.

During the rest of this century, many technology improvements such as collision avoidance systems and microwave landing systems will make the system run smoother and safer. A scheme for equitably allocating operating slots is needed to maximize the use of existing capacity. Larger airplanes and higher load factors will be needed to handle even moderate growth. It may become necessary to displace some general aviation to make room for commercial aviation.

After 2000, new airports, tilt rotors and high speed ground systems are a possibility as ways to handle the growth of air travel demand. Until then, aviation will be living in a constrained environment.

Conclusions and Suggested Research

The growth rate of air travel during the rest of this century is likely to be significantly less than in the past. The growth rate for the world will be 5% per year or less and no better than 4% for the U.S. Relatively strong growth sectors will include foreign business travel, off-peak leisure travel at cut rates and foreign visitors to the U.S. Slow growth does not lessen the need to improve and expand the aviation infrastructure. Failure to do so could further slow growth and inhibit the introduction of promising new technology in the next century.

The panel identified a few areas where research effort should be directed to improve the prospects for the industry. These include 1) a new Census of Transportation to update benchmark data on travel, 2) a bigger and better version of the Gallup survey, 3) better analysis of existing data, 4) investigation of how best to ration scarce resources such as airport operating slots in the next decade, and 5) studies to support the justification of higher public spending on aviation infrastructure improvements.

Discussion

Question: How was the hub-and-spoke system viewed by your panel?

Mr. Nesbit: With respect to hub-and-spoke, those people familiar with airplane scheduling and the way the system works would say that it is very difficult to imagine a more efficient system for moving large numbers of people.

Question: From the airline standpoint?

Mr. Nesbit: No, from everybody's standpoint. You get more people moved through the system that way. You can use much larger airplanes because you can combine all these loads. The demand is from large cities to large cities for the most part. Going from medium to medium there are very few cities that make any sense for point to point travel, and obviously if we are going to have to live with the airports we have now, we not only have to retain the hubs but we have to replace the small airplanes operating on the spokes with bigger airplanes or go from hub-and-spoke to hub-and-loop where

instead of just going out to one point, the airplane goes out and hits two or maybe three other cities and comes back in, so that means an even bigger airplane to consolidate more travel. It is by far the most efficient way to move people through; and without hub-and-spoke, there is no way the system can handle it.

Question: I just want to make sure I understand it. Is that panel discussion or is that your feeling on it?

Mr. Nesbit: The panel discussed it. Nobody really disputed that view. Point to point is a myth.

Mr. Shinton (Avmark): I just want to add to Bill Nesbit's comment that the point was made that the percent of connecting passengers was no higher now than it was before deregulation except that before these connections were interlined, and now they are mostly online.

Mr. Nesbit: One place where more point-to-point service is quite obvious is in the Trans-Atlantic service where there are new gateways, and quite an increase in frequency there from smaller cities in the U.S. They tend to focus on London from the traditional hubs in the U.S., but they are starting to serve smaller cities in Europe so you are getting more point-to-point there. That is because you have just as big airplanes as you can get flying Kennedy-Heathrow with as many as you can pack in, but it is not the same problem.

Mr. McDougall (Wichita State University): If you believe that the domestic growth rate might be around three percent and that that growth is going to come from non-business travel, would that suggest that your 50-50 split by the year 2000 is going to be 60-40?

Mr. Nesbit: Everybody has predicted that for a long time. It just does not seem to happen; but I will predict it again. It think is going to happen.

INTERNATIONAL RAMIFICATIONS OF DEREGULATION

Gerard Pronk, Fokker B.V.

This panel focused upon the following major issues.

- o The special position of aviation and the future role of national governments.
- o The present status of deregulation in domestic markets in and outside the USA.
- o The effects of deregulation in the international and intercontinental markets.
- o The world after deregulation.

The panel discussed, on a qualitative basis, the changes it foresees in the international, and more particularly the intercontinental markets, in the Western world to the year 2000. This period was selected as being sufficiently foreseeable in light of the market development which can be anticipated today.

1. Special Position of Aviation and the Future Role of National Governments

Air transport has always had a very special position in foreign relations not only in the economic, social and military field, but also, and in particular, in the political field.

National governments in all countries have the responsibility for international communications. To date, however, they have kept aviation out of bi-national or multinational discussions dealing with the promotion of international trade. For instance, in the recent negotiations leading to an open market between Canada and the USA, aviation was not discussed.

Governments take the viewpoint that traffic rights must be negotiated against traffic rights. Reciprocity was and still is the basis for international agreements in aviation. Governments refuse to balance aviation against bananas, potatoes or motorcars.

That situation, however, may not last for ever. There are two reasons why the role of the individual governments will be affected.

The first one is the increasing process of the formation of a politically and economically united Europe. The second one is a worldwide process of diminishing governmental interference in the form of denationalization and privatization.

First Europe. It is not unreasonable to expect that sooner or later the authority to negotiate rights will be surrendered by the respective governments to the Commission of the European Communities headquartered in Brussels. That Commission will then have to act and negotiate on behalf of the governments of the large (350 million people) European market and will have to designate carriers. That in itself means lower protection. If the European community becomes a domestic market, and if Brussels becomes the authority, then the bargaining power will shift from the individual governments to Brussels. In

the future this industry may no longer be discussed on the basis of reciprocity between nations but may or will be discussed in a much wider context such as GATT by Brussels, Washington or Tokyo.

The second longterm development is a worldwide process of less government-control resulting in a partial or complete privatisation of industries. This process includes aviation. Giving up the controlling position of European governments will ease mergers, take-overs and acquisitions of airlines. The "flagmentality" in some countries may disappear. It will certainly decrease the special, practically untouchable, position that aviation has at this moment. It will be possible that rules can be applied in the same way as elsewhere in the economic system. Specialization, exploitation of structural efficiency advantages, transfer of labour and capital will take place more and more. This is a development that the USA has already gone through.

That development will go hand in hand with an increasingly dominant role of commercial considerations in the industry. Market forces will take the lead. Innovations in marketing and strategy will be accelerated and governments will become followers instead of leaders although there will be a high degree of interrelationship and dependence between government and industry.

2. Deregulation: Where Are We Today?

Domestic deregulation has been completed in the USA and Canada. Both countries have gone through a quick and turbulent process leading to the formation of a limited number of megacarriers that

- control the market through hub formation;
- control the market through code-sharing agreements;
- control the market through Computer Reservation Systems;
- control the airports through contractual arrangements;
- are increasingly active in the international market;
- have ordered modern equipment that will allow them to operate very efficiently (size and economics) in the international market.

There is some form of deregulation (price competition) in Africa (Nigeria), Australia, Japan and New Zealand. The emphasis is upon "some". It is more "intensified competition on a restricted basis" primarily in the domestic market. (There is no free exit and access in the domestic market in those countries.)

Developments in aviation inside Europe are heavily influenced by the creation of the European market (1991). The Council of the Community has taken steps on fares, on sharing of capacity, on access for air carriers and on legal procedures for the application of the rules of competition for airline companies.

Liberalization in Europe takes different profiles in different countries. Some countries have shown more flexibility and have introduced the system of double disapproval for fare setting and frequencies for intra-European and sometimes for intercontinental services (Belgium and Holland). Other countries have not yet reached that situation for very valid reasons. Increased opportunities in Europe are underlying to the formation of larger companies.

Our panel foresees that the trend towards a more liberal policy in Europe cannot be reversed given the relatively short distances between countries in this continent. The domino effect can be expected.

That process inside Europe will certainly lead to the formation of more powerful carriers in Europe, sometimes through partial cooperation in the field of maintenance, engineering or marketing, and sometimes through direct acquisition.

3. The Effects of Deregulation in the Intercontinental Field

As most of the megacarriers in the USA have expanded heavily in the domestic market, they now place emphasis on intercontinental expansion primarily into Asia and Europe. The long-range trend shows an increasing share of scheduled passengers for U.S. carriers as result of better capacity, more frequencies and more point-to-point services. The number of airlines in the intercontinental field has gone up. The newcomers -- American, United, Delta and Texas Air -- served 48 markets in 1986.

Those airlines are rapidly reaching into markets traditionally served by non-American airlines or by U.S. airlines that by today's standard are not well placed or not well equipped (Panam, TWA).

a. How Will European Airlines React?

Several possible scenarios were discussed.

One is the formation of a group of very strong European megairlines through mergers or equity acquisition between European airlines. Today's cooperation could be a starting point (maintenance agreements, dovetailing of markets, and computer reservation systems could be the initial form for this development). This is what we called "regionalism". That process commences with consolidation of the domestic market (British Airways, British Caledonian). These large carriers will compete against American operators in the same way with the same weapons as their U.S. colleagues. Their rights have to be negotiated by their respective governments and later, possibly, by the EEC.

Another possible form is a cooperative association between airlines on different continents. Through a process of mutual equity acquisition, they come to a merger strategy in order to take advantage of the most effective factors of production and in order to increase market share through worldwide market presence. This form can be described as "multinational megacARRIER". Why should aviation be precluded from possibilities to increase its efficiency and its presence along lines that are generally accepted in other capital and labour intensive industries (oil industry is globalized, the motorcar industry is in that process and so is the shipping industry)? Why can't airlines in Europe, America and perhaps Asia not set up such a construction?

It assumes a change in the present ideas about the essence of having independent Flag Carriers; and it assumes also that the international regulatory system within the EEC will act in a non-discriminatory way against the European airline that goes intercontinental instead of European for cooperation.

In the long run also European megacarriers originating from regionalism will evolve into multinational megacarriers.

Once this trend of European megacarriers (regionalism) or multinational megacarriers has begun, it may go very fast. The potential advantages of synergy becoming apparent to all carriers, airlines will go after each other (as happened in the USA).

Other airlines in Europe for reasons outside aviation may remain independent but have to accept a secondary role.

b. Africa, Latin America and Asia

The panel is of the opinion that Latin America will stick to its policy of tight capacity control to protect their operators. There will be no encouragement of a more liberal policy.

The same can be said about the majority of the African countries.

The group also foresees that the economic reality of today will force/stimulate some countries in those continents to combine their resources and to form an airline that serves intercontinental markets.

Another possibility is to look for adoption by or cooperation with carriers in the developed world.

In Asia, countries like Korea, Thailand, Singapore and Indonesia have become more liberal. The relatively thin market beyond Tokyo makes the necessity to negotiate Fifth Freedom rights an important subject that may be solved within the trade discussions between Japan and the USA.

4. The World After Deregulation?

Cabotage has become an issue as result of code sharing; however, today's legal framework makes this impossible. The panel is of the opinion that in Europe and in the United States vertical integration may be a next step.

Aviation will continue its process of consolidation into the near future. This will occur for financial reasons. The industry in the USA is sliding back slowly towards some regulation as a result of congestion in airways and airports.

It will take a new recession in the USA to again shake up the aviation community. A new industry profile could emerge from such a shock. That new profile could go along with attaching less value to aviation. Attaching lower importance to the aviation industry could be eased by relaxation on sharetrading and ownership by foreign airlines.

As far as Europe is concerned, it can be expected that aviation in that continent will go through a very turbulent and interesting time similar to what happened in the recent years in the USA.

Summarizing the conclusions of our panel, deregulation having its roots in the USA, will have ramifications outside America. The intensity of this impact will depend upon the way airlines will be grouped together in the future. In the long run concentration will ultimately evolve into a globalization of our industry through marketforces, supported by an international relaxation of the legal framework.

Discussion

Mr. Nesbit (Airline Forecast Forum, Inc.): Deregulation in the United States effectively destroyed our small charter industry. Do you see deregulation in Europe wiping out the very large developed charter industry in Europe?

Mr. Pronk: As you know the European charter industry is quite important. In fact it carries about 50 percent of the total traffic inside Europe. The leading charter companies are trying to make use of the new legal possibilities that are created within the framework of the European community. Companies in Holland and in the United Kingdom are trying to set up a scheduled service in addition to their charter service. What we expect (now I am talking as a European manufacturer and not as a member of the group) in the long run is that the European charter industry and the European scheduled industry will become very close; and some of the chartering companies will be absorbed or acquired totally or partially by the mother companies.

To give a few examples: KLM is the owner of 50 percent of Martin Aire. KLM is joint owner of Trans Althia. Recently Lufthansa acquired shares in German Air. Recently Lufthansa made an agreement with Spain for the set-up of a chartered airline. That leads to the conclusion that the very strong separation between charter airline industry and industry in Europe will disappear. When it will completely disappear is a question. There are some fundamental structural differences resulting from high utilization and typical seasonality, but clearly those industries are coming closer and closer.

Mr. Griffith (Boeing): A couple of very successful airlines in the world have been built upon the creation of Sixth Freedom rights. What is likely to happen to these airlines if the global environment becomes more liberal?

Mr. Pronk: If the process that we foresee takes place, then those airlines will be faced with more competition and they will then have to compete with the airlines that will form part of what we have called the "multi-national mega-carriers." When they will completely disappear I do not know. But they will be faced with more competition.

AIRLINE AIRCRAFT MANUFACTURING DEVELOPMENTS

Peter Ivory, Douglas Aircraft Company

The manufacturing group developed a forecast of future civilian aircraft needs by first specifying the underlying factors stimulating these needs. Further the Panel tried to indicate the sources of the risk to that forecast. To put it in perspective, the forecast of this session will be compared with that given by the manufacturer's group at the TRB's 4th International Workshop on the Future of Aviation in 1985. (See TRB Circular No. 299, February 1986). This aircraft manufacturers' forecast to the year 2000 reflects the history of the industry. The near future is one of great promise buffeted by enormous risk.

Sources of Aircraft Demand

The average of the group's annual average free-world revenue passenger mile forecast from 1988 to 2000 was 5.2%. This rate is just slightly less than the 5.3% forecast (for the period 1986 to 1995) made by the manufacturers group at the 4th International Workshop. The closeness of these two forecasts reflects a somewhat more optimistic outlook for air passenger growth. Nevertheless, it was the consensus that the industry would mature in the late 1990's.

The modestly optimistic outlook spilled over into the load factor forecast. By the year 2000 the world load factor was forecast to be 67 percent. This figure compares with the 65 percent forecast for 1995 made by our immediate predecessors.

Some additional factors which were considered include dispersion, fuel prices, future yields, and airline consolidation. While dispersion was expected to continue, the impact of this on the size of the future aircraft was minimal. Fuel prices were forecast to remain flat to the early 1990's, then increasing toward the year 2000. These prices will help keep airline operating costs down and hence yields will remain under pressure. Consolidation of airlines is expected to continue but at a much slower rate. Perhaps most significantly, future airline liberalization in Europe is expected to put downward pressure on European yields. The net overall effect of projected revenue and costs is for continual airline profitability.

At the beginning of this Workshop we were all informed of the September, 1987 recommendations of the Working Group on Aircraft Noise/Airport Capacity of the Industry Task Force on Airport Capacity Improvement and Delay Reduction. This group recommends that the government provide financial incentives to encourage U.S. airlines to retire Stage II aircraft from the fleet by the end of 1999. With the question of incentives open, the likelihood of binding restrictions in the 1990's is lower than when the forecasts were developed. This information directly adds an upward bias to the retirement forecast which does assume some retirement of aircraft due to noise legislation.

Unfortunately, this additional uncertainty is assigned to the retirement forecast which was already felt to be the most risky forecast component. The retirement forecasts are based upon the judgment that wide bodies will be retired in 30 years and narrow body aircraft will be retired in 25 years. This

judgment was questioned due to several factors. These assumptions were used by the 1985 manufacturer's group and about one third of the aircraft forecast to be retired by 1987 were actually retired. Secondly, airframes and engine manufacturers believe that with proper maintenance aircraft will continue to fly indefinitely. Furthermore, with stable fuel prices, used aircraft are expected to be competitively priced relative to new aircraft with much improved technology.

The retirement forecast at least partially reflects the heightened concerns about retiring aircraft based solely upon age. Now the average annual retirement of aircraft is expected to be 200 aircraft per year. At the 1985 Workshop the manufacturers group forecast 225 aircraft per year to be retired. These retirements are not expected to occur evenly over time, nor by a rigid age-of-aircraft retirement rule. Rather, older aircraft are expected to retire in great numbers during years of slow traffic growth. Overall this retirement forecast is less optimistic than the 1985 forecast, but the risk is that the current forecast is still too high.

New Aircraft Deliveries

The expected deliveries of aircraft needed for the period 1988 through 2000 to satisfy growth and to replace retired aircraft are presented in Table 1.

In a similar fashion to that of the 1985 Workshop, four major categories of aircraft were forecast. While the categories were largely determined based upon range, two short-range categories based upon the number of seats/aircraft are also presented.

TABLE 1 **COMMERCIAL AIRCRAFT DELIVERIES AND RETIREMENTS**

	1988-2000	
	DELIVERIES	RETIREMENTS
Short-Range 80-145 Seats	1132	1262
Short-Range 145 Seats	2030	621
Medium-Range	1322	405
Long-Range	1111	289

The juxtaposition of deliveries and retirements is instructive for several reasons. The importance of retirements has risen over the last 15 years as the jet aircraft fleet has aged. Just how important retirements are to the forecast of aircraft needs by category is made crystal clear by the values in the Table. The forecast shows a future of a larger aircraft fleet, and the fleet will consist of larger aircraft with longer range.

Again, for comparison, the 1985 Workshop forecast approximately 400 aircraft to be delivered annually, whereas this forecast is for about 430 aircraft to be delivered annually. A forecast of 430 units is well within the manufacturers' production capability. Thus, the history of fierce competition ought to be continued.

Risk to be Confronted

After years of ever increasing orders for new aircraft, many production lines are near full-capacity, a high backlog of aircraft to be delivered exists, and now several new models have been launched. In these good times an unsettling feeling of well-being permeates the industry. Feelings of well-being are unsettlingly in this industry because they have been short-lived before.

Just as in the past, aircraft manufacturers are expected to compete fiercely for market shares. This competition resulted in reduced profit margins. To satisfy their customers not only have manufacturers geared up production, they have also accepted an increased amount of their customers' risk. In the past, airlines ordered new aircraft when times were good, only to receive them when times are bad. Some of this inauspicious-timing and risk has been transferred to the manufacturers. The most obvious case of this risk transfer are aircraft leases with quick turnback provisions. Secondly, large purchases of aircraft are typical for a small number of firm orders with the majority being future options. These conditional sales require manufacturers to block out part of their production line for these probabilistic future deliveries.

Added to the future delivery risk is the risk arising from the launch of a new product. Since most of the new products are in the development stages, consider the following problems. A new product manufacturer faces a dramatic decline in the production of his products line to be replaced. Just as revenues from the old product line are shrinking, the cost of launching a new product peaks. Furthermore, new products put price pressure on all competing products and increases the competitor's research and development expenditures. Thus, before a host of new products reach the market, all manufacturers face a burden of a reduced cash flow.

The issues considered at the 1985 Workshop were to lower cost and finance the development of new aircraft. These efforts are underway today while new risks seem even more troubling than those of the immediate past. Let there be no doubt that yesterday's risks were real. While much more progress will be made to lower production costs, today management needs to focus on the next period in the evolving history of the civilian aircraft industry. As yet undiscovered solutions will resolve the problems arising from today's risks, because the industry remains an expanding market for those who meet the challenges.

Discussion

Mr. Shinton (Avmark): Was there any discussion or consensus on the future of the retrofit programs that are currently in effect or being started?

Mr. Ivory: Yes, they would continue to be in effect. There was some astonishment that some of these programs are going forward. On the other hand, we all recognize the fact that it is very tough selling new aircraft in competition with the price of older aircraft.

Mr. Nesbit: Do you have either a beginning or ending inventory in those four categories?

Mr. Ivory: The beginning inventory is about 6,500 aircraft not broken down by category.

Mr. Nesbit: Somebody must have it.

Mr. Ivory: Yes, but not here.

THE EFFECTS OF ECONOMICS ON AVIATION SAFETY

Ed Wood, Flight Safety Foundation, Inc.

Background

Some economic factors which affect commercial aviation safety are fluctuating oil prices, recessionary trends, the Graham Rudman Hollings Deficit Reduction Act, the lack of access to the Aviation Trust Fund, product liability, and of course, the Aviation Deregulation Act of 1978. The following analysis focuses on the present deregulated environment as the overriding economic factor and views the others as perturbations which further aggravate the safety of the system.

Before discussing these economic factors and their impact on safety. it is appropriate to go back to 1981, three years after deregulation, when the professional Air Traffic Controllers (PATCO) went on strike. This action reduced the number of full performance level (FPL) controllers from 13,300 to about 7000. To keep the system operating, then FAA Administrator Helms put supervisory controllers back to working traffic, borrowed military controllers and put a cap on the traffic capacity. With these measures, the FAA felt the air traffic system was safe but wanted an independent view and asked the Flight Safety Foundation (FSF) to assess the system in the fall of 1981.

After several months of scrutiny, FSF concluded that the system was safe with these FAA restrictions. It was strongly recommended that the cap on air traffic be lifted gradually, only as the FPL complement was increased. (Other recommendations were offered, however, they are not pertinent to this discussion.)

The FAA chose to remove the traffic cap prior to acquiring a full complement of FPL's (As of the fall of 1987, the number of FPL controllers is still below staffing requirements). As a result of this action, by 1986, 9000 FPL controllers were handling 4,000,000 more flights annually than the 13,300 FPL's handled in 1980.

Assessment of Exposure to Risk

The panel concurred that safety cannot be accurately measured by accident statistics alone. Accidents in air carrier operations occur randomly and infrequently, and thus do not result in statistically valid data. Safety is better assessed by exposure to risk. The following discussion addresses economically related increases in exposure to risk.

The effects on safety brought about by the economic deregulation of the airlines can be conveniently grouped as (a) those most directly associated with the federal government and (b) those associated with airline operation. Of course, all factors are interrelated and affect the safety of operation of the overall commercial aviation system.

a. Risks Associated with the Federal Government. The annual number of all near mid-air collisions (NMAC) has increased from 475 in 1983 to over 850 in 1986. During August 1987 there were nearly two NMACs per day. This reflects the increase in traffic and the shortage of qualified controllers to handle that increase in traffic. Unfortunately, attempts to regulate traffic levels through slot allocation procedures would have serious economic consequences in that some operators would be forced out of the system.

There are shortages of qualified FAA personnel in the ranks of air carrier operations inspectors, maintenance inspectors and technicians, and navigational aid technicians. Airport security also suffers because security inspectors receive low pay and their job is uninteresting and repetitious.

Historically, the application of FAA research and development funding is controlled by events. Research money is at times reprioritized according to the most recent catastrophic event.

A soon-to-be-published General Accounting Office report cites four basic factors in assessing the safety health of an airline:

- o Pilot competence
- o Quality of maintenance
- o Management attitude toward safety
- o Financial stability

Currently, the FAA places greater emphasis on the first two items in their safety assessments. To our knowledge, these latter two items have not been utilized in assessing the safety of airline operations, although our panel concluded they were equally important.

Management attitude toward safety has a strong effect on how each airline employee carries out his responsibilities. The increased economic pressures brought on by intense competition in the deregulated environment can adversely affect safety if top management does not convey strong emphasis on safety throughout the organization.

A financially strapped airline may not have adequate resources for the safe conduct of its operations. Insufficient resources force management decisions regarding this allocation to areas of immediate need in order to survive. In this situation, it is not improbable that safety will be adversely affected.

Agencies such as the National Transportation Safety Board and the National Aeronautics and Space Administration have inadequate resources to fulfill their responsibilities and potential in the area of safety. The lack of rightful access to the billions of dollars in the Aviation Trust Fund is a deterrent to the ability of those agencies which are responsible to provide adequate input to safety needs. However, agencies have not always performed well even when

supplied with adequate funds. Then National Airspace System Plan is behind schedule and has suffered major cost overruns. The FAA has not been able to spend all the appropriated money for this plan.

b. Risk Associated With The Airlines. A recent Air Line Pilots' Association (ALPA) safety survey of its constituents revealed that 67% of those responding believed that safety had declined with economic deregulation. Twelve percent (12%) blamed the perceived safety reduction on decisions made by inexperienced airline managers many of whom have entered the airline industry since 1978. The pilots' concern is that these entrepreneurs may be more interested in economic efficiencies than in safe operations. About half of the total respondents noticed a reduction in maintenance and/or airworthiness of the equipment they were flying.

Abuse of the Minimum Equipment List (MEL) concept appears to be reducing the integrity of maintenance and airworthiness. With the multiple redundancy of some airworthiness items in today's commercial aircraft. MELs can be established which permit an aircraft, with specifically named items not operating, to be flown to the next facility where spare parts and certified maintenance personnel are available to effect a repair. In today's economic environment some airlines employ fewer certified maintenance personnel and stock fewer parts. This has resulted in situations where aircraft are flown for longer periods before proper maintenance is performed. In the meantime, other items may become inoperable, increasing the number of deferred maintenance items and increasing the exposure to risk. The MEL concept is carefully worked out for an aircraft by the operator, the manufacturer and the FAA. Used properly, it is a method of permitting limited continued operation with adequate safety provisions. The extended operation of aircraft with, at times, multiple deferred maintenance airworthiness items is not the intent of the MEL concept. Further complicating this situation are economic pressures under which a pilot feels obligated to take a flight against his better judgement.

A somewhat surprising result of the ALPA Safety Survey was that over 80% of the respondents cited carry-on baggage as a distinct safety hazard. The tie-in to economics here is the desire for a competitive edge. Airlines which allow almost anything to be brought aboard an aircraft can attract passengers who are well aware of the inconveniences of being separated from their baggage in the deregulated environment where flight cancellations and delays are not uncommon. What many passengers do not realize is that in turbulence encounters, these items of carry-on baggage can become lethal projectiles and, in a mishap situation, can seriously impede rapid egress. From the pilots standpoint, the five pounds carry-on weight per passenger figure used for weight and balance calculations, can amount to errors of as much as 4000 pounds in the actual takeoff weight on some jumbo-jets. From the airline's perspective, less passenger baggage in the cargo hold allows for more room for revenue-producing freight.

While the demand for experienced pilots, maintenance technicians and, as previously discussed, air traffic controllers increase, the reserve from which to draw is decreasing. The reserve of World War II, Korean conflict and Vietnam pilots is no longer there or is disappearing. Present FAA basic

minimum requirements for an airline pilot are that he/she be 23 years old and have a minimum of 1500 hrs. flying time. This means that a person with those basic qualifications can be hired by an airline (usually a regional airline) and, after as little as a year, can be eligible for captain. Because of the salary differences, after accumulating sufficient flying time, those regional airline pilots frequently move to one of the major air carriers. This tends to keep the experience level in the regionals relatively low, again increasing the exposure to risk.

Economic pressures of deregulation have encouraged extended operation of presently owned aircraft rather than replacing them with new models, thereby increasing the average age of the fleet. This, in itself, is not unsafe as long as these older aircraft are properly maintained. As previously mentioned, present maintenance procedures can be questionable. Further compounding the problem, more FAA maintenance surveillance is necessary to assure airworthiness of these aircraft, but sufficient experienced FAA maintenance inspectors are not available to adequately perform this task. Aircraft which had previously been sold to non-U.S. operators have, in some cases, been repurchased by U.S. operators which also places additional demands for the determination of airworthiness.

The numerous mergers, which have taken place to increase economic advantage, can adversely affect the resulting single organization. Seniority lists are changed, different operation and maintenance procedures are thrown together, and in some cases job security is threatened. All these can affect the attitude of the employee toward his job. and this can affect how well his responsibilities are carried out.

Economic pressures have resulted in some operators reducing or eliminating their engineering and safety staffs. This then results in more reliance on the manufacturer for engineering information and reduces or eliminates adequate safety oversight both within and outside the airline.

Conclusions

This panel came to the following conclusions: Deregulation has been imposed by the government, therefore, the government must assume its share of the responsibility in assuring an airline system in which the exposure to risk is reduced to an acceptable level. In order to do this, proper surveillance of operations and maintenance must be assured. Access to the Aviation Trust Fund would be a significant accomplishment if accompanied by careful planning in the use of these funds.

There should be assurance by the FAA that existing standards are being met. Recent concentrated examinations of specific airlines which have resulted in millions of dollars in penalties are an indication that all is not what it should be in the system. In addition closer monitoring of airline compliance with existing regulations, consideration should be given to strengthening some of these regulations or adding new ones to eliminate the potential abuse of safety to gain a competitive edge. Examples of items to consider are the misuse of the MEL concept and the procedures for carry-on baggage.

It is not enough to keep saying "The system is safe because there are so few major catastrophes." Exposure to Risk must be the safety criterion. Public acceptance of the safety of the airlines is not related to the large numbers of people who fly. In many cases flying is the only practical means of transportation. Public confidence in the system will only be achieved when indicators of decreased exposure to risk can be shown i.e., fewer delays, NMACs, runway incursions, pilot deviations, operational errors, and accidents.

Finally, a significant first step has been made by including a safety input to this economics-oriented workshop. It is clear to those of us in the field of safety that safety is, without a doubt, affected by actions which are intended to be purely economic, and we appreciate being included in this conference.

It is time the economic and safety experts join forces to achieve a common goal. The FAA, in its assessment of the safe operation of airlines, should utilize its economic specialists for evaluating financial stability in conjunction with its technical personnel for evaluating the GAO-identified indicators when assessing the safety health of airlines.

Discussion

Mr. Swanda (General Aviation Manufacturers Association): It is unclear to me what your bottom line was about the safety of the air traffic control system. Do you think the air traffic control system today is unsafe?

Mr. Wood: No; in fact, I testified about a year ago to that fact. I worked as a consultant with the GAO on their look at the air traffic control system five years after the strike. They asked me to work with them because the Foundation did its own study right after the strike. I testified that the system is not operating at the same level of safety as it was in 1981. That may sound like weasel wording, but that is the way we feel. Not unsafe, but not the same level that you had back then because there are fewer controllers and four million more flights to handle.

Mr. Nesbit: Safety came up in our panel, and the general feeling was that publicity about safety has not adversely affected demand for air travel. I would tend to support Blackburn's comment that the general public still feels the same. We pointed out that there is clear evidence that many times passengers avoid carriers, certain types of airplanes, and even airport when a safety problem is highlighted; so the public is sensitive to this issue and it cannot be dismissed lightly. This was particularly true with the Electra and the DC-10.

The Future of Light Commercial and General Aviation: Regional

Fred P. Dibble, SAAB Aircraft of America

Since 1978, a lot of changes have taken place in our sector of the industry. Our group looked at four areas for the next five years through the 1992: 1) the technological advances, 2) economic and financial issues, 3) the operational concerns, and 4) the market forces. Members of our panel had solid backgrounds in areas from engineering and avionics to market planning.

As a result of the presentations that were made, and the discussions that followed, we found those four subjects extremely interlinked. You could not talk about one without something rolling off into another.

With regard to technological advances, currently our marketplace is in a re-equipment phase. A lot of new aircraft are coming on the market. Worldwide there are approximately a thousand aircraft on order or option to be delivered in the next five to six years. Improvements to those programs, with two exceptions, will be derivatives and minor things like stretch versions and improvements in operating economics. Embraer is developing a 19-seater of an unusual configuration, and Dornier has started a new 30-passenger aircraft. Development is limited because 1) most everybody made the decision six to seven years ago to develop some new airplanes; and 2) we are not far enough down the line in technological development to make a significant impact in the DOC reductions required for the additional capital expenditures. Our panel was unanimous that any technology incorporated into the regionals must have a real payback for the operator.

With respect to engine programs, the gestation period is about seven years from design to incorporation into operation. We expect to see certain improvements in SFC's and derivatives of extra additional horsepower, but no significant changes in the design of the turbine engines that are the standard in this turbo-prop market.

Regarding economic and financial issues, all you have to do is talk to an operator and his first question will be: "How much am I going to have to pay for this new airplane?" Most of the operators are not buying aircraft. They are leasing them. This is something new for the commuters. Four years ago, the typical lease term was 10 to 12 years. That was the most that a commercial bank would finance. Now, 14 to 16 is the norm, and recently there has been some serious talk about taking that term to 20 years. This follows the pattern of the large commercial transports.

Also, because this is such a new market, most of the banks do not have a solid feel for what the residual value of this aircraft or any of the new generation aircraft will be in 20 years or 15 years. We feel that the residual value will climb from the typical 20 to 25 percent to 35 to 40 percent. Many deals are being made in that range. The financial markets are beginning to accept the regional aircraft for what they are, and that is long term productive asset in their portfolio.

Operational concerns. Most of these concerns are oriented around regulatory issues. We are starting to see more limited access to airports, and

the commuters will probably bear the brunt of that. At Boston, there is a Massport proposal to take most of the commuter traffic out of Boston Logan and move it elsewhere. The West Coast is the same way with noise and traffic restrictions and talk of peak time access charges. That type of change particularly hits the commuters where those charges are spread over only 19 to 50 seats instead of 175 or more in the large transports. While the goal is to improve safety, the result of additional avionics requirements will probably be to force the smaller operators out of business -- what we call our "fourth tier" operators. If flight data recorders are required on aircraft of 19 or fewer seats the cost for the data recorder alone would be on the order of \$150,000, not including installation and down-time. When you think that many of our operators consider \$350,000 to \$500,000 profit a good quarter, and they have fleets of 40 airplanes, that expense can take away a lot of profit in stockholders' return.

With regard to the market forces, ownership and effective control of most of the regionals is now dominated by the majors. Ninety-five percent of the regional passengers tickets are written through a major. They have done this by stepping up their equity infusion, either through stock purchases or loans. They have even leased the equipment that they are going to use; and they have done this with the ability to avoid liability if the carrier should fail or be sued. This will continue to expand. Texas Air, American, and others, will all end up purchasing their own commuters. It is a way to protect the traffic that they need at their hubs.

Once a commuter has come in to the major airlines' fold, its identity is lost and it not longer needs marketing people, a lot of management people -- especially the yield management people and scheduling people. All that is done by the major. However, the commuter gets access to the all-important ground-side position in the airport. No commuter has survived cutting the strings from its major and that will continue to be the trend. They are an operating arm of the majors, and they want to be perceived as that quality of carrier.

The result will be a small number of commuters. Currently, of the top 50 U.S. commuters only three are non-aligned, and they will probably fall by the wayside. The development of the "fourth-tiers" of commuters will not be significant. They will be small point-to-point carriers in areas in the Midwest and West, that serve the smaller cities with inadequate traffic for the jets and the large turbo-props. With 19 to 30-seat aircraft they can make a living, however.

Many small markets will lose their subsidized service. As profit rationale takes over, small cities in Kansas, Colorado, Nebraska, and similar states, will lose their service. There just is not enough traffic to support the capital investment in an aircraft to fly between those points.

Despite the gloom, traffic for major regional carriers continues to grow at eight to nine percent, and we see that continuing. The growth figures will probably be higher this year, but tapering and paralleling the growth of the majors as hub saturation is reached. There are a lot of dollars being pumped into that segment right now by the operators. Typical costs of a 19-passenger airplane is \$3.5 million. 30-passenger to 40-passenger planes are in the \$7 million range. The growing influence of these operations by the major airlines

is the significant marketing advantage from capturing the customer as soon as he starts his trip in order to carry him on your airline for the longer trip. One West Coast airline has said that their feed contributes \$20 million to the bottom line annually. That is important and cannot be ignored; but there is still a lot of turmoil left in this market. Some of the smaller operators will fall out and older equipment will be phased out. We expect that the next five years will prove to be as interesting as the last five years.

Discussion

Mr. Wood (Flight Safety Foundation) : I understood you say \$100,000 for a flight data recorder without installation. That sounds awfully high. Is that an accurate figure?

Mr. Dibble: The people at the Regional Airline Association and the operators say that none of these small airplanes have the wiring or the sensor systems installed for the flight data recorder so you have major down-time in developing a harness to take off engine parameters and things like that. A certain amount of data can be gotten off of the gauges -- the sensors -- but the rest of the system is not in place; and they do not have things like digital data busses to go into. It becomes a very costly thing in terms of man hours to require those aircraft and develop the system.

Mr. Wood: So you are counting the labor and everything in that figure?

Mr. Dibble: I think so.

Mr. Wood: I thought you were talking about an off-the-shelf recorder which might be \$10,000 to \$12,000.

Mr. Dibble: That is right, but the installation to get that in the airplane could break several of the carriers.

Mr. Wood: Has there been any consideration for a modified flight data recorder with just the basic parameters.

Mr. Dibble: One of the best proposals that I have heard of is a sophisticated cockpit voice recorder that, with altitude callouts from ground proximity warning, you could take feed off of that and pick it up in the cockpit voice recorder.

Mr. John Griffith (Boeing): How many commuter airlines do you foresee being in existence at the end of this five year horizon. Also, what kind of fleet size are we talking about on average just in the lower 48 States considering the tie-ins with the majors.

Mr. Dibble: Each major (depending on which forecast we have heard today as to how many majors there will be left) will have an operating arm. You will not see individual carriers. You will not see a ComAir, Business Express, or Brockway; they will be operating arms like the Delta Connection, so they lose their identity completely. Currently, there are about 1,800 aircraft in the commuter fleet. That includes a lot of piston engine aircraft that have nine seats. All of those will probably be gone over a period of time, except for the "fourth-tier" carriers.

The Future of Light Commercial and General Aviation: Business Aviation
 Ron Swanda, General Aviation Manufacturers Association

Business Aviation is defined as the employment of privately owned aircraft, used primarily for transporting people, at times and to locations dictated by business needs and priorities. Business Aviation and Airline business travel together make up the total business air transportation market. As such, Business Aviation travel and Airline business travel are common substitutes. Factors affecting the choice of one mode of travel over the other often changes each mode's "share" of the total business air travel market. Still other factors lead to increased use of business air transportation, thus expanding the total market for each mode. In order to look at the future of Business Aviation, one must first understand the relative size of the air transportation market and some of the factors that have traditionally influenced it.

Business Aviation includes the full range of general aviation aircraft in the fleet today. For the purposes of this report, however, business helicopters are not directly addressed. Helicopters are considered separately in this TRB Circular, even though many of the factors discussed in this section apply equally to business helicopters.

Size of the Business Aviation Market

The total size of the U.S. business air transportation market is estimated to be \$29 billion in 1987, broken down as follows:

Table 1
 Business Air Transportation Market

Airline business travel:	\$20 billion
Business Aviation:	<u>\$ 9 billion</u>
Total business air transportation:	\$29 billion

In 1987, based on total expenditures, Business Aviation met approximately one third of U.S. business air transportation needs. The 1986 Business Aviation fleet in the U.S., according to FAA surveys, consists of the following aircraft:

Table 2
 Aircraft in the Business Aviation Fleet

Single-Engine Piston	36,908
Multi-Engine Piston	15,110
Turboprop	3,935
Turbojets/fans	3,899
Rotorcraft	<u>3,035</u>
Total Business Aircraft	62,887

Business Aviation aircraft are approximately 29 percent of the total general aviation fleet of 220,000 aircraft. In 1986, Business Aviation flew approximately 12.6 million hours, or 37 percent of all the hours flown by general aviation. The FAA has estimated that U.S. commercial air carrier aircraft flew approximately 8.5 million hours in 1986.

Because of the inherent flexibility of general aviation aircraft, they operate at many landing facilities not served by air carriers. For companies with facilities located in these areas, Business Aviation travel may be the only efficient means of transportation.

The FAA reports that there are 16,582 landing facilities in the U.S., 5,434 of which are airports open for public use. All of these airports can be used by at least one type of Business Aviation airplane. In contrast, only 213 airports in the lower 48 states receive air service from a major or national air carrier. An additional 360 airports receive service from commuter or regional air carriers.

Overview of the Business Aviation Industry

Demand for Business Aviation travel is most frequently measured by the number of hours flown by Business Aviation in a year. Table 3 indicates the results of the FAA's survey of Business Aviation for the period 1977 - 1986. Another common indicator of the Business Aviation industry is the shipments of new turbine aircraft. Table 3 presents data on these shipments from 1975 to 1987.

Table 3
Business Aviation Flight Hours and Aircraft Shipments

<u>Year</u>	<u>Bus. Aviation Hours Flown</u>	<u>Shipment of New Turbine Bus. Aircraft</u>
1975	Not Available	529
1976	Not Available	555
1977	14,439,447	655
1978	17,319,382	805
1979	18,552,625	994
1980	17,300,790	1,305
1981	17,120,911	1,456
1982	15,032,140	858
1983	13,725,332	570
1984	14,427,234	476
1985	13,429,035	455
1986	12,589,697	323
1987E	Not Available	351

Unfortunately, the annual FAA survey on the number of Business Aviation hours flown is too infrequent and the results are delayed too long (10 months from year end) to make it a useful indicator of current Business Aviation activity. Likewise, using new aircraft shipments as the primary indicator of Business Aviation activity ignores the fact that new aircraft sales comprise only 14 percent of total general aviation industry revenues. New aircraft sales are also subject to factors not directly related to the underlying demand for Business Aviation travel, such as actual or proposed changes in corporate tax laws or capital investment incentives.

Activity in the used turbine aircraft market is another indicator of Business Aviation activity. Table 4 presents used aircraft sales in the U.S. for turbine aircraft in the years 1980 - 1987.

Table 4
Used Turbine Aircraft Sales

<u>YEAR</u>	<u>RETAIL SALES</u>
1980	988
1981	1,390
1982	1,224
1983	1,902
1984	2,049
1985	2,246
1986	2,181
1987E	2,075

Since the size of the Business Aviation fleet has grown only about 2 percent per year in recent times, it is apparent that most of the current demand for Business Aviation transportation is met by the existing fleet of aircraft. How this fleet is being used, as measured by the average hours per aircraft per year, is therefore very significant.

Table 5
Average Hours Flown Per Aircraft Per Year
(General Aviation)

<u>YEAR</u>	<u>SINGLE ENG. PISTON</u>	<u>MULTI-ENG. PISTON</u>	<u>TURBOPROPS</u>	<u>JETS</u>
1976	168.1	251.1	540.6	484.3
1977	166.5	280.4	533.4	509.0
1978	172.4	263.7	509.2	475.2
1979	180.2	273.2	511.7	473.2
1980	168.2	254.8	433.4	443.6
1981	165.8	251.1	470.1	436.3
1982	149.1	230.6	396.3	404.0
1983	139.1	230.5	389.4	382.2
1984	137.7	218.2	414.2	353.6
1985	139.5	207.6	362.0	368.7

From the data presented above, the following observations can be made:

1. The use of Business Aviation peaked in 1979, while the sales of new Business Aviation turbine aircraft peaked two years later in 1981.
2. Unlike the U.S. economy, Business Aviation did not bottom-out and then turn-up after the 1981-82 recession.
3. As demand for Business Aviation lessened, remaining demand was satisfied by the existing fleet of business aircraft. This caused the retail sales market for used turbine aircraft to more than double from 1980 levels.
4. As the Business Aviation fleet ages, average utilization rates decline. Average aircraft utilization for the turboprop fleet declined 32

percent and average utilization for the jet fleet declined 28 percent in the period 1977-1985. This is a much larger drop than can be explained by the normal aging process of the fleet, thus indicating unused capacity.

Explanatory Factors

Several key factors have contributed to the decline in the use of Business Aviation aircraft. Understanding these factors will explain the past and help to predict the future.

1. Alternative Travel. Since being deregulated in 1978, average fare levels for Airline travel have increased only 38 percent, while general prices, as measured by the Consumer Price Index (CPI), have increased 69 percent. In addition, 60 percent of the airline fares available today are discount fares, and 91 percent of airline travellers are using a discount fare. During this same period, the cost of owning and operating business aircraft climbed faster than the CPI. Those cities receiving airline service also have more service than in 1978. Businesses have therefore found it relatively convenient and less expensive to fly on airlines than to use Business Aviation. Accordingly, Business Aviation has lost market share to Airline travel in spite of the fact that the total amount of business travel has increased. In fact, domestic revenue passenger miles for Airline travel grew from 203.2 million in 1980 to an expected 311.4 in 1987, a growth of 53 percent.

2. Economic Factors. In the late 1970's, as competition from foreign countries began to challenge U.S. businesses, U.S. manufacturers began to move plants into more rural areas in order to take advantage of lower labor rates. At the same time, relatively high fuel prices led natural resource companies to expand their exploration of new areas. Often times these new locations were not served by airlines, or had a frequency of airline service that made business travel very inefficient. Consequently, these companies found a need for Business Aviation. In 1980, for instance, the oil industry alone accounted for 17 percent of all the business jets (new or used) sold in the U.S. Finance and real estate companies, on the other hand, bought 9 percent of the business jets.

After the 1981 - 1982 recession, the financial state of manufacturing and natural resource companies was slow to improve. As their demand for business travel stagnated, these companies often decreased the size of their flight departments, thus putting low-time used aircraft into the market place at relatively low prices. Companies that did prosper after the recession often chose to buy used rather than new aircraft, keeping average aircraft utilization rates low. Even though the economy had recovered, real. after.tax corporate profits were not growing uniformly, and the rate of change was not as robust as many businesses had experienced in the late 70's. Consequently, the demand for Business Aviation continued to decline.

As the U.S. economy has continued to grow since the 1982 recession, it has often been service companies that have grown fastest. Because of their nature, most service companies do business in major metropolitan areas that are well-served by airlines, so their demand for Business Aviation is less than manufacturing and natural resource companies.

In 1986, oil companies accounted for only 5 percent of all the business jets sold in the U.S., while the finance and real estate industries accounted for 23 percent of the jets sold. The percent of jets bought by the textile, chemical, and machinery industries has grown only slightly. Service industries accounted for 8 percent of jet sales in 1986, about the same percent as in 1978.

3. Infrastructure Issues. The air traffic controller strike of 1981 had a chilling effect on Business Aviation. Suddenly, company aircraft valued at millions of dollars appeared to lose a great deal of their utility. Even after the initial days of the strike, Business Aviation operators had to make advance reservations to fly, and capacity was severely restricted. Many corporations realized that because of something completely out of their control, their company aircraft was no longer reliable. In spite of the fact that the air traffic system was restored, the value of a business aircraft in the mind of company executives may have been permanently altered.

Today, extensive air traffic delays, often caused by peak traffic loads associated with airline hub and spoke systems, continue to threaten the reliability of traveling by air. These delays affect the Airline traveler primarily, but also often spill over to the Business Aviation traveler. Inasmuch as airline delays increase the need for alternate, more reliable and efficient travel, airline delays may have a positive effect on Business Aviation's market share. But whereas they create fear and distrust of the air traffic control system, delays could serve to lessen air transportation's share of total inter-city travel. The effect of this shift would be primarily felt by the Airline industry, but Business Aviation could also be impacted.

As air transportation continues to grow, available landing times at major air carrier airports will be highly contested. Business Aviation travelers, for the most part, use outlying reliever airports rather than major air carrier airports. Business Aviation traffic at New York's Kennedy, La Guardia, and Newark airports, for instance, is only 7 percent of total traffic, and this percent has been declining. As unused airport capacity becomes scarcer, large airports will greatly increase landing fees for Business Aviation aircraft, and some will propose outright bans on general aviation.

It is very difficult to add new air carrier airport capacity to our air transportation system, and no new air carrier airports have been built in the last 10 years. The FAA, however, has helped fund 36 new general aviation airports since 1982. The relatively low cost of new general aviation airports, and the continued operation of the Aviation Trust Fund, makes it likely that Business Aviation travelers will be able to find landing sites near their destination city.

Business Aviation Outlook

Short Term. During the next five years, the use of business aircraft will continue to grow at approximately the same rate as the GNP. Because the size of the business aircraft fleet will stay relatively constant in the short term, aircraft utilization rates will gradually increase. As this happens, firms owning aircraft will be less likely to want to sell them unless an appropriate replacement or an additional aircraft is available. Manufacturer's aircraft

inventory, already low for many models, will dry up. Used aircraft prices will rise, and some increase in demand for new aircraft will result. New turbine aircraft shipments will increase from 350 in 1987 to 535 by 1992.

As the U.S. dollar continues to drop, and U.S. manufacturing industries find themselves more internationally competitive, they will once again assume their traditional role as significant aircraft buyers and users. Increased profitability of the oil industry could also mean their return as aircraft buyers. The lower dollar will also lead to increased U.S. aircraft exports.

If U.S. GNP should grow more slowly than expected, or not grow at all, Business Aviation will parallel that trend.

Long Term. Business Aviation's share of the business air transportation market will gradually increase. Because fuel costs are a larger percentage of the total cost of operating an airliner than a business aircraft, increases in fuel prices will increase the price of airline tickets more than it will increase the cost of operating business aircraft. The relative price advantage enjoyed by the airlines will begin to lessen.

As air traffic system congestion and delays increase, more Airline business travelers are likely to conclude that a more reliable and efficient means of transportation must be found. Although Business Aviation will be impacted by air traffic system delays too, business travelers will find that business aircraft can minimize the impact these delays have on business travel.

The high cost of producing Business Aviation aircraft will be somewhat reduced as manufacturers become more efficient through the application of advanced manufacturing technology and management techniques. Significant price benefits could result, serving to further stimulate demand. Technological improvements to new aircraft will be undertaken only when meaningful performance or cost benefits are evident.

Changes to the U.S. tax system encouraging capital investment will stimulate business aircraft purchases.

Changes in U.S. product liability laws affecting Business Aviation, if enacted, could allow a return to rational and predictable liability expenses for aircraft manufacturers. The rapid increases in aircraft prices seen in recent years could subside, and stimulation of new aircraft demand could result.

The Future of Light Commercial and General Aviation: Helicopters
 Lt. Col. Lawrence P. Peduzzi, Federal Aviation Administration

The purpose of this report is to summarize the Civil Helicopter Panel's discussions and conclusions which may be useful to both the public and private sectors.

The Civil Helicopter Panel consisted of a very credible cross section of the industry, which included private operators manufacturers, associations, and representatives from the FAA, NASA, and DOD.

After a review of existing economic conditions, the panel members articulated present day problems which prevent growth and prosperity in the helicopter industry. These problems are:

- Public Acceptance
- Lack of Public Heliports
- Liability Insurance
- Lack of Standardized FAA Enforcement
- Industry Fragmentation

These problems must be considered when assessing the future. Without solutions, the civil helicopter industry's growth will be inhibited. The present day problems addressed by the Panel are only highlighted in this report. Because these problems lie mainly within the purview of the Government, they will be addressed in detail in a separate report to the FAA. The report to the FAA will recommend near-term solutions to the industry's pressing road-blocks.

The discussions on the future of civil helicopters concentrated on a 10-year span of time. The assessment generally substantiates the 1985 Workshop Report. (See Transportation Research Circular No. 299 February 1986).

Our discussions on the future involved the broad areas of:

1. Market Conditions
2. Government/Industry Structure
3. Liability Insurance
4. Technology
5. Infrastructure

1. Market Conditions.

In considering market conditions, helicopters and helicopter services were segmented into five submarkets.

- a. Offshore
- b. Business and Corporate Use
- c. Commuters and Intercity Services
- d. Public Service - law enforcement and emergency medical service
- e. Manufacturing

a. Offshore: The market for helicopter operations in the offshore oil industry will remain at present levels for the next 2 years. An upswing in the oil industry is expected in the early 1990's. This upswing will precipitate an increase in demand for helicopter operations, and new oil fields will be explored and developed at greater offshore distances. The demand will follow for larger helicopters with greater speed and range.

b. Business and Corporate Use: Stable to modest growth is predicted. The first and most critical issue to growth and promotion of corporate executive transport business is the establishment of downtown heliports. Availability of such landing sites is essential to developing a viable corporate helicopter market. Opposition to construction of heliports is strong and public education is required to allay unfounded fears and to reduce misinformation. The FAA and industry must work together to develop clear cut heliport design criteria and noise regulations that will foster the growth of heliport development and the helicopter industry in general.

Constructive solutions are needed to improve helicopter access to airports. Specified helicopter approaches into and out of airports, out of the mainstream of fixed-wing traffic, need to be developed to allow the helicopter to exploit its unique performance capabilities.

The FAA Heliport Design Guide must evolve to accommodate the tilt-rotor, which will also help accommodate the helicopter in downtown areas. These actions will enhance corporate transport business.

c. Commuters and Intercity Services: Helicopter commuter and intercity services are presently concentrated in the Northeast U.S. (NEW YORK/NEW JERSEY/PHILADELPHIA/BOSTON).

There is a significant demand for point-to-point travel among the larger cities, specifically in the northeast. The lack of a public-use heliport in Washington, DC is a real impediment to connecting our Nation's capital to other major north eastern cities via helicopter. The development of advanced rotorcraft, such as the EH101 and Tilt-Rotor, makes pursuit of an aggressive heliport development effort imperative if we intend to accommodate these aircraft and exploit their usefulness to the Nation's transportation system. More effective use of existing helicopters and use of the tilt-rotor could be a boom for major cities and have significant potential to enhance the capacity at major metropolitan airports.

The problems of airspace procedures, lack of heliports, noise, environment, and zoning considerations must be overcome in dealing with the expanded use of rotorcraft for point-to-point travel and heliport development. The public sector must be convinced that the helicopter and tilt-rotor are viable and necessary links in the Nation's air transportation system.

d. Public Service: Public service helicopters performing law enforcement and emergency medical service missions represent one of the most rapidly growing segments of the helicopter industry.

There are over 230 public service agencies flying approximately 570 helicopters. Most of the activity has been in the U.S. The trend is toward continued growth. Growth is predicted overseas but not nearly as dramatic as in th U.S.

Enhanced heliport facilities for emergency medical flights will be needed. There are approximately 1,400 private-use heliport facilities designed for emergency medical evacuation. Many of these facilities are at community-owned hospitals. Although the heliport is private-use, any helicopter operator may land at the facilities with a medical emergency patient on board. The term "private-use" applies here as a restricted use which is determined by the purpose of the heliport.

It is possible, with minor change in the enabling legislation, to fund development and safety improvements at hospital heliports through the Federal airport development grant process. At nonprofit hospitals, future Federal assistance in heliport development may be in the best interests of the Nation, even though these facilities are classified as private-use and are designed for the sole purpose of medical evacuation.

Potential technology transfer from the military to the private sector is not exploited. There are several existing or near term technological concepts that would be welcomed in the public service community. A "heads-up display," for example, would allow an emergency medical service pilot to monitor aircraft limitations while making an approach to an unimproved landing area. The public service operators' mission would be greatly enhanced by certification of this and other near term advances being developed in the military sector. NASA should act as the conduit between the manufacturers, the military, the FAA, and the public service community.

e. Manufacturing: Approximately 375 new helicopters are expected to be delivered in the world during 1988. A hundred of these will be delivered domestically. Other reports predict that 14,000 helicopters will be produced worldwide in the next 10 years. This equates to approximately \$65 billion worth of helicopters. A \$15 billion, 6,000 helicopters share is forecast for the civil sector, and \$50 billion, 9,000 helicopters share is forecast for the military sector.

Helicopters will become even more reliable. Real direct costs of operation should improve. Lower acquisition and spare parts costs will help stimulate the market. Product liability costs will have to come under control and back to pre-1984 levels. New production sources hold promise for reduced manufacturing costs. Assuming product liability comes under control, the outlook is reasonably positive for this period in which tilt-rotor aircraft will replace some helicopters and complement the operations of others.

2. Government/Industry Structure

Progress within the helicopter industry is dependent on significant enhancement of communications between government and the industry. The industry continues to perceive that they are made to operate with outdated regulations that forces operation in a system designed for fixed-wing aircraft only.

A review of FAA rules and regulations pertaining to helicopters/heliports was suggested. If feasible, the development of one set of regulations addressing rotorcraft would be desirable and was endorsed by the panel.

Lack of sufficient information about the helicopter industry reduces the industry and FAA's ability to educate the public on the safety and utility of the helicopter. Government and industry statistical gather methods differ significantly. The resulting analysis and forecasts, therefore, are often misleading and conflicting. A comprehensive review of the statistical gathering methodology of the FAA, NASA, NTSB, and the representative industry associations needs to be accomplished.

A consensus was clear that the industry needs the FAA to be more proactive. Specifically in their promotion of aviation role toward the helicopter industry. More heliports are needed now and for future tilt-rotor aircraft. The lack of suitable helicopter landing areas is stifling the industry.

3. Liability Insurance: Insurance costs of all types have driven many operators out of business. These high costs continue to stifle the industry to a significant degree. Several industry initiatives are planned to directly influence the cost of liability insurance. These initiatives are enhancing safety through human factors training to flight and maintenance crews on judgment and discipline; improved methods of measuring and controlling direct costs of helicopter operations; expanded use of simulators for training and certification; and development of a program that calls for mandatory helicopter and pilot checks.

Several bills relating to tort liability reform have been introduced in the Congress (H.R. 2238 and S.473) that are intended to provide some relief from the high cost of product liability insurance. Passage of these bills is possible in 1988. These legislative actions will have a positive impact on reducing the liability insurance costs and remove a major obstacle to industry growth.

4. Technology: Department of Defense (DOD) rotorcraft initiatives and programs are sophisticated and very impressive. However, it appears that our process of technology sharing between major Government agencies is lacking. A significant need exists for an enhanced process of intra-government sharing and transferring of technology for the benefit of the civil helicopter industry. Specific military technology transfer opportunities for civil application are entire airframe programs; broad functional areas in propulsion; composites; cockpit systems; rotors; antitorque systems; reliability, maintainability, and availability. Specific systems are heads-up display (HUD); electronic visual systems; automatic approach to hover; and navigation systems encompassing global positioning system (GPS).

Noise is still considered as a drawback to the rapid expansion of civil helicopter use. The current NASA/Industry National Rotor Noise Reduction Program is an excellent example of a cooperative effort and is achieving technical results yet to be applied in practice. Greater emphasis and application of technical results is required to continue rapid civil helicopter growth.

The big challenge in making these new rotorcraft systems cost-effective is for manufacturers and FAA to develop new analytical concepts and methods so as to make certification as least costly as possible. The NASA appears to be the most appropriate agency to serve as the focal point for coordinating this technology transfer regarding rotorcraft. A strong consensus was expressed that an increased emphasis is needed to expand the research and operational data bases and the sharing of these data bases among military and civil users.

The most exciting area of rotorcraft technology is the tilt-rotor development. A joint FAA/NASA/DOD study on the civil applications of tilt-rotor aircraft has just been completed. The study examined potential applications of the tilt-rotor, specifically V-22 technology, to the civil marketplace. A series of transports were examined, ranging in size from 8 to 75 passengers, with special attention to V-22 derivative designs. The transports were analyzed for applicability and economic viability in several markets: high-density metropolitan, low-density population centers, cargo/package express, public service, and resource development. The study concluded that:

- o the civil tilt-rotor is a unique vehicle with a large market potential.
- o the civil tilt-rotor is superior to multi-engine helicopters under most conditions.
- o success of the civil tilt-rotor depends on the success of the military V-22 tilt-rotor.
- o additional work is required to optimize the civil tilt-rotor's competitive economics, through application of advanced technology and innovative design.
- o a national civil tilt-rotor transportation plan, including suitable infrastructure and a technology demonstration program, is needed.

Good potential exists for a minimally modified military V-22 to serve as a civil demonstrator by 1994. A fleet of 10-15 civil tilt-rotor aircraft could be providing commercial services by 1998.

5. Infrastructure: The basic infrastructure that helicopters operate in is segmented into the three broad areas of: (1) operations within the National Airspace System; (2) use of heliports; and (3) the certification process of flight and maintenance crews and aircraft. This infrastructure aligns directly with the three primary areas of the FAA's Rotorcraft Master Plan -- Integration in the National Airspace System; Heliport Development; and Certification. The goals of the FAA plan are to enhance the National Airspace System (NAS) to permit rotorcraft to employ their unique capabilities to the maximum extent, to provide for an adequate system of visual flight rules/instrument flight rules (VFR/IFR) heliports, and to improve safety through certification by upgrading criteria and applying advanced technology.

The FAA's Rotorcraft Master Plan is a good plan that addresses all aspects of rotorcraft requirements through the year 2000 in the areas of National Airspace System, heliports, and certification. This plan has recently been revitalized through realignment of management responsibilities. Enhanced coordination with industry on the plan's implementation and progress is needed. The coordination process should review the plan for validity, and focus on integration of the plan into the FAA's major capital expenditure documents.

Conclusions

Market conditions indicate that the civil helicopter industry will experience slow, but steady, growth over the next decade.

Significant roadblocks to more moderate growth exist. An enhanced Government/Industry communication process must develop if these roadblocks are to be overcome. Key among these significant roadblocks is the lack of properly located public-use heliports. A more cooperative and mutually understanding relationship between Government and the Industry is necessary. A positive climate is developing and expected to continue in which the industry can continue to expand and realize the full potential of rotorcraft in enhancing the Nation's transportation system.

Liability costs are a substantial drain on the industry. But, relief through industry initiatives and Congressional action is expected.

The U.S. rotorcraft technology is expected to continue to provide world leadership. A civil tilt-rotor aircraft is expected to be in service within the next decade. Added emphasis on the application of rotorcraft noise reduction is necessary. However, our ability to share and transfer appropriate technology with other Government agencies to realize benefit to the civil industry in a timely manner needs significant improvement. The NASA should take the lead to serve as the focal point for coordinating appropriate technology sharing and transferring.

The present infrastructure in which the civil helicopter industry operates meets minimal requirements. A good plan exists in the form of the FAA Rotorcraft Master Plan to cause significant improvements to our infrastructure over the next decade. The primary challenge is to exercise the Government/Industry system to cause the plan to be implemented.

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Legend

A/C MFG	=	Airline Aircraft Manufacturing Developments Panel
IR	=	International Ramifications of Deregulation Panel
LC & GA	=	Light Commercial and General Aviation Panel
LC:BUS	=	Light Commercial and General Aviation Panel: Business Aviation
LC:HCP	=	Light Commercial and General Aviation Panel: Helicopters
LC:REG	=	Light Commercial and General Aviation Panel: Regional Carriers
MF	=	Market Forces in the Deregulated Aviation Environment Panel
PRESENTER	=	Major Presentation
SAFE	=	The Effects of Economics on Aviation Safety Panel
TRB	=	Transportation Research Board Staff