PART III FORECASTING AIR-CARRIER ACTIVITY

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LONG-TERM TRENDS AND FACTORS INFLUENCING AVIATION FORECASTING

General Trends and Issues

Reliable long-term forecasts are critical for all parties involved in commercial air transport, including airlines, aircraft manufacturers, airport operators, corporations dependent on air transport for air cargo or express services, tourist agencies, hotel operators, and so forth. If the Federal Aviation Administration is to perform its several functions related to the promotion and facilitation of aviation (air traffic control, airport maintenance and expansion support, and safety inspections), the agency must have a reasonably reliable forecast of future demands on the system. It is imperative that FAA, as well as other actors involved in the air transport system, know when and where various demand levels will exist. They must know where people are most likely to require air service and airport facilities, how many aircraft will be in the system, how fast and at what capacity they will be flying, and at what frequency service between points will be provided.

Decision making and policy implementation are not simple, straightforward processes. Even when some variables are known, several factors continue to make forecasting difficult. Each factor has somewhat different forecasting needs. For example, FAA and manufacturers are more concerned about long-term capital investments, while airlines are more interested in accurate short-term forecasts to guide decisions about such matters as aircraft leasing or large equity investments. For airport authorities and local government officials, political factors make it difficult to anticipate when and what projects may receive government funding. Elected officials, who make spending decisions, must balance constituent needs and demands with those of the Nation at large. It is not easy to vote for funding measures which could have a negative effect on constituents. Planning airport facilities, ATC computer acquisition programs, or weather prediction equipment are ultimately politically affected choices. Likewise, identifying alternative plans and research and development projects worthy of government funding can be politically influenced.

At the global level, discussions affecting international air transport are often even more problematic because they involve multilateral negotiations. The characteristics of large, diverse groups make international decision making a longer, more complicated and even less predictable process than at the domestic level. Global-level decisions which affect aviation take place primarily by agreements between nations. The International Civil Aviation Organization (ICAO) and to a lesser degree in the International Air Transport Association (IATA) also play significant roles in formulating a global system. The most critical types of decisions made by ICAO are those establishing standards, such as noise pollution or safety standards, which must be met by all nations.

Uncertainty of some input variables affects the quality of FAA forecasting. One way to deal with this uncertainty would be to create alternative future scenarios instead of single-point forecasts. Pursuing the multiple-scenario approach might result in more useful forecasts, in that it would be possible to identify the parameters (demographic, environmental, technological, energy, and so forth) that could delimit aviation behavior. Such a forecasting approach might also provide more effective and efficient means to identify significant technological research and development needs. In the early stages of technology-related research and development, it is difficult to predict which alternative might be the more likely to result in the most beneficial returns. Choosing one out of several technologies to fund essentially eliminates the competitive development of alternative technologies. Establishing parameters rather than specific outcomes may facilitate better decision making about issues such as these.

Similarly, forecasting might be enhanced by reframing fundamental questions about the future development of aviation. For example, are airlines in the business of flying airplanes, managing assets, providing intercity transportation of goods and people, or all three? Each perception of an air carrier's purpose generates a different style of management and set of forecasting requirements.

Energy Issues

The long-term availability and cost of energy remain important and somewhat uncertain variables. Aviation forecasting could be improved if a reliable indicator were developed. While petroleum supplies appear to be sufficient to support aviation for the next 20 years, the real questions are access and cost. Despite political instability in the prime producing region of the Middle East, there are enough sources of oil elsewhere in the world that certainty of supply and access are virtually guaranteed, even though these sources may be more difficult to reach.

Energy costs are affected by technological advances in various stages of production and the introduction of energy substitutes. Historically, these two factors have resulted in stable and, in fact, decreasing real costs of energy. Energy costs are also affected by supply and demand. Whenever access is threatened and demand remains constant (as during the OPEC embargoes of the 1970s, the initial stages of the Iran-Iraq war, or the current situation in Iraq), costs rise. This has a negative effect on air carriers because they are heavily dependent on oil products and because airline profit margins are historically slim. Thus, it is difficult for them to absorb higher commodity costs without raising fares, which in turn might affect consumer demand.

While the direct effect of oil price rises on operating costs for air carriers is significant, perhaps more dramatic will be the effect on the U.S. economy as a whole. Teetering on the edge of recession and dangerously dependent on petroleum for continued productivity, high energy costs for a sustained period of time could cause corporations and individual consumers to cancel travel plans, especially if they involve higher air fares.

Currently, aviation industry analysts estimate that oil prices will peak in the winter of 1990-1991 at a level 5 percent higher than prior to Iraq's invasion of Kuwait. Aviation analysts generally agree that this will be a short-term shock. Nevertheless, increasing energy costs coupled with a weak, if not recessionary, economy will probably contribute to a decline in air traffic. If these predictions are accurate, 1991 promises to be only the third time in the modern history of commercial aviation that traffic has decreased. Short-term air carrier responses to rising fuel costs will probably be limited to grounding old, fuel-inefficient aircraft and operational practices to reduce fuel consumption.

Equipment

Predicting equipment requirements is critical to both aircraft manufacturers and air carriers. Manufacturers need long lead times to develop and produce aircraft and engines. They must also be aware of special needs--such as range, capacity, and fuel efficiency--in order to plan production. Air carriers need to know when and what type of equipment is available for purchase or lease. Fleet management decisions are rational, but only as good as the information upon which they are made.

Perhaps the most dramatic influence on equipment needs has been the result of technological advances to increase the durability of aircraft and engines. With proper maintenance, the practical life span of the average commercial aircraft has increased dramatically from the once standard notion of 25 years to a potential 40-50 years. Virtually no commercial jet aircraft have been retired over the last 10 years worldwide. This trend is likely to persist into the future. If combined with a recession and slowed growth, this could have a devastating impact on equipment manufacturers.

Three other factors could influence future equipment needs:

(1) If oil prices stabilize at a much higher level than the currently predicted 5-percent increase, there may be an intensified demand for improved fuel efficiency. Airframe and engine manufacturers might return to designs (e.g., unducted fan engines) that were begun at the end of the 1970s in response to high energy prices but left on the drawing board. While costly from the standpoint of research and development funds, long-term benefits in the form of new and necessary products could accrue from commercialization of such technology.

(2) Manufacturers are concerned that current orders reflect a desire on the part of air carriers to ensure aircraft availability rather than an accurate assessment of their fleet needs based on perceived expansion plans. Aircraft orders far exceed what typical forecasts of traffic growth would indicate are appropriate.

(3) Any type of mandatory retirement regulation would affect equipment producers and airlines. Such a requirement could be the result of safety or environmental concerns about noise or air pollution.

SHORT-TERM TRENDS AND FACTORS INFLUENCING AVIATION FORECASTING

Short-term forecasting is a little easier than long-term prediction. Nevertheless, information about some relevant variables is still uncertain, and some data are subject to different interpretations with respect to the overall effect on aviation.

Domestic Effects

For at least the next two years, the U.S. economy is going to be hovering between slow or no growth and a recession.[1] Three factors will affect the continuing stability of the domestic economy. (1) Energy prices: If energy costs rise too far, they will exacerbate efforts to improve productivity throughout all parts of the U.S. economy. (2) Deficit Management: A classic monetarist solution to the U.S. budget deficit could contribute to a recession by taking money out of the economy. Therefore, management must incorporate a more creative set of policies. (3) Interest rates: If interest rates increase they this could also trigger the onset of a recession.

As with many other issues affecting aviation, management of the U.S. economy is essentially a political issue. Policy makers will attempt to avert a recession because they recognize the costs (including the likelihood of triggering a global recession) could be too severe. The track record of policy makers in this regard, however, is somewhat less than perfect.

Assuming a slow growth rate at best, most aviation analysts believe at least two major U.S. carriers will cease to exist over the next two years. In addition, a few national carriers could be eliminated. The options include merger, acquisition, or bankruptcy accompanied by asset sales. Federal policy decisions will affect the nature of this transition to fewer carriers. The most important policy question, anti-trust concerns, will be answered by Justice Department actions.

Little room now exists for new investment in new air carriers. Wall Street no longer views new entrants as plausible because gate space and routes are already saturated. Even if the demise of existing carriers opens up a number of routes and gates, no potential new entrant is likely to gain access to enough of them to be profitable.

The net effect of a slow growth economy and fewer carriers competing in the market will be higher fares, which could further depress traffic growth. Increased fuel prices and the loss of Continental Airlines as the ticket discount maverick will further contribute to a decline in air transport traffic.[2]

These gloomy forecasts are countered by historical data which reveal that the oil crises of the 1970s and early 1980s were not disastrous for air transportation. From 1980 to 1981, yields jumped 33 percent; from 1981 to 1982 yields increased by 15-20 percent; and yields rose again in 1984. Furthermore, air carriers should have learned how to adjust to short-term decreases in traffic. They can achieve cost control by parking inefficient planes, cutting employees, and other such belt-tightening measures.

Air cargo carriers have less flexibility. They must fly a fixed set of routes to get goods from sources to delivery points. At the same time, however, their fuel costs are not as high because they do not fly their airplanes as much.

International Effects

Air carriers with international routes enjoyed a tremendous year on the North Atlantic in 1990 because (1) new service to new points was available, (2) many potential tourists had postponed travel plans due to financial and political constraints in the preceding years, and (3) real international fares were at an all-time low compared to domestic fares.

However, 1991 does not promise to be as lucrative for international carriers. Economies on both sides of the Atlantic are weak, especially those of the United States, the United Kingdom, and the Federal Republic of Germany now that it must adjust to the costs of reunification with the former German Democratic Republic. On the whole, incorporation of Central Europe into the western trading system should have a neutral effect in the short term. While some costs associated with improving productivity and environmental clean-up in the former Soviet Bloc will be high, the return benefits are expected to counter the costs fairly soon. Another factor that could affect the profitability of international carriers is the recent action by the International Air Transport Association to increase fares, which should depress traffic demand. Instability in the Middle East, such as that sparked by Iraq's invasion of Kuwait, always raises the specter of terrorist activity, which depresses traffic demand.

Traffic on the Pacific Rim is also likely to slow. While flights originating in the United States will probably remain steady, those from Japan will decrease. Japan's economy is also weakening, as evidenced by the 38-percent drop in the value of the Nikkei Index since January 1990.

South American traffic is good and is likely to remain stable.

Infrastructure Issues

To promote more global traffic while alleviating the increasingly heavy traffic burden on such traditional international gateways as New York, Boston, Los Angeles, and San Francisco, the idea of opening alternative international hubs in the interior of the United States has gained popularity. Confronted with decreasing gateway availability and the constraints of existing bilateral agreements, European air carriers have been particularly eager to open new gateways. Furthermore, the likelihood that the United States will open its domestic air travel market to cabotage[3] is decreasing. Therefore, European carriers would like to serve those travelers who seek non-traditional U.S. tourist and business destinations.

U.S. carriers fear the Europeans are really trying to grandfather routes in the United States before the European Community merges into a single market in 1992. U.S. carriers worry that the U.S. Government--particularly the Departments of Transportation and State--are too eager to give away the comparative advantage of domestic carriers by granting too many landing rights to foreign carriers, while not doing enough either to protect U.S. carriers in their own domestic markets or to help U.S. carriers penetrate potentially lucrative foreign markets.

Concerns about opening up internal, alternative international hubs are exacerbated by the increasingly limited Federal resources available to support new airport and airspace infrastructure. Given that customs and air traffic control systems are severely strained already, it is hard to justify adding more capacity at previously domestic-only airports to accommodate foreign-carrier traffic.

The Federal Aviation Administration takes seriously its charter to promote commercial aviation. Historically, airlines have pursued their individual survival strategies, and FAA and has somehow managed to catch up with the new demands placed on the system by air carrier actions. Nevertheless, it appears that the structural changes in the air transport industry which have occurred since degregulation may call for reexamination of certain FAA policies and activities.

Given budgetary and infrastructure constraints and the need to reexamine FAA's role in facilitating air transport, several ideas were offered regarding possible new incentives and methods for providing air transportation services. A primary concern was the elimination of free riders from the system. As the system currently works, the air traffic control, customs, and airport operating and maintenance services are provided, and air carriers operate within that system. While airlines pay fees for these services, the fees are not necessarily directly related to the actual costs imposed on the system. Therefore, some air carriers do not pay their full share of costs.

For example, since economic deregulation of the U.S. air transportation system in 1978, virtually every carrier has adopted a hubbing strategy, which generates more income because it enables a carrier to channel traffic more efficiently from point to point. Hubbing also requires very close timing for landings and takeoffs of feeder aircraft. Thus at busy times of the day--typically early morning and early evening for the business traveler--airports become highly congested as they try to serve a concentrated number of aircraft. Similarly, densely traveled routes place a heavy burden on certain air traffic control facilities.

Often getting to and from the airport can be more difficult than the flight itself. Problems associated with landside constraints also raise questions about who is responsible for improving airport access.

Various mechanisms whereby users would pay true costs were discussed. One option is peak-hour pricing (differential landing fees for use of runways and related airport facilities) designed to recover the costs imposed by airline operations at hours when demand for airport capacity is highest. Another option is a passenger facility charge (a head tax levied by airports directly on passengers) based on the time and conditions of airport use. Privatization of the infrastructure is a third option in which a profit-based private corporation operates the airport and imposes charges (on airlines or passengers) proportionate to the cost of providing service. A somewhat different approach--directed at airspace rather than airport congestion--would be a system of fees paid by airspace users (aircraft) on the basis of the duration of time they operate under air traffic control and the level of service received.

No solution seemed to satisfy all participants. Air carrier representatives expressed concern that any real "user pays" system will increase the costs of flying. Since fares are not completely inelastic, traffic would decline as fares rise. While higher fares might may solve the problem of congested skies in the short run, they would create painful long-term costs for air carriers and those who provide them vital goods and services.

Without some change in infrastructure cost management, congestion of the airport and airways the system may become intolerable. As fewer air carriers compete in the marketplace, the potential increases for fares to rise. Whether they rise due to user fees or monopoly hubs, the effect on commercial aviation will be the same.

A second approach to solving congestion and infrastructure problems could be reexamination and change of the hubbing concept. Since deregulation, virtually every U.S. airline has adopted a hubbing strategy to manage traffic flow. A good primary hub requires a strong local traffic base. While there is room for developing a few more primary hubs, the airport system is reaching the saturation point.

It may be possible to develop more secondary hubs to relieve pressure on the existing primary hub structure. A recently published FAA report identifies 28 presently underutilized airports that could serve as secondary hubs. Significant improvements in regional commuter aircraft, in terms of range, speed and capacity, make the "catchment" area for a secondary hub encompass a much wider circle. Efficiently operated secondary hubs could ease congestion at primary hubs by drawing off a portion of present transfer traffic or by providing a way to accommodate future growth.

Finally, the discussion of possible solutions to infrastructure constraints turned to the role of technology. In addition to technologies related to improving efficiency and safety, such as those for monitoring weather conditions and guiding traffic, technological advances also offer the promise of alternative modes of transportation. For example, a combination of improved tiltrotor aircraft and dedicated rotorport facilities has been suggested as a way of alleviating current congestion problems. The technology is available for putting this combination system into place, but there are major obstacles to implementation. The start-up capital costs associated with building the airports and establishing new route systems, not to mention adding tiltrotor aircraft to air carrier fleets, are very high. As with other issues discussed at the workshop, such a decision to implement this technology requires political commitment in the form of incentives and leadership.

A relatively new technology may hold more promise--high speed transportation via magnetic levitation (maglev). Here research and development are in earlier stages. As with the combination concept above, the start-up capital costs will be great--approximately $12-15 million per mile.[4] Once in place, incremental operational costs are believed to be very low. Maglev transportation could require up to 60 percent less fuel than the current intercity transportation systems in the United States. Decreased dependence on fuel coupled with the promise that maglev would to be virtually noise-free means that it could be very clean environmentally.[5] Mag lev transportation systems could be fully automatic, saving 90 percent of labor costs. However, it seems unlikely that the public would be willing to ride in any high-speed vehicle without some human presence as a check on technological failure. Maglev systems can respond easily to traffic demand changes because vehicles can be readily shifted from large to small capacity with varying degrees of service frequency. Finally, maglev promises to be 99 percent reliable.

Potential problems of maglev technology are its high start-up costs and the environmental impact of guideway placement and construction. Everything will have to be new--especially the guideways, which will need to be as level and straight as possible to attain the speeds necessary to make it competitive with air travel. To be cost efficient, trips need to be in the 300-500 mile range. Uncertain futures again haunt the aviation forecaster. It is virtually impossible at this point to predict when, if,

TABLE 5 Percent of Total Trips Taken in Last 12 Months (By Age and Income)

Income	18-29	30-39	Age 40-40	50-64	65+	All Ages
$40,000 & over	8	18	20	8	3	57
$25,000-$39,999	3	6	3	3	2	17
$15,000-$24,999	3	2	1	2	3	10
Under $15,000	2	1	1	1	2	8
Undesignated	2	1	3	2	0	8
All Incomes	18	28	28	16	10	100

SOURCE: 1988 ATA Air Travel Survey

NOTE: Eight percent did not designate income.

TABLE 6 Percent Flying in Past Year, By Age and Income

	AGE GROUP				
Family Income	18-29	30-39	40-49	64 & 50-64	Over
$40,000 and up	50	50	51	50	40
$25,000-$39,999	24	30	30	32	40
$15,000- 24,999	21	25	13	21	23
Under $15,000	19	17	13	12	15
All Incomes (Weighed Average)	28	33	33	49	22

Source: ATA Air Travel Survey, 1988

and how maglev might be introduced into the transportation system; nor is it possible to predict what effect maglev might have on air transport.

The prevailing questions are: Who will invest to make this a reality? Is this the appropriate place for the government to be encouraging development through research and development assistance, or should airlines or railway corporations be investing in the new technology?

ADJUSTING LONG - RANGE FORECASTS TO ACCOUNT FOR CHANGES IN DEMOGRAPHICS*

Demographic trends are critical to accurate forecasting in the commercial air transport sector. To airline management demographic trends dictate fleet requirements: the range and capacity of aircraft, the routes the aircraft should be placed, and when the aircraft should be purchased. To government officials, demographic where trends suggest infrastructure needs: where airports should be located, when they should be built, how large they should be, when air traffic control systems should be expanded, where they should be installed.

The number of trips per capita drives demand. It is important, therefore, to identify as specifically as possible the type of person who has a propensity to fly and how frequently that person might fly. Research has identified several factors that affect the propensity to fly: (1) income, (2) age, (3) gender, and (4) geographical location. Data from the 1988 Air Transport Association (ATA) Air Travel Survey indicate that a 45-year-old male who resides in the northeast and earns a minimum annual income of $40,000 is the most likely to fly.

*Summary of presentation by Richard Golaszewski, Gellman Research Associates

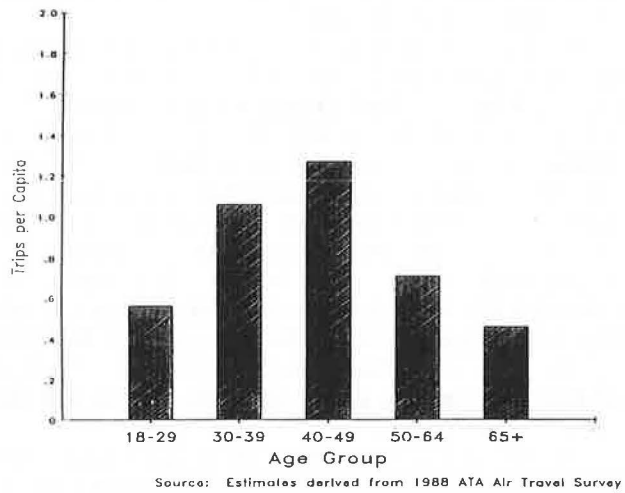

FIGURE 24 Propensity to Fly by Age Group, 1988

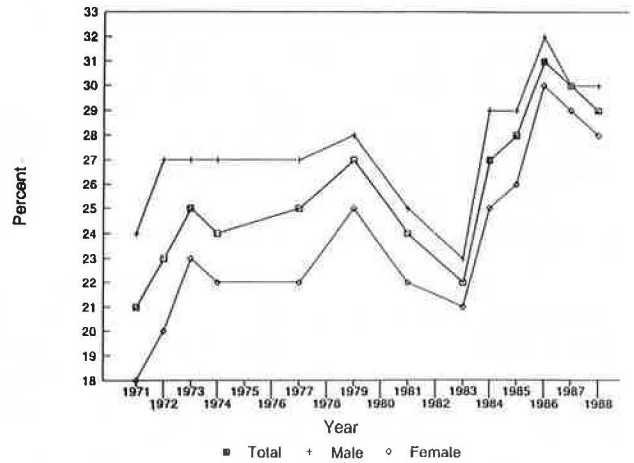

FIGURE 25 Percent of Respondents Who Have Flown in the Past 12 Months (By Gender)

Current methodological sophistication does not permit the multiple-variable analysis that would reveal more precise information. For example, demographic trends indicate that the U.S. population is increasing, especially for persons younger than 18, and that the greatest growth is occurring in the southeastern and southwestern United States. Howwever, per capita personal incomes are highest in the northeast. Current analytical techniques do not allow the forecaster to determine if aviation traffic growth will be greater in the southeast and southwest, due to the increasing numbers of people, or in the northeast where incomes are rising.

Golaszewski has devised an analytical approach which is more sophisticated than that now used by FAA. Amenable to sensitivity analyses, it can be implemented on spreadsheet software. It incorporates economic factors already considered in FAA forecasting methodologies but adds a demographic index derived

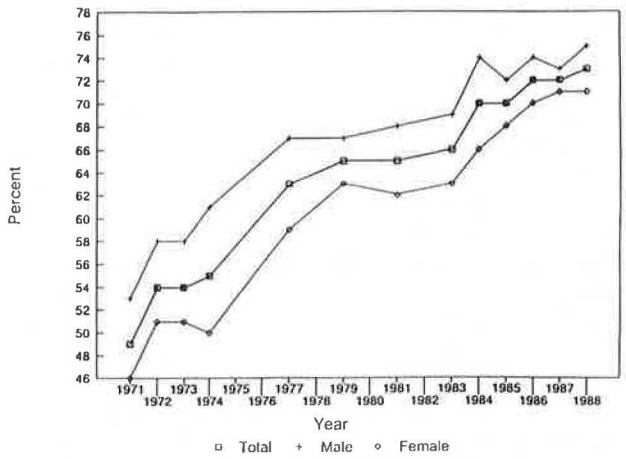

FIGURE 26 Percent of Respondents Who Have Flown in Their Lifetimes (By Gender)

from information about: (1) current propensities to fly by demographic cohorts, (2) present cohort populations, and (3) forecasts of cohort populations. The model generates demographically adjusted forecasts by multiplying FAA forecasts of enplanements by the demographic index. (Details of the forecasting models are provided in Appendix A.)

Using this model and 1988 ATA survey data, Golaszewski discovered that adjusting for population composition--gender, region, and age--to the year 2010 produces only a modest change of 1.55 percent in the FAA enplanement forecast. Two critical variables could not be accommodated in this projection due to lack of information: (1) potential changes in the income

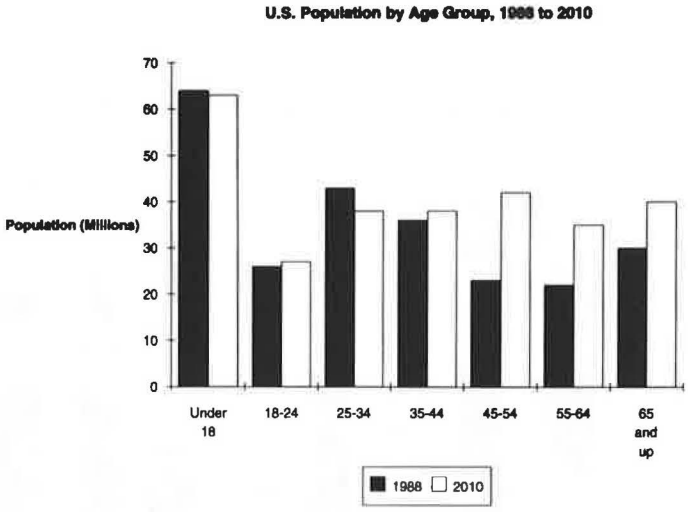

FIGURE 27 U.S. Population by Age Group, 1988 to 2010

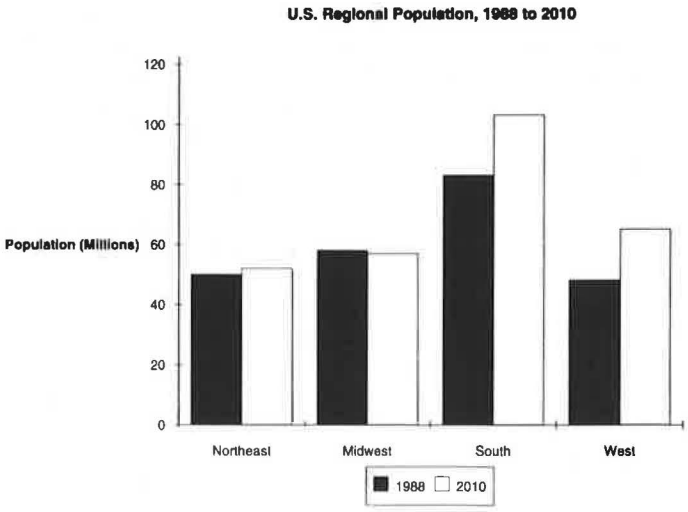

FIGURE 28 U.S. Regional Population, 1988 to 2010

composition of the population and (2) potential changesin the propensity to fly within population cohorts.

Accurate demographic information is crucial because only a 10-percent increase in trips per capita by in all cohorts (gender, region, and age) in 2010 would increase

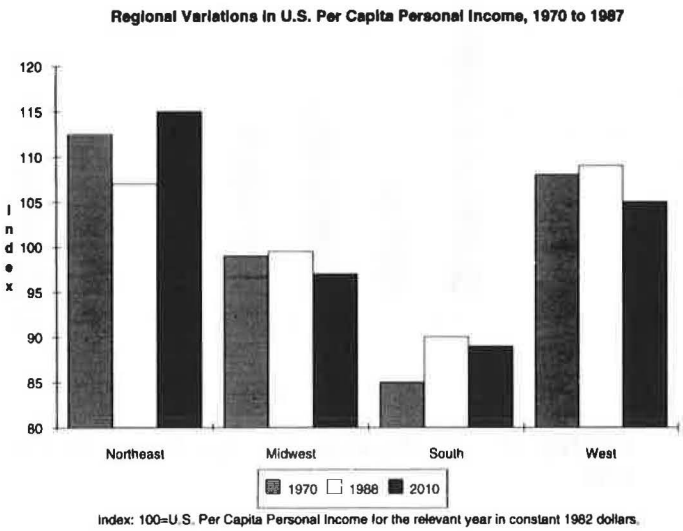

FIGURE 29 Regional Variations in Per Capita Personal Income, 1970 to 1987

enplanements by 11.7 percent over the FAA forecast. Currently, the United States represents a significant untapped market since the typical American adult flies only 0.6 to 0.7 times per year. One quarter of U.S. adults have never flown, and only one-third of the population takes an air trip is any given year. A more systematic collection of data at regular intervals would enhance the quality and quantity of information available to the forecaster. A larger base of comparable data over time would facilitate reliable time series analyses and improve forecasting outcomes.

A central issue is whether Americans have an increasing propensity to fly. Revenue passenger miles (RPMs)[6] have increased steadily over the last decade. While fares have decreased somewhat in real terms, income has remained fairly stable over the last 10 years. This suggests that a new group of people have come to regard to flying as the preferred mode of intercity travel.

Forecasting accuracy would be improved if analysts understood why this trend is occurring. Perhaps overall changes in life style explain traffic increases: people introduced to flying in the early days of economic deregulation when fares dropped dramatically may be more inclined to fly today. Similarly, people introduced to flying in their work may be more likely to fly on leisure trips as well. Families who are geographically dispersed may choose to travel by air for family reunions and holidays. The "graying" population may be more likely to fly as a result of a combination of these factors. Finally, technological advances may have made flying more accessible to would-be travelers. It is easier to buy tickets and arrange package trips--whether for business or pleasure.

Statistics indicate that the most frequent flyer is still the business traveler. Forecasters have been predicting an upsurge in leisure flying for years, but the data suggest this has not occurred. Nevertheless, aviation forecasters are aware of the potential. Better predictors of leisure flying would be a valuable tool.

SUPPLY-SIDE CONSIDERATIONS IN FORECASTING THE U.S. ALL-CARGO EXPRESS INDUSTRY*

In 1988, a study of the U.S. all-cargo industry was sponsored by the 10 leading U.S. carriers.[7] Internal data covering the 10 years following deregulation in 1977 were collected from each sponsor by means of written questionnaires. The results revealed the emergence of a growth industry.

From 1977 to 1988, the all-cargo sector of the industry increased its asset base eightfold to a level of $8 billion, and stockholder equity grew sevenfold to $4.9 billion. The number of shipments jumped 11 times to 414 million air shipments, and revenues increased from $1.1 billion to $9.1 billion. Tonnage carried expanded by more than 400 percent, and employment grew by a factor of 5. The jet fleet expanded from 59 aircraft to 372 (including 17 L-100 large turboprops), while the number of regular air shipper accounts ballooned by 700 percent to more than 4.5 million.

Three factors account for this success. (1) Economic deregulation encouraged private-sector innovation by freeing entry in the domestic arena and eliminating CAB jurisdiction over pricing and new product development. (2) The integrated door-to-door express business, pioneered by Federal Express in 1973, created new primary demand for services. This demand was supported by the creation of the zip code system and the steady deterioration of small package and document services by the Postal Service and the Railway Express Agency. (3) Federal Express's success inspired competitors like Emery, Airborne, UPS, and, more recently, DHL, Burlington Air Express and CF to establish dedicated air systems for the transportation of small packages and heavy-weight freight in the domestic market.

By all important measures, air cargo deregulation has been a success. Consumers enjoy overnight service from any zip code in the country to any other zip code, usually by noon the next day, or earlier. Every consumer typically has a choice of four or more air cargo or air

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* Summary of presentation by Brian Campbell, Leeper, Cambridge & Campbell, Inc.

express competitors offering a variety of price and service options. Relatively few consumer complaints have been registered against this industry. No one is suggesting that the air cargo industry should be regulated.

The growth of all-cargo carriers' has not exacerbated pressures on the airport and airways system. Because they operate most of their flights at night, they complement the passenger system and provide added revenue utilization for the Nation's airport system.

A fairly smooth geometrically increasing curve is generated when historical traffic statistics are plotted. Currently, growth rates are decreasing in the document sector due to widespread use of fax technology. Prediction is difficult, but forecasters anticipate that document movement will continue to be a major part of the industry's high-yield time-definite service.

Unpredictable variables make forecasting difficult. The greatest uncertainty affecting all-cargo forecasts today is airport access restrictions, which are proliferating throughout the country on an ad hoc basis. The associated economic costs are unevenly distributed and threaten the continued growth of this sector in the air transportation system. Sixty-five percent of all domestic shipments of the all-cargo carriers involve next-day service. Carriers must fly between 10:00 p.m. and 7:00 a.m. and use relatively inexpensive aircraft because they only average four hours utilization per day.

Locally imposed airport access restrictions and noise limitations are proliferating throughout the country. This movement toward local regulation, coupled with uncertainty about the costs and timing of Stage 3 conversion, will require forecasters to pay close attention to supply-side elements and to develop forecasts that reflect assumptions about national and local noise policy. Simple time-series forecasts will not work.

Airport access restrictions based on noise impose uneven costs on air carriers. While two-thirds of all-cargo flights occur between 10 p.m. and 7 a.m., only 6-8 percent of passenger flights operate during this period. Nevertheless, according to 1988 figures, passenger airlines operate 22,000 nighttime flights and 211,000 daytime flights compared to 6,200 nighttime and 3,200 daytime all-cargo flights. Restricting airport access for all carriers alike would have a greater negative affect on the all-cargo carriers even though three-fourths of the flights and associated noise is created by passenger airlines, which depend far less on nighttime flying for their profitability.

Restrictions on nighttime flying also affect a broad range of consumers and producers who rely on air express service for product delivery. This is particularly acute for those manufacturers who use just-in-time inventory in their production processes. The loss of one Boeing 727 carrying cargo at night affects 3,000 shippers and 3,000 recipients.

Noting that U.S. regulation of noise is fairly lax when compared to that in Europe and Japan, other ways of dealing with the issue were suggested. Perhaps several 24-hour airports, such as Osaka Kansai Airport being built off the coast of Japan, could be utilized. This would probably involve dual use of military airports or the transition to commercial use only of facilities at former military bases. The notion of "wayports" was not deemed useful, but using existing airports geographically distanced from large population centers appeared to be a sensible solution. The possibility of a more purely economic solution was raised: a "payment" system in which the offender would compensate the offended.

Distributing the costs and benefits of nighttime flying and noise pollution is a complicated process. If carriers pay an increased fee for the privilege of using the airport during nighttime hours, the cost of the service will rise and negatively affect the profitability of the airline and those dependent on the service. If delivery time is increased in order to avoid nighttime flying, those affected will bear asymmetrically high costs related to their time-sensitive production needs.

Slow growth of U.S. economy could be as devastating as uneven application of noise regulations throughout the country. With facsimile technology penetrating the documents sector of the express service sector, carriers are responding by increasing the weight limit they will ship express (as opposed to freight), seeking out new markets, and offering other new express services, such as shipping C.O.D.

Once again, the effects of political decisions can be crucial. To save money, the Postmaster General of the United States has indicated that the Postal Service may return to shipping regular mail by surface transportation and requiring extra fees for air mail. This could shift a lot of traffic to express carriers.

Despite its fairly recent emergence and rapid growth, the all-cargo sector is not yet clearly understood. The variables affecting the industry have not been fully identified, and clearer definitions of activity measures is needed. For example, there is no effective consumer profile; most shipments are made by managers of business and professional organization, but they are usually initiated by secretarial or clerical staff, making it difficult to know where to target sales pitches. Furthermore, it is not clear what might be the most useful unit of measuring activity--ton miles, revenue, or something else--to track growth within the express package and cargo shipping industry.

THE CRAF PROGRAM: IMPACTS ON CIVIL AIR COMMERCE AND FAA ACTIVITY*

The Civil Reserve Air Fleet (CRAF) is a program whereby U.S. civil air carriers commit aircraft and

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* Summary of presentation by Gene S. Mercer, Federal Aviation Administration

personnel to the Department of Defense (DOD) to augment U.S. military capability in times of crisis. Although instituted in 1952, the CRAF program had never been activated prior to its Stage I implementation on August 17, 1990.

Through interagency agreements between DOD and the Department of Transportation (DOT) and through contracts with civil air carriers, the CRAF program guarantees DOD a reserve of aircraft to meet national emergency requirements. As an incentive to volunteer for CRAF, air carriers earn entitlement to DOD peacetime airlift augmentation business in direct proportion to the equipment and personnel they contribute to emergency mobilization.

CRAF provides DOD a wide-range of options for responding to various world political and military situations. There are three stages.

Stage I: Carriers provide long-range international aircraft to perform airlift services that cannot be met by the Military Airlift Command (MAC), the DOD airlift manager. The MAC Commander has authority to activate Stage I. Aircraft committed by the carriers must be at their on-load site within 24 hours after mission notification. Currently 18 passenger and 22 cargo aircraft are under contract.

Stage II: This stage provides additional capacity for a major airlift emergency that does not warrant national mobilization. The Secretary of Defense has the authority to activate Stage II. Response time is 24 hours. Long- and medium-range aircraft are used to meet domestic and international route requirements. In total, 187 additional aircraft are committed to Stage II. Together with the Stage I aircraft, the fleet is comprised of 116 long-range aircraft (77 passenger and 39 cargo) and 71 medium-range aircraft (21 passenger and 50 cargo).

Stage III: All passenger and cargo capability contracted in the CRAF program, affecting 11.6 percent of the U.S. commercial jet fleet of 4,017 aircraft, are subject to full activation. Stage III is activated by order of the Secretary of Defense in time of war or during a defense oriented national emergency declared by the President or the U.S. Congress. The response time is 48 hours. In all, 506 aircraft including those activated in Stage I and Stage II are affected by CRAF contracts: 424 long-range aircraft (283 passenger and 141 cargo) and 82 medium range aircraft (32 passenger and 52 cargo).

CRAF program activation varies according to carrier and implementation phase. Appendix B indicates the wide ranging impacts of CRAF implementation and shows the distribution of the U.S. commercial jet fleet by type of aircraft, the number of aircraft committed to CRAF, and the anticipated calendar year (CY) 1990 deliveries. If not voluntarily committed to the CRAF program, the 222 two-engine narrow body aircraft scheduled for delivery in 1990 would be used in domestic service, while the 28 widebody aircraft would be used in international service.

Carriers commit four crew members per crew position for each aircraft supplied to CRAF. Crew members cannot be members of the National Guard or the Air Force reserve units. To meet security clearance requirements crew members must be U.S. citizens.

The short-term impact of Stage I implementation already under way is not significant. Airlines have been able to meet CRAF commitments with only minor schedule changes. CRAF activation is, in fact, benefitting certain carriers with pre-existing financial problems by providing a stable revenue stream.

SUGGESTED IMPROVEMENTS AND ADDITIONS TO FAA FORECASTING

The presentations and discussion at the workshop suggested several ways in which the Federal Aviation Administration might improve its forecasts of commercial aviation activity.

1. Develop and adopt a multiple-variable analytical tool to reveal more precise information about demographic trends, both domestically and internationally.
2. Initiate a data gathering process to capture potential changes in the income composition of the population and potential changes in the propensity to fly within population cohorts.
3. Develop indicators of the potential expansion of leisure air travel.
4. Consider preparing alternative future scenarios as a complementary approach to straightforward forecasting.
5. Consider reframing fundamental questions about air transportation, such as the purpose and function of airlines as providers of transportation services.
6. Assess the supply, access, and cost of energy under a number of different future scenarios to help aviation industry forecasters make realistic judgments about the parameters affecting air travel.
7. Assess the impact of creating new international hubs within the United States.
8. Assess the impact of noise regulations under a number of different scenarios -- ranging from a proliferation of ad hoc standards to a uniform national standard.
9. Assess the impact of imposing various types of user charges to help pay for the capital and operating costs of airports and air traffic control facilities.
10. Examine the viability of new transportation technologies and how their introduction might affect the nation's air transport system.
11. Consider means by which the transportation system could be integrated intermodally.

12. Determine the units of measure that would be most useful in tracking and forecasting growth in the express package and cargo shipping industry.

NOTES

1. The classic definition of a recession is employed here, namely at least two quarters of declining growth.

2. Since its Chapter 11 filing in the early 1980s, Continental has been, until recently, the only carrier consistently willing to keep fares down by means of deep discounts.

3. Cabotage refers to the right of a foreign airline to carry domestic passengers to and from destinations within another country. Currently most bilateral air transport agreements deny this privilege to foreign carriers.

4. While this sounds high, it is comparable to the cost of building a super highway.

5. The guideways, which entail the highest capital cost, would also affect the environment in terms of visibility.

6. A revenue passenger mile is one revenue (fare-paying) passenger transported 1 mile in revenue service.

7. The 10 carriers were Airborne, Burlington Air Express, C F Air Freight, DHL, Emery, Evergreen, Federal Express, Flying Tiger, Southern Air Transport, and UPS. As of 1990, this group has shrunk to eight with Emery's acquisition of C F Air Freight and Federal Express' purchase of Flying Tiger. This group represented about 90-95 percent of the U.S. all-cargo industry.