

A comprehensive planning framework for the National Aviation System, USA

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Preface

A document with the ideas included in this paper originally was prepared as part of a call for papers, "Writing the Wrongs," compiled by The Women's Transportation Seminar (WTS). The compilation was completed in May 2001 for presentation to the newly-confirmed U.S. Secretary of Transportation, Norman Y. Mineta, to assist in an agenda for national transportation policy initiatives.

In September 2001, as an aftermath of the air attacks on New York and Washington, DC, air carrier operations in the U.S. have been reduced by 20 percent, across the board; and passenger enplanements have fallen considerably below the 70-75 percent load levels of the past five years.

Industry experts expect a rebound in air traffic over the coming 12 to 18 months; and believe that it will catch up with former and forecasted levels. However, much has changed. At the very least, more attention will be paid to security; and airport design must incorporate such precautions. This will require new facilities; and, in the interim, lengthy wait-times may discourage short-haul and discretionary traffic. New air traffic modes, methods and supplements may emerge. Such

factors as fractional ownership in private jets may gain appeal to corporations and the wealthy. Supplemental luggage transportation may gain favor. And new screening technologies will be developed. In the long-term, however, problems will be identified and solved to allow the world to continue to fly.

Introduction

For the better part of a decade, federal and local planners, business and industry groups, airport sponsors, presidential and Congressional commissions have predicted the aviation gridlock currently crippling the country. Secretary Norman Y. Mineta chaired one of the latter, the National Civil Aviation Review Commission, which, in December 1997, issued its unequivocal warning, "Airport needs are not being met...our nation's aviation system will succumb to gridlock." Outcries have been loud and rife as the predicted capacity crunch recently took its toll on individual airports and the national aviation system.

Over the past two years, travelers have faced historic delays, cancellations and higher fares. Flights are so full that passengers bumped from a cancelled flight often cannot book a substitute flight for days. The business traveler cannot rely on an early-morning flight to arrive on time and must arrange an overnight trip, adding cost to an already costly business fare. The leisure traveler (contributor to a half trillion dollar national business) is relegated to a middle seat on many flights, as load factors exceed historic highs.

The business community, transportation planners, local officials and Congress have been concerned about many of these problems: lack of competition, higher fares, loss of service, delay and capacity constraints. These concerns have resulted in the initiation, then increase, of Passenger Facility Charges (PFCs) and the tripling of funds to address the problem. This is one of those rare instances where funding is not the problem. Lack of vision and political will, an unwillingness to acknowledge need in fear of community opposition, and attempts to control large market share of the industry, are. These are formidable obstacles.

The public, however, is demanding solutions, and demanding them now. Because the needed airports and runways are not in place, and aviation forecasts for this summer are strong, new short-term solutions are being sought. The solution being touted is congestion pricing: to distribute flights more evenly throughout the day; or to dampen demand. But a more permanent and long-term solution to this urgent problem is needed. This paper proposes an approach to such a solution.

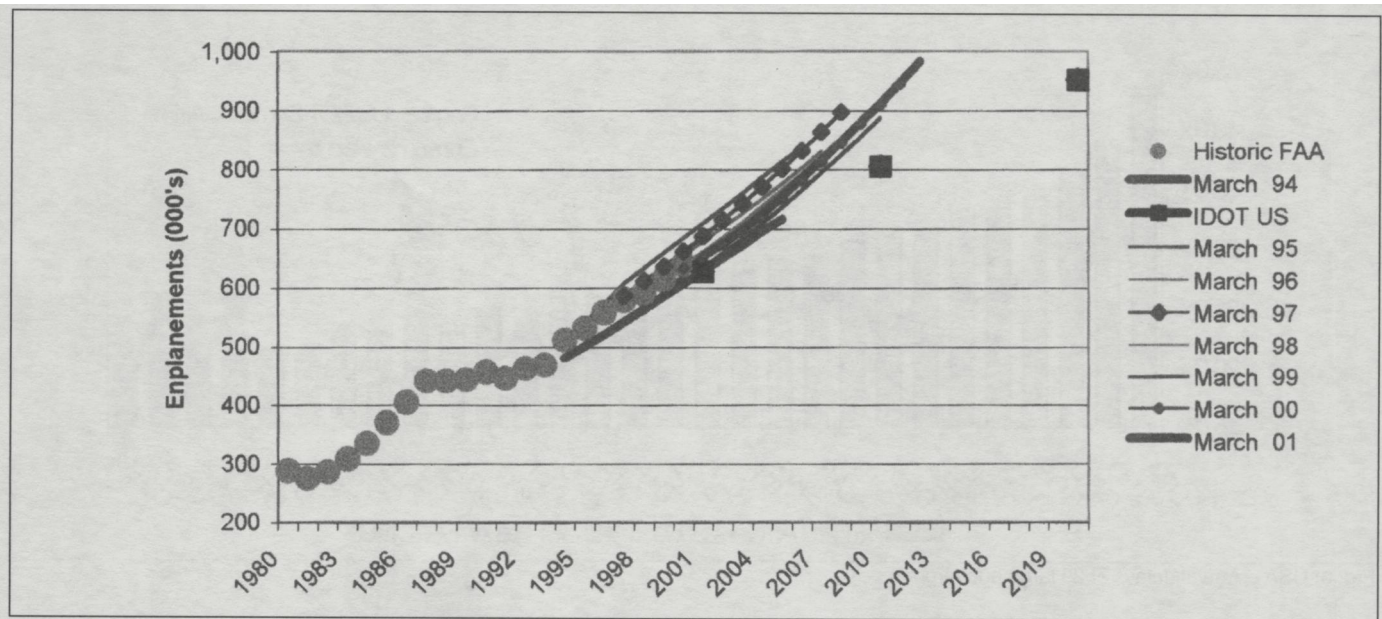


Fig. 1: U.S. domestic enplanement forecasts. (Source: Federal Aviation Administration – FAA).

The problem

The problem with the nation's aviation system is both obvious and simple. The national aviation demand is doubling every 15-20 years. The country is richer, its citizens more prosperous, and its economy more global. In spite of prodigious past development and forecasted aviation growth, only one new airport has been built since 1974. Few new runways have been built and almost all of the largest hub air-

ports are at capacity and landlocked. In 1980, there were 312 million enplanements in the U.S.; in 1990, there were 498 million; in 2000, 694 million; and, in 2010 over one billion are expected. The Federal Aviation Administration (FAA) has forecast this demand accurately (fig. 1). Unfortunately, there has been no corresponding effort to build the new airports or runways to accommodate this demand.

The main problem is a disconnect between national and regional forecasts (fig. 2).

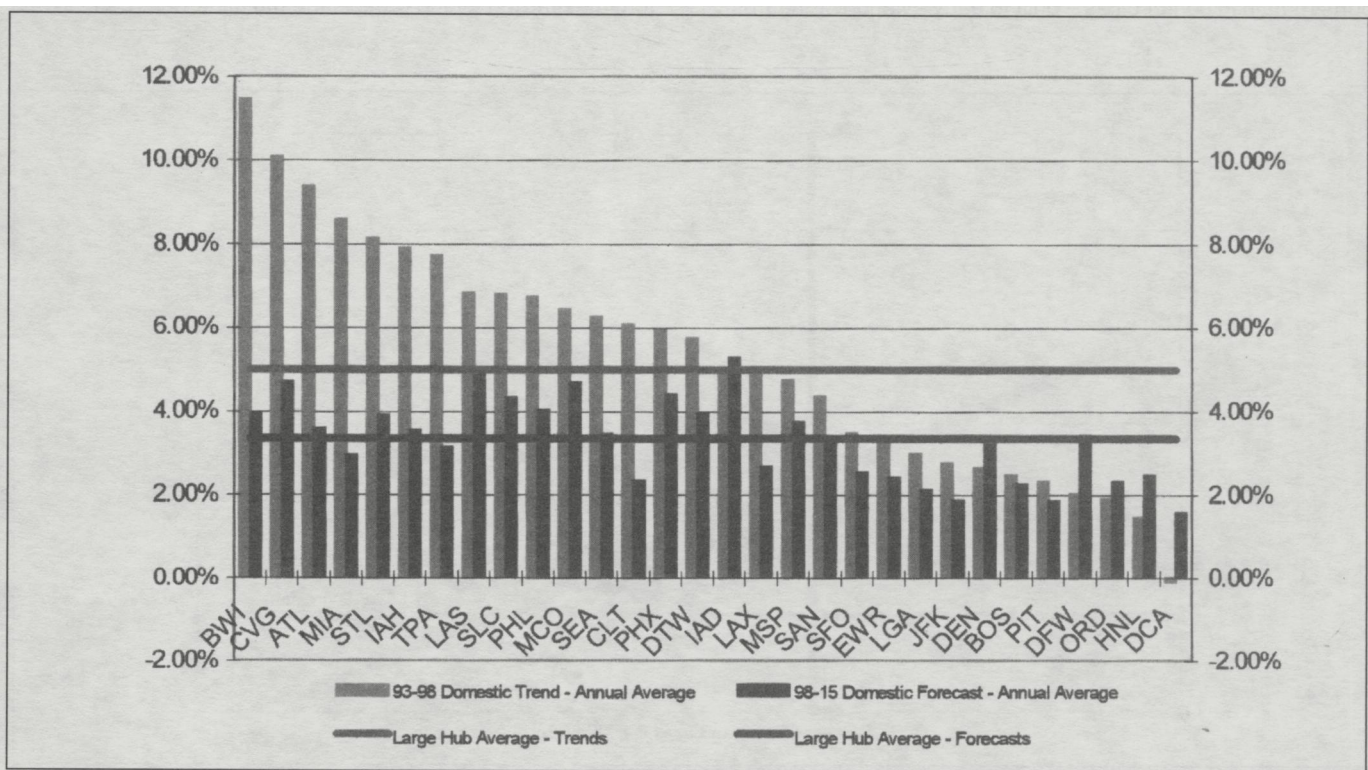
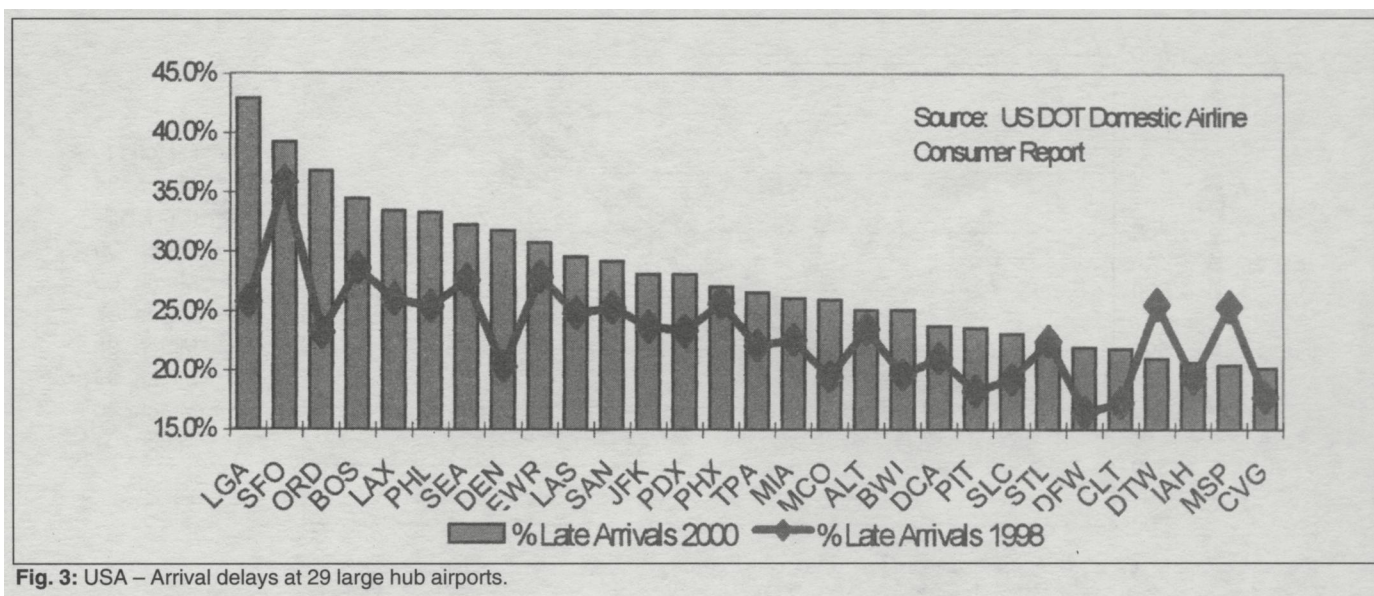


Fig. 2: USA – Trends and forecasts at large hubs.



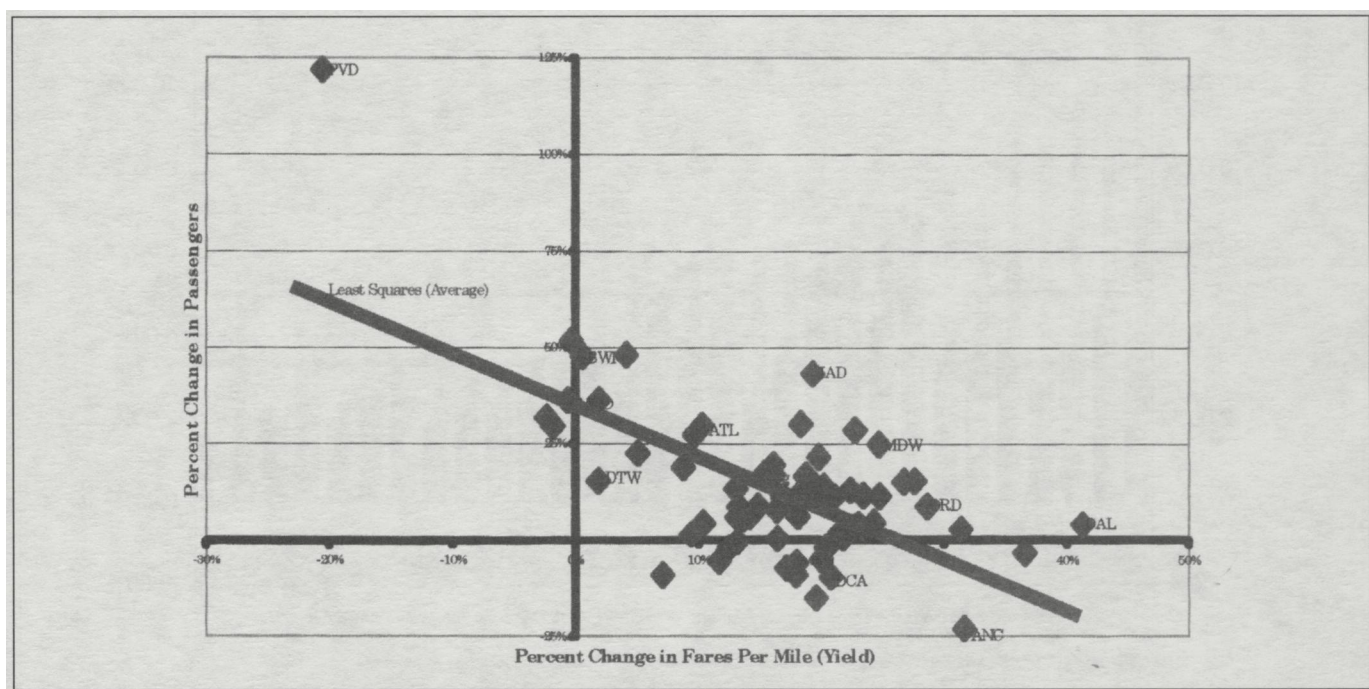
- Regional forecasts are based on extrapolation of very recent past trends at existing airports. This has the perverse effect of showing constrained airports – those with the greatest demand – at low forecast levels. Airlines are willing subscribers to these low forecasts, claiming them as the products of mature markets.

- This process, however, completely ignores real regional demand, specifically, the need for additional airports. There appears to be no direct connection between forecasted need at the national level and concrete plans to increase capacity where it is needed.

In spite of the fact that the nation has been spreading outward into more-expansive suburbs and regions, most airports remain in center cities – built to early aviation standards

and almost totally landlocked. Expansions are both costly and difficult; adverse impacts at many would be felt by thousands – sometimes hundreds of thousands – of nearby residents. The result is overtaxed facilities and – with the slightest weather or operational problems – major delays. In 2000, over one-quarter of all flights at the nation's large and medium hub airports were delayed more than 15 minutes; and 50 percent of the delays were contributed by the five most-constrained airports. While weather was claimed as the culprit, constrained capacity was the real villain (fig. 3).

The fact that the nation's busiest airports are also the most constrained allows fares at them to rise sharply. Part of the fare increase is intended to dampen demand. But, all too often, maximizing airline profit is the main intent (fig. 4). When



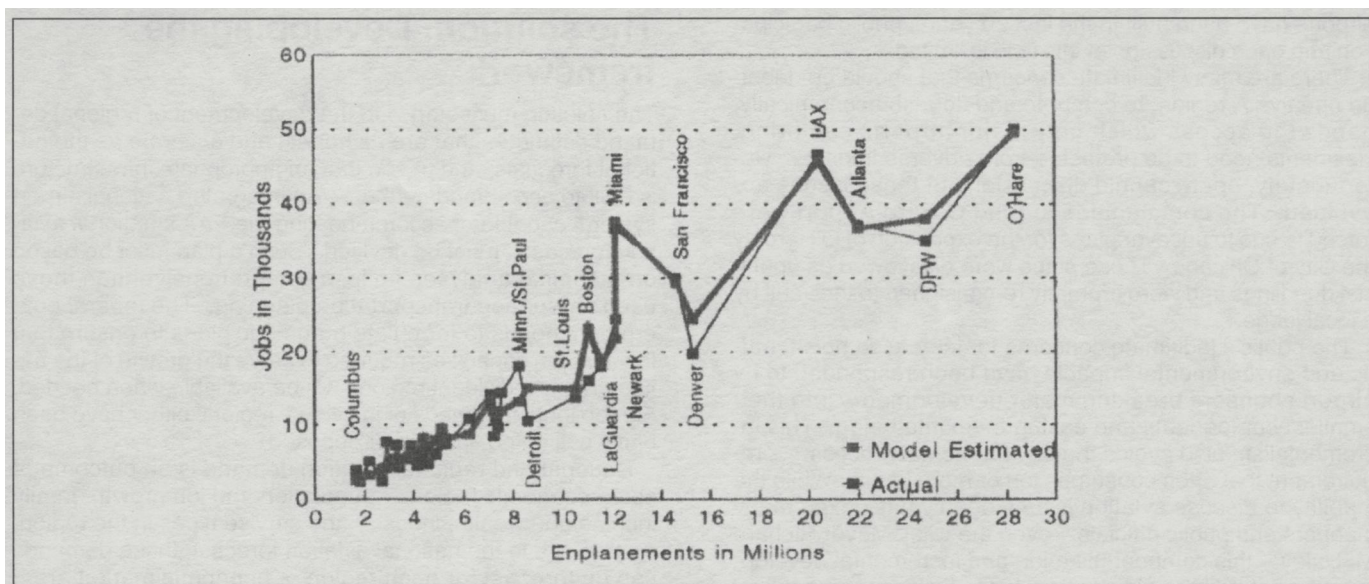


Fig. 5: Airports as economic engines – Direct jobs at airports. (Source: ACG Forecast Model).

approximately 80 percent of the nation's job growth comes from entrepreneurs and small businesses, such excessive costs can severely constrict the economy.

Major airports have been characterized, very correctly, as economic engines (fig. 5). Airports such as O'Hare, LAX, JFK, LaGuardia, San Francisco, Atlanta, Dallas-Fort Worth and Miami, generate \$15-\$30 billion, annually, for their regions. Capacity constraints can make it difficult for these mature urban areas to compete for new businesses and industries. The aviation industry provided four percent of the nation's jobs and six percent of its GNP in 1996. By 2020, these percentages will be seven and ten percent, respectively, with even greater ratios in hub-cities. With its major job and financial centers artificially constrained, it is difficult for the United States to compete in the global market place.

In its February 1990 report, *Current Market Outlook*, Boeing forecasted Year-2000 airport runway shortfalls,

based on runway capacity and forecasted traffic (fig. 6). Boeing was right. These airports now are at capacity and the cities/regions they serve are at risk. This comes as no surprise to anyone who has been involved in airport planning. Perhaps because these warnings angered airport authorities, both Boeing and the FAA stopped identifying constrained airports the next year. A long-promised FAA assessment of capacity thresholds at major airports was released April 25, 2001, confirming much of what air travelers knew and Boeing foretold.

Why the problem has grown and continues growing

The aviation industry and planning for it are complex, filled with arcane terminology and standards that vary by reporting source. Because no new airport and few runways at existing

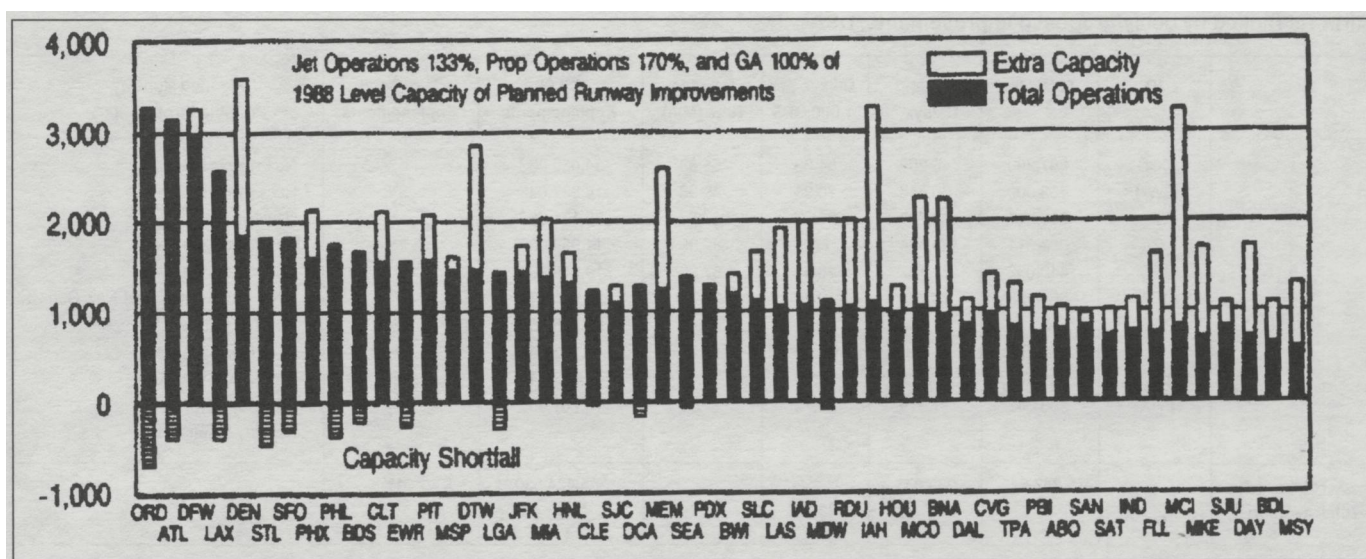


Fig. 6: Airport runway capacity – Boeing year 2000 forecast.

airports have been built in the last 20 years, public participation and open discussion in this field is limited.

There are many legitimate concerns that should be debated openly. A region, to compete and flourish economically, needs the access which only major airports can bring. Residents need to be protected from adverse impacts. Unfortunately, open, candid discussions of these issues are avoided. The communities around O'Hare Airport were forced to sue to uncover plans for the expansion of O'Hare by the City of Chicago. These plans were disavowed as unofficial doodlings and were promptly re-consigned to the vault by a local judge.

The public's legitimate concerns for increased noise, traffic and environmental impacts have been responded to by airport sponsors breaking major developments into their smallest components and easing them into being. This incrementalism also avoids the environmental process – a requirement that often consumes ten or more years. While the inability to discuss aviation issues openly has vexed many planners and public officials – even the wily Mayor Richard M. Daley – this componentization and incremental development has suited the airlines very well. Fiercely competitive, the airlines have created and embellished strong fortress hubs; they have developed tacit agreements among themselves not to encroach upon established routes and markets; they have fought new airports since 1927. Improvements that are meted out to avoid discussion, opposition and environmental review, accommodate well the expansion schedules of individual incumbent airlines. This development process (or lack of it) has bred skepticism and concern among the public.

The national aviation network, in reality, is a collection of fiefdoms, which plan only for their own markets and holdings. Because serving fewer high-fare paying patrons is more profitable than serving larger numbers of lower-fare patrons, the smallest expansions suit the financial objectives of the airlines. Consequently, the total of proposed improvements scheduled at all airports falls far short of accommodating the forecasted aviation demand for 2010 or beyond (table 1). Furthermore, no runway additions are proposed at many of the most congested airports, including five of the top ten with the highest levels of delay (table 1). And, large segments of the market remain unserved.

The solution: Developing the framework

The solution must start with the development of regional demand estimates that are as honest and accurate as the national forecasts; and to see that an appropriate infrastructure is built to accommodate them. An integrated national airport system, capable of accommodating the FAA's national aviation forecasts, must be devised. Such a plan must be based on technical analyses no less comprehensive than those used for surface transportation planning. The federal government needs to formulate pragmatic plans to ensure that the aviation capacities required to serve the growth of the nation and its individual regions will be available when needed. For too long, the needs of individual regions either have been badly estimated, ignored or opposed.

National and regional aviation demand is an outcome of socio-economic factors – population and job growth, family income and wealth, industry and service types in the region. As they are in the national aviation forecast, these demands can be forecast for each region or economic market area. The region, however, is more than the sum of its airport demands, particularly if one or more of that region's airports is at or near capacity.

When regional demand is not accommodated – whether airports are at capacity or too far distant – demand for long-distance travel is satisfied by another, more-accessible mode. This transfer is likely to be to the auto. The result of this transfer (slow or no growth) often is attributed to the region's mature market. This is wrong. ACG estimates that, by 2000, the Chicago region had lost or foregone 3.1 million domestic enplanements due to capacity constraints (fig. 7). The loss would have been greater, but Midway's extraordinary growth partially compensated for O'Hare Airport's losses. The 2001 forecast for the Third Airport for Chicago, made in 1994, was 7.1 million enplanements. Had it been built, many national delay problems could have been avoided; and the Chicago region would have been 23,000 jobs richer.

By examining local economics and devising local aviation forecasts that parallel national ones, the planner can get a more accurate estimate of demand than by accepting or extrapolating local airport data. As a general rule, the forecast

Table 1
Airports ranked by delay/proposed improvements, USA

Rank	ID	Total Ops	Total Delays	Delays per 1,000 OPS	Average Time (Min)	CY 99 Enplanements	% of Total Enplanements	Planned Runway Projects through 2005
1	ORD	897,290	49,202	54.83	55.83	34,050,083	5%	No Projects Planned
2	EWR	463,000	36,553	78.94	49.98	16,927,048	3%	Runway Extension
3	ATL	909,911	32,737	35.97	37.67	38,136,866	6%	New Runway
4	LGA	368,311	28,474	77.3	39.95	11,968,030	2%	No Projects Planned
5	SFO	440,032	21,187	48.14	52.96	19,249,988	3%	No Projects Planned
6	DFW	867,338	16,731	19.29	38.7	27,990,212	4%	3 Runway Extensions; 1 New Runway
7	BOS	502,164	14,989	29.84	43.96	15,375,183	2%	New GA Runway
8	PHL	480,279	14,516	30.22	45.25	13,183,145	2%	No Projects Planned
9	JFK	355,677	13,547	38.08	36.44	11,762,140	2%	No Projects Planned
10	PHX	563,843	11,919	21.13	27.11	16,781,835	3%	New Runway; Runway Extension
Total		5,847,845	239,855			205,424,530	31%	
Total average				43.38	42.79			

(Source: 2000 Aviation Capacity Enhancement Plans).

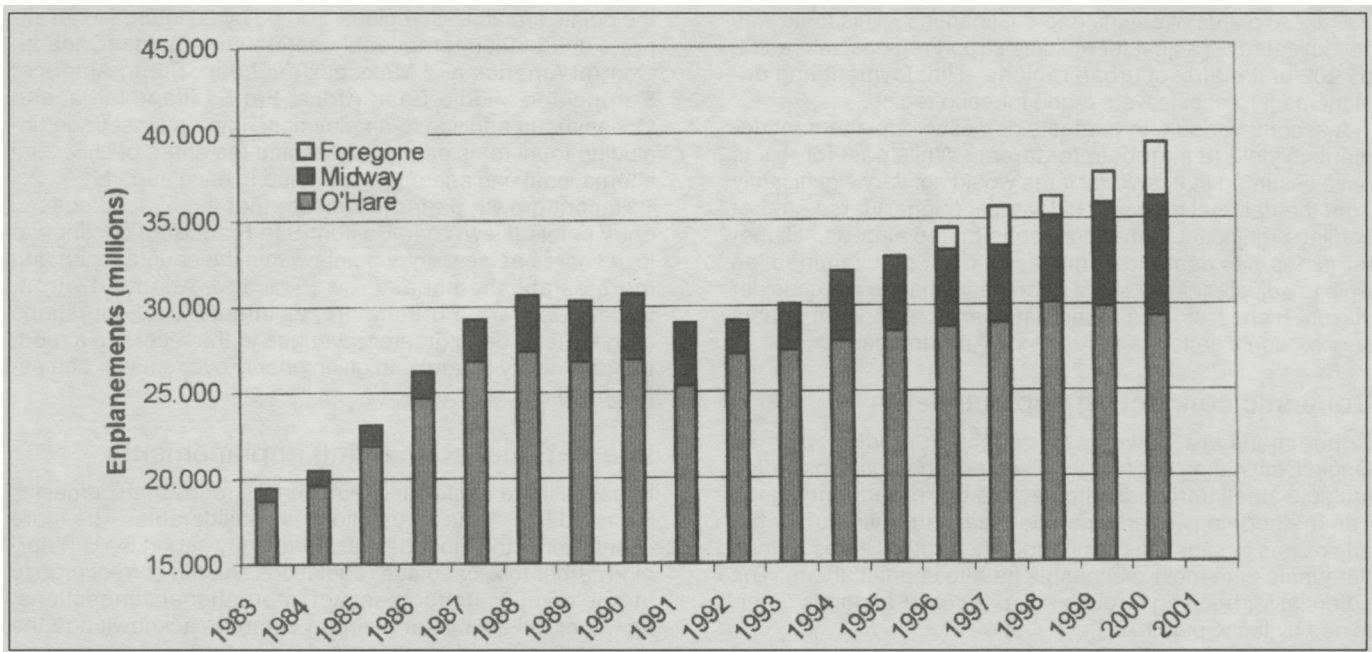


Fig. 7: Constrained domestic growth in Chicago, 1983-1999.

methodology should be economics-based and comprehensive. Forecasts should be prepared, not only for the region under study, but for all economic regions in the U.S. Such a comprehensive approach protects against unreasonable forecasts for a single region. The regional aviation demand consists of the following components:

- domestic origin/destination (O/D)
- domestic connecting enplanements
- international O/D enplanements
- international connecting enplanements
- freight operators

Domestic origin/destination enplanements

Studies by ACG: The al Chalabi Group, Ltd., during its fifteen-year work on the proposed Third Airport for Chicago,

indicate that there is a very close correlation between economic activity and O/D enplanements. However, attempts to correlate changes in regional employment to changes in O/D enplanements have resulted in very low forecasts. This is because enplanements per job are increasing. This fact is recognized in the FAA's preparation of national aviation forecasts.

For this reason, the single-most important variable for predicting variations in a region's share of national domestic O/D enplanements is shifts in a region's share of national employment (fig. 8). Employment statistics are readily available at both the national and regional level by a number of national forecasting firms (WEFA, Woods & Poole, NPA). Furthermore, most regional planning agencies produce, debate and adopt employment forecasts as a primary guide for future development. ACG constructed and used an air-trip matrix of

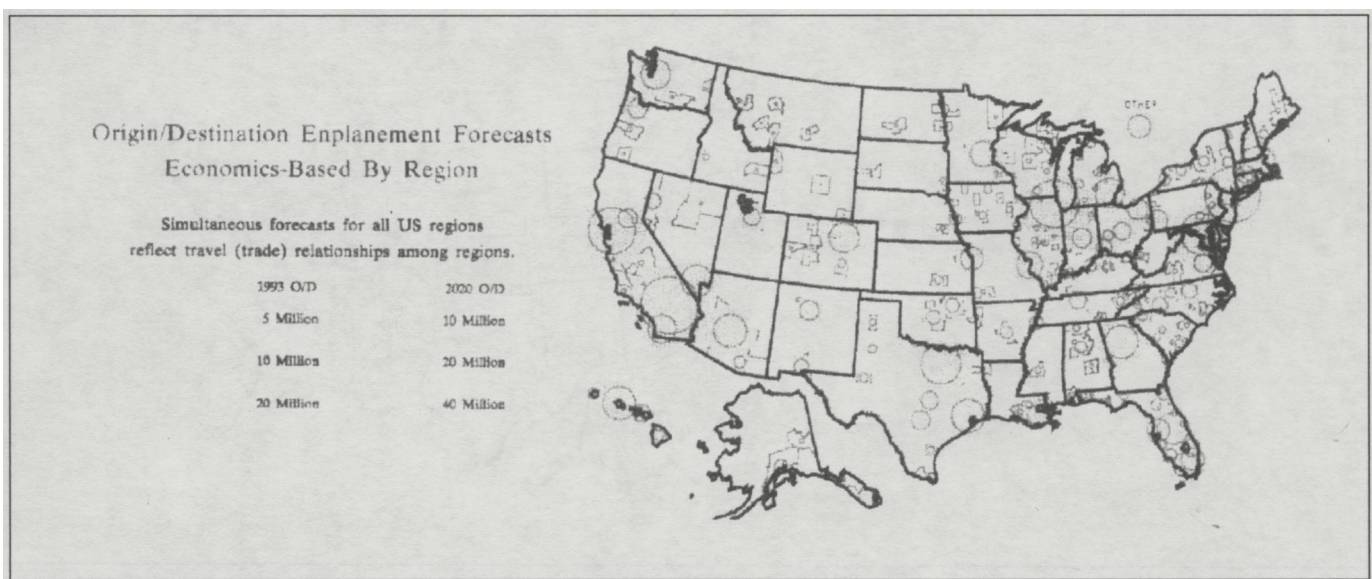


Fig. 8: Origin/Destination enplanement forecasts.

236 x 236 points of origins and destinations. This table was consolidated, to adjust for multiple airport regions, into a 202 by 202 unit matrix of urban regions. Employment and enplanement forecasts were made for each region.

A second variable that affects domestic enplanement demand is yield (a surrogate for fares). While past forecasts have assumed that regional fares would not vary significantly from the national average, differential (higher) fares are becoming significant at the most-constrained airports. Higher fares depress demand. This factor must be examined, as well, to adjust regional totals. Forecasts that do not consider current high fares, abandonment of markets and unreliable service would generate unreasonably low forecasts.

Domestic connecting enplanements

Connections are viewed as a collection-point stop on an Origin/Destination trip (fig. 9). Connecting hubs consolidate multiple small demands into several more-frequent flights. The methodology used examines the distribution of air trip origins and destinations throughout the United States. It then determines the most reasonable path to connect them. The potential for hubbing through any one major airport is determined by these paths.

Recognizing the difficulty in developing a national aviation network model to forecast connecting enplanements, many airports/regions try to develop regression models tying connections through their hubs to local conditions. The variables for such models vary from region to region and from time to time for the same region. The end results of such methods are usually connecting forecasts that simply fill the gap between the estimated O/D and the extrapolated total demand. The "flight path analysis", summed to the national forecast total, provides a consistent logic.

International origin/destination enplanements

Forecasts of international enplanements are both more complex (due to treaties and assignments) and simpler (due to the small number of entry points.). The methodology remains the same as for domestic O/D: identify the employment-generated growth in trips between points. In the ACG case,

the points are 20 U.S. regions, served by 39 international airports and eight international destination regions (Canada; Central America and Mexico; Caribbean; South America; Europe and Middle-East; Africa; Far East and India; and Oceania). In addition to employment, international trade (including tourism) is used to determine the share of U.S. total international enplanements assigned to each airport.

Recent growth patterns indicate that the historic coastal entry points (New York, Boston, San Francisco) continue to lose shares as new entry points within the country open and more established ones grow (Chicago, Atlanta, Detroit, Dallas, Denver). Furthermore, as international operations (and visitors) bring greater revenues to the receiving airport, they are highly sought and given priority over smaller domestic operations.

International connecting enplanements

Because there are fewer international airports than domestic, the need to provide connections is considerable. The more connections, the more desirable the entry airport is. U.S./foreign carrier mix, cabotage regulations and the current urge to merge complicate forecasts of international connections. However, all airlines and airport planners acknowledge the desirability of and need for many and frequent connecting domestic legs for international flights.

Freight operations

Calculation of freight operations used to be fairly simple. With the exception of a few all-cargo carriers and primarily-cargo airports, freight was virtually subsumed by passenger traffic. Most freight was carried as belly-cargo; the few all-cargo flights occurred after hours. Those simple assessments are over as the growth of narrow body planes reduces the share of belly cargo; as the public's and business's need for express mail and just-in-time inventory escalates; and as capacity constraints push passenger operations into traditional cargo slots. With its growth higher than that of both domestic and international enplanement traffic, freight deserves greater attention. Data – both availability and consistency – remains a problem.

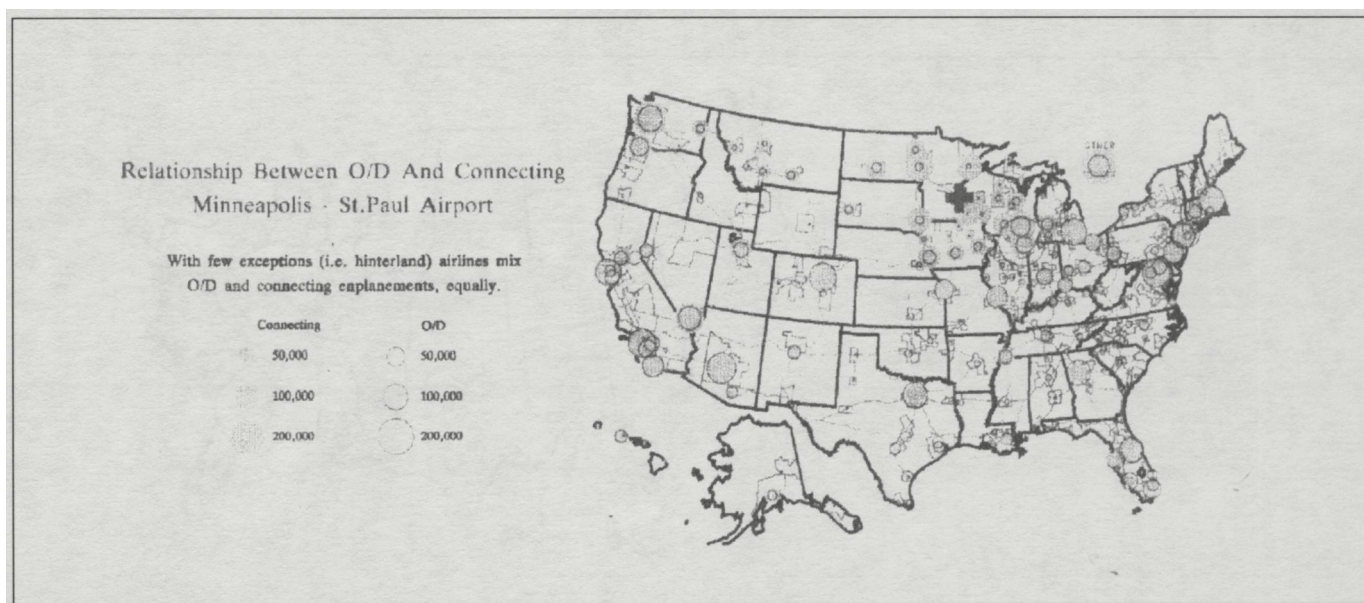


Fig. 9: Relationship between Origin/Destination and connecting.

Developing the models

Incorporating all of the above regional forecasts and using national aviation forecasts and national econometric forecasts as control totals, a national aviation network simulation (NANS) model can be developed. It would parallel ground transportation models (fig. 10). The NANS model would forecast regional air travel based on socio-economic factors; these forecasts would sum to the national. The model could provide aviation policy input similar to that provided by regional transportation plans. In multi-airport regions, or in regions considering supplemental airports, a second set of models would allocate enplanements to specific airports.

ports. In fact, because of their catalytic force, airports have drawn massive developments around themselves.

When plans are made for these airports, they are generally done under the constraints of a very-limited expansion potential. Consequently, the real and latent demands of their suburban regions are often underestimated. The long distances from suburban fringes to the old central airport also make these areas less attractive for commercial/industrial development. This reduces both job and travel options to the outlying resident. Yet, suburban fringes are the most desirable places to build new supplemental airports because available land is sufficient to buffer its adverse impacts and available to support the economic development that airports

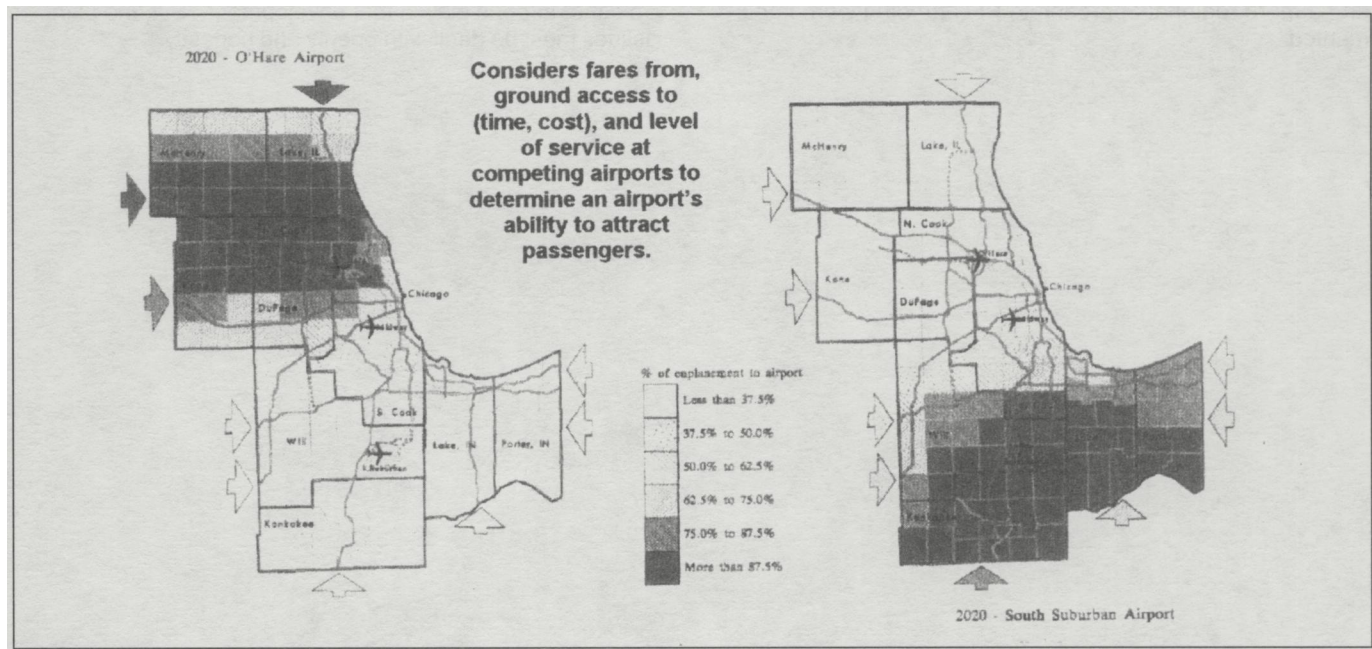


Fig. 10: Enplanement allocation model.

Policy implications of the model

Aviation is essential to the nation's participation in global trade and critical to each metropolitan area's ability to compete and grow with the U.S. economy. Air links are the highways of the 21st century. Just as highways were considered essential to national security in the 1950s, so should airports be today. Because many of the nation's oldest and largest airports serve older large cities, they have grown with those cities and now are landlocked. Expansion is costly; noise and traffic impacts are great; opposition is greater. This urban conglomeration is at the center of the aviation congestion triangle (New York-Washington-Chicago) that recently has caused cascading delays and traffic snarls.

This Northeastern/Great Lakes urban core houses 38 percent of the residents and 37 percent of the jobs in the United States. In spite of having a population increase of 8.4 million and a job increase of 19.7 million between 1970 and 2000, its number of airports has remained virtually the same. Since 1960, only two new airports, Chicago's O'Hare and Washington's Dulles have been added; and since 1970, none, although Pittsburgh, Detroit and Cincinnati were expanded. Massive growth and suburbanization throughout this segment of the country has landlocked most of its air-

attract. Many suburban residents, recognizing an airport's considerable economic benefits, want such development. One airline, Southwest, has made it a practice to locate in small, fringe airports; and small towns and airport operators flock to Southwest's door to bring them to town.

Because air service is so fundamental to economic development, no large group or urban segment should be denied it. Aviation planning and forecasts should ensure that all demands are recognized and accommodated. Because it is the user who funds the bulk of any airport development (PFCs, landing fees, parking), aviation is basically a pay-as-you-go (or grow) proposition. However, many who are paying are receiving little for their investment. A series of surveys, conducted in 1995, indicated that the residents of the South Suburban area of Chicago made up approximately 17 percent of the region's O/D travel and provided that share of the funding to the existing airports.

In spite of the fact that PFC legislation was enacted primarily to build a new airport for Chicago, those funds (\$110 million collected annually) are being used to gild O'Hare without expanding its operational capacity. In fact, the City of Chicago continues to claim that O'Hare has adequate capacity through 2012, in spite of FAA conclusions that it is at capacity. PFCs should not be hoarded; and their primary use

should be to increase capacity. Current legislation on PFCs gives the airport sponsor and the incumbent airlines almost total control over these funds. New airport construction is entirely feasible with this funding. The proposed Third Airport for Chicago assumed PFCs that it can generate, as part of its financing plan; but it is being denied the PFCs that its market area currently is generating. Even though the South Suburbs of Chicago want a new airport, they cannot stockpile the PFCs that they generate for it.

Secretary Mineta has stated that he wants to see more runways and airports built, more concrete poured. Airline officials have begun to echo this call. Surprisingly, because of the considerable demand and the in-place funding mechanism, this could be accomplished if appropriate planning tools were used; obstructionist maneuvers were removed; and a more regional approach to PFC funding were implemented.

Also, a closer look at many regions would reveal that airports are recognized for their many economic benefits and that – contrary to conventional wisdom – desire for them has “bubbled up” in many places, such as Chicago. Chicago’s South Suburban leaders have worked tirelessly to promote the South Suburban Airport; and Chicagoans have tolerated expansions at Midway, where homes are located within areas where noise levels reach 80 Dnl. Where the public has been extensively involved and informed of the planning process – such as in Minneapolis and Pittsburgh – airport expansions have been accepted. And, in cities such as Providence, airport development has meant both low-cost fares and economic growth.

The American public understands how important development and a thriving economy are. Furthermore, it knows the role that airports play in that development. But, the planning issues must be dealt with openly and honestly.