U.S. Department
of Transportation

ANALYSIS OF THE IMPACT OF CHANGES TO THE WRIGHT AMENDMENT

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ON THE WRIGHT AMENDMENT

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1. BACKGROUND

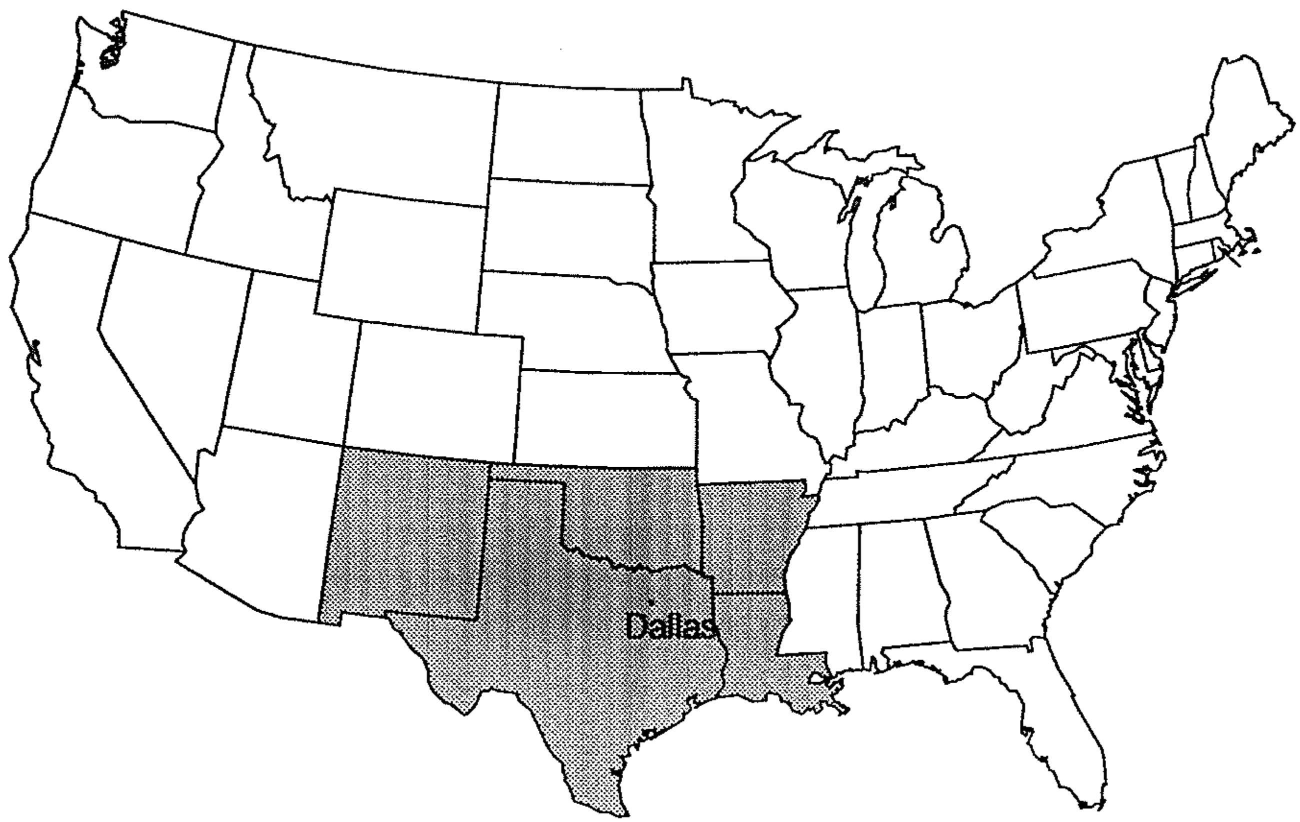
Dallas-Fort Worth International Airport (DFW) opened in 1974. To ensure its success and to provide assurance that the airport could meet its bond obligations, the cities of Dallas and Fort Worth agreed to move commercial passenger carrier operations from Love Field (DAL) in Dallas and Meacham Field in Fort Worth to Dallas-Fort Worth Airport. At the time, most of the major carriers serving the area signed an agreement to transfer. Only Southwest Airlines -- then a small, intrastate carrier -- did not sign. The courts subsequently found it eligible to continue to provide intrastate service from Love Field. Concern arose that other carriers might seek to enter Love Field an provide expanded service, a move which might dilute the service and financial standing of Dallas-Fort Worth Airport. The legislative result of that concern was the Wright Amendment -- a provision contained in the *International Air Transportation Competition Act* of 1979 and signed into law in 1980 that expressly prohibits air service (including connecting and through-ticketing) between Dallas Love Field and points beyond states contiguous to Texas, including Arkansas, Louisiana, New Mexico, and Oklahoma (See Figure 1.1).

Since passage, two views of the impact of the Amendment have developed. Advocates of change to the Wright Amendment are concerned that the Amendment's restrictions limit the benefits of Southwest's lower fare structure as well as the potential economic contribution of the airport. As a result, residents outside the Wright Amendment area, as well as some residents of Dallas, have argued for changes to the Amendment in order to allow Southwest to expand its operations and provide low-fare service to more cities. Opponents to changing the current restrictions believe that removing or changing the current restrictions would violate the original agreements that supported construction of Dallas-Fort Worth Airport, divert traffic from the airport, thus weakening justification for plans to expand, and would lead to major capacity problems.

To date, proposed Congressional legislation and legal challenges to repeal the Wright Amendment have failed. Legal attempts to challenge the constitutionality of the Amendment are currently underway.

The controversial nature of the Wright Amendment led to the creation of a U.S. Department of Transportation (DOT) team to conduct a study of the issues that surround the Wright Amendment. This team included members from the Office of the Secretary, Federal Aviation Administration, Federal Highway Administration, and Urban Mass Transit Administration (now the Federal Transit Administration). Contractors (Apogee Research and Howard Needles Tammen and Bergendoff) provided technical support. This study does not make any recommendations; instead it evaluates five scenarios and measures the potential effects of each scenario on a variety of issues.

Figure 1.1. Wright Amendment Service Limits



Shaded Area represents service boundaries from Dallas Love Field.

STUDY APPROACH AND METHODOLOGY

This study evaluates five questions surrounding changes to the Wright Amendment:

- What will be the impact on competition and fares?
- How much capacity can Love Field add?
- What will be the impact of opening Love Field on the continued growth of Dallas-Fort Worth Airport?
- Will travellers prefer Love Field to Dallas-Fort Worth Airport?
- What are the likely environmental consequences of more air traffic at Love Field?

Scenarios Examined

The scenarios identified for evaluation were developed based on a review of the existing conditions at Love Field, extensive interviews with experts, airlines, and local representatives of the region, a review of legal constraints (i.e., the Wright Amendment and related contractual and legal issues), and discussions among the consultants and the study team.[1] They are defined based on the degree of change to the Wright Amendment and include:

- Base Case. The Wright Amendment would be retained in its present form. This scenario examines the operational and environmental implications of continued growth.
- Modified Wright. A modified Wright Amendment would limit non-stop flights from Love Field to destinations within 650 miles of Dallas and permit through-ticketing and through-service for all destinations. This scenario is patterned on a resolution passed -- and subsequently repealed -- by the City of Dallas.
- Full Repeal of the Wright Amendment. All restrictions on air carrier access to Love Field would be removed. Signatories that had agreed to transfer their operations to Dallas-Fort Worth Airport when that airport was opened would be allowed full access to Love Field.

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[1] A list of individuals and organizations contacted by the study team is shown in Appendix A.

Because air carrier response to full repeal could vary widely, three scenarios that represented possible responses were evaluated. These scenarios were:

- Equal access. Other carriers would serve their hubs from Love Field.
- Major O&D. One carrier would develop Love Field as a major origin and destination (O&D) base (70 flights daily), with service to its hubs and other O&D markets.
- Major hub. Love Field would be developed into a full airline hub by a carrier other than Southwest (230 flights daily).

Figure 1.2 presents the relationship of all scenarios examined. The impact of these scenarios was evaluated through both supply-side and demand-side analyses. A supply forecast was developed based on industry response, O&D traffic data, size of hub, and other defining characteristics of traffic. Demand was modelled using time-series data, including air-traffic demand by carrier, fares by carrier, population, employment and gross income by city, and mileage between each city-pair.[2] Issues and scenarios reviewed by the study team but for which no quantitative analysis was prepared are discussed in Appendix B.

HISTORY OF METROPLEX AIR SERVICE

When Dallas-Fort Worth International Airport opened in 1974, it became, by agreement between the cities of Dallas and Fort Worth, the primary airport for the Metroplex region. Dallas-Fort Worth Airport's opening and the closure of other airports to scheduled passenger service, including Dallas Love Field, was to end nearly a half-century of planning and rivalry between the cites of Dallas and Fort Worth over how to best meet the region's air service needs. Love Field, however, continues to provide scheduled passenger service today. Figure 1.3 illustrates the history of Love Field enplanements.

Dallas/Fort Worth International Airport

Planning for a regional airport began in the late 1920s with discussions between the cities of Dallas and Fort Worth. During that period both cities also saw air service initiated at their airports -- Dallas Love Field and Fort Worth Meacham Field. In the early 1940s the Texas Aeronautics Advisory Committee was formed to discuss plans for a regional airport. Soon afterwards, the cities of Dallas, Fort Worth, and Arlington agreed to build Midway Airport, a regional airport which opened in the mid-1940s as a military field.[3] Shortly after World War II, Midway was converted and, in 1953 re-opened as Greater Fort

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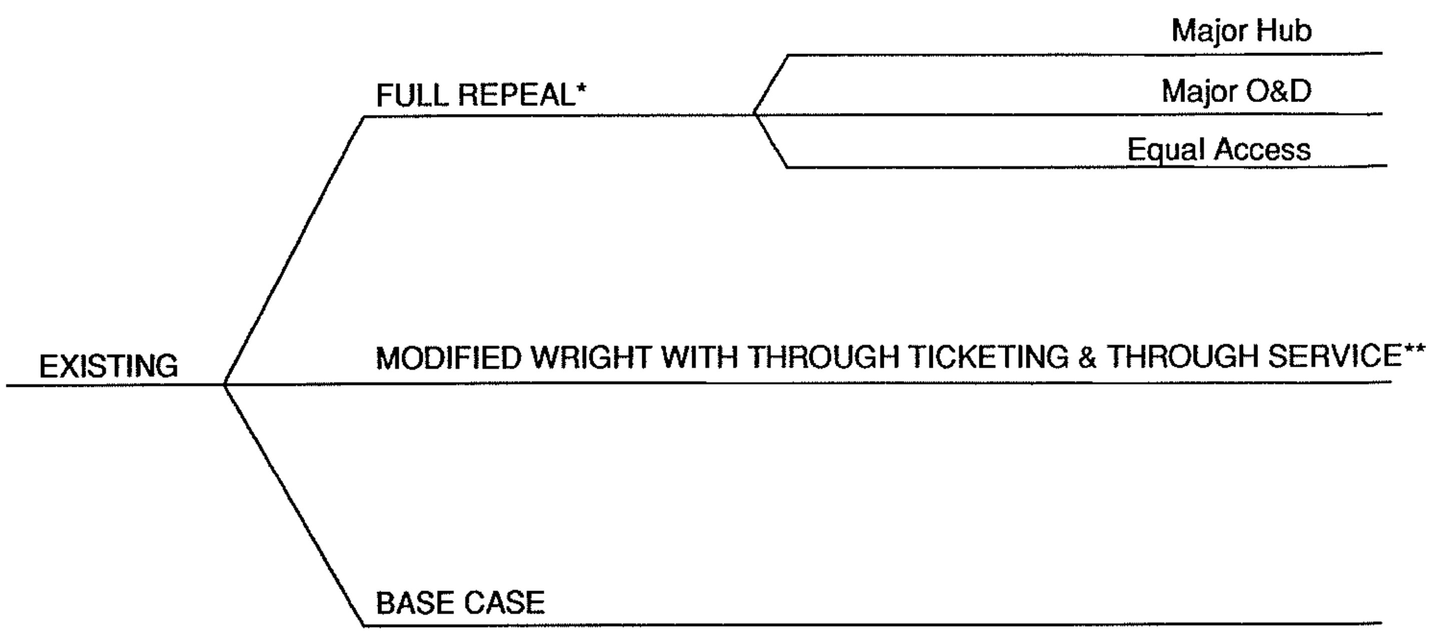
[2] For a complete description of the forecast methodology, See Appendix C.

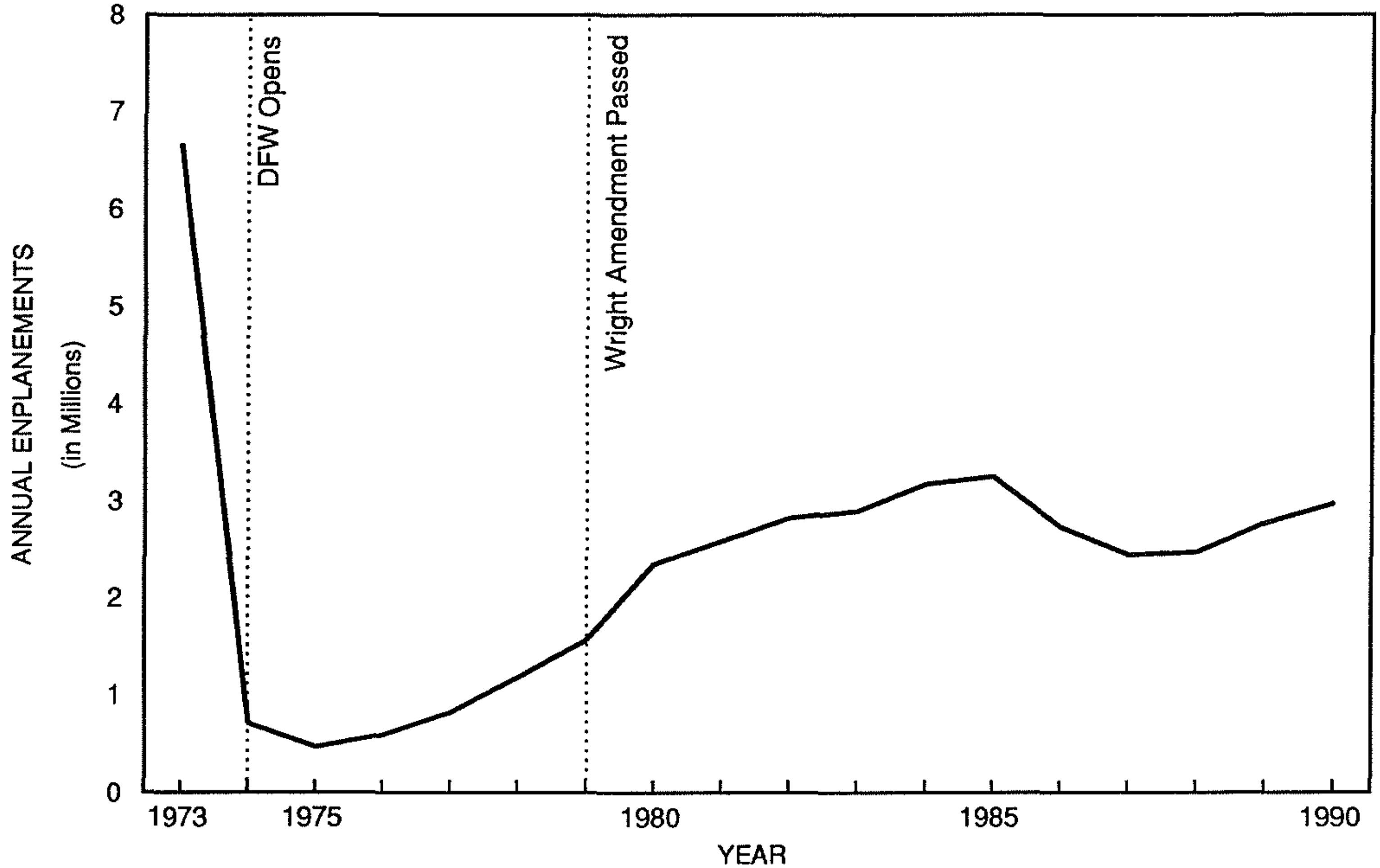
[3] *Dallas-Fort Worth Airport Development Plan*, September 1990, pp. 1-3.

Figure 1.2. Scenarios Examined



* Includes signatory access.
** Assumes 650-mile perimeter, through-ticketing, and signatory access.

Figure 1.3. Enplanements at Dallas Love Field, 1973 to 1990



Source: Dallas Love Field

Worth International (the name later changed to Amon Carter Field, then Greater Southwest International Airport).

In the early 1960s, the Civil Aeronautics Board (CAB) determined that Greater Southwest International Airport and Dallas Love Field were inadequate to serve the air travel needs of the Metroplex and ordered the cities to decide upon a single airport through which certificated air carriers would serve the Metroplex. By 1965, the Dallas-Fort Worth Regional Airport Board had been formed and site selection for Dallas-Fort Worth Airport was completed. Construction began on the present site in late 1968. The adoption of the 1968 Regional Airport Concurrent Bond Ordinance Authorization allowed for the issuance of Dallas-Fort Worth Regional Airport Joint Revenue Bonds which provided a finance mechanism for the new airport.[4]

As part of the bond agreement, the cities committed to end all CAB-certificated air carrier services at Love, Redbird, Greater Southwest International Airport, and Meacham Field. The intent of the ordinance was to move all certificated air carriers activity to Dallas-Fort Worth Airport and to prohibit the cities from taking any actions that would be competitive with Dallas-Fort Worth Airport.[5]

The early 1970s saw the establishment of the Joint Airport Zoning Board and the completion of the Environmental Impact Statement (EIS) required to initiate service. In late 1973, Dallas-Fort Worth Airport was officially dedicated and opened to service in January 1974.

A Foreign Trade Zone was opened at the airport in 1978, and soon after airline deregulation Braniff expanded service from Dallas-Fort Worth Airport to include service to Europe. American Airlines began hub-and-spoke activity from Dallas-Fort Worth Airport in the 1980s. The mid-80s saw the replacement of bankrupt Braniff airlines with Delta and the completion of new terminal facilities and runways. In 1985, the airport was renamed Dallas-Fort Worth International Airport. Currently, Dallas-Fort Worth Airport has plans for future expansion with a new terminal and two new runways. The EIS for the runways and associated development was approved in December 1991 and a record of decision endorsing the EIS was signed in April 1992.

Dallas Love Field

In 1970, all CAB-certified carriers that served Love Field signed agreements with the Dallas-Fort Worth Airport Board to move their operations to Dallas-Fort Worth Airport upon

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[4] Allen, Eric. *Journal of Air Law and Commerce*, "The Wright Amendment: The Constitutionality and Propriety of the Restriction on Dallas Love Field," Summer 1990, P. 1014.

[5] *Ibid*, pp. 1015.

upon its completion. These "signatory" agreements prohibit interstate operations by the carriers at all other Metroplex airports. As a result, Love Field, which had served as the primary air carrier airport for Dallas since the late 1920s, was to be closed to commercial service when Dallas-Fort Worth Airport opened in 1974.

In 1971, Southwest Airlines began intrastate service as a certified Texas Aeronautical Commission Carrier. Shortly thereafter, Southwest announced its intention to remain at Love Field after the other carriers left for Dallas-Fort Worth Airport.

In 1973, the cities of Dallas, Fort Worth, and the Dallas-Fort Worth Airport Board brought suit against Southwest for a declaratory judgment that Southwest was not entitled to use Love Field. The federal district court ruled that Southwest could remain at Love Field because the State had authorized its use of Love Field and because denying Southwest access to Love Field would violate Dallas' obligation under federal law to give airport users nondiscriminatory treatment.[6]

After deregulation of the airline industry in 1978, Southwest Airlines applied for and received authorization from the CAB to establish a route from Love Field to New Orleans, Louisiana.[7] In 1979, Congress passed the *International Air Transportation Competition Act*.[8] Section 29 of that act, the Love Field Amendment (introduced by Representative Jim Wright and subsequently referred to as the Wright Amendment), prohibits nonstop and through airline service with large aircraft from Love Field to points outside Texas and the contiguous states of New Mexico, Oklahoma, Arkansas, and Louisiana. The only exceptions to the prohibition are for a limited number of charter flights and commuter aircraft seating less than 56 passengers.[9]

In 1985, Continental proposed new service between Love and its hub at Houston Intercontinental Airport. The City of Dallas and Southwest Airlines asked DOT to maintain that Continental could not lawfully serve Love Field since Continental interlined with other carriers elsewhere on its system. Continental argued that its proposed service was consistent with the statutory restrictions because the airline would not provide interline service on its Love Field flights. The Department's order agreed with Continental's position on the interline issue, but held that Continental could not advertise or otherwise publicize service

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[6] See City of Dallas v. Southwest Airlines Company, 371 F. Supp. 1015, (N.D. Texas 1973), aff'd, 494 F.2d 773 (5th Circuit, 1974), certiorari denied, 419 U.S. 1079 (1974).

[7] P.L. 95-504, 92 Stat. 1705 (1978).

[8] P.L. 96-192, 94 Stat. 35 (1980).

[9] See Appendix D for legislation.

between Love Field and points outside Texas.[10] The Court of Appeals affirmed the Department's interpretation of the statute, but declined to rule on First Amendment arguments made by Continental.

Continental subsequently sued the City of Dallas because the City refused to lease any Love Field facilities to Continental for the proposed Houston service. The City argued that the agreement among the Dallas-Fort Worth Airport Board, Continental, and the other federally-certificated carriers that had relocated to Dallas-Fort Worth Airport barred Continental from using Love Field for Houston flights. That agreement allowed those carriers to operate only intrastate service at Love Field. The state courts in Texas held that Continental's proposed Love Field-Houston service was intrastate service within the meaning of the carriers' agreement and accordingly, was not barred by the agreement.[11] Continental has not begun that service.

Since enactment of the Wright Amendment, Texas International and Muse Airlines are the only carriers other than Southwest to have provided scheduled commercial passenger service from Love Field. Texas International Airlines briefly provided service at Love Field in 1980. Muse Airlines operated at Love Field for several years until it was acquired by Southwest in 1985.

In 1989, the Dallas City Council adopted a resolution to support a modified repeal of the Wright Amendment which would allow non-stop service within 650 statute miles of Dallas and through-ticketing and through service to points beyond.[12] The City Council rescinded this resolution in July 1990.

<u>Legislative and Constitutional Challenges to the Wright Amendment</u>

<u>Legislative Challenges</u>. Since the passage of the Wright Amendment, there have been attempts at modification or repeal. The first attempt was introduced as an amendment to an appropriations bill in 1987. Introduced by Senator Robert Dole (R-Kansas), the amendment proposed a modification of the Wright Amendment to permit Southwest Airlines to serve Wichita, Kansas, from Love Field. The amendment passed the U.S. Senate on a voice vote, but was deleted from the final legislation during a conference committee.

In 1989, Congressman Dan Glickman (D-Kansas), with 16 original co-sponsors, introduced H.R. 2911, which called for total repeal of the Wright Amendment. The bill was

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[10] Order 85-12-81 (December 31, 1985), aff'd sub nom, <u>Continental Air Lines v. DOT</u>, 843 F.2d 1444 (D.C. Cir. 1988).

[11] <u>City of Dallas v. Continental Airlines</u>, 735 S.W. 2d 496 (Texas Ct. App., 1987).

[12] Additionally, the legislation called for expanded use of noise abatement procedures to 24 hours and increased use of Stage 3 aircraft.

assigned to the U.S. House of Representatives Committee on Public Works and Transportation, Subcommittee on Aviation, where no action was taken. Senator Nancy Kassebaum (R-Kansas), and two co-sponsors, Senators Robert Dole and Jim Sasser (D-Tennessee), introduced identical legislation (S. 1333) which was referred to the U.S. Senate Commerce, Science, and Transportation Committee. No action was taken.

Congressman Glickman and 17 co-sponsors reintroduced the legislation (H.R. 858) in February 1991. H.R. 858 is currently before the U.S. House of Representatives Committee on Public Works and Transportation, Subcommittee on Aviation; hearings before the Subcommittee were held on September 24, 1991. Identical legislation was introduced in the U.S. Senate (S. 377) by Senator Kassebaum, but no action has been scheduled.

Constitutional Challenges. In the last two years, three cases have been filed challenging the constitutionality of the Wright Amendment. The first was filed by a Dallas resident, Buddy Cramer, in the U.S. District Court in Dallas. The District Court granted the U.S. Department of Transportation's motion to dismiss the case on standing grounds. Mr. Cramer appealed this decision to the Fifth Circuit. On May 9th, that court issued a decision holding that Mr. Cramer had standing to challenge the statute, but the statute did not violate his right to travel, the Constitution's Port Preference Clause, or his First Amendment rights.[13]

While Mr. Cramer's appeal was pending, a San Diego resident, Ms. Zamutt, challenged the Love Field Amendment in the U.S. District Court in San Diego. That court held that Ms. Zamutt did not have standing to challenge the statute and that the statute did not violate her constitutional rights.[14] Ms. Zamutt did not appeal the court's judgement.

The State of Kansas, several residents of the Dallas area and Kansas, the Wichita airport authority, and a Wichita travel agency have filed a suit in the U.S. District Court in the District of Columbia. They claim that the statute violates their right to travel, the Port Preference Clause, and the First Amendment.[15] The plaintiffs have moved for summary judgement. The government filed a cross-motion for summary judgment. American Airlines and the Dallas-Fort Worth Airport Board also intervened to defend the statute's constitutionality.

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[13] Cramer v. Skinner, 931 F. 2nd 1020 (5th Cir., 1991), cert. denied, 60 U.S.L.W. 3292 (Oct. 15, 1991).

[14] Zamutt v. Skinner et al., S.D. Calif. Civil No. 90-0602-B9M) (December 7, 1990 order).

[15] State of Kansas et al. v. United States et al., D.D.C. Civil No. 91-0233 TFH (filed February 4, 1991).

2. ECONOMIC, FINANCIAL, AND DEMOGRAPHIC ANALYSIS

From the consumer's perspective, any change in operations at Dallas Love Field (DAL) could have repercussions on the extent, quality, and cost of air service. From an airline's perspective, modification may affect the demand for air service to or from Metroplex airports as well as the costs of providing that service. This section reviews:

- Demand forecasts, including quantitative analyses to support the demand relationships;[1]

- Estimated impacts on demand and the financial condition of Dallas-Ft. Worth International Airport (DFW);

- Estimated financial impacts of a change to the Amendment on the airlines and consumers;

- The accessibility and demographics of residents and business within the Metroplex.

Each of the following sections reviews these implications by air service scenario.

DEMAND FORECASTS

Demand forecasts were developed in two categories: (1) the base case scenario (i.e., no change) over the period 1991 to 2001, and (2) each of the air service scenarios.

In the latter category, two forecasts were developed. The first, an econometric approach, was based on forecasts of demand stimulated by higher service levels and lower fares. The second was based on service levels that would hypothetically exist if the carrier mix identified for that scenario were to be realized, and all participating carriers were to realize standard industry load factors. No attempt was made to reconcile these two forecasts since they are intended to simply demonstrate the potential range of service levels. However, for the purpose of evaluating the operational implications, supply side results were used since they more accurately reflect the full range of potential demand necessary to support operations at levels identified for each scenario. This section presents:

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[1] The forecasts are based on analysis of the historical impact of Southwest Airlines market entry and exit. In addition, qualitative factors such as carrier motivations (as identified through personal interviews with key airlines) and historical levels of service (at cities with scheduled commercial service from multiple cities) were reviewed by the study team.

- The Base Case forecast

- Analyses and inputs to support the scenario forecasts, and

- Forecast results.

Base Case Forecasts

Passenger demand at Love Field over the forecast period for the Base Case (no change) scenario was estimated to grow at 2.6 percent annually between 1991 and 2001. This rate is based on a linear time-series model that estimates the time trend of demand at Dallas Love Field (see Appendix C) as well as Dallas employment projections.[2] Because of the dramatic rise and fall of air traffic at Love Field in the mid-1980s, this model includes a dummy variable for the entry and exit of Muse/Transtar Airlines, carriers affecting operations and demand during that period. The forecast results are presented in Table 2.1.

Table 2.1.
Base Case Scenario Actual and Forecast Enplanements and Operations at Dallas Love Field, 1990-2001

Factor	1990	1996	2001
Enplanements	2,968,000	3,463,000	3,930,000
Operations	214,200	249,000	283,000

Source: Apogee Research, Inc.

This forecast is lower than growth rates implied by the 1990-2000 forecasts by KPMG (3.1 percent)[3], the FAA (7.1 percent)[4], and Reese (10.5 percent).[5] The Reese forecast assumes repeal of the Wright Amendment; the KPMG and FAA forecasts do not. There are several reasons for the difference between the FAA forecast and the one prepared for this study, such as the forecast period and the underlying assumptions. At the time of the FAA forecast, Continental Airlines, over several years, had made large investments to secure and maintain the option to enter Love Field, including litigating several court cases.

[2] As provided by the North Central Texas Council of Governments.

[3] *Evaluation of the Potential Effects of Changing the Air Service Restrictions at Love Field (Wright Amendment Study)*, prepared for DFW International Airport Board, Peat Marwick Main & Co., Airport Consulting Services (March 1990).

[4] Federal Aviation Administration *Terminal Area Forecasts*, July 1990.

[5] *The Impact on Air Traffic Activity at Dallas Love Field Resulting from Repeal of the Wright Amendment*, prepared by Reese & Company for the City of Dallas, July 31, 1989.

Consequently, the FAA forecast assumes that Continental would enter Love Field with a three-gate operation. However, in light of Continental's recent financial condition (Chapter 11 bankruptcy) and the fact that they have not yet elected to pursue this option, this forecast assumes Continental will not enter Love Field unless a change to the Amendment occurs.

Analysis to Support Scenario Forecasts

Four factors influenced scenario forecasts: (1) the stimulus of Southwest Airlines' low cost structure on demand, (2) the supplemental stimulus on city-pairs within close proximity of a new Southwest market (also called the Halo Effect), (3) carrier assertions regarding plans following any change to the Wright Amendment, and (4) the nature of demand in cities with multiple scheduled commercial passenger service airports.

Effects of Southwest Airlines Market Entry and Exit

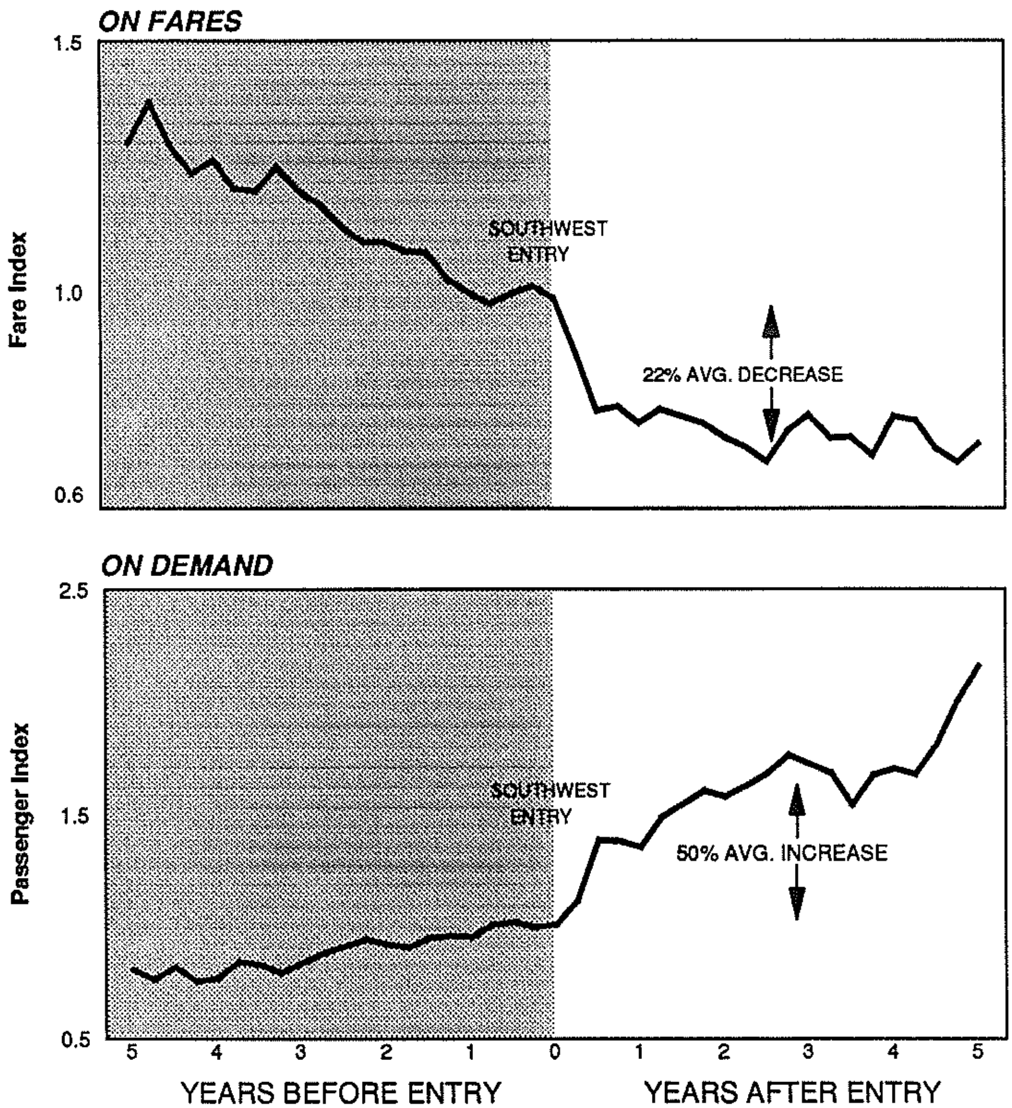
There is considerable evidence that when Southwest Airlines enters a market, fares tend to decrease and air traffic tends to increase substantially.

In order to estimate the effects of market entry by Southwest, 26 markets that Southwest has entered since 1979 were examined (see Appendix E). They include seventeen nonstop markets and nine one-stop and/or connecting markets. For each of these markets, fare and passenger indices and descriptive statistics were calculated to estimate the historical fare and passenger effects of Southwest market entry. The weighted averages of these indices are shown in Figure 2.1., where the average decrease in real fares was approximately 22 percent over the five-year period following Southwest's entry and, for a similar period, the average increase in passengers was approximately 50 percent.

In addition to these markets, this analysis included the only two markets Southwest both entered and exited: Denver-Houston and Denver-Phoenix. Because Southwest withdrew from these markets after three-and-a-half years, they offer unique examples of the impact of Southwest entry. For example, Figure 2.2 depicts the rise in traffic and fall in fares while Southwest was in the Denver-Phoenix market, and how these trends reversed when Southwest exited from the market. After Southwest left the market, traffic fell and fares rose to levels similar to those that preceded Southwest entry. A similar pattern occurred in the Denver-Houston market.

Further evidence of Southwest's low-fare structure is presented in Figure 2.3. This figure shows that 1990 fares for markets served by both Love Field (provided by Southwest Airlines) and Dallas-Fort Worth Airport (provided by various airlines) average 39 percent *below* the Standard Industry Fare Level (SIFL). Fares for markets served only by Dallas-Fort Worth Airport average 19 percent *above* the SIFL. A similar pattern is evident when examining fare data from previous years.

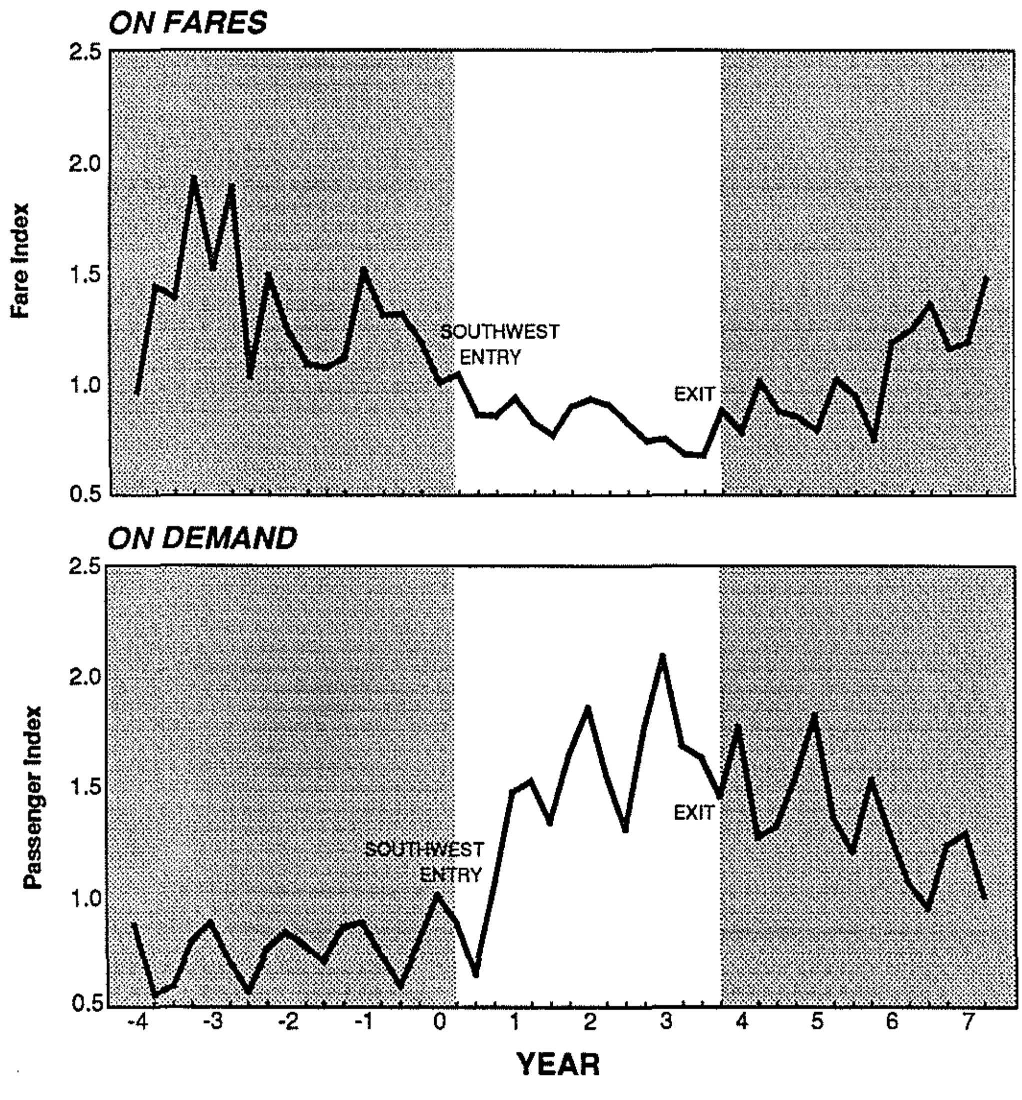
Figure 2.1. Effect Of Southwest Airlines...



Note: Fare index based on constant dollar fares.

Source: Apogee Research, Inc., based on U.S. Department of Transportation survey of origin and destination passengers.

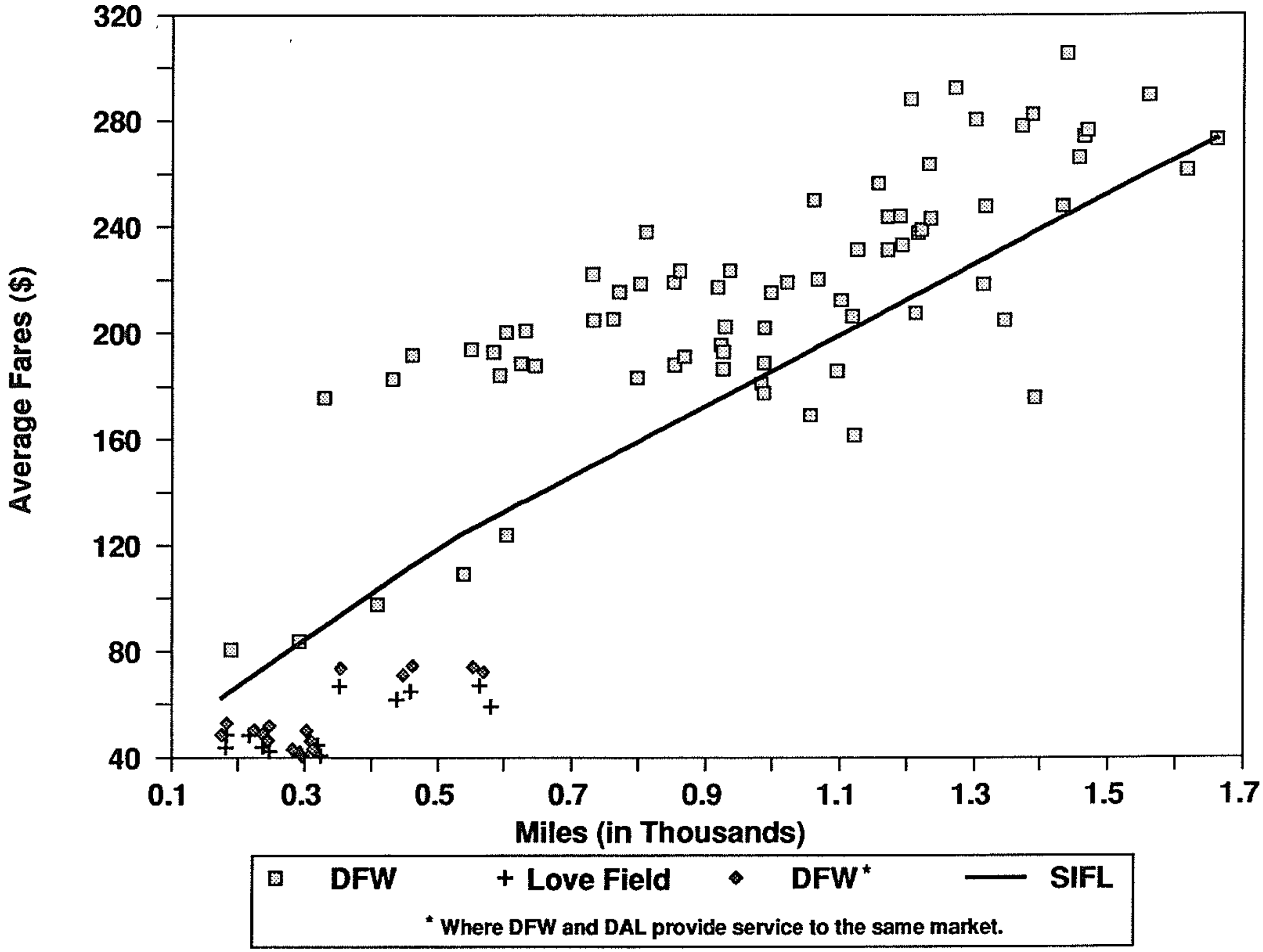
Figure 2.2. Effect Of Southwest Airlines Entry And Exit in DEN-PHX Market...



Note: Fare index based on constant dollar fares.

Source: Apogee Research, Inc., based on U.S. Department of Transportation survey of origin and destination passengers.

Figure 2.3. Average Fare and Standard Industry Fare Level (SIFL) Non-Stop Jet Markets Served from Love Field and DFW (1990)



Source: Apogee Research based on data from U.S. Department of Transportation.

Halo Effects

A "halo effect" is a spillover effect which occurs not only in the market that receives new or expanded service, but also in other, nearby markets for which similar route structures may exist. For example, when Southwest entered Detroit from Chicago, fares fell and air traffic increased in the Detroit-Chicago market, and also to a lesser extent in the Lansing-Chicago market, which Southwest does not serve. This effect may be realized when two markets are not entirely independent. Detroit is less than a two-hour drive from Lansing. Thus, some passengers in Lansing seeking a lower air fare to Chicago might drive to Detroit. As a result, carriers might offer similar fares to Chicago from both Lansing and Detroit.

The halo effect was examined through a comparative analysis of the change in demand and price in six market pairs:

- Detroit-Chicago / Lansing-Chicago
- Detroit-Kansas City / Lansing-Kansas City
- New Orleans-Austin / Baton Rouge-Austin
- New Orleans-Dallas / Baton Rouge-Dallas
- New Orleans-Phoenix / Baton Rouge-Phoenix
- Phoenix-St. Louis / Tucson-St. Louis

For each of these six market pairs, fare and passenger indices were prepared. These indices are presented in Figures E.3 through E.14 in Appendix E.

Based on this data, a halo effect appears to exist between some market pairs, such as Lansing and Detroit. The pattern, however, is less clear and sometimes mixed for the other market pairs. Given this fact and the difficulty in predicting which specific communities would exhibit the halo effect, no additional demand impacts attributable to the halo effect were included in the econometric projection of demand.

Carrier Motivations

A change in the Wright Amendment could significantly affect air travel to the Metroplex region by changing the number and type of air service options. These changes might include new (lower) fare structures, a change in frequencies, and service by airlines from each of the two commercial passenger airports. The magnitude, nature, and form of these potential impacts, however, depend on how air carriers react to each scenario. The impact of these reactions will affect frequency of service, markets served, and equipment type.

This section summarizes airline's views and reactions to changes in the Wright Amendment and presents the expected reactions by scenario.[6]

American. The key motivations identified by American Airlines representatives in developing a strategic response to a change in the Wright Amendment include:

- Making American Airlines the premier U.S. carrier,
- Making Dallas-Fort Worth Airport the world's largest airline hub,
- Avoiding loss of their local frequent fliers, and
- Concern tnat another carrier would make Love Field into a major operations base/hub.[7]

As a result, American has stated that if the Wright Amendment were repealed, American would operate 230 flights daily out of Love Field. This would, in the view of top management, prevent any challenge to American's supremacy in the Metroplex region. American would also challenge the legality of the alternative initially advanced by the City of Dallas, a 650-mile perimeter rule (modelled in this analysis as the Modified Wright scenario).

American believes that if it or any other airline were to develop a major hub at Love Field, air service in the Metroplex would decline. Consequently, nearly all markets would experience a reduction in service frequency.

Delta. Delta's Dallas-Fort Worth Airport hub is smaller than American's and serves a higher percentage of connecting traffic (approximately 68-70 percent).[8] If the Wright Amendment were to change, Delta's primary concern would be that equal access be ensured at Love Field. The airline, however, has no plans to divert flights from Dallas-Fort Worth Airport to Love Field because of its capital investment in Dallas-Fort Worth Airport.

Southwest. Southwest is interested in providing better customer service by offering through and connecting services from Love Field. In addition, management would like to add a small number of nearby cities to its Love Field network, primarily cities already

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[6] The changes described are based on discussions with senior management of America West, American, Delta, Midway, Northwest, Southwest, United, and USAir.

[7] This concern is based on American's market research that suggests Love Field would be the region's preferred airport, an assertion based primarily on geographic proximity rather than driving time.

[8] Approximately 65% of American's traffic is connecting through DFW.

served by Southwest. The airline does not expect to add any long-haul nonstop flights (with the possible exception of Phoenix).

America West. America West feels that Southwest operates in an environment protected from competition at Love Field, and has taken advantage of that fact by charging higher fares from Love Field to support lower fares elsewhere. America West is not constrained by the signatory agreements and could provide service from Love Field if it wished to do so. Nonetheless, America West has aggressively pursued repeal of the Wright Amendment.

Other Carriers. Other carriers interviewed, including Northwest, United, and USAir, had similar views on the Wright Amendment:

- The Wright Amendment is a regulatory constraint in a deregulated environment;
- The other carriers are interested in serving Love Field, with service to their hubs;
- Love Field service would probably be less frequent, to fewer hubs, and with smaller aircraft than Dallas-Fort Worth Airport service;
- The other carriers could compete successfully against Southwest;
- The other carriers believe that if American were to add 230 flights at Love Field American would be harmed more than any other carrier.

Summary of Airline Entry Expectations by Scenario

Based on the motivations identified above and a review of the route network and operations of each of the major carriers, an assessment of the likelihood of entry to Love Field was developed by service scenario. In short, all carriers except Midwest Express are expected to be interested in providing service to their hubs from Love Field if that opportunity becomes available. Under the Modified Wright scenario, however, only American, Continental, Northwest, and TWA could provide non-stop service to one of their hubs. All other scenarios, except for Base Case, assume repeal and, therefore, all carriers could provide non-stop service to their hub. The likelihood that a carrier will enter was based on the findings of the interviews described above and on the carrier's current financial position. The overall assessment is summarized in Figure 2.4.[9]

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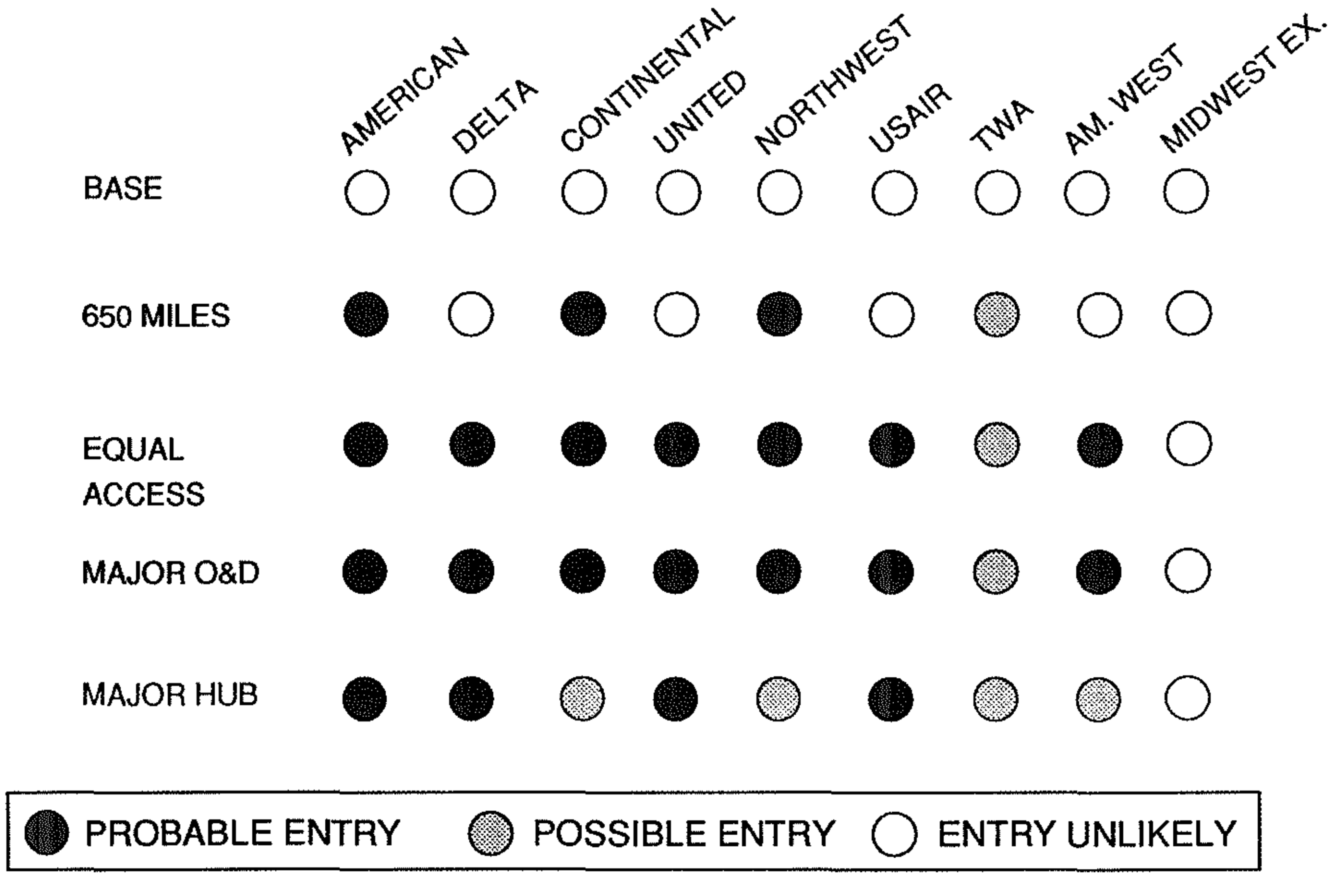
[9] Originally, Pan Am and Midway were also included in the analysis. The forecast numbers reflect their status at the time of the initial forecast in mid-1991.

Figure 2.4. Likelihood of Airline Entry by Scenario



Service in Cities With Multiple Airports

As our nation's demand for air travel has increased and older airports have neared capacity, multiple airport systems have proliferated. While no current system identically matches Love Field and Dallas-Fort Worth Airport, examples from other cities can provide insight as to possible impacts of Wright Amendment repeal.

Characteristics of Multiple Airport Systems. Multiple airport systems have proven to be beneficial to many of the metropolitan areas in which they are located. Presently, most multiple airport systems have one "full service airport" while other airports act as specialists, offering more limited service. For example, in the New York area, Newark, which grew to its current position based on limited, low-cost flights, now provides short, medium, and long-haul service, as well as enough frequency to other airline hubs to serve as a terminus for origin and destination (O&D) passengers. By comparison, JFK is primarily an international gateway, with long-haul domestic service and LaGuardia is primarily a short and medium haul O&D airport. Other air carrier airports in the New York region (Islip, Westchester, Stewart) are mainly short-haul O&D airports.

The primary airport will always have the majority of passengers and operations in a region. In most cases, the secondary airport's purpose is not to compete with the primary airport for passengers, but to complement the primary airport by offering alternative service or by attracting passengers who have poor access to the main airport. Additionally, if the secondary airport is successful it will offer passengers greater utility by increasing choices available.

Secondary airports will generally offer less frequent service, limited primarily to short and medium haul destinations. For example, in the San Francisco Bay Area, Oakland provides service to major hubs (Table 2.2) and Southern California. This service means residents living in or near Oakland do not have to drive all the way to San Francisco to catch a flight, especially short-haul flights. This has increased passenger convenience and allowed flights to/from Southern California to divert from San Francisco. This, in turn, increased capacity at SFO for more long-haul and international operations, consistent with its role as the primary airport for the Bay Area.

In Chicago, both O'Hare and Midway serve as hub airports. Midway, despite its close location to downtown Chicago, still has very limited service to many destinations, especially by carriers other than Midway Airlines (See Table 2.3) which recently terminated operations. Unlike other cities where carriers compete at nearly all area airports, the hubbing carriers at O'Hare do not compete at Midway.[10]

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[10] On occasion, United has offered service to Florida from Midway.

Table 2.2.
Comparison of Service to Major Hubs With One Hubbing Airport
San Francisco and Oakland

Destination	San Francisco		Oakland	
	Frequency	Carriers	Frequency	Carriers
Atlanta	4	Delta	0	
Chicago (O'Hare)	22	American United	4	United
Dallas (DFW)	18	American Delta	5	American
Denver	14	Continental United	4	United
Detroit	5	Northwest	0	
Houston (Intercontinental)	4	Continental	0	
Pittsburgh	5	USAir	0	
Salt Lake City	13	Delta United	4	Delta

Source: Apogee Research from the *Official Airlines Guide*, June 1991.

Table 2.3.
Comparison of Service to Major Hubs With Two Hubbing Airports:
Chicago O'Hare and Midway

Destination	Chicago O'Hare		Chicago Midway	
	Frequency	Carriers	Frequency	Carriers
Atlanta	20	American Delta United	5	Midway
Dallas (DFW)	21	American Delta United	5	Midway
Denver	20	American Continental United	3	Midway
Detroit (DTW)	19	American Northwest United	17	Midway Northwest Southwest
Houston (Intercontinental)	16	American Continental United	0	
Pittsburgh	16	American United USAir	4	USAir
Salt Lake City	10	American Delta United	0	
San Francisco	17	American United	0	

Source: Apogee Research from the *Official Airlines Guide*, June 1991.

Forecast Results

Forecasts were developed using two different sets of assumptions. The first, or demand-based approach, forecasts shifts in demand likely to be stimulated by the higher service levels and lower fares that would result from increased competition from Love Field (from Southwest Airlines, in particular). This approach used traditional economic forecasting models.

The second set of forecasts took a supply-side approach based on service levels identified for each scenario and assumed that all carriers were able to realize standard industry load factors. Both forecast methods were used to estimate the expected shift in demand under each scenario. Once a new market equilibrium had been established, growth in demand from Love Field was assumed to return to the baseline annual growth rate of 2.6 percent.

No attempt was made to reconcile these two forecasts since they are intended to simply demonstrate the potential range of service levels and to explore different aspects of the market -- the demand side approach emphasizes consumer responses, while the second or service-based approach emphasizes competitive responses within the airline industry. In order to evaluate the operational implications (discussed in Chapter 3), the latter of the two forecasts were used. These should more accurately reflect the facility requirements of each scenario and, in general, the higher level of traffic imposes a stricter test on the system.

Econometric Results (Demand-Based)

This section summarizes the findings of the econometric analysis. A detailed discussion of the approach and results of that analysis are contained in Appendices C and E. These results are based on more than ten years of data on market stimulation by the entry of Southwest Airlines. The types of effects caused by this market entry have several dimensions, including price and service impacts, that are difficult to separate from each other.

The econometrically derived results show that significant increases in demand would be stimulated under both the Modified Wright and the Equal Access scenarios (see Table 2.4). The Modified Wright Scenario shows a majority of the total potential increase, simply because it opens up the largest number of new non-stop markets to service by Southwest Airlines. Repeal of the Wright Amendment adds only one more key market -- Phoenix -- likely to receive non-stop service by Southwest Airlines. Therefore, while repeal (including Equal Access, Major O&D, and Major Hub) does open many other markets to non-stop service, as discussed above, the success of Southwest Airlines and, consequently, the impacts are based on limiting Southwest Airlines non-stop service to markets with relatively short stage lengths. Southwest will provide one-stop and connecting service to many of these markets, and the effect of improved service and lower fares is incorporated into both the Modified Wright and the three Wright Amendment repeal scenarios.

Table 2.4.
Actual and Forecast Passenger Enplanements at Dallas Love Field
Based on Stimulated Demand
1990-2001

Scenario	1990	1996	2001
Base Case	2,968,000	3,463,000	3,937,000
Modified Wright	--	5,150,000	5,855,000
Repeal	--	5,234,000	5,951,000

Source: Apogee Research, Inc.

Because variations in service following repeal may not result in service to additional markets from Love Field, there is no change in the nature of Metroplex service, and no additional demand stimulus is expected based on the econometric relationships. In practice, some additional demand is likely to be realized at Love Field as service expands dramatically at Love Field and shrinks at Dallas-Fort Worth Airport, but that demand will be either at the expense of airline load factors at Dallas-Fort Worth Airport or will be stimulated as a result of the initial service change. In either case, that traffic would be diverted from Dallas-Fort Worth Airport.

Note that the estimates of fare-induced and through-ticketing-induced growth (appearing in Table 2.7 on page 29) do not vary between the Equal Access, Major O&D, and Major Hub scenarios. This is because the model estimates the total effect on the Metroplex market and not how the new traffic is split between Dallas-Fort Worth Airport and Love Field.

Service Level Forecast Results (Supply-Based)

The service forecast results, shown in Tables 2.5a and 2.5b, are based on an analysis of carrier motivations, competitive strategies, and operating characteristics. Specifically, the estimates were based on:

- The expected number of daily flights,
- The number of seats per flight, and
- An assumed load factor of 60 percent.

This analysis also assumes that the service levels associated with each of the scenarios would be fully developed within five years (by 1996) and that growth will return to the Base Case scenario rate of 2.6 percent annually after 1996.

Table 2.5a.
Actual and Forecast *Operations* at Dallas Love Field Based on Projected Service Levels, 1990-2001

Scenario	1990	1996	2001
Base Case	214,200	249,000	283,000
Modified Wright	--	287,000	325,000
Equal Access	--	329,000	356,000
Major O&D	--	346,000	378,000
Major Hub	--	442,000	490,000

Source: Apogee Research, Inc.

Table 2.5b.
Actual and Forecast Passenger *Enplanements* at Dallas Love Field Based on Projected Service Levels, 1990-2001

Scenario	1990	1996	2001
Base Case	2,968,000	3,463,000	3,937,000
Modified Wright	--	5,068,000	5,763,000
Equal Access	--	7,201,000	8,179,000
Major O&D	--	8,892,000	10,122,000
Major Hub	--	14,094,000	16,024,000

Source: Apogee Research, Inc.

EFFECTS ON DALLAS-FORT WORTH AIRPORT

Changes to the Wright Amendment could have two types of impacts on Dallas-Fort Worth Airport:

- The operational impact, realized as a net change in traffic levels from the base forecast, and

- The financial impacts of changes in traffic -- particularly on Dallas-Fort Worth Airport's ability to recover costs.

These effects are discussed below. The impacts on Metroplex airspace of rapid growth in operational levels at Love Field and the relationship to delays at Dallas-Fort Worth Airport are discussed in Chapter 3.

Operational Impact on Dallas-Fort Worth Airport

Operational impacts at Dallas-Fort Worth Airport were estimated in two ways. First, the net difference between the econometrically established forecast of demand at Love Field and the air service levels anticipated by scenario were calculated to identify the relative magnitude of traffic that could be diverted. Second, the carrier motivations described above were used to estimate the net change in Dallas-Fort Worth Airport schedule passenger service jet operations. Both cases imply a minor impact on operations under the Base Case, Modified Wright, and Equal Access scenarios but a considerably larger impact under the Major O&D and Major Hub scenarios.

As shown in Table 2.6, there were 759 estimated daily jet departures at Dallas-Fort Worth Airport in 1990.[11] This number is forecast to increase to 955 (or by 25.8 percent) in 1996 under the Base Case scenario. Under the Modified Wright and Equal Access scenarios, forecast departures are anticipated to remain virtually unchanged at 955 and 950, respectively. Daily jet departures would decrease slightly more under the Major O&D scenario to 918 total (a 4 percent decline from 1996 departures under the base case, or the equivalent of about one year's growth). Under the Major Hub scenario, however, daily jet departures at Dallas-Fort Worth Airport would fall by 8 percent (or about two years of growth) below the base case to 881 daily jet departures, assuming Delta elects to increase its operational presence at Dallas-Fort Worth Airport in response to the dramatic shift to Love Field by American. If Delta does not elect to increase operations, average daily jet departures would drop to 831, or 13 percent below the base case.

Because the major operational changes attributable to a shift in the Wright Amendment are assumed to be realized in the first 5 years following repeal, the same

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[11]Domestic jet departures based on *Official Airlines Guide*.

forecast growth rate (based on the Metroplex rate) is applied to the average number of daily jet departures for all scenarios to arrive at the forecast 2001 levels (see Table 2.6).

Table 2.6.
Projected Daily Jet Departures at Dallas-Fort Worth Airport by Scenario
(Total 1990 estimated average daily jet departures = 759)

Year	Scenario				
	Base Case	Modified Wright	Equal Access	Major O&D	Major Hub*
1996	955	955	950	918	881 (831)
2001	1,063	1,063	1,058	1,022	981 (931)

* The number in parentheses reflects the operations level if Delta did not increase operations in response to American Airlines' move to Love Field.

Source: Apogee Research, Inc.

The second approach to evaluating the potential effects on traffic at Dallas-Fort Worth Airport of a modification in the Wright Amendment was based on the difference between econometrically derived forecasts of demand and the demand level necessary to maintain average load factors of 60 percent under each scenario's projected service level. The remaining difference, classified as "other" in Table 2.7, can be interpreted as including such effects as the shift in traffic from Dallas-Fort Worth Airport and the halo effect.[12] For example, for the Equal Access scenario, the supply-side estimate is 1,967,000 enplanements greater than the demand-side estimate.[13] This suggests that, under this scenario, not all of the increase in traffic at Love Field would be stimulated by these effects; rather, it would be the result of the combination of halo effect and/or a shift in traffic from Dallas-Fort Worth Airport.

[12] This analysis assumes that all estimated fare-induced growth and through-ticketing induced growth take place at Dallas Love Field because Southwest is expected to be the low-fare carrier. Insofar as other air carriers offer fare and through-ticketing competition, these effects could be distributed between Love Field and DFW. This would cause the estimates of the "other" category to increase.

[13] The demand-side estimate is the sum of the estimated fare, service, and through-ticketing impacts.

Table 2.7.
Sources and Magnitude of Increased Traffic at Dallas Love Field
Forecast Originating Enplanements, 1996

Scenario	Fare-Induced Impacts	Through-Ticketing Induced Impacts	Other Impacts
Base Case	N/A	N/A	N/A
Modified Wright	205,000	1,482,000	(82,000)
Equal Access	289,000	1,482,000	1,967,000
Major O&D	289,000	1,482,000	3,658,000
Major Hub	289,000	1,482,000	8,860,000

N/A: Not Applicable.
Source: Apogee Research, Inc.

Note that the estimates of fare-induced and through-ticketing-induced growth do not vary between any of the Wright Amendment repeal scenarios (Equal Access, Major O&D, or Major Hub). The fare-induced impact is smaller in Modified Wright because the 650-mile perimeter excludes Phoenix -- one of the cities to which Southwest would be likely to offer direct service from Dallas if the Wright Amendment restrictions were lifted.

It is important to note that these figures provide only rough estimates of the general magnitude of the expected shift in traffic from Dallas-Fort Worth Airport under each scenario. More significant than the absolute size of the "other" category for any particular scenario is the relative size of the "other" category between scenarios. In this respect, the implications of the analysis are clear: the shift of traffic from Dallas-Fort Worth Airport would probably not be large under Modified Wright, but the development of a major O&D/hub market at Love Field under the Major O&D or Major Hub scenarios could probably occur only if traffic were shifted from Dallas-Fort Worth Airport to support the scenario operational level. In other words, the degree of impact on Dallas-Fort Worth Airport depends most significantly on the actions taken by the airlines that currently serve Dallas-Fort Worth Airport -- most obviously, by American Airlines.

Financial Impact on Dallas-Fort Worth Airport

Virtually all airlines serving Dallas-Fort Worth Airport have entered into exclusive Airport Use Agreements (signatory agreements) with the Dallas-Fort Worth Airport

Board.[14] In order to recover airport service costs, operation and maintenance (O&M) expenses, and debt service allotted to each terminal, provisions of the signatory agreements require that terminal rentals be calculated on a cost center basis. Therefore, Dallas-Fort Worth Airport charges landing fees based on the landing weight of the signatory airline.

Landing fees at DFW are calculated using the following generalized formula:[15]

$$\textit{Landing fee rate} = \frac{(A+B+C-D)}{E}$$

where:

where:	A	=	O&M expenses;
	B	=	1.10 times debt service on Joint Revenue Bonds;
	C	=	Airport service costs (as allocated to the runway and taxiway complex);
	D	=	"Ancillary Net Revenues," defined as (1) gross revenues from sources other than landing fees (and certain other items) less (2) "Gross Expenses of the Board less Landing Fee Elements" -- (an element that includes the balance of required 0.25 times debt service coverage on *all* Joint Revenue Bonds); and
	E	=	Total number of 1,000-pound units of signatory airline landing weight.

Under this residual cost formula, the Dallas-Fort Worth Airport Board is guaranteed payment of the total *net costs* each year for the airfield cost center by the signatory airlines, allowing for credit of all *Ancillary Net Revenues*.[16] To calculate a landing fee rate, these costs are spread over the total forecast landing weight of all airlines serving Dallas-Fort Worth Airport.

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[14] Exceptions include Southwest, America West, and Alaska Airlines.

[15] Based on *Evaluation of the Potential Effects of Changing the Air Service Restrictions at Love Field (Wright Amendment Study)*, prepared for DFW International Airport Board, Peat Marwick Main & Co., Airport Consulting Services (March 1990).

[16] *Ancillary Net Revenues* include revenues from concession operations. For example, if the growth in the number of passengers at DFW is reduced because of a move to Love Field, growth in concession revenues would be expected to decrease. Such a decrease would be reflected in the rate calculation.

The overall impact on Dallas-Fort Worth Airport from a diversion of service to Love Field (or any change in the Wright Amendment under the existing scenarios) is negligible. As embodied in the provisions of the signatory agreements and the above formula, a reduction in the number of departures, and therefore the landing weights at Dallas-Fort Worth Airport, will not reduce the airport's revenues or ability to meet its expenses. A reduction in flights will, however, increase the rate per pound charged to the airlines. Depending on how each air carrier responds to the reduction in flights, the increased landing fee could have an effect on the carrier's operations.

The operational impact on the airlines for each of the existing scenarios is anticipated as follows:

- All Scenarios Except Major Hub - No significant change to landing fee expenditure is anticipated due to minimal decrease in departures at Dallas-Fort Worth Airport. For example, total daily jet departures at Dallas-Fort Worth Airport remain unchanged for Base Case and Modified Wright in 1996, virtually unchanged (0.5 percent decline) under Equal Access) and decline by only 5.5 percent under the Major O&D scenario.

- Major Hub Scenario - Projections for operational impacts under this scenario depend on whether Delta Airlines expands service at Dallas-Fort Worth Airport after American Airlines shifts some flights to Love Field. If Delta chooses not to fill the gap left by the departure of American, it could experience an increase of nearly 32 percent in landing fees. (A reduction in American's operations increases Delta's percentage of total departures at Dallas-Fort Worth Airport). On the other hand, by adding 50 departures, the relative increase in landing fees (on a per flight basis) to Delta would be lower. No significant change in landing fees is anticipated for the other carriers at Dallas-Fort Worth Airport because they operate relatively few flights to the airport.

A standard industry measure to analyze airport costs is airline costs paid to the airport sponsor per enplaned passenger. Because total costs to operate Dallas-Fort Worth Airport would not fall in proportion to the lower use of the facility (fixed costs would remain the same for the near term), airline costs paid per passenger at Dallas-Fort Worth Airport would increase. The magnitude of that increase would depend on the amount of passenger traffic remaining after any service diversion to Love Field. The higher the airline cost per passenger, the more difficult it would be for the Dallas-Fort Worth Airport Board to obtain agreement on capital improvement programs.

FINANCIAL IMPACTS OF CHANGES TO THE WRIGHT AMENDMENT

The impacts of any changes to the Wright Amendment on the airlines depend on two factors:

- The financial status of the affected airline(s); and

- The financial impacts on consumers and airlines of broad service and fare changes following change to the Wright Amendment.

Airline Financial Analysis

This analysis, based on each airline's annual financial reports, 10-Ks, and filings of financial information with the U.S. Department of Transportation examines five factors:

- Overall Industry Financial Position;

- Income;

- Liquidity;

- Debt (including related measures of debt capacity, such as aircraft ownership); and

- Operating Efficiency.

Not all comparative financial performance measures calculated for this analysis are discussed. Additional details on these and other financial performance measures are presented in Appendix F.

Airline Industry Financial Position

1990 could be characterized as a year in which airlines, in an effort to remain competitive both domestically and abroad, continued to add debt. Simultaneously, many airlines' operating expenses were increasing. Further, in late 1990 and early 1991, the airline industry was beset by the convergence of two key events: (1) *rapidly increasing fuel prices* (which necessitated price increases and, combined with concerns over security, resulted in decreased demand) and (2) *fare cuts*, which were initiated to offset short-term declines in passenger demand. While these fare cuts resulted in increased bookings and income in the short-term, the longer term impact has been to lower passenger yields, further eroding overall airline financial standing.

However, while this generalization applies to the industry as a whole, there are many important variances. For example, based on 1990 financial data, Delta and Southwest could be characterized as strong; American, United, and USAir, as moderate; and Continental, America West, and TWA as weak.[17] Figure 2.5 presents a summary of the relative financial status of each of the airlines for which complete data were available for 1990.

Income and Liquidity

Since the mid-1980s, gross revenues for the airlines have been increasing. Their gains, however, have been more than offset by increased operating expenses. As a result, operating income has declined (see Table 2.8).

For the purposes of evaluating relative liquidity and general short-term financial position, three additional measures were evaluated: (1) the *Current Ratio* (current assets to current liabilities), (2) the *Net Operating Cash* relative to *Total Revenue*, and (3) *Times Interest Earned* (the number of times that revenues covered interest expenses).

The general findings indicate that these measures have been declining between 1989 and 1990.

Debt

Debt has generally increased between 1989 and 1990, most notably for America West. America West generally operates under a highly leveraged condition and continues to add debt. Table 2.9 presents the change in debt from 1988 to 1989 and 1989 to 1990.

The increase in debt between 1989 and 1990 is demonstrated by a review of three ratios:

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[17] Northwest and TWA assessments are based on limited financial data provided by each carrier's filings with the U.S. Department of Transportation. The financial structure of these airlines, however, precludes a comprehensive assessment of condition based on these data.

1990 operating data for Midway are not complete because the carrier filed for Chapter 11 bankruptcy in early 1991 and terminated operations in November 1991.

The data for Continental Airlines Holding, Inc., are not suitable for direct comparison since Eastern Airlines was operating during part of 1990 as a debtor-in-possession under the U.S. Bankruptcy Code. Consequently, financial operations data for Continental for the entire year are unavailable and not comparable to the prior year's activity.

Figure 2.5. Summary of Airline Financial Strength

		American	Am. West	Continental	Delta	Southwest	TWA	United	USAir
REVENUE	Operating Income	●	◍	○	●	●	○	◍	○
OPERATING EFFICENCY	RPM Yield	◍	○	○	●	◍	○	◍	●
	ASM Cost	◍	●	◍	◍	●	◍	○	○
	Net RPM Yield - ASM Cost	◍	◍	○	●	●	◍	○	●
DEBT	Debt/Equity	◍	○	◍	●	●	○	◍	◍
	Liabilities/Assets	◍	○	○	●	●	◍	◍	◍
	Liabilities/Equity	◍	○	◍	●	●	○	◍	◍
LIQUIDITY	Current Ratio	●	○	◍	●	◍	○	◍	◍
	Net Oper. Cash/Rev.	◍	◍	○	●	●	○	◍	○
	Times Int. Earned	◍	○	◍	●	●	○	◍	○
KEY ASSETS	% of Aircraft Owned	◍	○	○	●	●	◍	◍	◍
FINANCIAL STRENGTH		◍	○	○	●	●	○	◍	◍

● STRONG ◍ AVERAGE ○ WEAK

Source: Apogee Research based on DOT Form 41 filings and annual reports (1990).

Table 2.8.
Operating Income by Carrier, 1986-1990

Airline	Operating Income (in Millions)				
	1990	1989	1988	1987	1986
American	124	744	807	461	411
America West	(32)	48	18	(35)	4
Continental			(see note below)		
Delta	420	678	497	405	35
Midway	(89)	(20)	11	24	11
Southwest	82	98	86	30	89
TWA	(162)	24	259	N/A	N/A
United	(36)	465	665	347	90
USAir	501	22	434	319	169

Note: Data for Continental considered not comparable due to operation of Eastern Airlines.

Sources: Apogee Research based on airline annual reports and financial filings with the U.S. Department of Transportation. Midway Airlines 1990 data based on *Aviation Daily*, May 24, 1991.

- *Long-Term Debt to Equity*: Measure of the airline's long-term debt position. Delta and Southwest had the lowest debt to equity ratios in 1990, of the airlines evaluated (approximately 50 and 54 percent, respectively). On the other hand, America West and TWA had the highest debt-equity ratios (approximately 2,900 and -346 percent, respectively).[18]

- *Total Liabilities to Assets*: Measure of the airline's short-term liquidity position. America West and Continental had the poorest short-term liquidity positions in 1990 (approximately 98 and 198 percent, respectively). All other airlines evaluated for this analysis had safe short-term liquidity positions in 1990.

- *Total Liabilities to Equity*: Measure of total liabilities. In 1990, Delta and Southwest had low liabilities (1.8 and 1.4 percent times equity, respectively). In contrast, America West and TWA had high liabilities in 1990 (approximately 54 and -6 percent times equity, respectively). TWA's 1990 liabilities/equity ratio represents negative equity.

Table 2.9.
Percent Change in Long-Term Debt and Capital Leases

Airline	1989 - 1990	1988 - 1989
American	42	(16)
America West	31	23
Continental	N/A	N/A
Delta	87	(3)
Midway	N/A	99
Southwest	(8)	(4)
TWA	(8)	N/A
United	(6)	(35)
USAir	54	N/A

Source: Apogee Research, based on airline annual reports.

Since the mid-1980s, many airlines have secured additional financing through the sale and leaseback of existing assets, most notably aircraft. As such, information on aircraft ownership can be an additional indicator of the potential to secure additional financing. Of those airlines for which data were available, only United, Delta, and Southwest own more than half of their aircraft. Table 2.10 presents airline aircraft ownership data.

[18] TWA had negative equity, hence the negative debt-equity ratio.

Table 2.10.
Owned Aircraft as a Percent of Total Fleet
(Excludes Commuter Aircraft)

Airline	1990
American	43%
America West	21
Continental	29
Delta	60
Midway	(a)
Southwest	60
TWA	(b)
United	56
USAir	(c)

Notes:
(a) Midway 1990 data unavailable. 1989 ownership was 24 percent.
(b) TWA 1990 data unavailable. In mid-1991, 133 aircraft leased, 2 unavailable for purchase upon expiration of lease.
(c) USAir data unavailable. Approximately 454 aircraft in fleet.

Source: Apogee Research from airline annual reports.

Operating Efficiency

The best measures of operating efficiency are: revenue per revenue passenger mile yield (R/RPM) and cost per available seat mile (C/ASM). The net difference between these two measures reflects the degree to which the airline can manage both costs and yields. Of those evaluated, Delta, Southwest, and USAir have the highest net difference while Continental and United the lowest. Table 2.11 presents the findings of this analysis.

Table 2.11.
Revenue per RPM Less Cost per ASM
(in cents)

Airline	1990	1989
American	3.8	4.0
America West	3.8	4.9
Continental	N/A	2.9
Delta	5.2	5.4
Midway	N/A	5.1
Southwest	4.8	4.3
TWA	N/A	N/A
United	3.0	3.3
USAir	5.3	6.0

Source: Apogee Research based on airline annual reports.

Financial Impacts on Consumers and Airlines

Assuming Southwest elects to expand service, repeal or modification of the Wright Amendment would benefit consumers in the form of lower fares to more destinations from the Metroplex and, conversely, would reduce income to carriers that were subsequently in direct competition with Southwest Airlines. As described above, two approaches were developed to quantify these financial impacts. The first was based on the econometric relationships developed for the demand forecast which describe mathematically the historical relationship between fares and demand. The second was based on actual airline schedules to identify where the impacts of a change would be realized most directly, and, based on an assumed load factor, estimated the potential number of passengers affected. Both rely on three inputs: (1) the key non-stop service and one-stop/connecting service assumed to be undertaken by Southwest Airlines following modification or repeal, (2) the average fares for each of those city-pairs, and (3) the average change in fares following entry by Southwest Airlines.

For the third, the relationship between fares and demand for air service for markets served by Southwest Airlines was developed.[19] The results of that analysis indicate that weighted average fares in markets with new non-stop Southwest service are expected to decrease approximately 25 percent and that fares in key markets that benefit from through-ticketing (one-stop and connecting traffic) would decrease 15 percent. Overall, fares would decline by 22 percent, leading to an average increase in demand on those markets of 50 percent. Table 2.12 presents markets Southwest would either enter following change as well as the estimated changes in fare structure.

Based on these approaches, fare savings to travellers or, conversely, revenue reductions to carriers resulting from a Wright Amendment repeal (including the Equal Access, Major O&D, and Major Hub scenarios) range from $183 million to more than $300 million in the first year following repeal (in 1991 dollars). These results would be slightly lower (approximately 5 to 10 percent) under the Modified Wright scenario. These results reflect the current operating environment and therefore are conservative in that carriers' schedules and operating practices would change rapidly in response to a changed competitive environment.

Forecast Based on Historical Demand

Based on a forecast of historical demand and the impacts on fare and demand of Southwest market entry, repeal is expected to result in $183 million in annual savings (in 1991 dollars). If the Wright Amendment were only modified, as was initially proposed by the Dallas City Council, fare savings would be $167 million, 91 percent of the repeal level. This is due to the inability of Southwest to serve Phoenix with non-stop service, although there would still be some benefit from the availability of through ticketing. Results of the analysis of the potential savings from repeal are presented in Table 2.13.

Based on historical data, demand was estimated by escalating city-pair demand in 1990 by the Metroplex forecast rate to 1996.[20] 1996 was chosen because it is expected that, given the need to adjust service and adapt to new operating patterns, all air service changes resulting from a change in the Wright Amendment would take place within a five-year period. This number provides a conservative estimate of the potential fare savings that would accrue to consumers because it excludes the level of additional demand that would be stimulated in addition to origination and destination (O&D) passengers -- for example, demand that would be stimulated at key connecting points -- was not included.

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[19] This analysis, described in greater detail in Appendix E, was based on analysis of 26 markets that Southwest has entered since 1979.

[20] Based on the rate of growth in demand for the DFW Metroplex as presented in *Terminal Area Forecasts*, Federal Aviation Administration (July 1990).

Table 2.12.
Market Entry By Southwest Airlines and Subsequent Fare Savings[a]
to/from the Metroplex
Following Change to the Wright Amendment

Most Likely Non-Stop Markets from Love Field[c]	**Fare Savings**	**Most Likely Key One-Stops and Connections[b]**	**Fare Savings**
Birmingham	17%	Chicago	18%
Memphis	25%	Detroit	8%
Phoenix	27%	Indianapolis	10%
St. Louis	25%	Las Vegas	10%
Kansas City	27%	Reno	10%
		Ontario	10%
		Burbank	10%
		San Diego	10%
		San Francisco	21%
		Oakland	19%
		Nashville	10%

Notes:
a) The non-stop cities listed above represent the most likely additional entry points from Love Field given Southwest's current operating pattern. Analysis suggests that Southwest may enter a limited number of additional cities (all smaller than those shown).
b) The overall weighted average fare savings is estimated to be 22 percent. The weighted average increase in demand for air service in response to these fare savings and service increases is estimated to be 50 percent.
c) Analysis includes impact on all major airports in cities with multiple airports.

Source: Apogee Research, based on analysis of U.S. Department of Transportation Survey of Origin and Destination Passengers.

Table 2.13.
Annual Fare Savings by Market Resulting From Wright Amendment Repeal

MARKET (From the Metroplex)	Forecast 1996 Passengers[a]	Additional 1996 Passengers[b]	Average Fare Savings (Millions of 1991 Dollars)
Non-Stop Markets			
BHM	60,000	23,000	$ 3.1
MCI	209,000	128,000	18.1
MEM	113,000	64,000	8.4
PHX	263,000	161,000	22.7
STL	295,000	168,000	23.2
One-Stop and Connecting Markets			
BNA	133,000	30,000	3.4
BUR	64,000	15,000	2.2
CH	817,000	334,000	45.7
DT	292,000	53,000	5.4
IND	128,000	29,000	3.3
LAS	216,000	49,000	4.6
OAK	79,000	34,000	5.9
ONT	122,000	28,000	3.8
RNO	53,000	12,000	1.4
SAN	185,000	42,000	5.4
SFO	299,000	143,000	26.4
TOTAL	**3,328,000**	**1,313,000**	**$183.0**

Notes:

a) Market forecast based on 1990 U.S. Department of Transportation Survey of Origin and Destination Passengers for each city pair forecast to grow at rate of the Terminal Area Forecasts provided by the Federal Aviation Administration.

b) Demand would increase by less than the 50 percent non-stop average since many of the markets would only be affected by multiple stop (through-ticketing) service.

Analysis Based on Current Route Structure

A second estimate of fare savings was based on the existing carrier route structure and equipment, as published in the August 1991 *Official Airlines Guide*.[21] Historical average fares were used to estimate the potential change in route revenues (fare savings). Total passengers were estimated based on average load factors and historical average fares.

This analysis estimates that the total decline in passenger revenues (or, conversely, increase in fare savings to consumers) as a result of repeal would be more than $300 million (in 1991 dollars). Because carriers would rapidly adjust their operations to reflect a change in the market, this figure should only be considered an estimate of the potential change in the existing revenue base. For example, it is unclear how changes in frequencies and equipment would affect demand. Therefore, the results of this analysis were not estimated for 1996 as was done for the estimate of historical demand.

One benefit of this approach, however, is the ability to estimate the relative distribution of impacts by carriers, since certain carriers would be affected more significantly that others. In order to estimate the *maximum* (conservative) negative revenue impact, one simplifying assumption was made: a reduced fare would result in an airline revenue loss (consumer fare savings) on the existing passenger base but demand would remain unaffected. This scenario, therefore, represents the largest possible loss to the carrier on that route.

Table 2.14 presents the relative magnitude of the potential decline in revenues that would result over the course of one operating period assuming the carriers make no adjustments to their operating practices following repeal (or modification). In short, with the exception of America West Airlines, the loss associated with this change would be very small relative to total operating income (0.66 percent overall for the affected major carriers).

Should the Wright Amendment be modified rather than repealed, the overall change in revenue loss would be relatively small (from 0.66 percent to 0.63 percent, 5 percent change), but the relative negative impact on America West, American, and Delta would be smaller since modification would not allow non-stop service direct to Phoenix from Love Field. The impact of through-ticketing on this market would, however, still draw down average fares and would still have an impact on service to key West-coast markets, in spite of the fact that it would be via multiple stops on Southwest.

[21] The detailed data supporting these findings are presented in Appendix G.

Table 2.14.
Estimated Revenue Loss To Major Airlines from Expanded Southwest Service as a Percent of Gross Income[a]: *Worst Case Scenario*

Airline	Revenue Change as a Percent of Gross Revenues	
	Repeal	**Modification[b]**
America West[c]	2.97%	2.65%
American	1.14	1.08
Delta	1.03	0.97
Continental[c]	0.60	0.60
TWA	0.27	0.27
USAir	0.09	0.09
Northwest[d]	0.08	0.08
United	0.07	0.07
Weighted Average[d]	**0.66**	**0.63**

Notes:

a) Estimate based on existing route structure forecast for a one-year period as compared to operating income for 1990. However, the actual impact would likely be lower and for a period of less than an operating quarter as carriers adjust schedules and equipment, particularly for carriers most dramatically affected.

b) Would only affect carriers with non-stop service to Phoenix (American, Delta, and America West).

c) Operating under bankruptcy protection.

d) Northwest income based on passenger revenues, as filed with the Department of Transportation. Midway Airlines data included in Weighted Average only.

ACCESSIBILITY AND DEMOGRAPHICS

Accessibility and the demographic characteristics of the population served are important determinants of demand for an airport. Therefore, an analysis of the relative driving times from both Dallas-Fort Worth Airport and Love Field was prepared, coupled with data on population, income ranges, and employment characteristics of those people within those driving times.[22] The results suggest that Dallas-Fort Worth Airport is consistently superior to Love Field. Further, that position improves over time. For example, Dallas-Fort Worth Airport will serve a larger percent of people in 2010 than presently, while Love Field's service will actually decline. This can be attributed to the continued improvement of roads serving Dallas-Fort Worth Airport, in contrast to the increased congestion of roads serving Love Field.[23]

The results of the analysis are presented in three sections:

- Driving time,
- Population by driving time, and
- Demographic characteristics of population by driving time.

Driving Time

To evaluate accessibility, market areas served by each airport were developed based on average drive time data developed for both Dallas-Fort Worth Airport and Love Field (See Figure 2.6).[24] In general, the entire Metroplex area is within one hour travel time and more than one-third of the Metroplex region's population (34 percent) is within 30 minutes of Dallas-Fort Worth Airport. This is due in part to ease of accessibility to Dallas-Fort Worth Airport provided by the existing highway network (represented by the thin black lines on Figure 2.6). In addition, because of the central location of Dallas-Fort Worth Airport, both Ft. Worth and Dallas are within a 30 to 45 minute drive.

Accessibility to Love Field, however, is slightly more limited. As a result, the western and central-northern portions of the region are within a travel time of more than one hour

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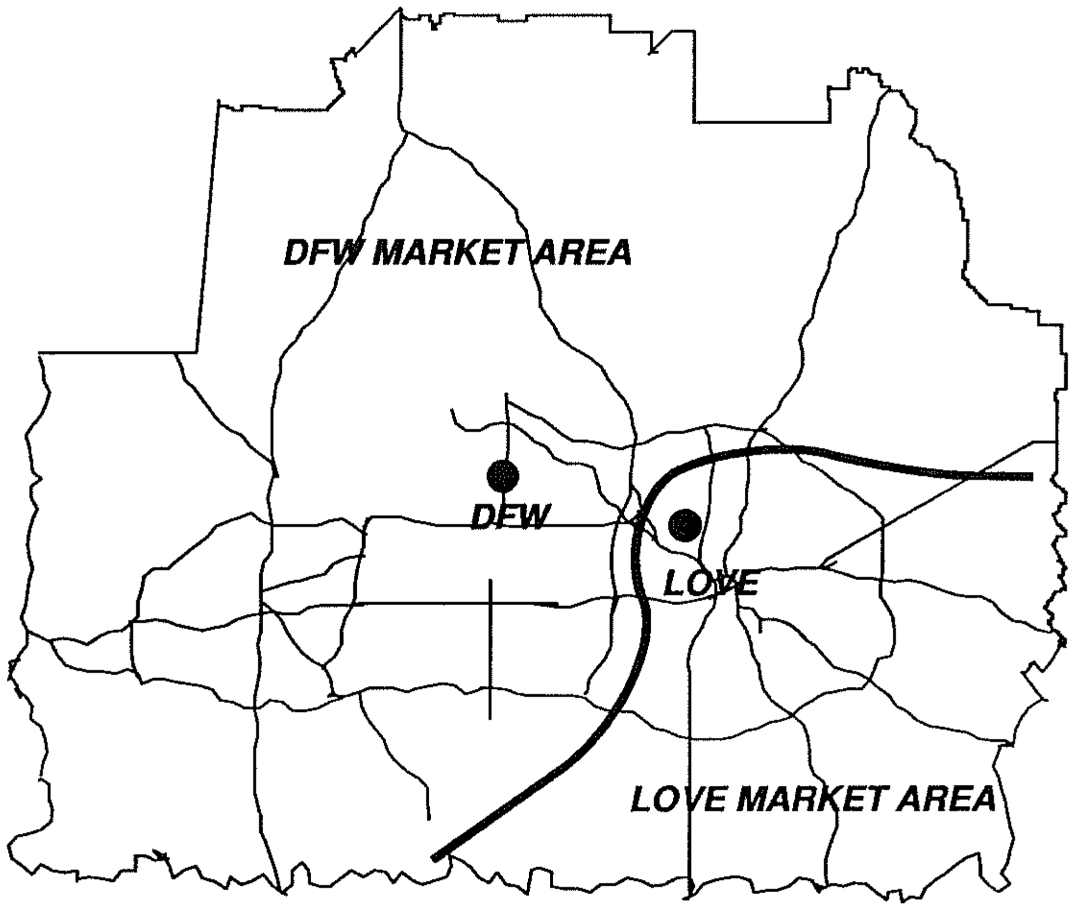
[22] Analysis of drive time and demographic characteristics are based on data provided by the North Central Texas Council of Governments.

[23] See also Appendix H for detailed data on population, employment (by sector and total), and income characteristics, presented by travel time contour interval.

[24] Average drive times are based on a final loaded network traffic assignment. In general, the average drive times determined in this way will be less than peak network travel times.

Figure 2.6. DFW and DAL Market Areas Based on Drive Times



Source: Apogee Research based on data from the North Central Texas Council of Governments.

to Love Field and less than one-fourth (23 percent) of the Metroplex region's population is within 30 minutes of the airport. Further, the central business district of Ft. Worth is over 45 to 60 minutes travel to Love Field.

Metroplex Population Profile

Figure 2.7 contrasts the percentage of Metroplex population served by travel time contour intervals from both Love Field and Dallas-Fort Worth Airport. In 1986, 22 percent of the Metroplex population (25 percent of all households) was within 30 minutes driving time of Love Field and 65 percent of the population (67 percent of the households) were within 45 minutes of Love Field. Although the region is expected to increase its population by over 1.3 million people by the year 2010, regional shifts in the population densities indicate that the percentage of population within 30 minutes of Love Field actually fall to just over 17 percent. Likewise, 60 percent of the metroplex population (62 percent of all households) will be within 45 minutes of Love Field. Conversely, almost 40 percent of the region's population will have at least a 45-minute travel time to Love Field.

Dallas-Fort Worth Airport serves over 26 percent of the region's population (28 percent of households) within 30 minutes and 85 percent (88 percent of households) within 45 minutes. Conversely, only 15 percent of the population is greater than 45 minutes travel time from Dallas-Fort Worth Airport. Projected regional population shifts for 2010 reveal that Dallas-Fort Worth Airport actually becomes more accessible to a greater percentage of the population. For example, approximately 38 percent of the region's population and households will be within 30 minutes of Dallas-Fort Worth Airport and 87 percent of the metroplex population will be within 45 minutes travel time to Dallas-Fort Worth Airport. The entire metroplex population/households will be within 1 hour of Dallas-Fort Worth Airport.

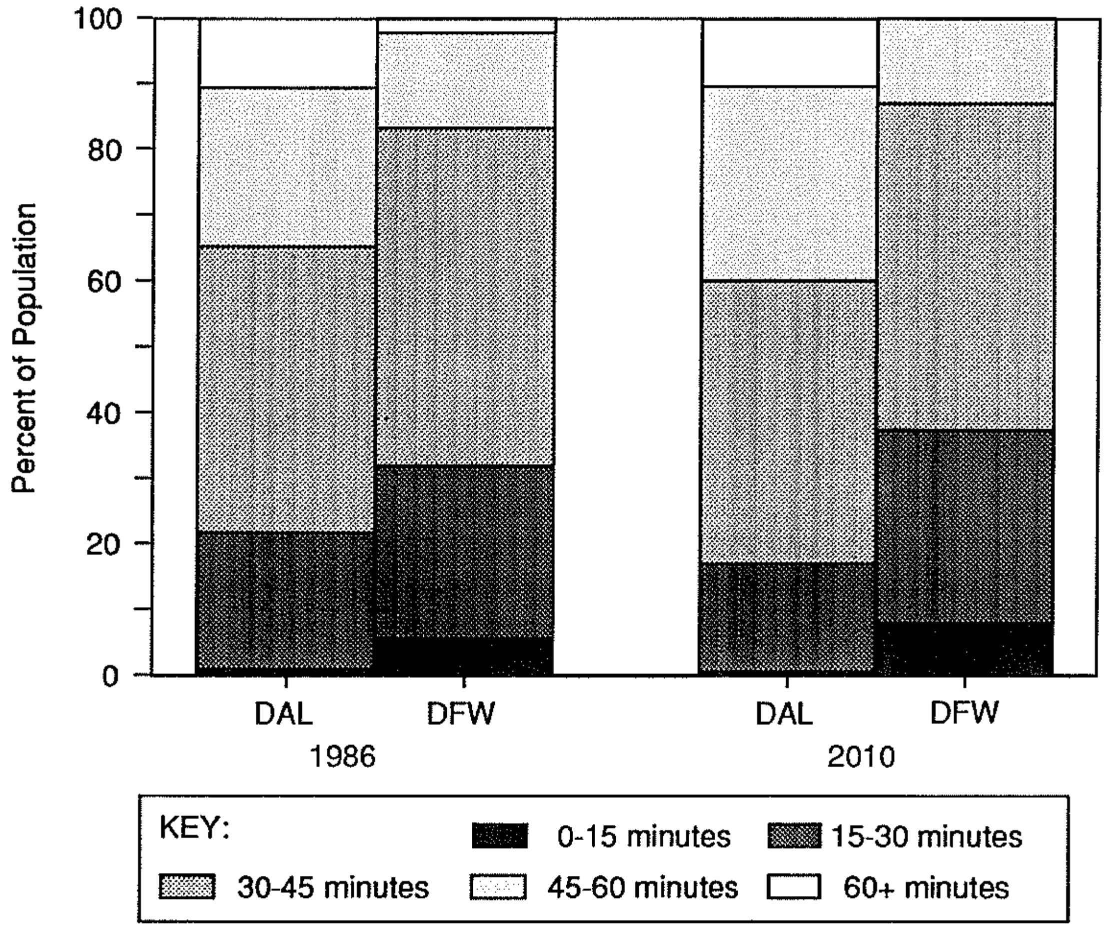
Demographics

A review of the demographics of the Metroplex area indicates that, although Dallas-Fort Worth Airport and Love Field would serve the same area, each is accessible to a different mix of employment and population profiles. When projected to the year 2010, moderate but relatively consistent population growth does not significantly change these rankings.

Income Characteristics

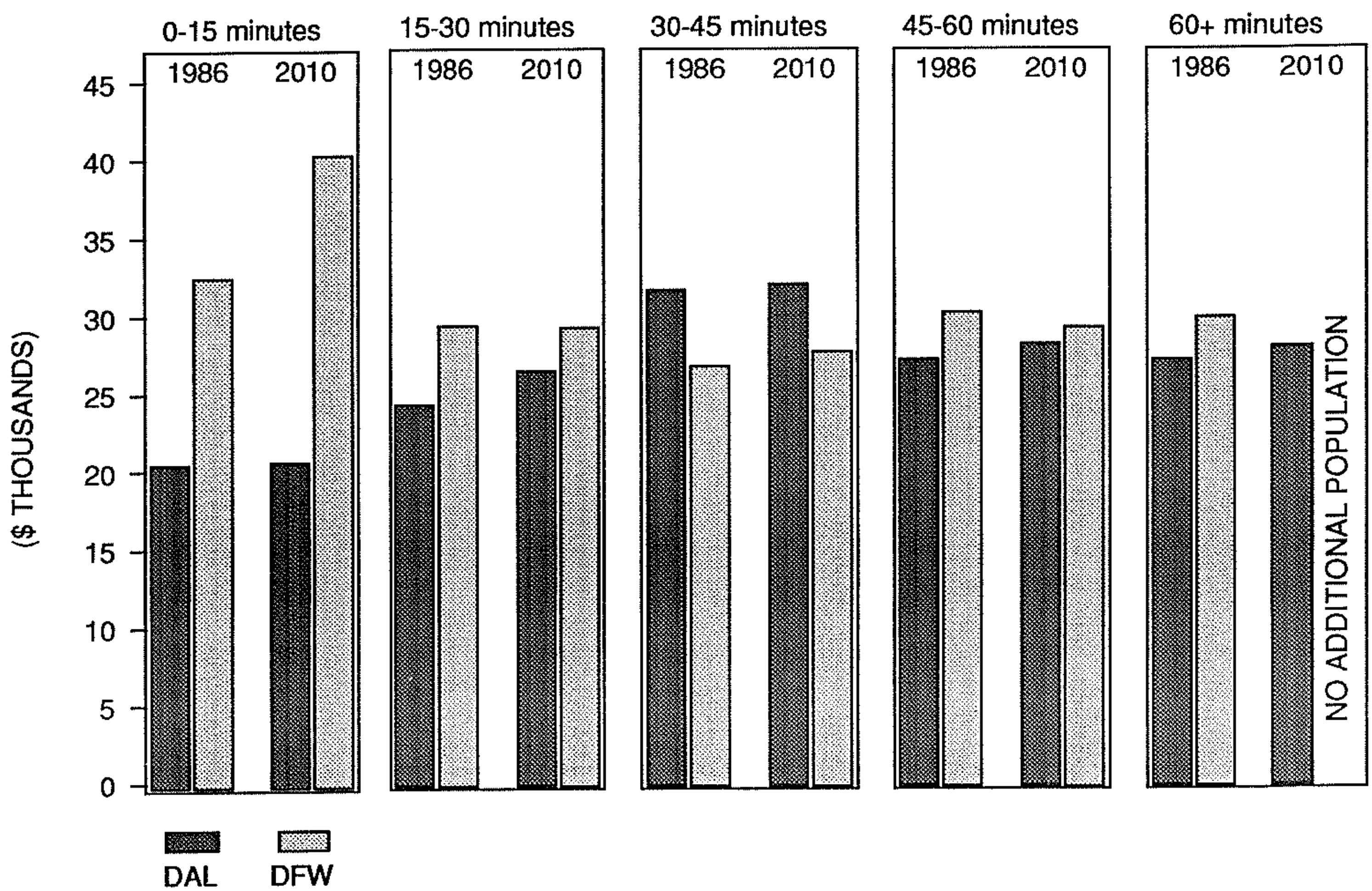
Since the likelihood of air travel tends to increase with income, it is reasonable to equate higher median income with greater potential for air travel. The median income by travel time contour intervals for Love Field and Dallas-Fort Worth Airport are characterized in Figure 2.8. In general, Dallas-Fort Worth Airport is more accessible to a larger population with higher annual median income.

Figure 2.7. Percentage of Metroplex Population Served By Travel Time Contour Interval



Source: Apogee Research from NCTCOG data.

Figure 2.8. Median Income by Travel Time Contour Interval 1986 & 2010



In 1986, median income within 15 minutes of Love Field was approximately $20,000, the lowest average of this analysis. Income increased to $24,500 in the next 15 minute time interval. (The 30 to 45 minute interval had highest median income from Love Field of $31,900). The median income for more than 45 minutes travel time from Love Field was approximately $27,400. Overall median incomes are expected to increase slightly for all time intervals by the year 2010. However, the highest median income is still found in the 30 to 45 minute contour interval.

These results differ markedly with the overall median incomes of the contour intervals around Dallas-Fort Worth Airport. For example, the median income within 15 minutes of Dallas-Fort Worth Airport was $32,700 -- the highest of any travel band evaluated from either Love Field or Dallas-Fort Worth Airport. The median income drops slightly below $30,000 between 15 to 45 minutes from Dallas-Fort Worth Airport and then increases to more than $30,000 for over 45 minutes travel time from Dallas-Fort Worth Airport. The projected outlook for 2010 indicates that the median income within 15 minutes of Dallas-Fort Worth Airport will increase to approximately $40,500. The median income of the population between 15 and 30 minutes and over 45 minutes from the airport decreased slightly. The interval with the highest population, between 30 to 45 minutes from Dallas-Fort Worth Airport, shows a slightly higher median income of $27,900. Therefore, the overall level of income of a larger percentage of population living closer to Dallas-Fort Worth Airport is higher than that found in the case of Love Field.

Regional Employment Overview

The Dallas-Fort Worth metropolitan region is dominated by service industries followed closely by basic employment.[25] Retail employment makes up the balance. In 1986, service employment accounted for 44.6 percent of the workforce in the region. Basic employment occupied 38.1 percent of the workforce. Retail sales accounted for only 17.3 percent of the regional total. By 2010 service industries are expected to employ over 49 percent of the workforce. The retail industry is also expected to increase to 18.9 percent of the total workforce. Basic employment is expected to decline slightly to 31.8 percent of the regional total.

Of the two airports, Dallas-Fort Worth Airport has slightly better access to all employment types, an advantage that increases with travel time. For example, in 1986 Dallas-Fort Worth Airport was within 30 minutes of one half (51 percent) of the entire Metroplex workforce and nearly all of the workforce (99 percent) could access the airport within an hour. These percentages are projected to increase over time. Love Field, on the other hand, was within 30 minutes for 44 percent of the Metroplex workforce in 1986.

[25] Service Employment includes travel-intensive industries such as management and technical consulting, education, training, and telecommunications. Basic Employment includes construction, manufacturing, public utilities, and mining.

Travel times of over 60 minutes were required to access over 92 percent of the workforce. The overall level of accessibility is projected to be reduced by the year 2010. The following analysis details the workforce accessibility for Dallas-Fort Worth Airport and Love Field.

Dallas-Fort Worth Airport. Accessibility to Dallas-Fort Worth Airport by all employment types is good. In 1986, more than 90 percent of all employment types were within 45 minutes of Dallas-Fort Worth Airport, while more than 50 percent of all basic and service employment were within 30 minutes. Retail employment lags behind this with almost 42 percent of the retail workforce within 30 minutes of Dallas-Fort Worth Airport. By the year 2010, the concentration of employment shifts slightly, affecting the accessibility within 30 minutes of Dallas-Fort Worth Airport. Both access times and basic employment decrease slightly while retail employment increases slightly. However, more than 93 percent of all three employment types are within 45 minutes of Dallas-Fort Worth Airport.

Moving from Dallas-Fort Worth Airport towards the regional borders, basic and service employment dominate the regional employment mix with roughly 40 percent of the workforce occupied in each of these industries within each 15 minute interval. Retail employment captures the remaining 15 to 20 percent. Retail sales take an increasing larger percentage of the workforce as the travel time to the airport increases. Only 15 percent of the workforce within 15 minutes of the airport is retail. However retail employment increases to 23 percent of the employment mixture as the travel time increases to over 60 minutes.

Love Field. Accessibility to Love Field is slightly more limited. In 1986, Love Field could be reached within 30 minutes by 44 percent of basic, retail, and service workforce combined. Only 76 percent of the total workforce can reach Love Field within 45 minutes. To obtain the same level of service to all employment types as Dallas-Fort Worth Airport achieves at 45 minutes travel time, the travel time to Love Field would have to be more than 60 minutes. Despite growth of employment, regional shift of employment types affects the overall accessibility of Love Field. Forecasts for 2010 indicate that 39 percent of all three employment types will be within 30 minutes of Love Field -- a net loss of service to over 5 percent of all employment types. Less than 73 percent of total employment will be within 45 minutes of Love Field.

The regional employment mix that Love Field serves is slightly different than Dallas-Fort Worth Airport. In 1986, service employment dominated the workforce within 30 minutes of the airport. Basic employment slowly trades places with service employment as the travel time from the airport increases. In 2010 service employment continues to dominate the workforce but decreases as the travel time to the airport increases while basic employment increases slightly. Retail employment in both 1986 and 2010 maintain a level of approximately 12 percent of the workforce within 15 minutes of the airport, increasing to more than 22 percent as the travel time to the airport increases to 60 minutes or more. A projected total of 27 percent of all employment types will be at least 45 minutes away from Love Field.

3. CURRENT CONDITIONS AT LOVE FIELD AND PHYSICAL IMPACTS OF ALTERNATIVES TO THE WRIGHT AMENDMENT

This chapter reviews the current conditions at Love Field: the physical facilities; operations and enplanements; related safety issues; and environmental issues. The chapter also presents estimates of the physical impacts of the five defined scenarios.

FACILITIES

Love Field occupies 1,300 acres and is located about 5 miles north of the Central Business District of Dallas. This site is almost fully developed and offers few opportunities to add new facilities. The airport, which opened as a World War I training base in 1917, first provided air passenger service in 1927.

The airfield has two parallel runways (each with Instrument Landing Systems) capable of handling most domestic aircraft operations and one shorter north/south runway used for light general aviation aircraft. Industrial and residential development adjacent to Love Field make it impractical to add new capacity through land acquisition. While Love Field is closer to downtown Dallas than is Dallas-Fort Worth Airport, access is limited by two signal-controlled roads expected to reach capacity within the next 5 to 10 years.

The airport's facilities can be separated into three categories -- airside, terminal, and groundside. This section describes these facilities as well as other aviation-related facilities that are adjacent to the airport property.

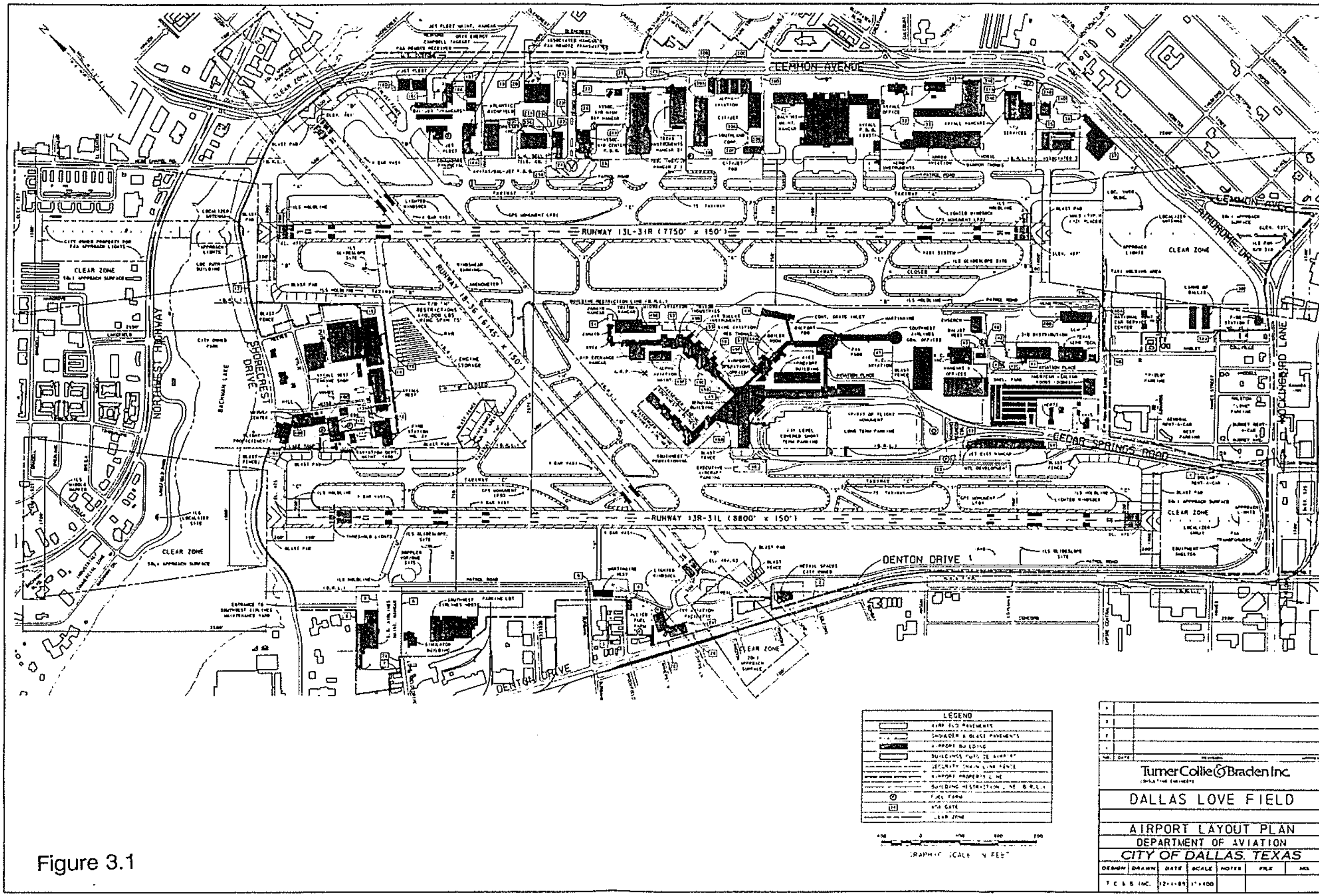
Airside

Love Field has three runways: two parallel runways oriented in a northwest/southeast direction (13L-31R and 13R-31L), and one crosswind runway in a north-south orientation (18-36). The terminal lies between the parallel runways. Figure 3.1 depicts the airport layout plan.

Runway 13L-31R is 7,753 feet long, 150 feet wide, and has a full-length parallel taxiway on the east side that serves general aviation and area maintenance activities. It is a grooved concrete runway with an instrument landing system (ILS) and has approach lights on both runway ends.

Runway 13R-31L is 8,800 feet in length and 150 feet wide. It has a single, parallel taxiway on the east side of the runway, next to the terminal. It is a grooved asphalt runway with an ILS on both ends, but only 31L has an approach light system. Runway 13R has a displaced threshold of 490 feet so only 8,300 feet is usable.

The crosswind runway, 18-36, is 6,149 feet long and 150 feet wide. A single, parallel taxiway extends along the east side, closest to the terminal. An engine run-up area is located


LEMMON AVENUE
AIRDROME DR
MOCKINGBIRD LANE
CEDAR SPRINGS ROAD
DENTON DRIVE
SHORECREST DRIVE
NORTHWEST HIGHWAY
BACHMAN LAKE
RUNWAY 13L-31R (7750' x 150')
RUNWAY 13R-31L (8800' x 150')
RUNWAY 18-36 (6145' x 150')
CLEAR ZONE
LEGEND
GRAPHIC SCALE IN FEET
Turner Collie & Braden Inc.
DALLAS LOVE FIELD
AIRPORT LAYOUT PLAN
DEPARTMENT OF AVIATION
CITY OF DALLAS, TEXAS
Figure 3.1

west, between the parallel runways. It is served by the only connecting taxiway. A blast fence provides protection for the buildings to the northwest. Runway 18-36 is not a designated instrument runway.

There are no plans to change airside facilities at Love Field. Only minor maintenance and airfield pavement improvements are contained in an ongoing capital improvement program.

Terminal

The Love Field Terminal Area covers 860,000 square feet, lies between runways 13L-31R and 13R-31L and is bounded on the north by runway 18-36. The area contains a terminal building with three concourses serving a lower departure level and an upper arrival level, an air freight building, and a parking lot. Surface access is via the six-lane Cedar Springs Road which intersects Mockingbird Lane at the southern border of the airport.

The terminal structure contains a central lobby, a mezzanine, ticket and baggage claim wings, and covers 315,000 square feet. The terminal building has had a relatively recent external renovation. A new FAA Air Traffic Control Tower is under construction where the north and east concourses join the terminal building. This new tower, scheduled to open in June 1992, will replace the old control tower currently located atop the terminal building.

The west concourse houses Southwest Airlines, presently the only commercial airline servicing Love Field. This concourse contains 145,000 square feet on two levels and has 14 gates. The bi-level east and north concourses have 21 gates each -- the north contains 135,000 square feet and the east 265,000 square feet. Of the 21 gates on the north concourse, seven are blocked by hangars and 11 currently allow only ground loading of passengers. Two of the 21 gates on the east concourse are blocked by a hangar and four permit only ground loading. These three concourses occupy a total of 545,000 square feet.

A majority of the concourse space previously utilized by air carriers has been leased or is under reconstruction. The north concourse is undergoing re-roofing and asbestos removal. Three hangars, occupied by Triton, Air Exchange and Alpha Aviation, have been constructed on the former aircraft parking ramp of the north concourse. A hangar for K.C. Aviation has been constructed near the end of the east concourse. Most of the east concourse is under long-term lease.

The air freight building, with approximately 24,000 square feet, is situated in the terminal area near the main terminal.

Hydrant fueling is available in the terminal area, although it is generally unused except by Southwest Airlines. The fuel farm, which supplies the hydrant system, is located on the west side of the airport and is served by a pipeline. It is owned by Southwest Airlines but operated by Allied Fuel. Capacity of the terminal fueling system is not considered to limit future commercial air service.

A four-level parking garage provides 3,028 public short-term automobile parking spaces. An adjacent single-level parking lot provides 1,450 long-term public parking spaces. In addition, on the east side of the airport entrance, there are 948 covered parking spaces on airport property, leased to a commercial firm. Thus, within close proximity to the airport there are 5,426 parking spaces. All parking is within walking distance and the parking garage is connected to the terminal by a 250-foot walkway.

Part of the terminal area situated south of the passenger terminal and east of Cedar Springs Drive contains a large general aviation facility, a former distribution building, a building formerly occupied by an Aero Tech school, a covered parking lot, rental car lots, and several smaller buildings.

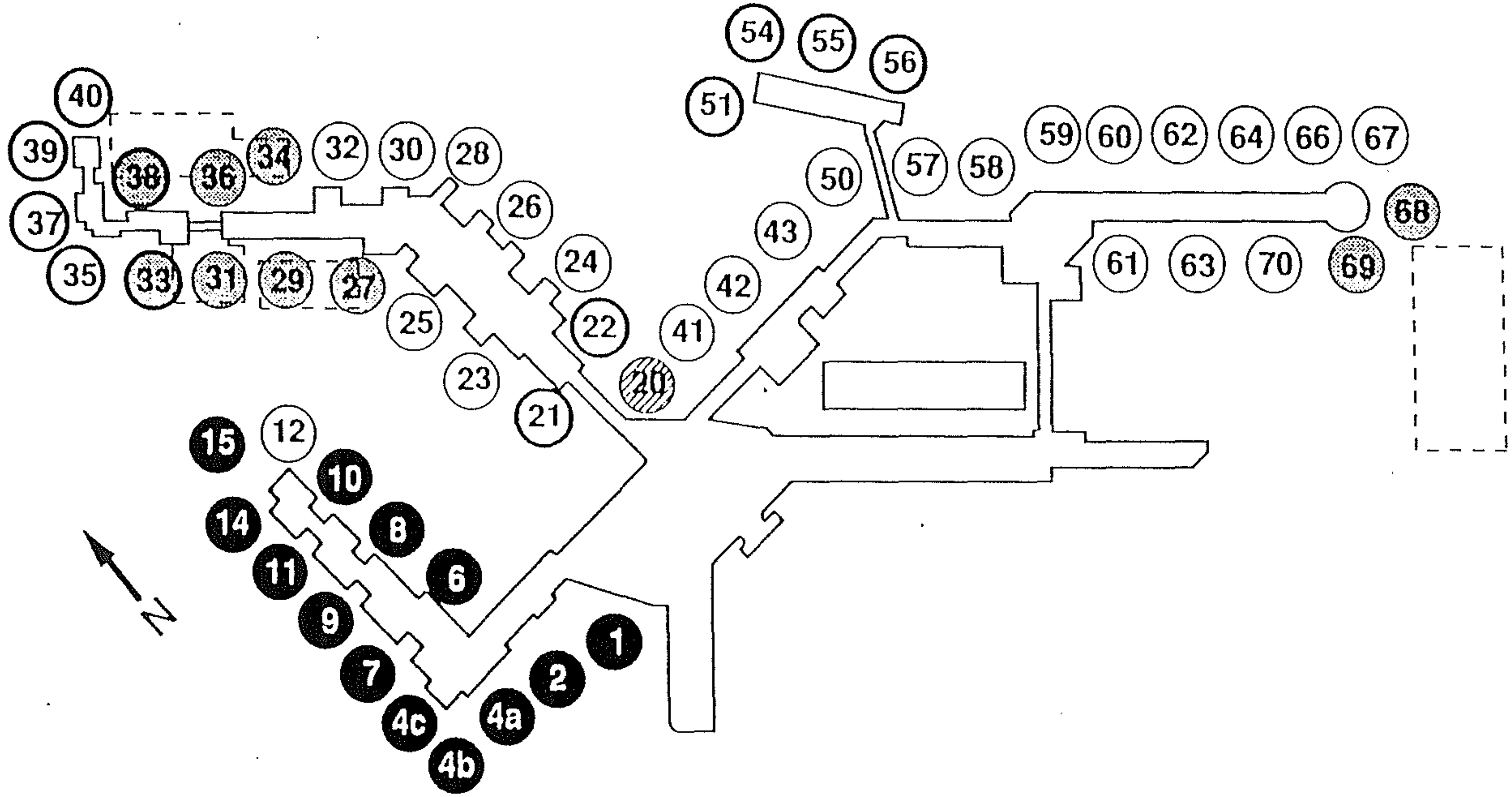
The Dallas Department of Aviation estimates that, in addition to the 14 air carrier gates available to Southwest Airlines, 3 gates on the west side of the north concourse, 6 gates on the east side of the north concourse, and 2 gates on the north side of the east concourse could be made available to air carriers without disrupting current leases. Two of these gates do not have foundations for loading bridges. Additionally, two gates on the east concourse could be made available, for a total of 27 gates. Figure 3.2 shows the gate numbers previously utilized and indicates their current status. There are 12 gates without loading bridges, 9 gates blocked by hangars and one nonfunctional gate due to the new control tower. Table I.1 of Appendix I lists the current tenants.

Triton Industries has a long-term lease to 2007 for 16,900 square feet in the north terminal. Triton also has a lease of similar terms on about 500,000 square feet of ramp. Dalfort currently has the entire east concourse under lease with options to the year 2023. Of the 525,000 square feet occupied by the three concourses, therefore, about 54 percent are currently under long-term lease, as is 500,000 square feet of ramp.

The City's current plans call for preserving the option for increased use of the existing passenger terminal spaces and gate locations. Building maintenance, routine ramp maintenance, and minor improvements or corrective maintenance, such as asbestos removal are included in the ongoing capital improvement program.

Groundside

Vehicular traffic enters the terminal area at Love Field via Cedar Springs Road -- a six-lane arterial with a median. In the vicinity of the terminal, Cedar Springs Road forms a one-way loop roadway with a counter-clockwise flow. At the terminal proper, the roadway consists of multiple lanes with medians to provide terminal area frontage and traffic by-pass capacity. Cedar Springs Road connects with the Dallas arterial street system via an intersection with Mockingbird Lane at the southeastern boundary of the airport. Dallas City Hall is four and one half miles southeast of the airport. Figure 3.3 shows roads adjacent to the airport.



N — 13 Gates in use	N — Gate number
N — 9 Gates blocked by hangar	N — 1 blocked by tower
N — 12 Ground loading gates	Hangars

Source: Dallas Aviation Department

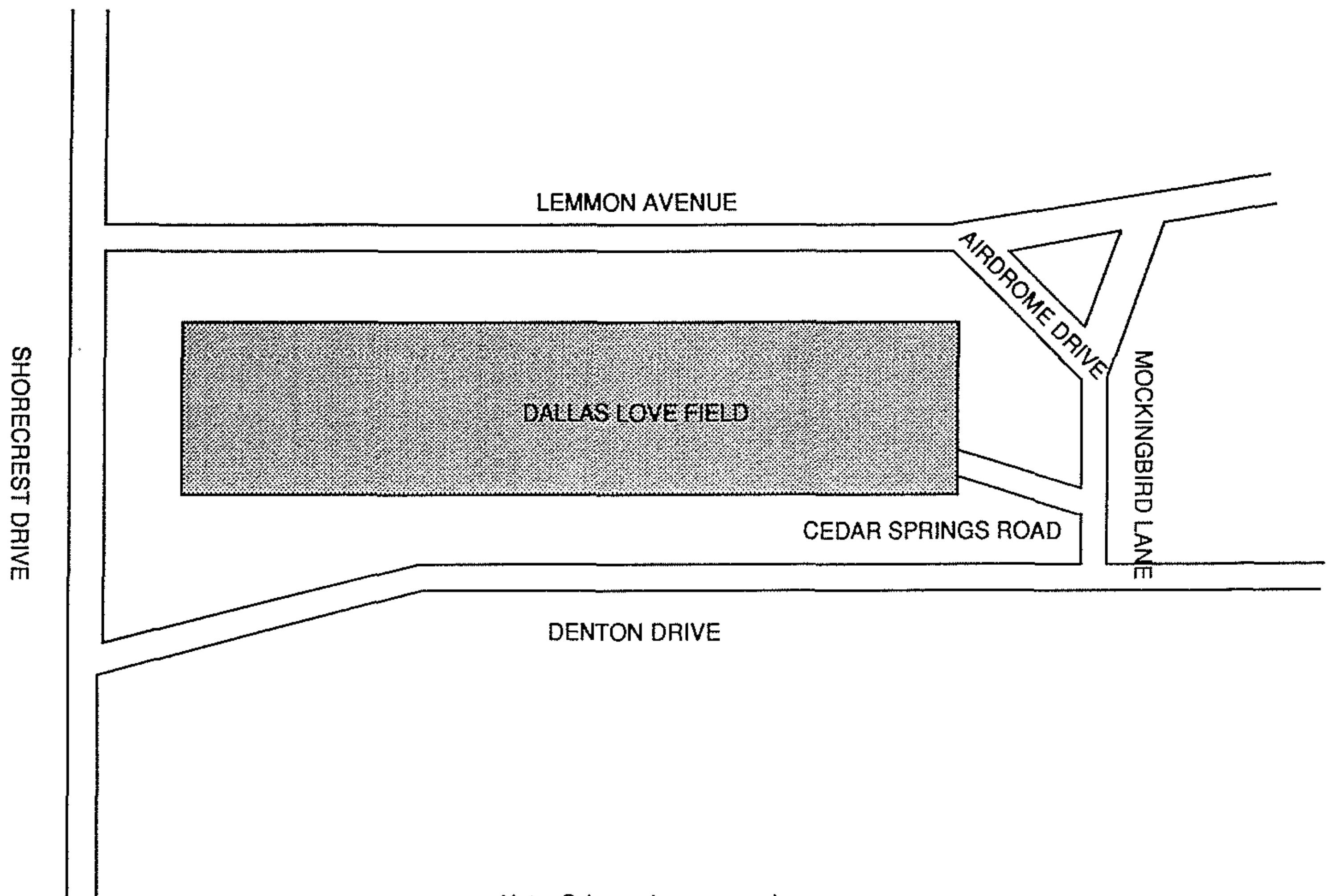
Schematic not to scale

Dallas Love Field

Gate Conditions
Love Field Terminal - 1990

Figure 3.2

Figure 3.3. Road Access to Love Field



Note: Schematic not to scale.

Dallas Love Field is surrounded by major and minor arterials and served additionally by freeways located to the east and west. Mockingbird Lane, Lemmon Avenue, Northwest Highway, and Denton Drive are the four arterials which surround and form the basic boundaries of Love Field. Several freeways provide regional access to the airport: the Dallas North Tollway, Business Route 77 (Harry Hines Boulevard), and I-35/U.S. 77 (Stemmons Freeway).

Mockingbird Lane, the southeastern boundary, is six lanes wide and has a center median. This configuration extends west of the airport for two miles and intersects with several arterials and freeways. East of the airport, Mockingbird Lane narrows to four lanes until it interchanges with the Dallas North Tollway, beyond which it is only two lanes. As a result, Mockingbird Lane serves only as a connector for airport traffic to the Dallas North Tollway and does not feed traffic from further east.

Lemmon Avenue forms the northeast boundary of the airport and is also a six-lane arterial with median. Heavy aviation-related uses are located along the southwest (airport) side of the arterial, while moderate cost housing is located to the east.

Northwest Highway is the arterial closest to the northern boundary of the airport. It is a four- to six-lane arterial with a median and extends for many miles to the east and west of the airport. Because of its continuity and capacity, it is a major route of access to Love Field from areas east of the airport.

Low- to moderate-cost housing lies to the north of Northwest Highway while Lake Bachman and its Park lie between Northwest Highway and the northern boundary of the airport.

Denton Drive forms the southwestern boundary of the airport. Unlike the other arterials, Denton Drive is a minor arterial with only two lanes. Commercial businesses line the east (airport) side while a railroad line lies immediately to the west, with low-cost housing beyond. The headquarters for Southwest Airlines is reached via Denton Drive.

The Dallas North Tollway, located one and one-half miles to the east, provides regional access to the airport from downtown Dallas, the suburbs to the north, and to a lesser degree from the east (via Northwest Highway).

Business Route 77 (Harry Hines Boulevard) lies one mile to the west of Denton Drive and provides access to the northwest via its connection with Mockingbird Lane. Further west, two miles from the airport, I-35 East/U.S. 77 (Stemmons Freeway) is the prime route of access to the airport from the west.

Today Mockingbird Lane carries approximately the same number of vehicles as it did before airline passenger traffic was shifted to Dallas-Forth Worth Airport. Denton Drive and Cedar Springs Road, east of Mockingbird Lane, also appear to have vehicular traffic at about the same level as that prior to the transfer. Both Lemmon Avenue and the Northwest Highway have exceeded their pre-transfer vehicular activity.

Visual observation indicates that some reserve capacity is available. However, data provided by the North Central Texas Council of Governments (NCTCOG) indicates that most of the roads adjacent to the airport operate at level of service E and F. Level E is defined as volumes at or near the capacity of the highway. Level F represents forced flow operation at low speeds. Only the western half of Denton Drive has service levels better than E and F.

Vehicular traffic on an airport terminal access is generated by the transportation requirements of originating and terminating passengers and the transportation requirements for services normally required at the passenger terminal such as concessions, employees, administration, and air cargo. Love Field also has aircraft maintenance, various commercial enterprises, and other activities not normally related to a passenger terminal area.

Other Facilities

Other facilities are located on the southwest side of the airport property. These include City-owned retail spaces, the TXI Aviation Facility, Martinaire West, and the fuel farm. Southwest Airlines' headquarters, its maintenance hangar, and simulator buildings are also located along Denton Drive on the southwest side of the airport.

On the northwest side of the airport, the airport property line parallels Shorecrest Drive at the edge of Bachman Lake, except between the parallel runways. A pocket of off-airport aviation facilities exists between the two runways, outside airport property. These include a large engine overhaul activity located there, along with several other aviation activities, such as Hill Aviation, Flight Proficiency, and McMoy Associates. Also situated on airport property in the same general area is the Aviation Department Maintenance Yard and Fire Station Number 21. A large area for engine storage is located on airport property adjacent to the off-airport engine overhaul activity.

East-side airport property includes Lemmon Avenue and Airdrome Drive. Adjacent to these streets and Runway 13R-31L are a large number of Fixed Base Operators, corporate aviation entities, several maintenance hangars, and a large Southwest Bell Telephone building. On airport property near the intersection of Airdrome Drive and Mockingbird Lane is Fire Station Number 42. There are a number of air navigation and approach aids located both at the ends and adjacent to each runway.

A large parcel of land located between the runways and south of the airport property line and north of Mockingbird Lane contains a number of dilapidated buildings. West of Cedar Springs Road there is one general aviation operator in a constricted space between Taxiway C and Cedar Springs Road.

The City has established a policy of acquiring properties adjacent to the airport, when available, for aeronautical purposes or transportation purposes. This policy is implemented when appropriate.

Long range plans for general surface access improvements in the Dallas-Fort Worth area may be initiated and/or coordinated by North Central Texas Council of Governments (NCTCOG), but are implemented by the appropriate political jurisdictions. Long range plans exist for rapid rail transit between Dallas and Fort Worth with a connection to Dallas-Fort Worth Airport, but not to Love Field. A shorter range plan for improved light rail in the Dallas area will include a stop in the Love Field area at Denton Drive. There is a long range plan for the improvement of certain streets and boulevards to "super streets." Such a program for Inwood, Harry Hines Boulevard, Lemmon Avenue, and Northwest Highway could bring about major improvements in surface access for the areas adjacent to Love Field. There are no existing plans for major improvements to Mockingbird Lane, the major access to Love Field activities and the only access to the passenger terminal.

OPERATIONS AND ENPLANEMENTS

Operations

Love Field is one of 12 airports of significance in the Dallas-Fort Worth Metroplex Area but only Love Field and Dallas-Fort Worth Airport provide scheduled commercial passenger service. DFW, primarily an air carrier facility, has approximately three times the number of operations and eight times the enplanements of Love Field.[1] The newest airport, Fort Worth Alliance, is an industrial airport. The two military airports are the Dallas Naval Air Station and Carswell Air Force Base; the latter is slated for closure in September 1993, and has been discussed as a possible a civil airport.[2] The remaining airports are used by general aviation. Figure 3.4 shows the relative locations of these airports.

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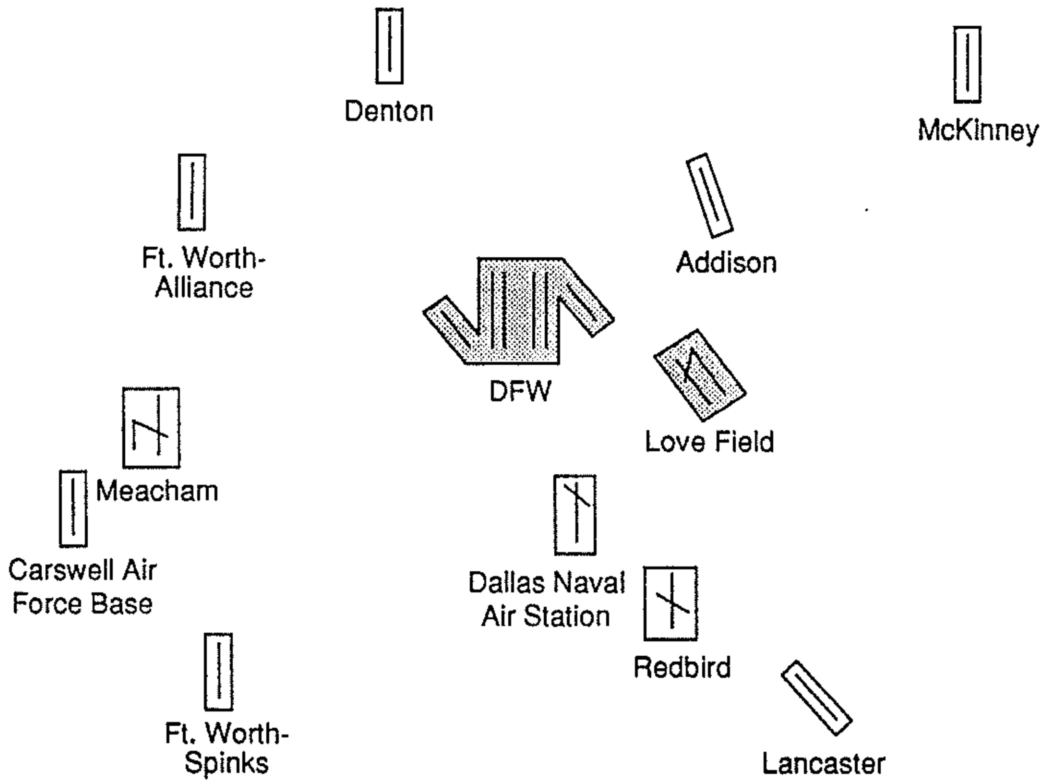
[1] An operation is either a takeoff or a landing.

[2] Located 21 miles west of DFW, Carswell is among the list of base closures recently accepted by Congress. While no one can be certain about the facility's long-term use, the FAA believes Carswell will become a reliever airport for general aviation aircraft, and it foresees minimal capacity or other operational problems in that regard. Likewise, the FAA does not expect Carswell to have a significant impact on operations at DFW.

Figure 3.4 Dallas-Forth Worth Area Airports



Notes: Schematic not to scale.
Shaded airports have scheduled commercial passenger service.
Carswell Air Force Base is scheduled for closure.

Source: Based on Metroplex Briefing Guide, February 1, 1989, FAA SW Region.

In 1973, Love Field was the principal airport in the area, with a majority of operations conducted by air carriers. In 1974, a majority of the air carrier operations were transferred to Dallas-Forth Worth Airport. Love Field aircraft operations have declined steadily since that time even as commercial traffic has grown. Table 3.1 summarizes aircraft operations in 1973 and 1989 for airports in the Metroplex with FAA-approved towers. These airports recorded an increase in operations of approximately 44 percent.

Table 3.1.
Aircraft Operations at Area Airports

Airport	1973	1989
Dallas-Ft. Worth Regional (DFW) [(1)]	----	693,614
Love Field	415,042	213,705
Fort Worth Meacham	276,137	492,743
Greater Southwest International [(2)]	156,703	----
Addison	188,086	156,273
Red Bird	145,248	144,683
Total	**1,181,216**	**1,701,018**

Notes: (1) Opened in 1974.
(2) Closed when DFW opened.

Source: *FAA Air Traffic Activity Reports*, Fiscal Years 1973 and 1989.

Some short-haul air carrier operations remain at Love Field, all currently operated by Southwest Airlines. Table 3.2 shows aircraft operations at Love Field by year, peak month, and average day while Table 3.3 illustrates the split in aircraft operations at Love Field among types of aircraft. Fifty-six percent of the operations at Love Field are by jet aircraft. Of these, only a small percentage of air carriers fly at night (Table 3.4).[3] General aviation jets contribute 9 percent of the night operations while nearly all of the jet air taxis fly at night.

The number of operations by day of the week varies considerably. Thursday is the busiest day (759 operations on an average Thursday in 1989) with Saturday the slowest -- only 56 percent of Thursday operations. Table I.2 in Appendix I shows the distribution of operations by day-of-week for October 1990.

[3] For the purpose of determining noise contours, night is defined as between 10:00 p.m. to 7:00 a.m. Otherwise, night is defined as one hour after sunset to one hour before sunrise, as stipulated in FAR § 61.57(d).

Table 3.2.
Love Field Aircraft Operations,
Year Ending June 1989

Measure	Number	Percent of Average Day
Total Operations	215,916	N/A
Peak Month (October)	20,387	N/A
Average Day	592	N/A
Air Carrier	215	36
Air Taxi	76	13
General Aviation	296	50
Military	5	1
Departures (Day)	253	43
Departures (Night)	40	7
Arrivals (Day)	252	43
Arrivals (Night)	41	7

Sources: Tables 2 and 3, Harris Miller Miller & Hanson, Inc., *Dallas Love Field Noise Contour Update*, October 1989

Table 3.3.
Love Field Average Daily Operations By Aircraft Model,
Year Ending June 1989

Air Carrier	Aircraft	Percent of Total
737	209	35.5
DC9-15	3	0.5
727	3	0.5
	215	
Air Taxi		
Turbojets	8	1.5
Propeller	68	11.5
	76	
General Aviation Jets	105	18.0
General Aviation Propeller	191	32.5
TOTAL	**587**	**100.0**

Source: Harris Miller Miller & Hanson, Inc., *1989 Noise Contour Update*, October 1989; derived from Table 3, which excludes military.

Table 3.4.
Night Operations as Percent of Average Daily
Operations, Year Ending June 1989

Air Carrier	4
Air Taxi Jets	99
General Aviation Jets	9

Source: Derived from Table 3: *1989 Noise Contour Update*, Oct. 1989 Harris Miller Miller & Hanson, Inc.

The average hourly distribution of total operations for Thursdays during October 1990 reveals morning and evening peaks (Table I.3 in Appendix I). The peak hour of the peak day occurred at 6:00 p.m. with 58 operations, representing 7.6 percent of the day's operations. Peak hours also occurred at 8:00 a.m., 3:00 p.m., and 4:00 p.m. The peak hour for air carrier operations was 8:00 a.m. with a secondary peak at 4:00 p.m. For each of these peak hours, air carriers averaged approximately 20 operations per hour, with general aviation comprising the remainder. General aviation traffic peaked at 39 hourly operations at 6:00 p.m., with significant volume at 4:00 p.m. and 5:00 p.m.

During mid-day (9 a.m. to 2 p.m.), total operations averaged approximately 36 per hour, of which 13 to 15 were air carrier operations. Only 16 air carrier operations (6 percent of total) occurred between 10:00 p.m. and 7:00 a.m. During these same night hours, 108 general aviation operations (21 percent of total) took place.[4]

Table 3.5 shows aircraft based at Love Field. There are no air carrier aircraft based at Love Field. Unlike many other general aviation airfields, training operations do not comprise any portion of Love Field local operations. Jet aircraft use the parallel runways 13L-31R and 13R-31L. Only propellored aircraft use the crosswind 18-36, except on rare occasions when wind conditions dictate otherwise. Two-thirds of the time, traffic operates in a south flow on either runway 13R or 13L (see Table I.4 in Appendix I). As might be expected, air carrier aircraft tend to use Runway 13R-31L, the longer runway. Since much of the general aviation activity is located on the northeast side of the airport, general aviation aircraft tend to use Runway 13L-31R.

A preferential runway program designating Runway 13R-31L for jet aircraft and all aircraft weighing more than 12,500 pounds, is in effect from 9:00 p.m. to 6:00 a.m. for noise abatement purposes. This does not coincide with FAA's definition of nighttime for noise calculations, which are the hours between 10:00 p.m. to 7:00 a.m.

Table 3.5.
Aircraft Based at Love Field in 1990

Single Engine Aircraft	29
Multi Engine Aircraft	56
Jet Aircraft	127
Helicopters	20
Total	**232**

Source: Dallas Aviation Department

Enplanements

When Dallas-Forth Worth Airport opened, all air carriers except Southwest moved their operations from Love Field to the new airport. Enplanements at Love Field, dropped from 6.2 million in 1974, to 4.1 million in 1975, and 560,000 in 1976. By 1985, enplanements had risen to 3.3 million, but declined over the next few years. 1990 enplanements were an estimated 3.0 million.

[4] The average hourly distribution of operations for Thursday during October 1990 is shown on Table I.3 in Appendix I. Tables I.4 and I.5 reveal that air taxi operations are included with general aviation.

Dallas-Fort Worth Airport reported 3.3 million enplanements in 1975, its first year of operation. Enplanements have increased steadily since the time, and in 1990 there were an estimated 24.4 million enplanements, eight times the number at Love Field. Table 3.6 presents enplanements from 1974 through 1990 for Love Field and Dallas-Fort Worth Airport.

Table 3.6
Number of Enplanements at Dallas Love Field and Dallas-Fort Worth Airport (DFW),
1974 - 1990

Year	Number of Enplanements (in thousands)		
	Love Field	DFW	Total
1974	6,176	0	6,176
1975	4,139	3,346	7,485
1976	556	8,024	8,580
1977	606	8,570	9,176
1978	836	9,687	10,523
1979	1,195	11,177	12,372
1980	2,235	10,801	13,036
1981	2,586	11,485	14,071
1982	2,095	12,999	15,094
1983	2,930	12,861	15,791
1984	3,158	15,480	18,638
1985	3,257	18,276	21,533
1986	2,851	19,682	22,533
1987	2,491	20,751	23,242
1988	2,481	22,365	24,846
1989	2,725	23,342	26,067
1990	2,962	24,398	27,360

Source: *FAA Terminal Area Forecasts*, various years.

SAFETY ISSUES

The FAA maintains safety through flow control and air traffic management. Aircraft are either held enroute or at the origination airport when the arrival airport, for reasons of weather and/or traffic, cannot safely accommodate them. As described below, the capacity of Love Field to accept arrivals and departures is less in IFR weather conditions than it is in VFR weather conditions and there are times when demand exceeds capacity. In order to control traffic safely into and out of Love Field (as well as the Metroplex Area), FAA air traffic controllers manage that traffic through delays either in the air or at the origination airport. The Metroplex Plan will increase the capacity of traffic into the entire Dallas-Fort Worth area, thus decrease the number and length of delays.[5] This will not be realized at the expense of safety, however, but through additional facilities and the more sophisticated traffic management techniques that will result. The FAA will not permit air traffic safety to be compromised under any circumstance. Safety is ensured by FAA procedures and requirements based on air traffic control and systems capacity, both of which can effect/result in delays.

In addition, under any of the scenarios examined, appropriate security measures would be undertaken at Love Field as needed to ensure the security of more passengers flying to more numerous destinations. In particular, because of the increased number of entities on the airfield and with access to the ramp, it is probable that additional security measures would be taken under the Equal Access, Major O&D, and Major Hub scenarios.

Safety is largely a function of three critical elements:

- Air traffic,
- Capacity, and
- Delay.

Air Traffic

Air traffic in the Dallas-Fort Worth area is controlled by one of three types of facilities. Traffic to and from the immediate vicinity of an airport with a tower (including Love Field and Dallas-Fort Worth Airport) is controlled by the tower cab at the airport. Once aircraft leave the vicinity of an airport with a tower, they are controlled by the Terminal Radar Approach Control (TRACON), located at Dallas-Fort Worth Airport. TRACON controls all aircraft within the Dallas-Fort Worth Airport terminal area, as well as enroute instrument flight traffic operating

[5]The *DFW Metroplex Air Traffic System Plan*, which will be implemented over the next several years, will make major changes to air traffic procedures in and around the Dallas-Fort Worth area. See Appendix J.

below 17,000 feet mean sea level (MSL). (Figure 3.5 shows the lateral boundaries of TRACON's airspace.) The Fort Worth Air Route Traffic Control Center (commonly called Fort Worth Center) controls enroute air traffic entering, transiting, and departing the area, excluding the airspace delegated to the TRACON.

Dallas-Fort Worth Airport is the center of a positive control area called a Terminal Control Area (TCA). All aircraft operating within the TCA are subject to certain operating rules and pilot and equipment requirements. Love Field is 12 statute miles southeast of the center of Dallas-Fort Worth Airport and is within the inner ring of the TCA, including the airspace from the surface to 10,000 feet MSL.

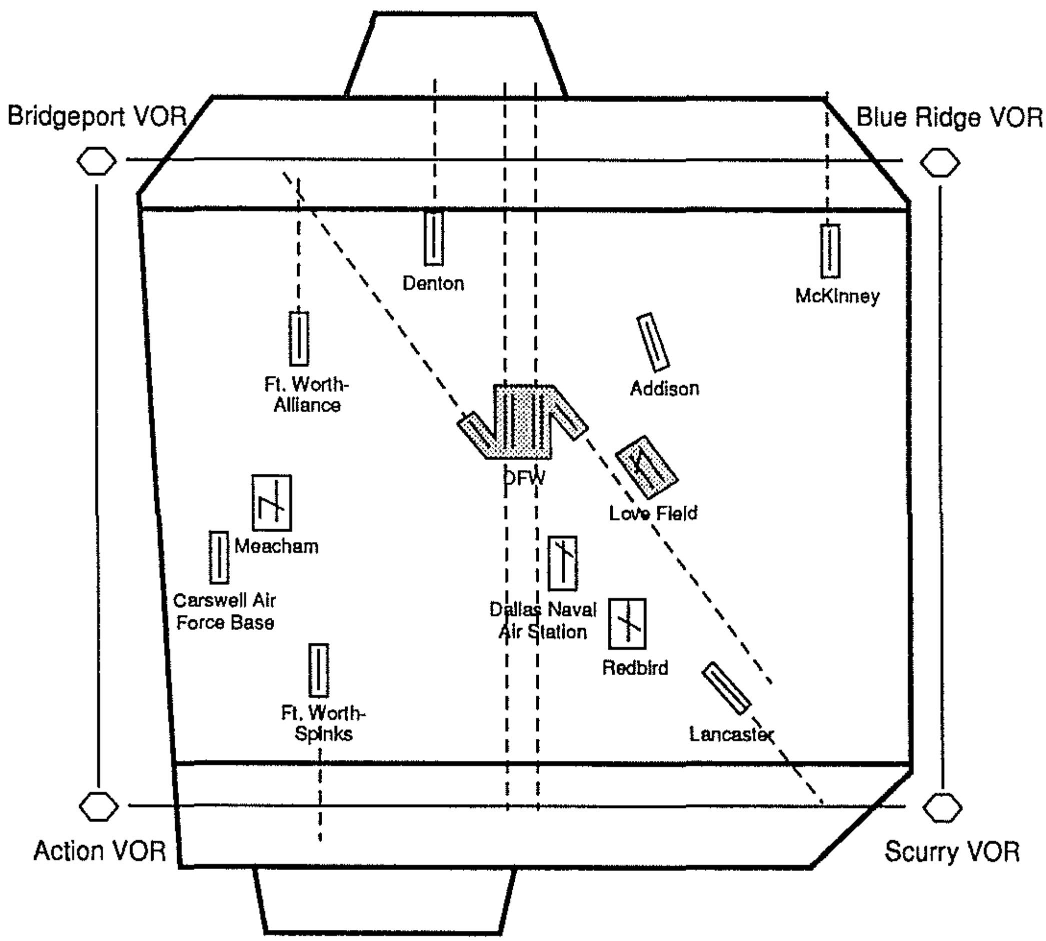
Love Field's main runways are 13-31, while Dallas-Fort Worth Airport's are 17-35. The dissimilar runway alignments between the two airports cause the final approach courses to converge northwest of Love Field in south-flow conditions. As a result, arrivals to Love Field are constrained to a single stream because of limited airspace and the interaction between Dallas-Fort Worth Airport and Love Field arrival traffic. Departures are also constrained; departures from Love Field climb straight ahead until reaching 3,000 feet (for noise abatement) or higher (for procedural airspace design and air traffic control). This procedure prevents simultaneous departures from both runways at Love Field.

Aircraft departing Love Field cannot turn 15 degrees either to the right or left to facilitate departures because of interaction with Dallas-Fort Worth Airport traffic. Aircraft that are leaving the Dallas-Fort Worth area depart through Metroplex airspace "exit gates" and, for every aircraft from one airport that is accommodated through an exit gate at a given time, there is another aircraft that cannot be accommodated through that gate at the same time.

Trinity 3, a noise abatement procedure in effect from 9:00 p.m. to 6:00 a.m. at Love Field, is used by all jets and any aircraft weighing more than 12,500 pounds. During south flow conditions, this procedure requires a right turn from Runway 13R to 160 degrees until the aircraft is established on the 140-degree radial of the Love Field VOR. Since this turn is towards the Dallas-Fort Worth Airport departing traffic, the interaction problems between Love Field and Dallas-Fort Worth Airport traffic are increased. However, since this procedure is used only at night when traffic volumes are low, its practical effect is minimal (see Appendix K for an analysis of Trinity 3).

Love Field air traffic interacts with other air traffic in the Dallas-Fort Worth terminal area although the principal interaction is with Dallas-Fort Worth Airport. In 1989, total operations at six towered airports in the area (Dallas-Fort Worth Airport, Love Field, Meacham, Addison, Redbird, and Fort Worth Alliance) were 1,701,318. Dallas-Fort Worth Airport and Love Field accounted for approximately 53 percent of this total. (Table 3.1, presented above, shows the number of operations at these airports.)

Figure 3.5. DFW Approach Control Airspace



Notes: Schematic not to scale.
Shaded airports have scheduled commercial passenger service.
Carswell Air Force Base is scheduled for closure.

Source: Based on Metroplex Briefing Guide, February 1, 1989, FAA SW Region.

There are other areas in the United States where two air carrier airports are located relatively close to one another. However, of those providing scheduled passenger service, Dallas-Fort Worth Airport and Love Field are the closest with runway alignments at an angle. Two airport pairs, LaGuardia-JFK and San Francisco-Oakland, are closer together than Dallas-Fort Worth Airport and Love Field, but they have parallel runways and a smaller number of operations. The only airport pair with a larger number of operations than Dallas-Fort Worth Airport-Love Field is O'Hare-Midway, which have parallel runways and are four miles further apart than are Dallas-Fort Worth Airport and Love Field. Table 3.7 summaries these findings.

Because Dallas-Fort Worth Airport and Love Field are so close, any physical improvements to Dallas-Fort Worth Airport can impact air traffic at Love Field. The two new runways proposed for Dallas-Fort Worth Airport, Runway 16R-34L and Runway 16L-34R, will cause existing air traffic procedures at both airports to be modified slightly.[6]

Proposed Runway 16R-34L, to be located on the west side of Dallas-Fort Worth Airport, would not change the operating environment that exists today. Love Field is located on the east side of the Metroplex, and since the primary function of Runway 16R-34L at Dallas-Fort Worth Airport will be to handle arrivals from the west and departures to the west, very limited interaction between the proposed west runway at Dallas-Fort Worth Airport and Love Field is expected once the runway becomes operational. The only interaction, if any, will be for departures. As with all the airports in the Metroplex, all IFR departures will continue to share the same departure route and airspace gate structure out of the Metroplex. Therefore, interaction will occur, and delay will accumulate, at both airports when, for example, a westbound departure from Love Field and a westbound departure from Runway 16R-34L at Dallas-Fort Worth Airport are assigned to the same departure route out of the Metroplex.

The only potential conflict between operations on the new runways at Dallas-Fort Worth Airport and Love Field identified by the FAA is when there are arrivals to both new Runway 16L-34R at Dallas-Fort Worth Airport and Runways 13R and 13L at Love Field in a south flow operation. Departures to the south and north, and arrivals to the north at Love Field will be unaffected by new Runway 16L at Dallas-Fort Worth Airport. However, the airspace and airfield constraints that exist today will continue to exist when both the new runways at Dallas-Fort Worth Airport and the new terminal airspace structure are in place. In the case of departures in both a south and north flow operation, all Dallas-Fort Worth Airport IFR departures and satellite airport IFR departures (including Love Field) will continue to share the same departure route and airspace gate structure. Therefore, delays will occur at both Dallas-Fort Worth Airport and Love Field (or other satellite airports), when there is a departure at both airports wanting to use the same departure route out of the Metroplex. The FAA will use delay, when necessary, to ensure safety.

[6]The findings of this analysis are based on meetings with FAA Southwest Region personnel and a review of previous Metroplex airspace studies. Relevant studies, their objectives and findings are discussed in Appendix J.

Table 3.7
Closely Spaced Air Carrier Airports

Airport	Airport Pairs Operations	Airport	Operations	Total Operations	Distance	Alignment
LaGuardia	364,965	JFK	342,275	707,240	10	Parallel
San Francisco	436,955	Oakland	389,144	826,099	11	Parallel
Dallas-Ft. Worth	724,786	Love	214,468	939,254	12	Angle
LaGuardia	364,965	Newark	384,148	749,113	16	Angle
O'Hare	810,911	Midway	322,197	1,133,108	16	Parallel
Detroit City	128,199	Wayne County	391,165	519,364	21	Angle
Dulles	239,818	Washington National	320,366	560,184	23	Parallel
Houston	310,477	Houston Hobby	267,326	577,803	24	Angle

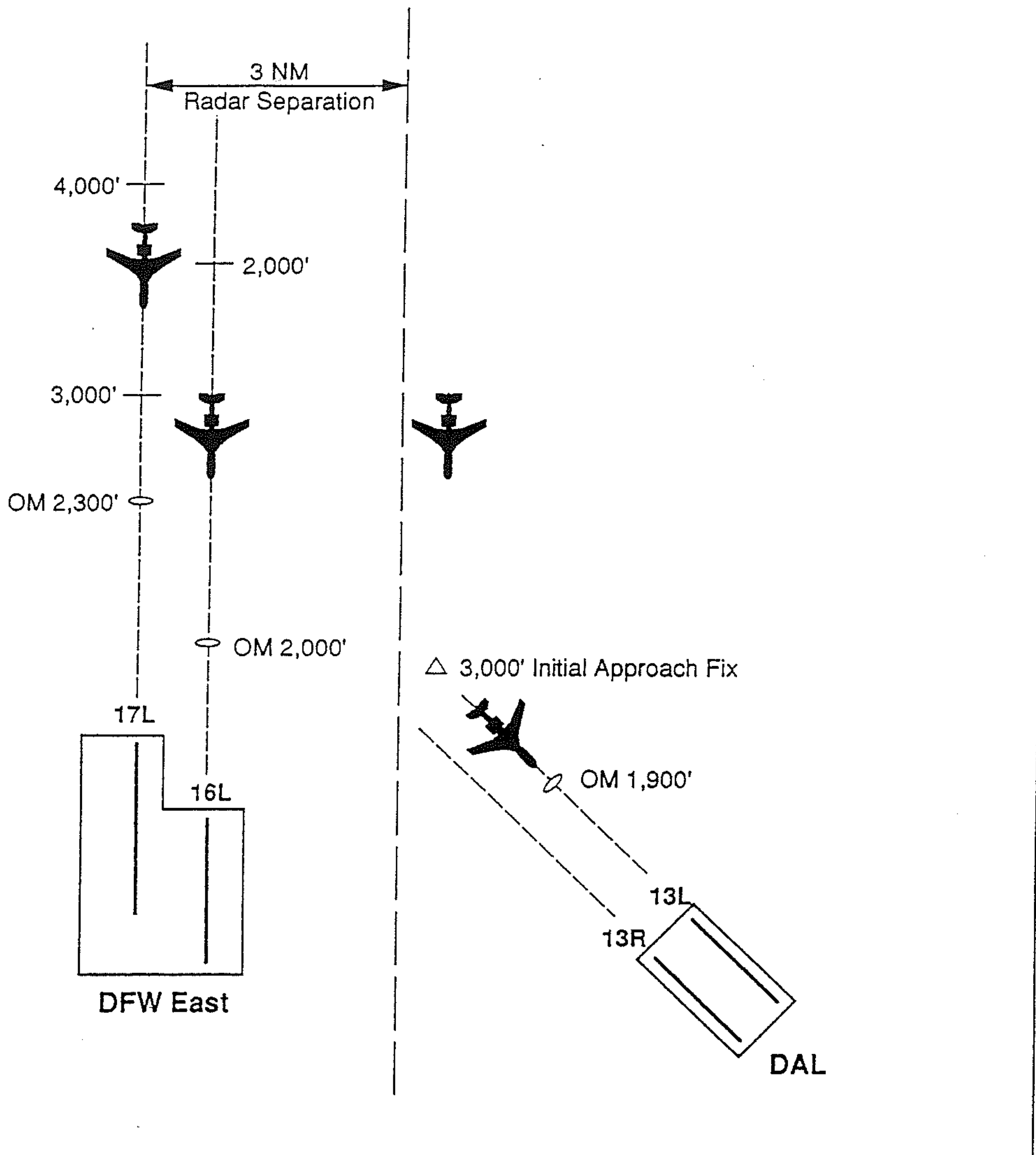
Source: VFR Terminal Area Charts, FAA Air Traffic Activity, Fiscal Year 1990, Table 4.

In the case of arrivals to the north, due to the difference in orientation of the runways at Love Field relative to the runways at Dallas-Fort Worth Airport, there will be adequate separation between the arrival stream into new Runway 34R at Dallas-Fort Worth Airport and the arrival stream into Runway 31L at Love Field to operate the two approaches independently of each other. However, since there is not sufficient airspace available west of Love Field to radar vector IFR aircraft between Dallas-Fort Worth Airport and Love Field, nearly all Love Field arrivals will continue to be merged through a common final approach point. This airspace constraint will continue to limit arrival capacity at Love Field in a north flow to 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.

The primary concern with arrivals to the south are the separation requirements which will enable the airports to operate independently of each other. In an IFR environment, a minimum of three nautical miles horizontal separation or 1,000 feet vertical separation is required for independent operations. Currently, the final approach fix to Runways 13R and 13L at Love Field has adequate horizontal separation from the arrival stream to Runway 17L at Dallas-Fort Worth Airport (see Figure 3.6). Beyond the final approach fix, the arrival streams to the two airports are on a diverging course. When the new Runway 16L at Dallas-Fort Worth Airport is operational, there will no longer be adequate horizontal separation between the two arrival streams. The FAA has developed air traffic control procedures for arrivals in a south flow to new Runway 16L at Dallas-Fort Worth Airport and to Runways 13R and 13L at Love Field which will enable the two operations to remain independent of one another. The procedures as modified maintain vertical, rather than horizontal separation between the two arrival streams.

The proposed arrival procedure into Runways 13R and 13L at Love Field will maintain the existing final approach fix which is located approximately five miles from the runway end (see Figure 3.6). This will continue to require aircraft to intercept the final approach course approximately eight miles northwest of the airport when instrument approaches are being conducted. Arrivals to Runways 13R and 13L will be required to intercept the final approach fix at an altitude of 3,000 feet MSL. The aircraft glide angle will have to be increased from the standard 3.0 degree glide angle to a 3.25 degree glide angle in order to maintain the standard threshold crossing height of 55 feet.

To establish the required 1,000-foot vertical separation between arrivals to the two airports, procedures have also been developed for the proposed new Runway 16L at Dallas-Fort Worth Airport that will require aircraft on final approach to descend to an elevation of 2,000 feet (mean sea level) at a distance of approximately 10 nautical miles from the runway threshold. The aircraft will maintain this elevation until crossing the outer marker at 4.1 nautical miles from the runway threshold. Once the aircraft has crossed the outer marker, it will then be able to complete the approach on a standard 3.0 degree glide angle. This procedure is depicted in Figure 3.7. As with arrivals in a north flow, limited airspace between the two airports will continue to limit arrival capacity at Love Field in a south flow to 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.



Legend: 0000' - Altitude of Aircraft
OM - Outer Marker

Not to scale

Dallas Love Field

Schematic Proposed ILS Approaches DFW and DAL

Figure 3.6

Capacity

The capacity of Love Field to accommodate aircraft operations is a function of:

- Airfield layout, including runway configurations and its geographical relationship to Dallas-Fort Worth Airport;
- Weather conditions; and
- Types of aircraft that take off and land (i.e., the fleet mix).

Hourly capacities of Love Field's airfield layout for both arrivals and departures at Love Field were estimated from the FAA's Advisory Circular on Airport Capacity and Delay and by a series of discussions with area air traffic control specialists. Inherent in this analysis was the principle that safety would be maintained.

In good weather (defined as a 3,500 foot or greater ceiling and five miles or greater visibility), Love Field can accommodate 36 instrument flight rule (IFR) aircraft *arrivals* per hour. In weather that has a lower ceiling and/or visibility, Love Field can accommodate only 24 *arrivals* per hour. *Departures* by IFR aircraft (air carriers operate under instrument flight rules, as discussed above) range between 37 and 63 per hour in good weather, depending on whether departures or arrivals are granted priority. In poor weather, Love Field can accommodate 47 IFR aircraft *departures* per hour. Both arrivals and departures are affected by the separation requirements maintained by controllers, who generally use a greater separation distance during poor weather to assure that the required minimum separation is maintained. Departures are also constrained by interaction with traffic from other airports, primarily Dallas-Fort Worth Airport.

Average hourly IFR aircraft demand for 1990 at Love Field was developed using the monthly, daily, and hourly distributions of demand. Table 3.8 presents the hourly demand for Love Field for 1990. Average total peak hour demand at Love Field in 1990 was 45 operations, occurring between 4 p.m. and 5 p.m. Aircraft departures also peaked at 25 between 4 p.m. and 5 p.m. The average number of peak arrivals was 28 and occurred between 3 p.m. and 4 p.m.

Peak hour demand versus capacity is depicted in Table 3.9. This table illustrates that the airfield has adequate IFR aircraft departure capacity in both visual meteorological conditions (VMC) and instrument meteorological conditions (IMC). Love Field also has adequate arrival capacity in VMC. Arrival demand in IMC approached or exceeded arrival capacity during three hours of the day. When arrival demand exceeds arrival capacity at Love Field, aircraft are either held in the air in the enroute system or are held on the ground at the origination airport.

Table 3.8
Hourly IFR Aircraft Demand at Love Field 1990

Time	Arrivals	Departures	Total
12:00 - 12:59 a.m.	6	3	9
1:00 - 1:59 a.m.	2	2	4
2:00 - 2:59 a.m.	5	1	6
3:00 - 3:59 a.m.	2	0	2
4:00 - 4:59 a.m.	1	1	2
5:00 - 5:59 a.m.	4	2	6
6:00 - 6:59 a.m.	0	17	17
7:00 - 7:59 a.m.	15	17	32
8:00 - 8:59 a.m.	16	25	41
9:00 - 9:59 a.m.	14	18	32
10:00 - 10:59 a.m.	18	15	33
11:00 - 11:59 a.m.	11	19	30
12:00 - 12:59 p.m.	18	15	33
1:00 - 1:59 p.m.	18	18	36
2:00 - 2:59 p.m.	16	19	35
3:00 - 3:59 p.m.	28	16	44
4:00 - 4:59 p.m.	20	25	45
5:00 - 5:59 p.m.	24	19	43
6:00 - 6:59 p.m.	22	20	42
7:00 - 7:59 p.m.	13	17	30
8:00 - 8:59 p.m.	13	12	25
9:00 - 9:59 p.m.	16	11	27
10:00 - 10:59 p.m.	16	4	20
11:00 - 11:59 p.m.	4	4	8

Source: HNTB analysis.

Table 3.9
1990 Demand Versus Capacity

Operational Category		Arrival	Departure
A. Demand (a)			
1. Arrival Peak	(3:00 p.m. - 4:00 p.m.)	28	16
2. Departure Peak (b)	(8:00 a.m. - 9:00 a.m.)	16	25
	(4:00 p.m. - 5:00 p.m.)	20	25
B. Capacity			
1. Mixed Operations			
- VMC		36	49
- IMC		24	47
2. Arrival Priority			
- VMC		36	37
- IMC		24	47
3. Departure Priority			
- VMC		36	63
- IMC		24	47

Notes: (a) See Table 3.8.
(b) The 4:00 p.m. - 5:00 p.m. peak hour for departures is also the peak hour for total operations.

Source: HNTB analysis.

Delay

To accommodate the expected growth in air traffic in the Dallas-Fort Worth area, a major review of the Dallas-Fort Worth Airport terminal airspace configuration was made by the FAA in 1989. The result of this review was the *DFW Metroplex Air Traffic System Plan*, which will be implemented over the next several years. The Plan will make major changes to air traffic procedures in and around the Dallas-Fort Worth area. Facilities and equipment will be provided to support the airspace and system expansion, such as new runways planned for Dallas-Fort Worth Airport. The benefits of the plan include increased capacity, reduced delays, and improved safety. Appendix J describes the principal points of the Metroplex Plan.

The Metroplex Plan will benefit satellite airports, including Love Field, as well as Dallas-Fort Worth Airport. Delay savings due to improvements in airspace management in the DFW Metroplex Plan accrue primarily to Dallas-Fort Worth Airport because of the larger number of operations at that airport. In visual flight rules (VFR) weather conditions, 46.6 hours of the total of 54.3 hours saved in daily delays for the year 2000 will accrue to Dallas-Fort Worth Airport. In IFR weather conditions, the daily delay savings due to Metroplex Plan improvements is 66.6 hours. Approximately 85 percent of that savings, or 56.9 hours, will accrue to Dallas-Fort Worth Airport, while 11 percent, or 7.2 hours, will accrue to Love Field. Table 3.10 presents the daily delay reductions expected as a result of the Metroplex Plan. These delays do not take into account any change to the Wright Amendment, however.

Table 3.10
Hours of Daily Delay Reductions for DFW Metroplex Traffic Due to New Proposed Airspace

Airport	VFR Weather			IFR Weather		
	1987	1990	2000	1987	1990	2000
Dallas-Fort Worth Airport	10.0	18.4	46.6	12.2	22.5	56.9
Love Field	1.6	2.5	5.6	2.0	3.2	7.2
Other Satellites	0.6	1.0	2.1	0.8	1.2	2.5
Total	12.2	21.9	54.3	15.0	26.9	66.6

Source: *Dallas/Fort Worth Metroplex Air Traffic Analysis*, March 1990, ATAC Corporation; Table 5.5.

Changes to the Wright Amendment could affect delays at both Dallas-Fort Worth Airport and Love Field. The delays expected at Love Field for 1996 and 2001 under each scenario are described in the review of the physical impacts of the alternative scenarios, below. A review of the relationship of Dallas-Fort Worth Airport and Love Field operations indicates that Dallas-Fort Worth Airport delays will not be increased by additional operations at Love Field under either the Base Case, Modified Wright, or Equal Access scenarios. This conclusion is derived from three assumptions: (1) operations at Dallas-Fort Worth Airport and Love Field in 2001 will not exceed that forecast for 2010; (2) significant numbers of aircraft will not seek to depart in the same direction at the same time from Love Field and Dallas-Fort Worth Airport; and (3) adequate separations will be maintained to ensure safety. This conclusion is consistent with:

- An analysis of Dallas-Fort Worth Airport using SIMMOD,[7] which concludes that an increase to 955 daily operations at Love Field -- an increase of more than 50 percent over the 1990 operations and one within the forecast levels for the Base Case, Modified Wright, and Equal Access scenarios -- would not result in additional delay at Dallas-Fort Worth Airport (see Figures 3.7 and 3.8);

- The delay analysis that was undertaken as part of the Love Field analysis, which assumed no change in the Metroplex airspace rules. These rules are designed to protect the air service quality at Dallas-Fort Worth Airport (see Figures 3.9a and 3.9b); and

- The view of air traffic personnel in the FAA Southwest Region.

ENVIRONMENTAL ISSUES

The two primary environmental issues associated with operations at Love Field are air pollution and noise pollution. Increased aircraft operations and the corresponding increase in surface traffic could increase ozone pollution. The Dallas-Tarrant County area is a non-attainment area for ozone. The Texas Air Control Board has developed State Implementation Plan (SIP) revisions. The SIP revisions address motor vehicles, certain industrial facilities, gasoline service stations, and dry cleaners. No specific measures for control of aircraft emissions have been identified in any of the SIP revisions. Increases in aircraft operations will not be inconsistent with the SIP.

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[7]Simulation Model (SIMMOD) is the FAA's computer airspace and airport simulation model.

Figure 3.7
Average Daily Love Field Activity Forecast -- 1996 and 2001

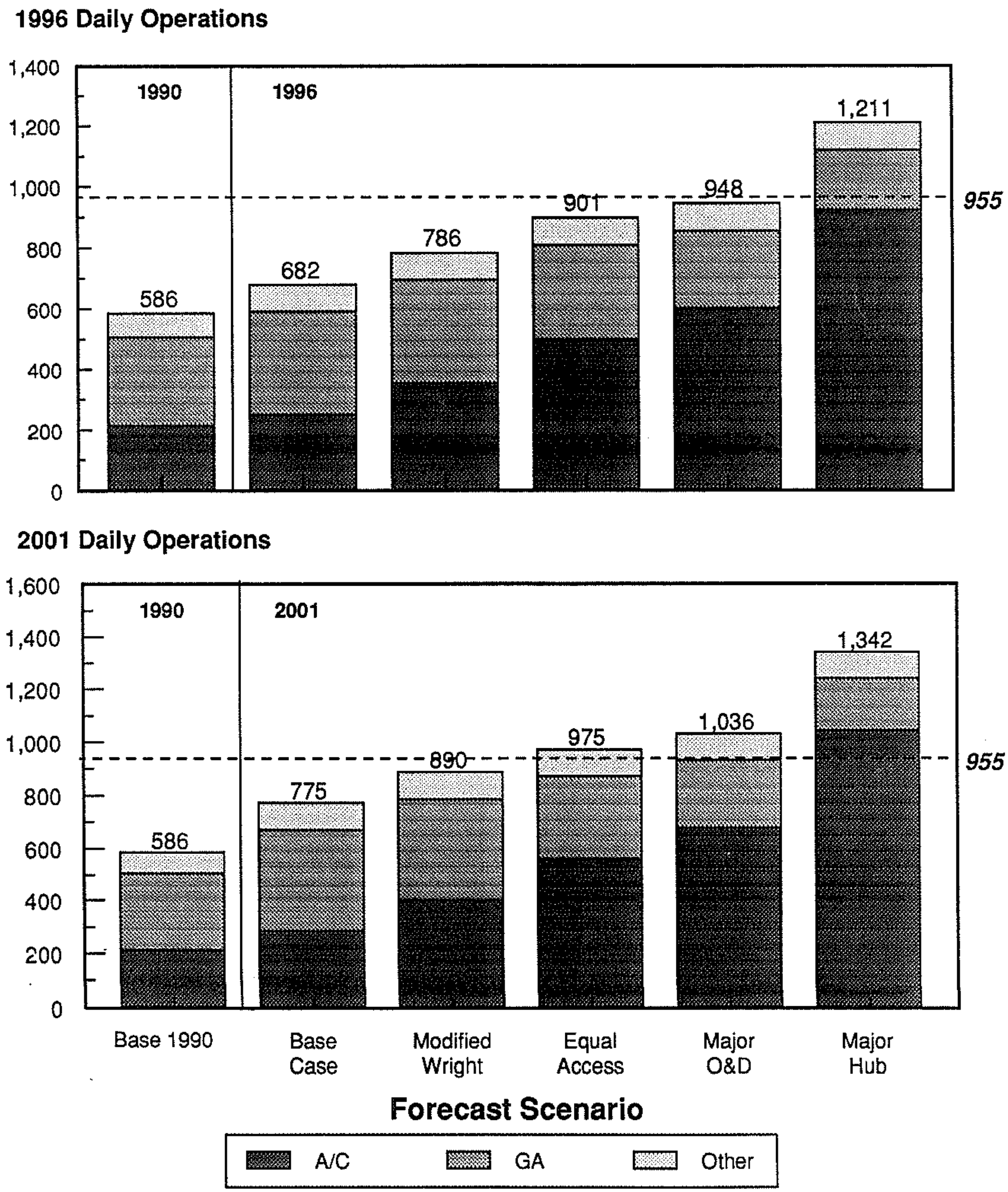


Figure 3.8 Daily Jet Departures from Love Field and DFW

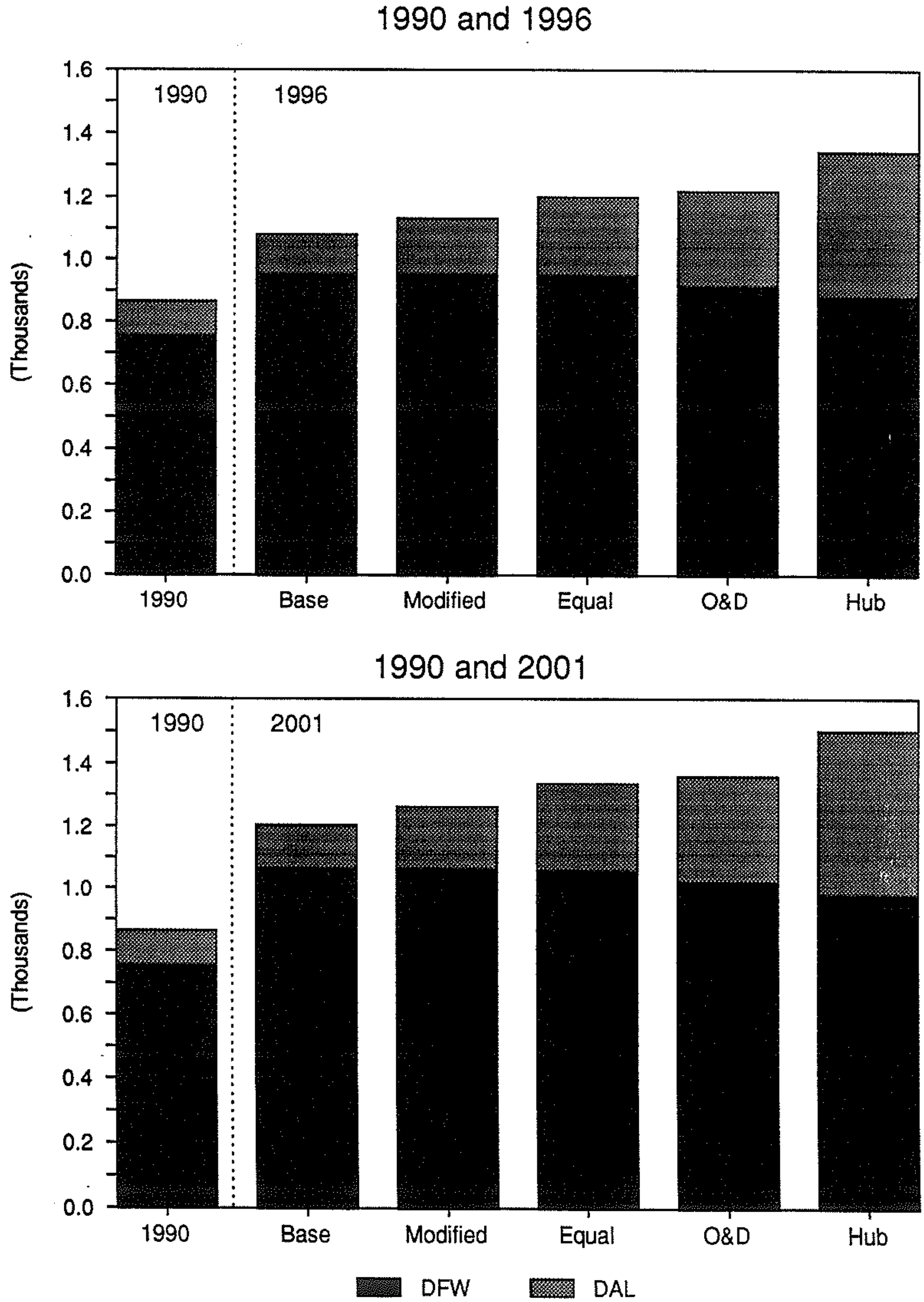
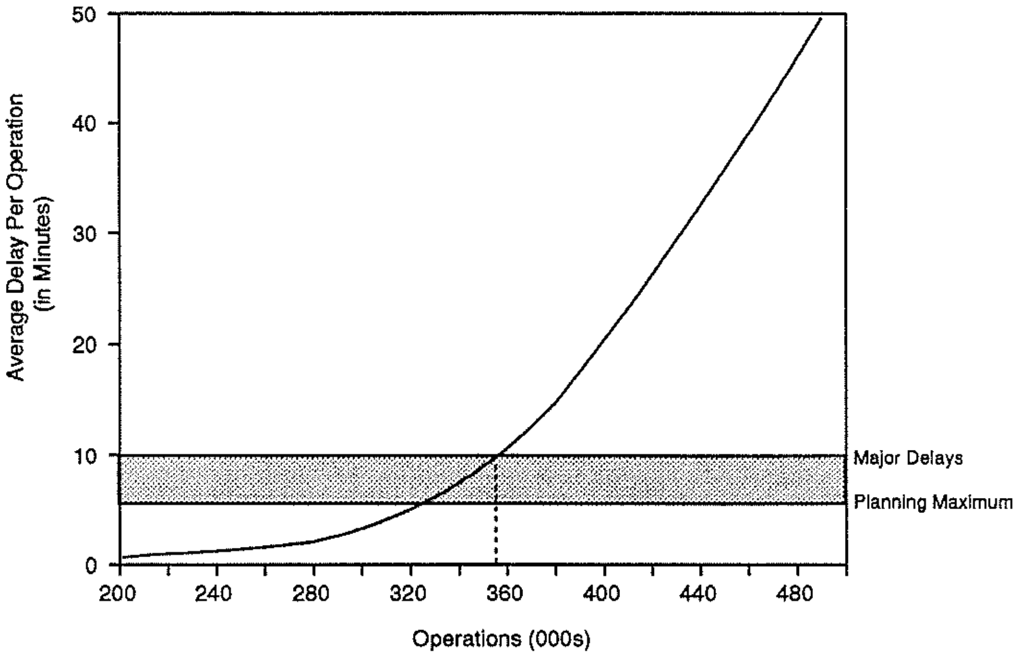
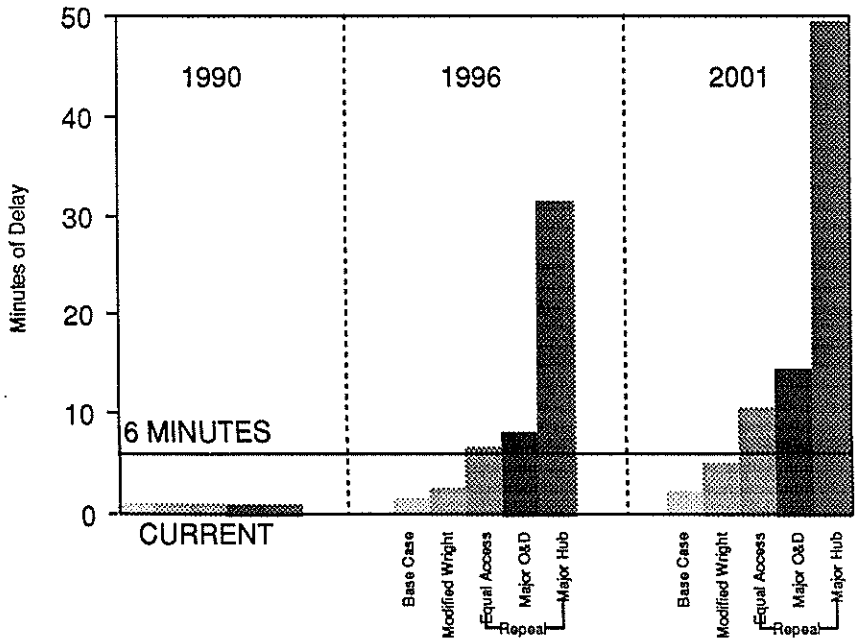


Figure 3.9a. Relationship Between Operations and Delay at Love Field (with 1996 Scenario Forecasts)



Source: Howard Needles Tammen Bergendorf based on forecasts prepared by Apogee Research and FAA Delay Model.

Figure 3.9b. Average Delay at Love Field by Scenario



Source: HNTB based on FAA Airport Capacity and Delay Model.

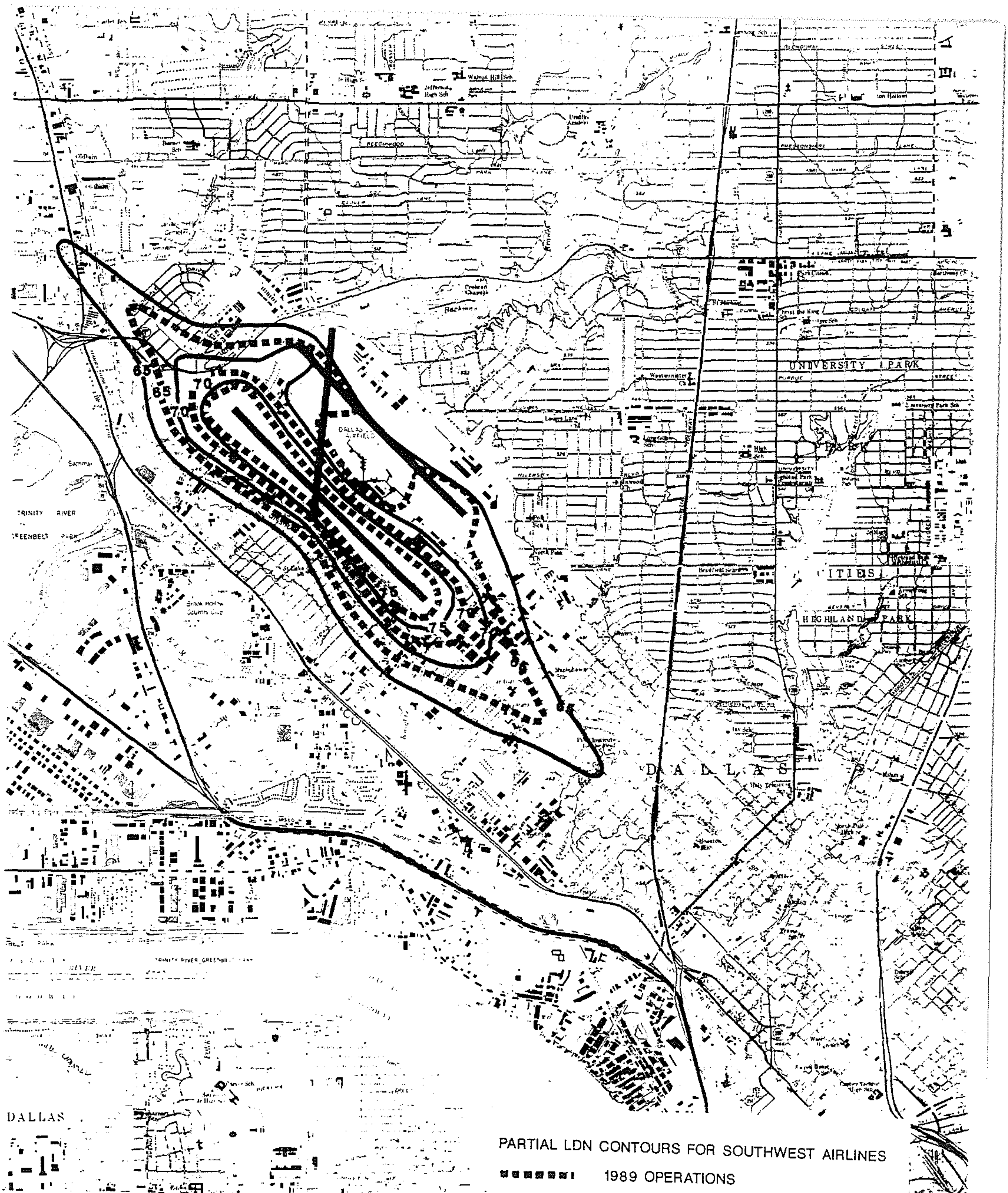
Noise has, however, been identified as a significant environmental issue for Love Field. On December 17, 1986, a revised Dallas Love Field policies statement was adopted by the City of Dallas. Included was Policy #5, designed to promote land use compatibility. The terms outlined in Policy #5 are generally consistent with the guidelines set forth in Federal Aviation Regulations Part 150 and City Policy #6 to achieve, through voluntary means, a specified population and acreage count within the 65 Ldn contours by 1992. Policy #5 also proposed that a 1989 update of the noise contours be undertaken as a means of measuring progress made toward the noise goal established for 1992. A review of the Love Field Noise Control Program will be conducted by the City in 1992 to reassess the feasibility of the established noise goal.

In October 1989, a contractor (Harris Miller Miller & Hanson, Inc.) reported on the study results of the 1989 noise contour update. This study concluded that Southwest Airlines had exceeded the reduction required by the 1992 noise goals (Figure 3.10). The 1992 noise goal was based on sixty-five percent of all commercial air carrier operations and sixty-five percent of all air carrier nighttime operations being performed by Stage 3 aircraft. General aviation operations had, to the contrary, increased the noise contours, particularly on the east side of the airport, so that the noise contours for general aviation apparently encompassed a greater area than did the noise contours for air carrier operations (Figure 3.11).

Nighttime use of Runways 13L and 31R for departures has increased substantially since 1986. There has been a significant increase in nighttime operations by the noisier general aviation jets. Most of the nighttime activity increases occurring on Runway 13L-31R took place in the hour between 6:00 a.m. and 7:00 a.m. The voluntary program of preferential use of 13R-31L ceases at 6:00 a.m. The Trinity 3 departure, discussed above, was designed to place departing aircraft over the Trinity River, thus minimizing residential overflights. This procedure also ceases at 6:00 a.m. The Dallas Aviation Department, with its Noise Advisory Committee, is currently evaluating the noise problem.

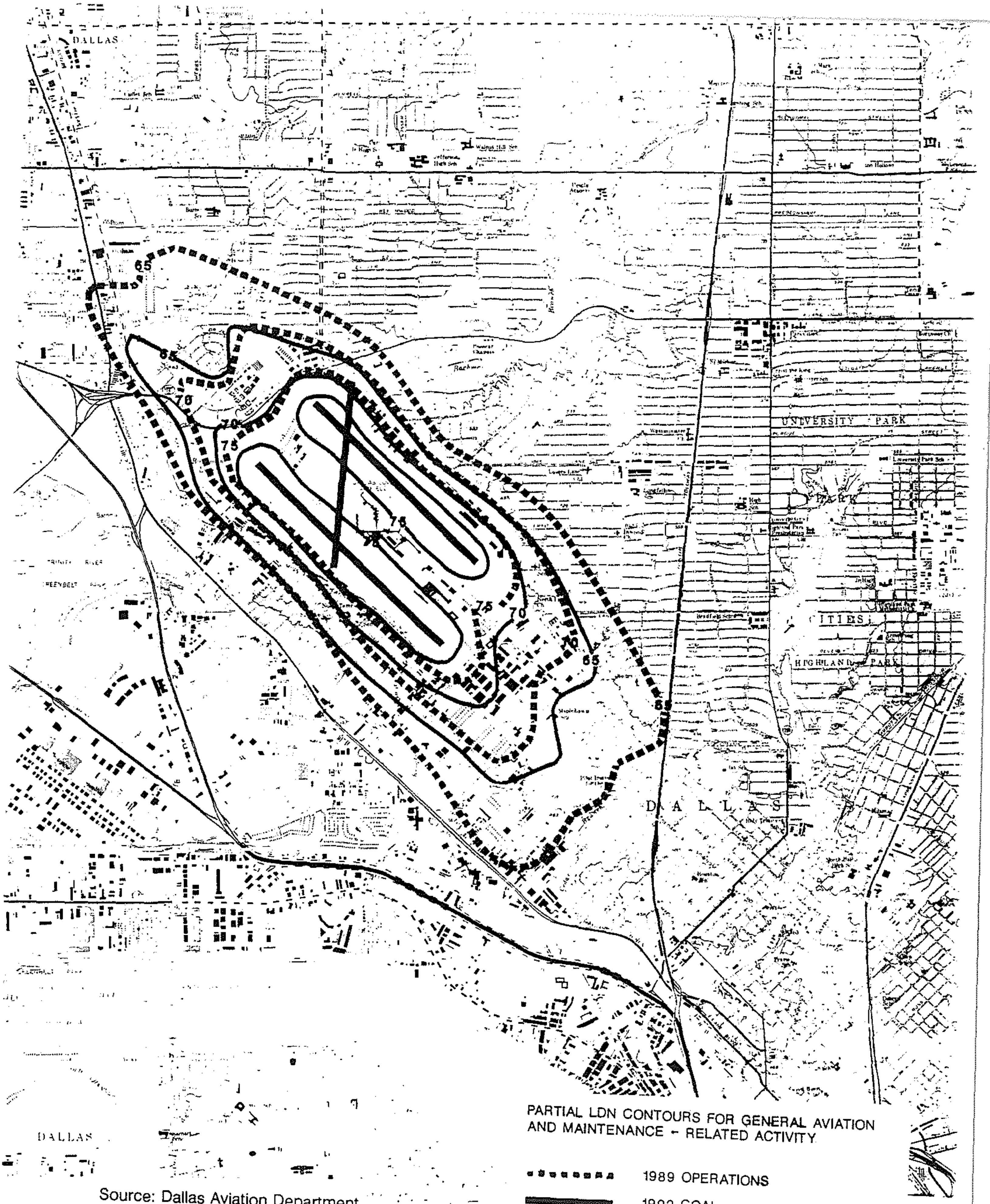
The Ldn noise index was developed under the auspices of the U.S. Environmental Protection Agency (EPA) for use in describing aircraft noise impacts and other environmental noise impacts. Ldn is the index preferred by the Federal Aviation Administration (FAA). Ldn is the logarithmic average of sound levels measured in decibels weighted to closely approximate the sensitivity of the human ear. It is based upon the yearly average for a 24-hour Equivalent Sound Level (Leq) and is weighted to account for increased noise sensitivity between 10:00 p.m and 7:00 a.m. A 10 dBA penalty is applied to noise events during that nighttime period. Figure 3.12 shows examples of Ldn sound levels.

In 1989, noise contours were developed by Harris Miller Miller & Hanson (HMMH), Inc., using NOISEMAP, a program for the calculation of Ldn values. NOISEMAP was developed for military use and was subsequently approved by the FAA for civilian airport use.



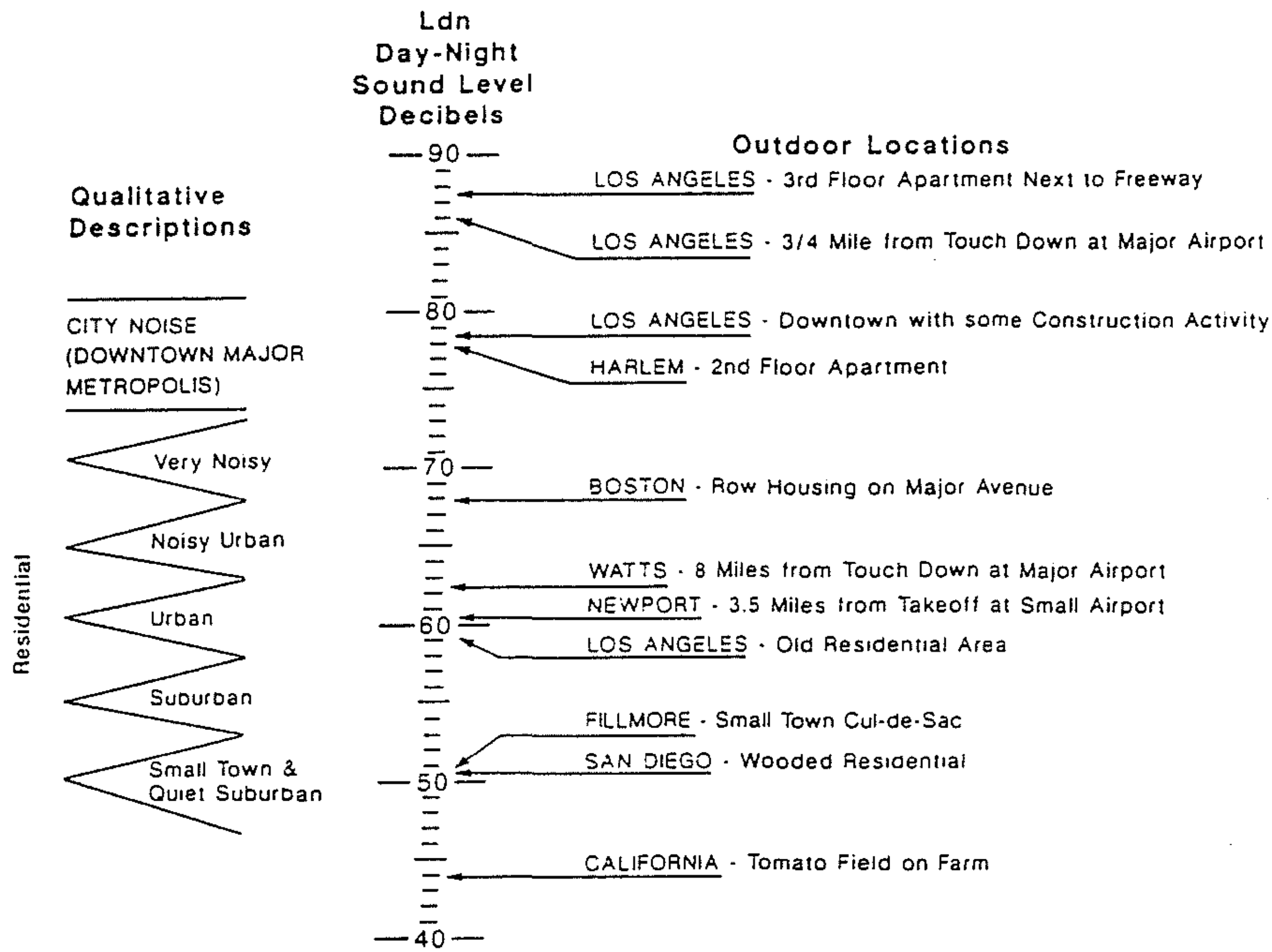
Source: Dallas Aviation Department

Figure 3.10



Source: Dallas Aviation Department

Figure 3.11



Source: United States Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. 14.

Dallas Love Field

Examples of Day-Night Average Sound Levels, Ldn

Figure 3.12

For this study, 1989 Ldn noise contours were produced using a different computer model, the FAA's latest version of INM.[8] The contour set represents a base case from which a comparison of alternative scenarios was derived. The procedure for modeling aircraft noise takes into account flight paths, the number of operations, and the fly-over noise associated with a given aircraft on a given flight path, corrected for the duration of the sound. Contours of equal Ldn value are then developed and mapped, reflecting the average noise of takeoffs and landings over a year's time. Much of the data used to generate these 1989 INM Ldn noise contours was taken from HMMH reports. A summary of the process and assumptions used to develop the INM contours is contained in Appendix L. Figure 3.13 presents the INM baseline Ldn contours for 1989. The Ldn 65 contour encompasses approximately 6.8 square miles and a population of 28,552.[9]

The 1990 population data at the census tract and block level was obtained from the City of Dallas Planning Commission. The 1989 noise contours generated using INM were superimposed on a census tract and block map. From this overlay, population within the contours was estimated. Table 3.11 shows the population contained within the contours. This technique permits a comparative evaluation of the noise impacts of each scenario.

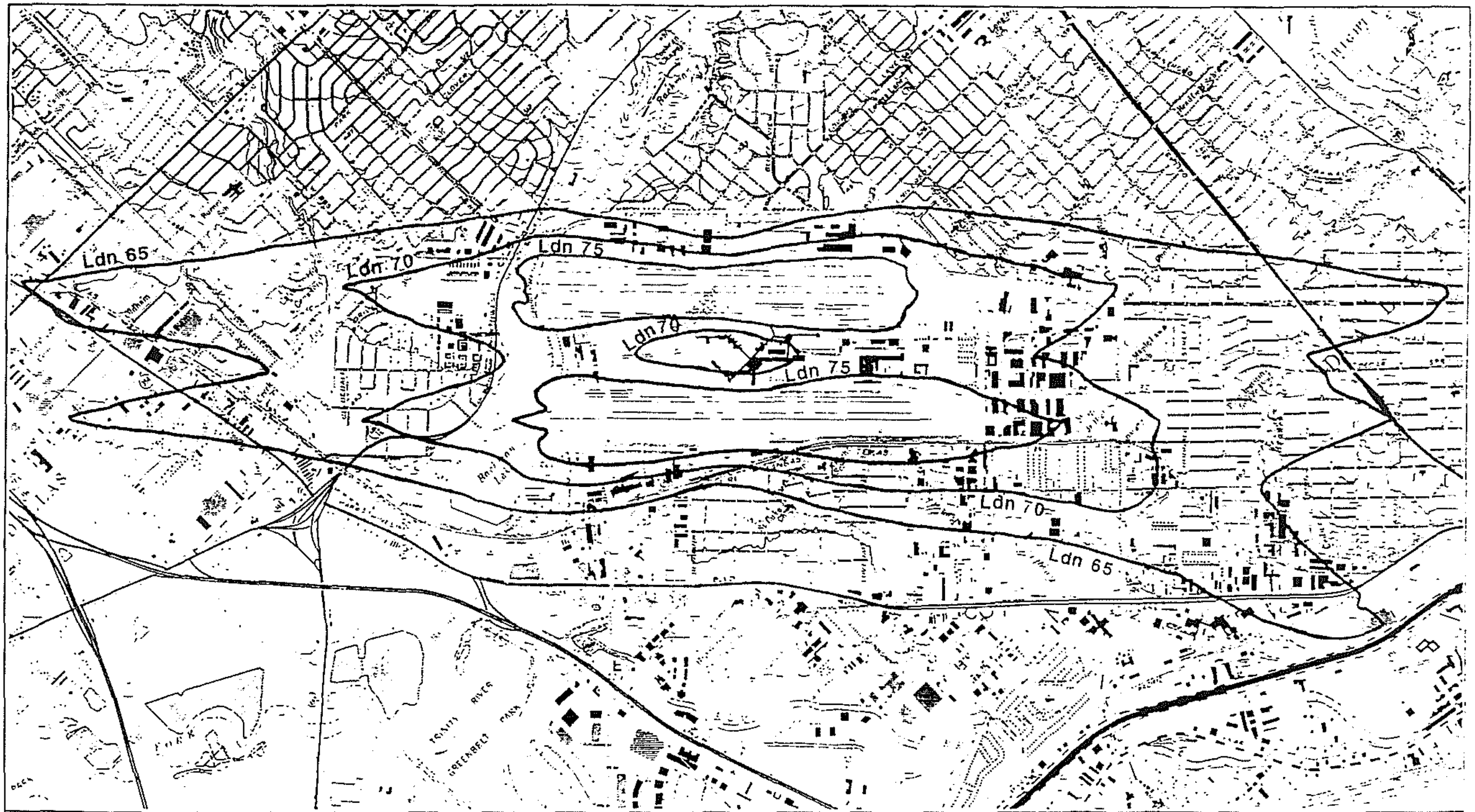
Table 3.11
1989 Noise Contour Population Count

Ldn	Population
65 - 70	25,663
70 - 75	2,755
Inside 75	164
Total 65 or greater	**28,582**

Source: HNTB calculation.

[8] Integrated Noise Model (INM) version 3.9.

[9] This Ldn 65 population estimate is 13 percent less than an estimate reported in the 1989 HMMH study. This difference is the result of HMMH's use of a different noise-contour model and use of different data. As mentioned, instead of the INM model, HMMH used the NOISEMAP model -- a different model with different methods of calculation. Additionally, instead of 1990 population data from the City of Dallas Planning Commission, HMMH used 1980 census data adjusted to 1989 levels.



Source: HNTB Using INM 3.9

Figure 3.13

Dallas Love Field
1989 Ldn Contours

Noise Mitigation Under Alternative Scenarios

Due the increasing use of quieter Stage 3 aircraft, the noise contours under each of the five scenarios are expected to shrink. With reduction in the size of the noise contour, there is a parallel reduction in the population impacted by noise. Table 3.12 shows that the forecast population impacted in 2001 is substantially less than the population impacted in 1989 and the City's 1992 goal of 27,000. (A detailed discussion of the noise impacts is presented under each of the five scenarios below.) It is, therefore, anticipated that no noise mitigation will be required under any of the five scenarios.

Table 3.12
Population Impact Due to Noise in Ldn 65
(Rounded to the Nearest 10)

Year	Base Case	Modified Wright	Equal Access	Major O&D	Major Hub
1989	28,580	28,580	28,580	28,580	28,580
2001	4,360	4,910	5,850	11,070	12,740

Source: HNTB analysis.

PHYSICAL IMPACTS OF ALTERNATIVE SCENARIOS TO THE WRIGHT AMENDMENT

This section describes the physical impacts of the scenarios identified in Chapter 1. It evaluates the terminal, concourse, and surface access requirements. The section examines the numbers of operations and enplanements, the delays, and the noise that could be expected under each scenario. All scenarios assume that:

- The percent of day versus night operations will remain proportionate to current operations for each type of aircraft or operation;
- Runway and flight track use does not change;[10]
- The *DFW Metroplex Air Traffic System Plan* is implemented as planned;
- Stage II commercial passenger carrier aircraft are not used at Love Field by the year 2001 in order to comply with national and local regulations;
- The only change to the general aviation fleet mix is a reduction in the use of noisier and less fuel efficient business jets, specifically the Lear 25 and Gulfstream II aircraft. By the year 2001, the operators of these aircraft are expected to replace them with newer more fuel efficient aircraft like the Challenger 600, Citation, and Gulfstream IV; and
- The current Trinity-3 noise abatement procedure (in operation between 9:00 p.m. and 6:00 a.m.) remains in place.

With the exception of the Base Case, all demand forecasts are based on the projected demand necessary to sustain the operational level hypothesized by each scenario, rather than on the projected demand stimulated by the new fare structure and increased service. Chapter 2 reviews this supply-based approach to the demand forecast as well as the forecast results of the econometric approach. This section concludes with an assessment of the airspace impacts of the two proposed runways at Dallas-Fort Worth Airport as well as the relationship between operations at Love Field under each of the scenarios and delays at Dallas-Fort Worth Airport.

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[10] Approximately two-thirds of the time the airport will be in a south flow, with aircraft landing and taking off towards the south. Air carriers will continue to use runway 13R-31L, while general aviation aircraft will use runway 13L-31R. Tables L.3 and L.4 in Appendix L present the daytime and nighttime runway and track use percentages for each type of operation. Table I.4 in Appendix I presents the use of Love Field's runways for each type of operation.

Scenario 1: Base Case (No Change to the Wright Amendment)

Operations and Enplanements

Base Case operations and enplanements are expected to grow at 2.6 percent annually. Operations will rise from 214,200 in 1990 to 249,000 in 1996 and 283,000 in 2001. Southwest Airlines would serve its current destinations with increasing frequency, but would not increase the number of destinations it now serves from Love Field. Enplanements will rise from 3.0 million in 1990 to 3.5 million in 1996 and 3.9 million in 2001.

Terminal and Concourse Space Requirements

Under the Base Case, 472,000 square feet of terminal/concourse space would be required to accommodate the growth in operations and enplanements by the year 2001.[11] This exceeds considerably the 356,200 square feet of the west concourse and the terminal that was utilized in 1990. No gates beyond the 14 available to Southwest today (13 are in use) would be required. However, renovation of the additional 115,800 square feet of space would be necessary.[12] Terminal/concourse renovation costs are estimated at $11 million. With the loading gate for gate number 12 in place, all gates would have loading bridges. No changes to existing long-term leases on other concourses appear to be required. Figure 3.14 shows a schematic gate layout for the Base Case scenario.

Airfield Capacity and Delay

The percentage of large air carriers using Love Field is expected to increase throughout the decade. As a result, the VMC mix index (MI), a measure that gives more weight to the presence of heavier aircraft, increases from 57 in 1990 to 58 in 2001. Likewise, the Instrument Meteorological Conditions (IMC) MI increases from 81 in 1990 to 82 in 2001.

With these increasing proportions of large aircraft, an increase in the variability of aircraft speeds is expected in VMC. However, since a large portion of the general aviation fleet is projected not to operate in IMC, a reduction in the variability of aircraft speeds is expected. As a result, IFR aircraft departure capacity in VMC decreases slightly from 63 in 1990 to 61 by 2001, as shown in Table 3.13. However, the decrease in the variability of aircraft speeds is not significant enough in the Base Case scenario to increase IFR aircraft departure capacity in IMC. IFR aircraft departure capacity in IMC remains constant at 47 departures per hour.

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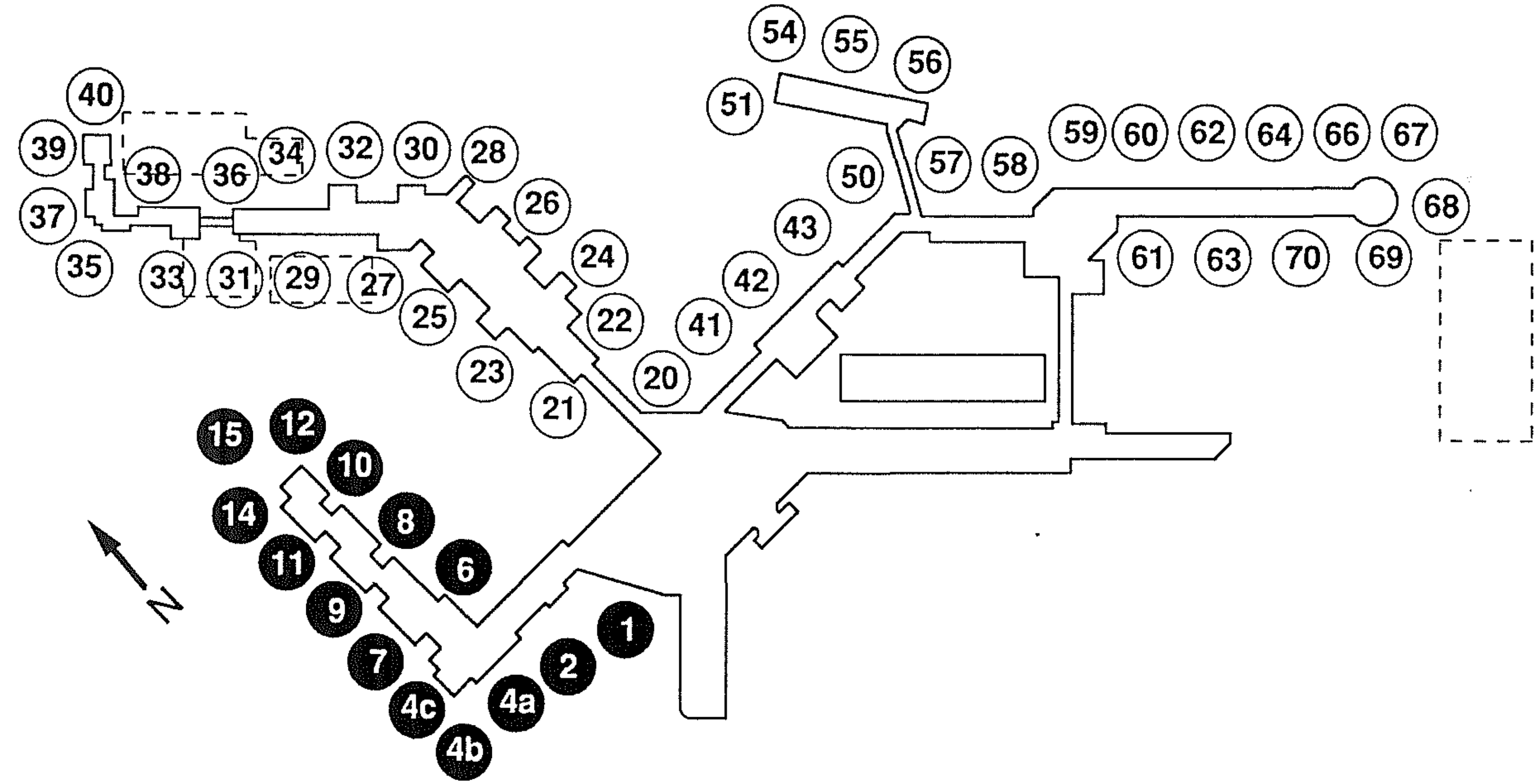
[11] The methodology for estimating the space for renovation and additional structures for each scenario are shown in Appendix M.

[12] The space allocation and cost for the Base Case Scenario assumes a continuation of the high utilization pattern of Southwest Airlines.



Gates in use

Hangars

Source: HNTB

Schematic not to scale

Dallas Love Field

Base Case Scenario
Love Field Terminal - 14 Gates

Figure 3.14

Table 3.13
Base Case Scenario:
Summary of Love Field Airfield Capacity and Delay

Fleet Mix Assumptions
Mix Index (a)

Year	VMC	IMC
1990	57	81
1996	57	82
2001	58	82

Demand Vs. Capacity

Year	Arrivals			Departures		
	Peak Demand (b)	Capacity (c)	Hours Exceeded	Peak Demand (b)	Capacity (d)	Hours Exceeded
1990 VFR	28	36	0	25	63	0
1990 IFR	28	24	1	25	47	0
1996 VFR	28	36	0	25	61	0
1996 IFR	28	24	1	25	47	0
2001 VFR	32	36	0	29	61	0
2001 IFR	32	24	3	29	47	0

Aircraft Delays During Peak Hour(e)
(minutes/operation)

Year	Average Aircraft Delay	VMC	IMC
1990	1.0	2.4	4.5
1996	1.6	3.7	10.1
2001	2.2	5.1	14.0

Notes: (a) Based on forecasts provided by Apogee Research, Inc., May 1991.
(b) Forecasts provided by Apogee Research, Inc., May 1991. Includes only IFR aircraft demand (all air carriers, 70 percent of other commercial, military and general aviation operations). Peak demand based on a peak month (9.32%), average day (31 days), peak hour methodology.
(c) Love Field Analysis, FAA Southwest Region, December 10, 1990.
(d) IFR aircraft departure capacity assumes a one-for-one capacity tradeoff with Dallas-Fort Worth Airport departures for 25 percent of all Love Field departures in VMC and 50 percent of all Love Field departures in IMC.
(e) Calculated using FAA Airport Capacity and Delay Model.

Implementation of the *DFW Metroplex Air Traffic System Plan* will improve the overall arrival and departure system serving the region but will not significantly affect the IFR aircraft arrival capacity into Love Field. Extremely limited airspace available between Dallas-Fort Worth Airport and Love Field will require controllers to continue to meter all IFR arrivals and merge all arrivals to a common point prior to the final approach. As such, IFR aircraft arrival capacity remains constant in the Base Case scenario at 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.

The VMC and IMC peak hour demand for IFR aircraft was determined assuming that the monthly, daily, and hourly distribution of demand is held constant through the planning period. As shown in Table 3.13, peak hour arrival demand in VMC increases from 28 in 1990 to 32 by 2001. Likewise, peak hour departure demand increases from 25 departures in 1990 to 29 departures by 2001. Arrival demand exceeded arrival capacity on an average of one hour per day in 1990 in IMC. Arrival demand is expected to exceed arrival capacity for an average of three hours per day by 2001 in IMC. The airfield has adequate arrival capacity in VMC, and adequate departure capacity in both VMC and IMC through the planning period, under this scenario.

The FAA Airport Capacity and Delay Model (AC 150/5060.5) was used to determine aircraft delays at Love Field for the Base Case scenario. As shown in Table 3.13, average aircraft delays are projected to increase from 1.0 minute per operation in 1990 to 2.2 minutes per operation by 2001. Average aircraft delay in the peak hour is projected to increase from 2.4 minutes per operation in 1990 to 5.1 minutes per operation by 2001 in VMC, and increase from 4.5 minutes per operation in 1990 to 14.0 minutes per operation by 2001 in IMC. Since IFR aircraft arrivals are metered into Love Field, arrival delays are incurred by aircraft either in the enroute airspace or at the origination airport.

Surface Access to Love Field

As the number of originating and terminating passengers increases at an airport, access traffic will also increase. However, some of the vehicular traffic is not directly related to transporting passengers, and therefore, will not change at the same rate. To account for this factor the estimated increase in vehicular traffic between 1990 and 2001 was reduced to 70 percent of the growth of originating air passenger activity.

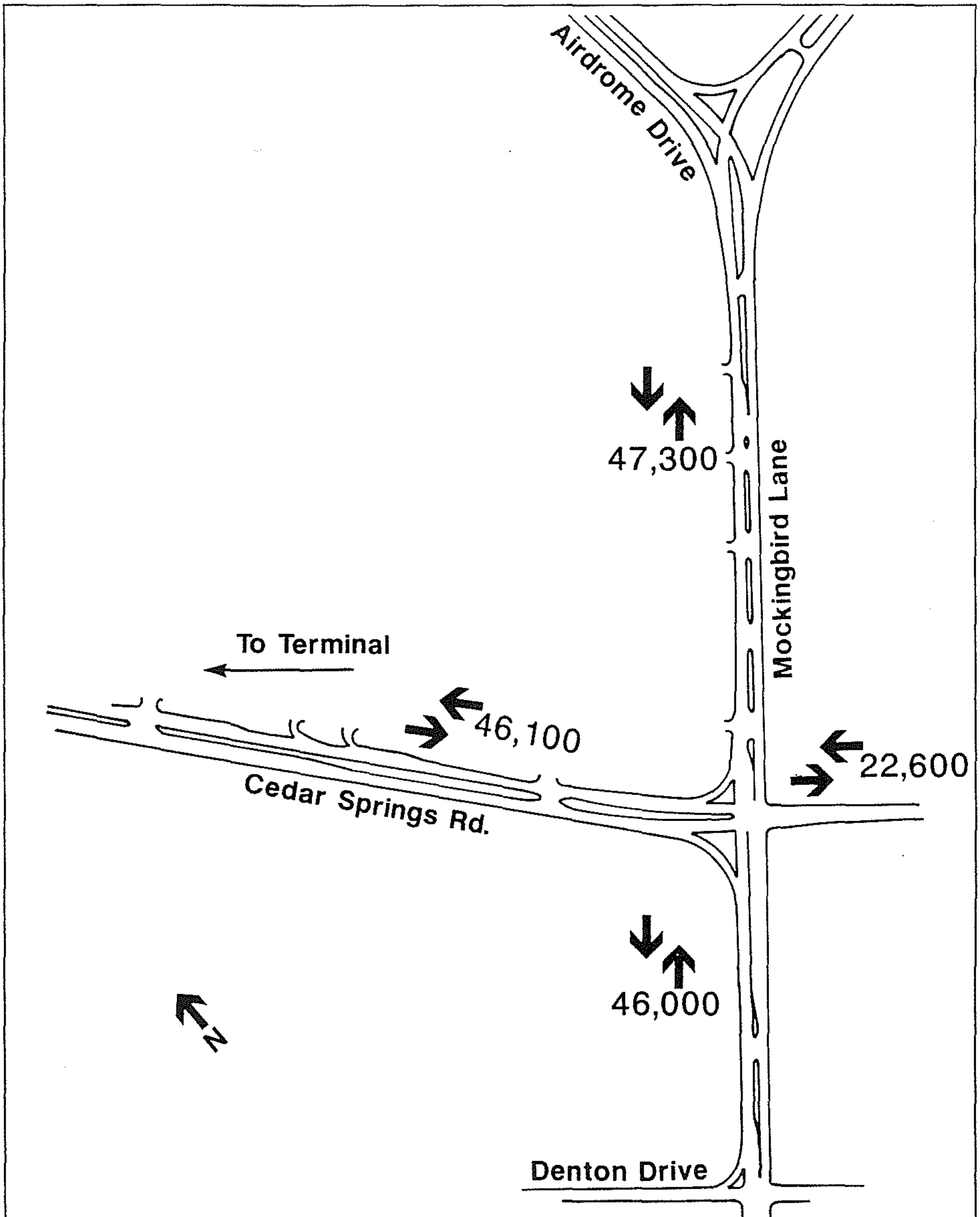
NCTCOG provided estimates of two-way vehicular traffic on road segments in the Love Field area for the year 2000 without accounting for any increase in Love Field surface traffic. The estimated growth in vehicular traffic on Cedar Springs Road was added to the north, south, and east legs of the entrance intersection in proportion to the traffic on each of those legs in 2001. The impact of additional vehicular traffic, due to estimated passenger traffic increases at Love Field on road segments other than the entrance intersection, would require network analysis much more extensive than can be performed in this study. Typically, however, airport surface traffic tends to dissipate rapidly on the road network and becomes a small element of the overall traffic within one to two miles of the airport.

The increase in vehicular traffic on Mockingbird Lane and Cedar Springs Road east of the entrance intersection would increase travel time on these streets, which are estimated by NCTCOG to be at Level of Service E and F already. As described above, E is a Level of Service operating at the capacity of the highway. F is a Level of Service of forced flow at low speeds. No known plans exist for improving the at grade intersection of Cedar Springs Road and Mockingbird Lane. Elevation of the roadways at this intersection to create a grade separated entrance could be difficult because it lies within the runway protection zone for Runway 13R/31L. Using an underpass alternative for the intersection is likely to encounter problems with utilities and would be more expensive. Eliminating curb cuts and providing service roads along Mockingbird Lane would provide only marginal capacity improvements.

There are approximately 4,500 public parking spaces at the terminal which appears to be adequate. The requirement for public parking places will increase in near direct proportion to the increase in originating passengers.

The Base Case scenario increases originating passengers from 2,355,556 in 1990 to 3,119,000 in 2001. Figure 3.15 shows the two-way vehicular traffic through the intersection of Cedar Springs Road and Mockingbird Lane in the year 2001. Vehicles on Cedar Springs, from the intersection with Mockingbird Lane to the terminal, would increase from 37,500 in 1990 to 46,100 in 2001 based upon 70 percent of the growth in originating passengers. Table 3.14 shows projected vehicular traffic for the year 2001. This table also shows year 2001 traffic at the intersection without any growth at Love Field. Table 3.14 further shows vehicular traffic on Mockingbird Lane north and south of the intersection and Cedar Springs east of the intersection with vehicular traffic due to Love Field growth added. The increase in traffic on Mockingbird Lane and Cedar Springs is not significant. It is, however, additional traffic on roadways deemed to be otherwise operating at very low levels of service.

Parking requirements at the airport increase from the 4,500 spaces available in 1990 to 5,960 spaces in 2001.



0 200 400
Scale in feet

Source: Dallas Love Field ALP
HNTB Analysis

Dallas Love Field
Entrance/Exit Intersection
Average Daily Traffic
Base Case Scenario - 2001

Figure 3.15

Table 3.14
Base Case Scenario - Vehicular Traffic

Road Section	Year 2001 without Love Growth	Year 2001 with Love Growth
Mockingbird Lane north of Cedar Springs	43,800(1)	47,300(3)
Mockingbird Lane south of Cedar Springs	42,600(1)	46,000(3)
Cedar Springs Road east of Mockingbird Lane	20,900(1)	22,600(3)
Cedar Springs Road into terminal	37,500(2)	46,100(3)

Notes:
(1) NCTCOG estimates for 2000 assumed to approximate 2001.
(2) HNTB estimate for 1990.
(3) HNTB estimates.

Noise Analysis

The year 2001 noise analysis for the Base Case scenario is based on a forecast fleet mix which assumes normal growth from the levels of air traffic at the airport in 1989. There are changes in aircraft type, compared with 1989, as Stage II air carrier aircraft are phased-out of service as required by national policy. Tables 3.15 and 3.16 show 2001 average daily arrivals and departures by aircraft type.

The year 2001 Ldn contours (see Figure 3.16) for this scenario are much smaller than the 1989 contours. The reduction in contour size is due primarily to the reduced use of older, more noisy aircraft. The Ldn 65 contour is approximately 43 percent of the size of the Ldn 65 contour for 1989.

With the reduction in the size of the noise contour there is a parallel reduction in population impacted by noise. The total population within Ldn 65 for the Base Case scenario is approximately 4,360 based on 1990 Census data. This is a significant decrease in population impact as compared with 1989, and substantially below the City's 1992 goal of 27,000.

Table 3.15

Base Case Scenario – 2001 Average Daily Arrivals for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	65.1	5.4	70.5
737–300	67.8	5.6	73.4
Subtotal	132.9	11.0	143.9
Air Taxi/General Aviation –			
Citation	9.2	0.7	9.9
Lear 25	1.3	0.6	1.9
Lear 35	46.1	7.4	53.5
Challenger 600	4.6	0.5	5.1
Gulfstream II	1.2	0.0	1.2
Mitsubishi 300	1.2	0.2	1.4
Saberliner 80	3.1	0.6	3.7
Twin – Turboprop	40.7	3.7	44.4
Twin – Piston	38.6	15.6	54.2
Single – Piston	54.7	11.1	65.8
Subtotal	200.7	40.4	241.1
Total	**333.6**	**51.4**	**385.0**

Source: Apogee and HNTB analysis, May 1991.

Table 3.16

Base Case Scenario – 2001 Average Daily Departures for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	68.0	2.5	70.5
737–300	70.8	2.6	73.4
Subtotal	138.8	5.1	143.9
Air Taxi/General Aviation –			
Citation	9.4	0.5	9.9
Lear 25	1.5	0.4	1.9
Lear 35	44.8	8.7	53.5
Challenger 600	5.1	0.0	5.1
Gulfstream II	1.2	0.0	1.2
Mitsubishi 300	1.4	0.0	1.4
Saberliner 80	3.4	0.3	3.7
Twin – Turboprop	39.4	5.0	44.4
Twin – Piston	37.7	16.5	54.2
Single – Piston	51.3	14.5	65.8
Subtotal	195.2	45.9	241.1
Total	**334.0**	**51.0**	**385.0**

Source: Apogee and HNTB analysis, May 1991.

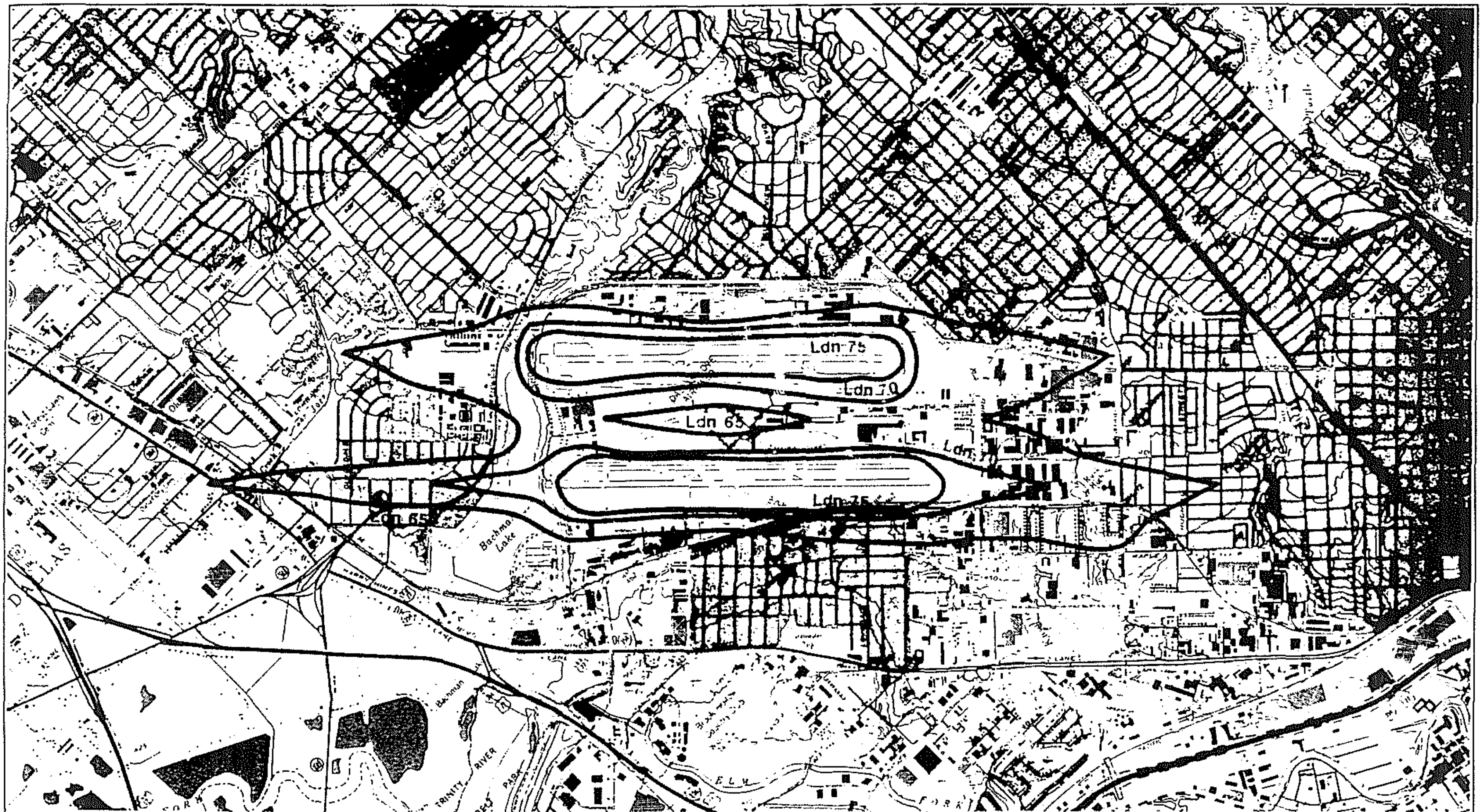


Figure 3.16

Source: HNTB Analysis

Dallas Love Field
Base Case Scenario
Year 2001 Ldn Contours

Scenario 2: Modified Wright with Through-Ticketing and Through-Service

Operations and Enplanements

Because of wider service limits (up to 650 miles) and the availability of through-ticketing and through-service to points beyond the 650-mile limit, modification would likely result in expansion by Southwest into additional short-haul markets as well as limited entry into Love Field by other carriers, primarily those that could access their hub with non-stop service. As a result, operations and enplanements under the Modified Wright scenario are expected to grow more rapidly than over the Base Case through 1996 (6 percent annually) and then continue to grow at the base rate of 2.6 percent annually through 2001. Operations will rise from 214,200 in 1990 to 287,000 in 1996 and 325,000 in 2001. Enplanements are forecast to rise from 3.0 million in 1990 to 5.1 million in 1996 and 5.8 million in 2001.

Terminal and Concourse Space Requirements

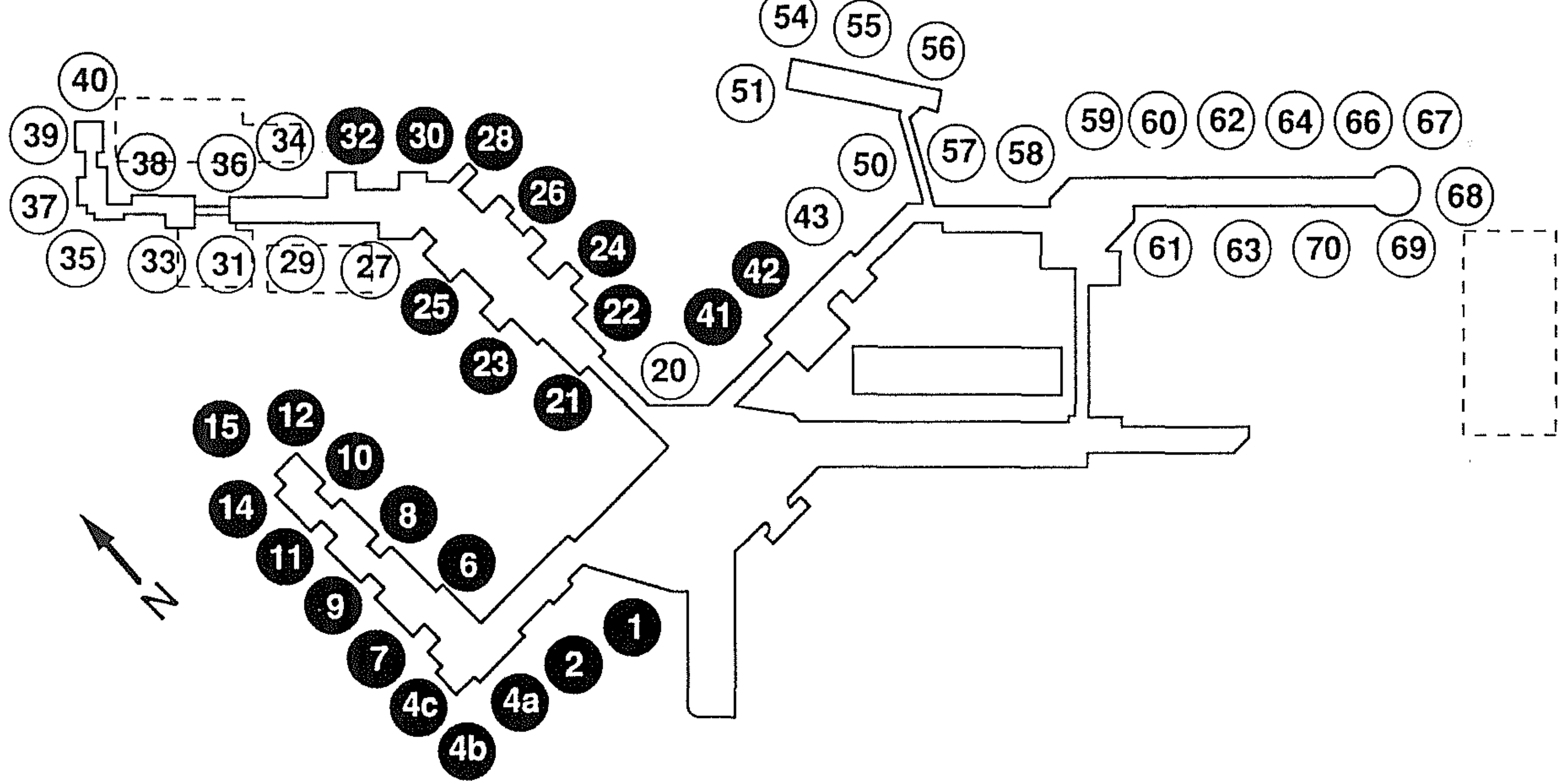
The Modified Wright scenario would need 691,600 square feet of terminal and concourse space, 335,400 square feet beyond that in use today. The additional 335,400 square feet of space can be renovated to meet the requirements of this scenario. Gates can be provided relatively easily for this scenario by adding 9 gates on the north concourse and two gates on the east concourse. Two of the gates on the north concourse would have to be ground loading gates unless modified. Some modification to the existing long-term leases would be required. In the event that modification to the long-term lease for the east concourse can be modified with less difficulty, an appropriate number of gates could be made available at that concourse. Figure 3.17 shows the 25 gates that would be used under the Modified Wright scenario.

Airfield Capacity and Delay

The percentage of large air carrier aircraft in the fleet increases throughout the planning period. As a result, the VMC mix index (MI) increases from 57 in 1990 to 63 by 2001. Likewise, the Instrument Meteorological Conditions (IMC) mix index increases from 81 in 1990 to 85 in 2001. The projected mix index for the Modified Wright scenario is shown in Table 3.17.

With these increasing proportions of large aircraft, an increase in the variability of aircraft speeds are expected in VMC. As a result, IFR aircraft departure capacity in VMC decreases slightly from 63 in 1990 to 60 by 2001, as shown in Table 3.17. Since a large portion of the general aviation fleet is projected not to operate in IMC, a reduction in the variability of aircraft speeds is expected. The IFR aircraft departure capacity in IMC remains constant at 47 departures per hour.

Implementation of the DFW Metroplex Air Traffic System Plan will improve the overall arrival and departure system serving the region but will not significantly increase the IFR aircraft



N Gates in use

Hangars

Source: HNTB

Schematic not to scale

Dallas Love Field

Modified Wright Scenario
Love Field Terminal - 25 Gates

Figure 3.17

Table 3.17
Modified Wright Scenario:
Summary of Love Field Airfield Capacity and Delay

Fleet Mix Assumptions
Mix Index (a)

Year	VMC	IMC
1990	57	81
1996	63	85
2001	63	85

Demand Vs. Capacity

Year	Arrivals			Departures		
	Peak Demand (b)	Capacity (c)	Hours Exceeded	Peak Demand (b)	Capacity (d)	Hours Exceeded
1990 VFR	28	36	0	25	63	0
1990 IFR	28	24	1	25	47	0
1996 VFR	33	36	0	30	60	0
1996 IFR	33	24	3	30	47	0
2001 VFR	38	36	1	34	60	0
2001 IFR	38	24	4	34	47	0

Aircraft Delays During Peak Hour(e)
(minutes/operation)

Year	Average Aircraft Delay	VMC	IMC
1990	1.0	2.4	4.5
1996	2.7	4.6	17.7
2001	5.1	5.3	46.4

Notes:
(a) Based on forecasts provided by Apogee Research, Inc., May 1991.
(b) Forecasts provided by Apogee Research, Inc., May 1991. Includes only IFR aircraft demand (all air carriers, 70 percent of other commercial, military and general aviation operations). Peak demand based on a peak month (9.32%), average day (31 days), peak hour methodology.
(c) Love Field Analysis, FAA Southwest Region, December 10, 1990.
(d) IFR aircraft departure capacity assumes a one-for-one capacity tradeoff with Dallas-Fort Worth Airport departures for 25 percent of all Love Field departures in VMC and 50 percent of all Love Field departures in IMC.
(e) Calculated using FAA Airport Capacity and Delay Model.

arrival capacity into Love Field. Extremely limited airspace available between Dallas-Fort Worth Airport and Love Field will require controllers to continue to meter all IFR arrivals and merge all arrivals to a common point prior to the final approach. As such, IFR aircraft arrival capacity at Love Field remains constant in the Modified Wright scenario at 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.

The VMC and IMC peak hour demand for IFR aircraft was determined assuming that the monthly, daily, and hourly distribution of demand is held constant through the planning period. As shown in Table 3.17, peak hour arrival demand increases from 28 in 1990 to 38 by 2001. Likewise, peak hour departure demand would increase from 25 departures in 1990 to 34 departures by 2001. Arrival demand exceeded arrival capacity for an average of one hour per day in 1990 in IMC. Arrival demand would exceed arrival capacity an average of four hours per day by 2001 in IMC. In the Modified Wright scenario, arrival demand would exceed arrival capacity an average of one hour per day by 2001 in VMC. The airfield would have adequate departure capacity in both VMC and IMC through the planning period under this scenario.

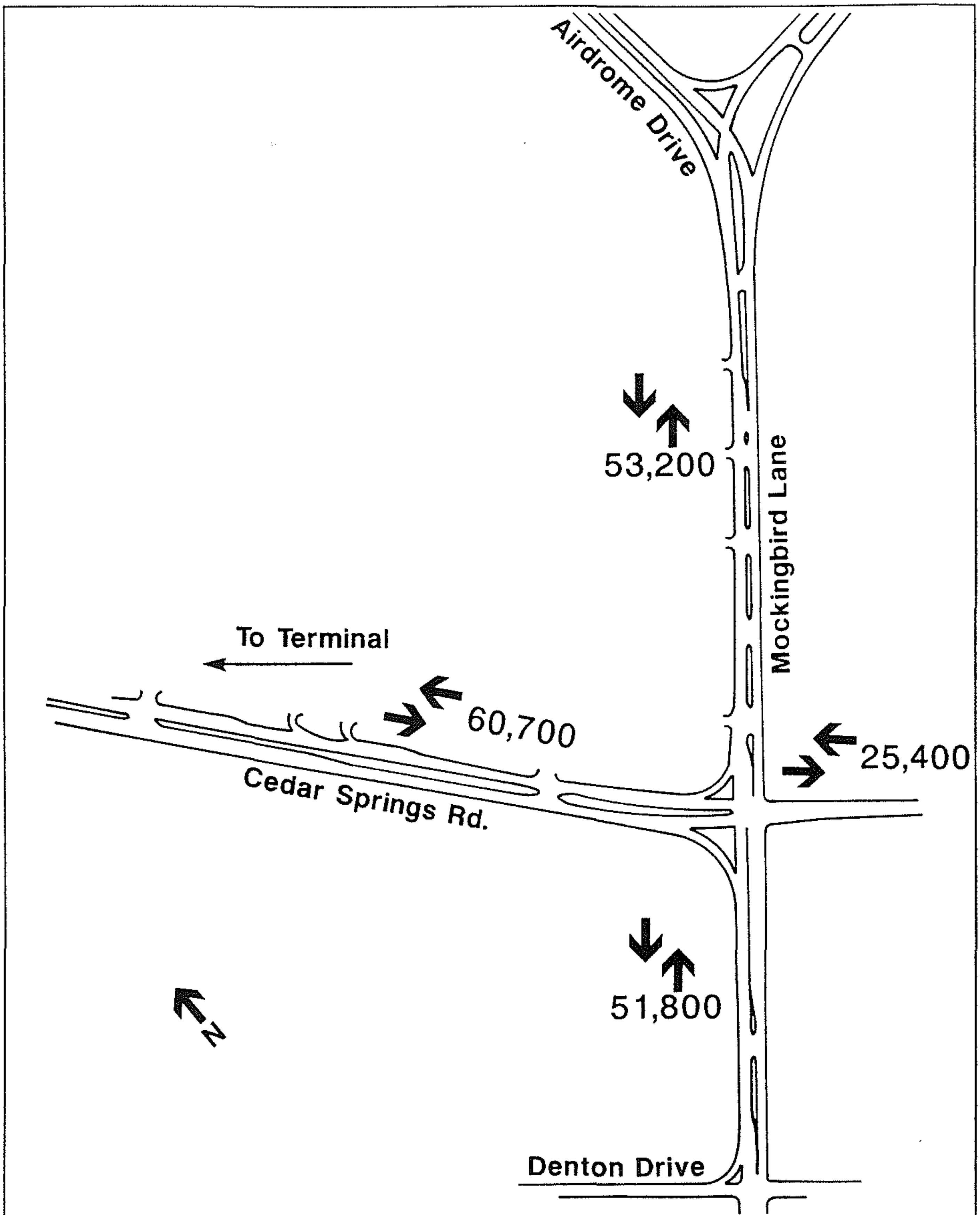
Average aircraft delays are projected to increase from 1.0 minute per operation in 1990 to 5.1 minutes per operation by 2001 (see Table 3.17). Average aircraft delay in the peak hour is projected to increase from 2.4 minutes per operation in 1990 to 5.3 minutes per operation by 2001 in VMC, and increase from 4.5 minutes per operation in 1990 to 46.4 minutes per operation by 2001 in IMC. Since IFR aircraft arrivals are metered into Love Field, arrival delays are incurred by aircraft either in the enroute airspace or at the origination airport.

Surface Access Analysis

Traffic under the Modified Wright scenario would increase from 37,500 vehicles in 1990 to 60,700 in 2001 (based upon assumptions discussed under the Base Case scenario). Table 3.18 shows vehicular traffic at the Love Field entrance intersection. Traffic for year 2001 without any increase in Love Field vehicular traffic is shown. Traffic with the increase attributable to the Modified Wright scenario is also shown in the table. The increase in traffic on segments of roads already operating at low levels of service (E and F) will cause an increase in surface access travel times. Figure 3.18 shows two-way vehicular traffic through the intersection in 2001.

The peak hour capacity of the existing Cedar Springs Road into the terminal from its intersection at Mockingbird Lane is estimated at about 50,000 Average Daily Traffic and normal hourly distribution. Traffic would be operating at Level of Service E or at slightly above capacity. The capacity limitation is the signalized intersection of Cedar Springs Road and Mockingbird Lane.

Parking requirements increase from 4,500 spaces available at the terminal in 1990 to 8,200 spaces in 2001.



0 200 400
Scale in feet

Source: Dallas Love Field ALP
HNTB Analysis

Dallas Love Field
Entrance/Exit Intersection
Average Daily Traffic
Modified Wright Scenario - 2001

Figure 3.18

Table 3.18
Modified Wright - Vehicular Traffic Year 2001

Road Section	Year 2001 without Love Growth	Year 2001 with Love Growth
Mockingbird Lane north of Cedar Springs	43,800(1)	53,200(3)
Mockingbird Lane south of Cedar Springs	42,600(1)	51,800(3)
Cedar Springs Road east of Mockingbird Lane	20,900(1)	25,400(3)
Cedar Springs Road into terminal	37,500(2)	60,700(3)

Notes:
(1) NCTCOG estimates for 2000 assumed to approximate 2001.
(2) HNTB estimate for 1990.
(3) HNTB estimates.

Noise Analysis

The year 2001 noise analysis for the Modified Wright scenario is based on a forecast fleet mix which assumes the growth of air traffic from 1989 levels which would likely occur with the 650-mile perimeter rule modifying the Wright Amendment. There are changes in aircraft type, compared with 1989, as Stage II air carrier aircraft are phased-out of service as required by national policy. The day and night average daily operations are depicted in Tables 3.19 and 3.20.

The current Trinity-3 noise abatement procedure in operation between 9:00 p.m. and 6:00 a.m. is assumed to remain in place.

The year 2001 Ldn contours (see Figure 3.19) for this scenario are much smaller than the 1989 contours. The reduction in contour size is to be due primarily to the reduced use of older, more noisy aircraft. The Ldn 65 contour is approximately 47 percent of the size of the Ldn 65 contour for 1989. Table 3.21 shows this comparison.

With the reduction in the size of the noise contour there is a parallel reduction in population impacted by noise. The total population within Ldn 65 for the Modified Wright scenario is approximately 4,910 based on 1990 Census data. This is a significant decrease in population impact as compared with 1989 (see Table 3.22) and substantially below the City's 1992 goal of 27,000.

Table 3.19

Modified Wright Scenario – 2001 Average Daily Arrivals for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	87.4	7.2	94.6
737–300	83.7	6.9	90.6
757–200	1.9	0.2	2.1
MD–80	13.0	1.1	14.1
Subtotal	186.0	15.4	201.4
Air Taxi/General Aviation –			
Citation	9.2	0.7	9.9
Lear 25	1.3	0.6	1.9
Lear 35	46.1	7.4	53.5
Challenger 600	4.6	0.5	5.1
Gulfstream II	1.2	0.0	1.2
Mitsubishi 300	1.2	0.2	1.4
Saberliner 80	3.1	0.6	3.7
Twin – Turboprop	40.7	3.7	44.4
Twin – Piston	38.6	15.6	54.2
Single – Piston	54.7	11.1	65.8
Subtotal	200.7	40.4	241.1
Total	**386.7**	**55.8**	**442.5**

Source: Apogee and HNTB analysis, May 1991.

Table 3.20

Modified Wright Scenario – 2001 Average Daily Departures for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	91.3	3.3	94.6
737–300	87.4	3.2	90.6
757–200	2.0	0.1	2.1
MD–80	13.6	0.5	14.1
Subtotal	194.3	7.1	201.4
Air Taxi/General Aviation –			
Citation	9.4	0.5	9.9
Lear 25	1.5	0.4	1.9
Lear 35	44.8	8.7	53.5
Challenger 600	5.1	0.0	5.1
Gulfstream II	1.2	0.0	1.2
Mitsubishi 300	1.4	0.0	1.4
Saberliner 80	3.4	0.3	3.7
Twin – Turboprop	39.4	5.0	44.4
Twin – Piston	37.7	16.5	54.2
Single – Piston	51.3	14.5	65.8
Subtotal	195.2	45.9	241.1
Total	**389.5**	**53.0**	**442.5**

Source: Apogee and HNTB analysis, May 1991.

Table 3.21
Modified Wright - Contour Area
(in square mile)

Year	Ldn 75	Ldn 70	Ldn 65
1989	1.3	3.1	6.8
2001	0.7	1.3	3.2

Source: HNTB analysis.

Table 3.22
Modified Wright - Population Impact
(Rounded to the Nearest 10)

Year	Inside Ldn 75	Within Ldn 70-75	Within Ldn 65-70	Total
1989	160	2,760	25,660	28,580
2001	30	130	4,750	4,910

Source: HNTB analysis.

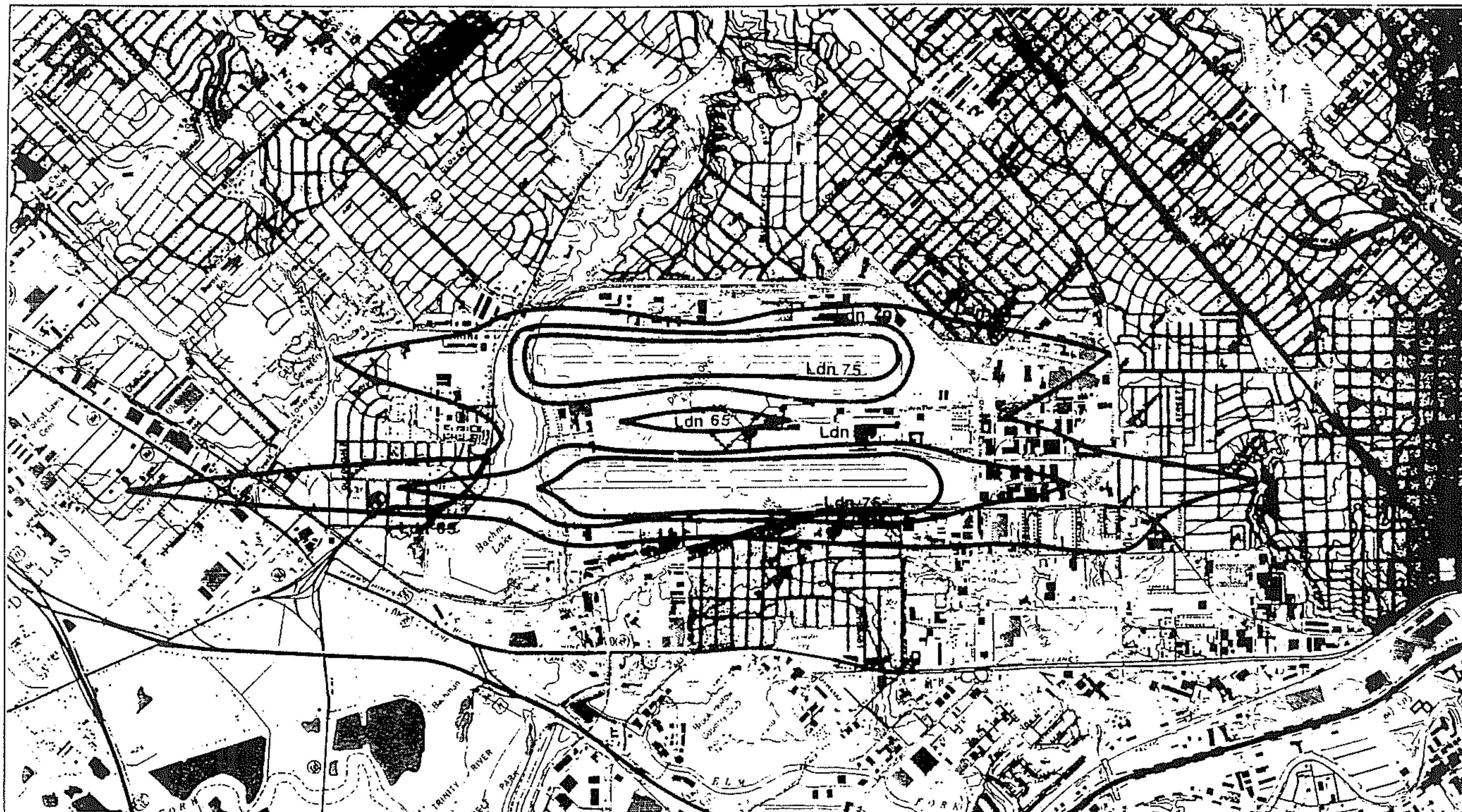


Figure 3.19

Source: HNTB Analysis

Dallas Love Field
Modified Wright Scenario
Year 2001 Ldn Contours

Scenario 3: Repeal/Equal Access

Operations and Enplanements

The Equal Access scenario assumes that all carriers wishing to do so will provide non-stop service to at least one of their hubs. In addition, Southwest will likely provide non-stop service to those short-haul markets expected under the Modified Wright scenario plus service to Phoenix. As a result, demand for air carrier operations is expected to grow rapidly over the first 5 years (15 percent annually through 1996) and subsequently return to the base rate of 2.6 percent annually through 2001. Operations would rise from 214,200 in 1990 to 329,000 in 1996 and 356,000 in 2001. Enplanements are forecast to rise from 3.0 million in 1990 to 7.2 million in 1996 and 8.2 million in 2001.

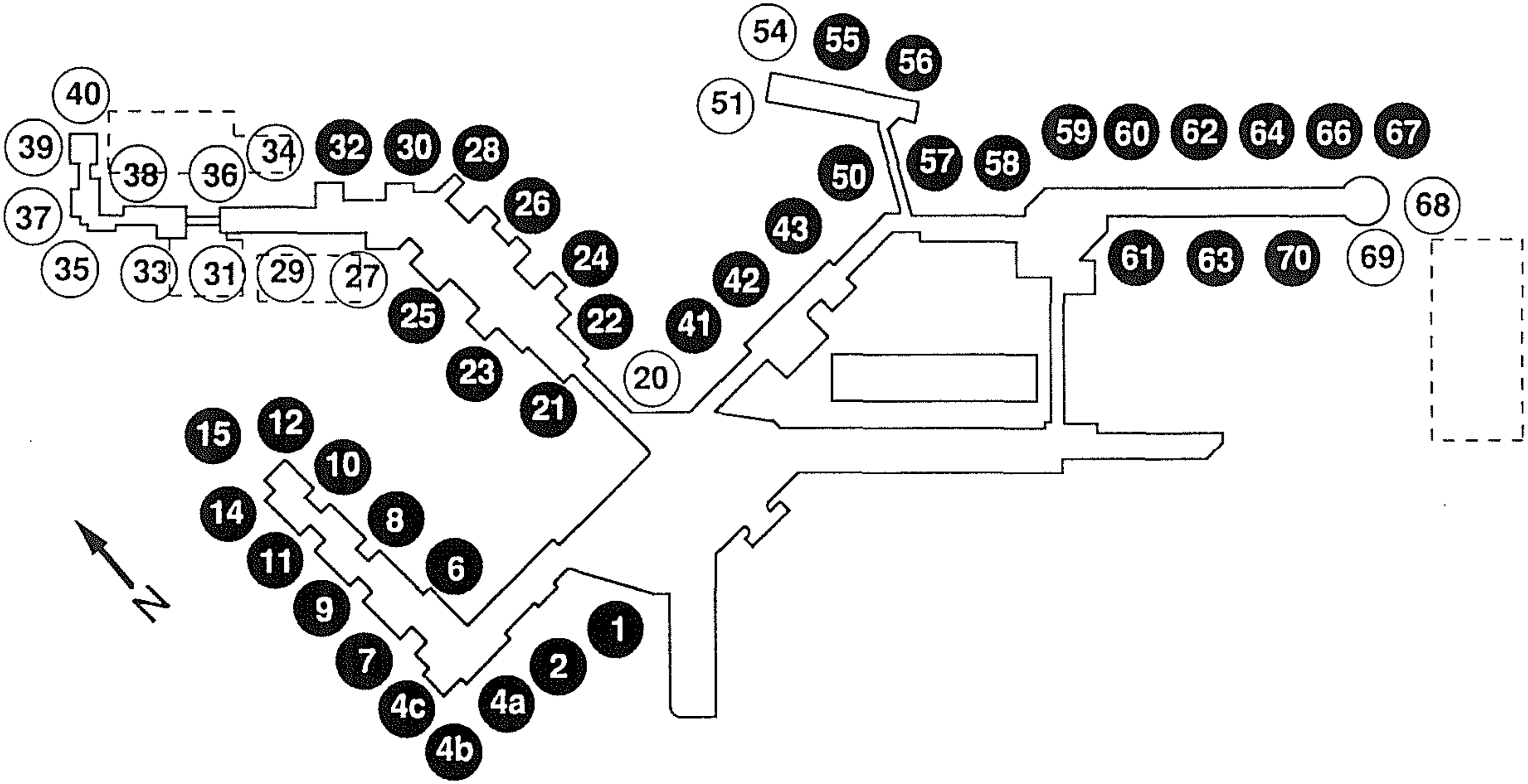
Terminal and Concourse Space Requirements

The Equal Access scenario requires an estimated 981,500 square feet of space and 40 gates. Depending on how the additional capacity is developed, this requirement exceeds the capacity of the existing structure by between 121,500 and 306,500 square feet. Therefore, renovation of all the existing and presently unused space will be required in conjunction with construction of limited new terminal facilities. It is assumed that with the renovation of existing space and the provision of new structure existing ground loading gates would be converted to loading bridges.

Because of the more extensive demands of this scenario, two development options were examined: *Maximum Reuse/Minimum Hangar Removal* and *Maximum Use/North Concourse*. For the first, it is assumed that sufficient space exists between the east concourse and KC Aviation hangar to permit aircraft to taxi to gates 61, 63 and 70. Former gates 68 and 69 cannot be used. Some use of the low level wing on the east concourse might be undertaken. The north end of the north concourse, currently blocked by hangars, might not be utilized in this scenario. Figure 3.20 shows the schematic gate arrangement for this scenario with the minimum hangar removal. Some additional space may be required to compensate for that space on the north concourse now used by tenants.

Additional review of the Maximum Reuse/Minimum Hangar Removal option indicated the following other factors of major significance.

1. Retaining the hangars on the north concourse would result in continued mixing of the general aviation, maintenance, and air carrier activity in the passenger terminal area. With large scale air carrier activity, this interaction of different functions poses problems of efficient aircraft movement and safety. Removal of the three hangars on the north concourse would require relocation of tenants in that area.
2. The low-level addition to the east concourse would pose aircraft parking location problems and could be a major impediment to efficient aircraft movement in the



N Gates in use

Hangars

Source: HNTB

Schematic not to scale

Dallas Love Field

Equal Access Scenario - Maximum Reuse
Minimum Hangar Removal
Love Field Terminal - 40 Gates

Figure 3.20

terminal area. Its present location is an impediment to a dual taxiway on the north side. The value of the structure for reuse is questionable.

3. If there is room to taxi between the end of the east concourse and the K.C. Aviation Hangar, use of gates 61, 63, and 70 may not be desirable for another reason. Aircraft taxiing to and from those gates could cause severe problems for the maintenance activities in the hangar. The availability of ramp for the hangar activities would be severely restricted. Mixing maintenance activities and air carrier movements is undesirable where large scale air carrier activity is involved. Use of the south side gates on the east concourse probably should not be attempted until the K.C. Aviation hangar is removed. This hangar contains a large scale maintenance facility. Relocation of that activity would require a detailed planning study.

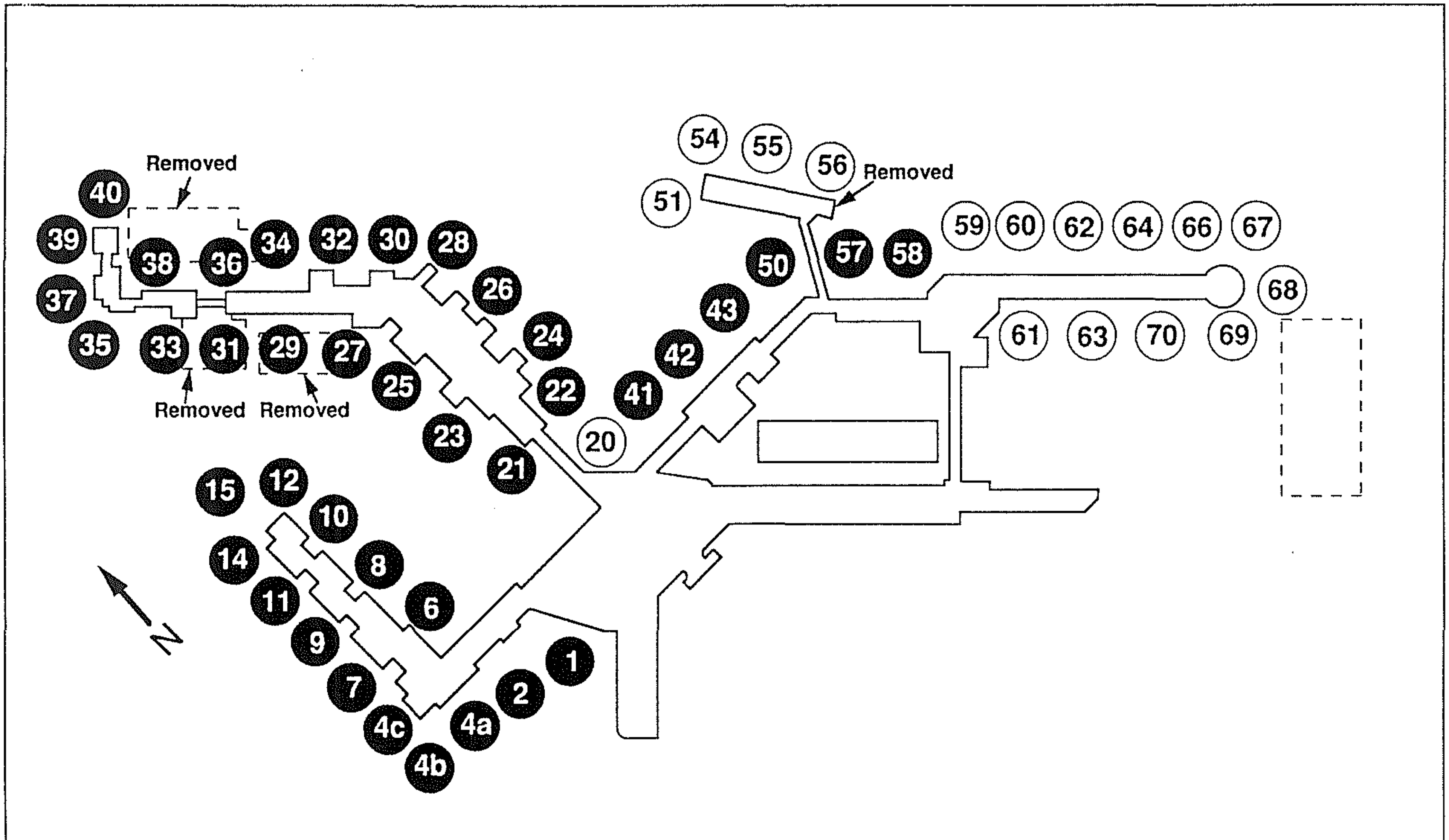
Therefore, an alternative gate utilization option was developed, Maximum Use/North Concourse. This option requires removal of the three hangars on the north concourse (and both gate options) and relocation of those tenants. The entire north concourse would be renovated and additional facilities added. The low-level addition to the east concourse would be removed and six gates on that concourse utilized. Only about one-third of the existing space on the east concourse would be utilized. Additional new structures would be required. However, prior to undertaking a major reconstruction of the north concourse and part of the east concourse to accommodate 40 gates, a detailed terminal area development plan would be necessary and may indicate that it would be more cost effective to demolish the existing structure and provide total new facilities for an expansion of this magnitude. A schematic showing Maximum Use/North Concourse is shown in Figure 3.21.

For the Maximum Reuse/Minimum Hangar Removal option, some modification of the long-term lease on the north concourse would be required. The long-term lease on the east concourse would require complete revision. For the Maximum Use/North Concourse its long-term lease would have to be revised completely. Some revisions to the long-term lease on the east concourse would also be required.

Airfield Capacity and Delay

The percentage of large air carrier aircraft in the fleet increases throughout the planning period. As a result, the VMC mix index (MI) increases from 57 in 1990 to 72 by 2001. Likewise, the Instrument Meteorological Conditions (IMC) mix index increases from 81 in 1990 to 89 by 2001. The projected mix index for the Equal Access scenario is shown in Table 3.23.

With these increasing proportions of large aircraft, an increase in the variability of aircraft speeds are expected in VMC. As a result, IFR aircraft departure capacity in VMC decreases slightly from 63 in 1990 to 60 by 2001, as shown in Table 3.23. Since a large portion of the general aviation fleet is projected not to operate in IMC, a reduction in the variability of



Gates in use

Hangars

Source: HNTB

Schematic not to scale

Dallas Love Field

Equal Access Scenario - Maximum Reuse
North Concourse
Love Field Terminal - 40 Gates

Figure 3.21

Table 3.23
Equal Access Scenario:
Summary of Love Field Airfield Capacity and Delay

Fleet Mix Assumptions
Mix Index (a)

Year	VMC	IMC
1990	57	81
1996	70	89
2001	72	89

Demand Vs. Capacity

Year	Arrivals			Departures		
	Peak Demand (b)	Capacity (c)	Hours Exceeded	Peak Demand (b)	Capacity (d)	Hours Exceeded
1990 VFR	28	36	0	25	63	0
1990 IFR	28	24	1	25	47	0
1996 VFR	39	36	1	36	60	0
1996 IFR	39	24	7	36	48	0
2001 VFR	43	36	2	39	60	0
2001 IFR	43	24	10	39	48	0

Aircraft Delays During Peak Hour(e)
(minutes/operation)

Year	Average Aircraft Delay	VMC	IMC
1990	1.0	2.4	4.5
1996	6.7	5.8	60.9
2001	10.6	10.9	69.8

Notes: (a) Based on forecasts provided by Apogee Research, Inc., May 1991.
(b) Forecasts provided by Apogee Research, Inc., May 1991. Includes only IFR aircraft demand (all air carriers, 70 percent of other commercial, military and general aviation operations). Peak demand based on a peak month (9.32%), average day (31 days), peak hour methodology.
(c) Love Field Analysis, FAA Southwest Region, December 10, 1990.
(d) IFR aircraft departure capacity assumes a one-for-one capacity tradeoff with Dallas-Fort Worth Airport departures for 25 percent of all Love Field departures in VMC and 50 percent of all Love Field departures in IMC.
(e) Calculated using FAA Annual Delay Model.

aircraft speeds is expected. The IFR aircraft departure capacity in IMC increases slightly from 47 in 1990 to 48 by 2001.

Implementation of the DFW Metroplex Air Traffic System Plan will improve the overall arrival and departure system serving the region but will not significantly increase the IFR aircraft arrival capacity into Love Field. Extremely limited airspace available between Dallas-Fort Worth Airport and Love Field will require controllers to continue to meter all IFR arrivals and merge all arrivals to a common point prior to the final approach. As such, IFR aircraft arrival capacity remains constant in the Equal Access scenario at 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.

The VMC and IMC peak hour demand for IFR aircraft was determined assuming that the monthly, daily, and hourly distribution of demand is held constant through the planning period. As shown in Table 3.23, peak hour arrival demand would increase from 28 in 1990 to 43 by 2001. Likewise, peak hour departure demand would increase from 25 departures in 1990 to 39 departures by 2001. Arrival demand exceeded arrival capacity for an average of one hour per day in 1990 in IMC. Arrival demand would exceed arrival capacity for an average of ten hours per day by 2001 in IMC. Arrival demand would exceed arrival capacity for an average of two hours per day by 2001 in VMC. The airfield has adequate departure capacity in both VMC and IMC through the planning period.

Average aircraft delays are projected to increase from 1.0 minute per operation in 1990 to 10.6 minutes per operation by 2001 (see Table 3.23). Average aircraft delay in the peak hour is projected to increase from 2.4 minutes per operation in 1990 to 10.9 minutes per operation by 2001 in VMC, and increase from 4.5 minutes per operation in 1990 to 69.8 minutes per operation by 2001 in IMC. Since IFR aircraft arrivals are metered into Love Field, arrival delays are incurred by aircraft either in the enroute airspace or at the origination airport.

While more efficient movement of aircraft on the ground would not enhance runway capacity, ground movement of aircraft could be enhanced by several possible improvements to taxiways. Taxiway B located on the east side of the airport could be completed. With extensive air carrier operations it is desirable to have dual parallel taxiways around a terminal area. Extension of Taxiway X, located on the east side of the airport, about 2,300 feet northward could provide a dual taxiway on the east side of the terminal area. A dual parallel taxiway system on the west side of the terminal area might require utilization of an apron edge taxi lane in lieu of a taxiway. Approximately 1,800 feet of new taxiway would be required. Taxiways M, N, and 0 could be studied to determine if cross airport movements could be made more efficient. With extensive air carrier operations, additional aircraft hold areas and by-pass capability may be required at both ends of the parallel runways.

Surface Access Analysis

Equal Access scenario vehicular traffic on Cedar Springs Road into the airport would increase from 37,500 in 1990 to 87,310 in 2001 (based upon 70 percent of the growth in originating passengers discussed in the Base Case scenario). Table 3.24 shows year 2001 vehicular traffic on Mockingbird Lane north and south of the entrance intersection and on Cedar Springs Road east and west of the intersection. Vehicular traffic is shown with no growth at Love Field and with the growth attributable to the Equal Access scenario. The increase in traffic on streets already estimated to be operating at Service Levels E and F could cause severe congestion at the at grade intersection. Figure 3.22 shows two-way vehicular traffic through the intersection in 2001.

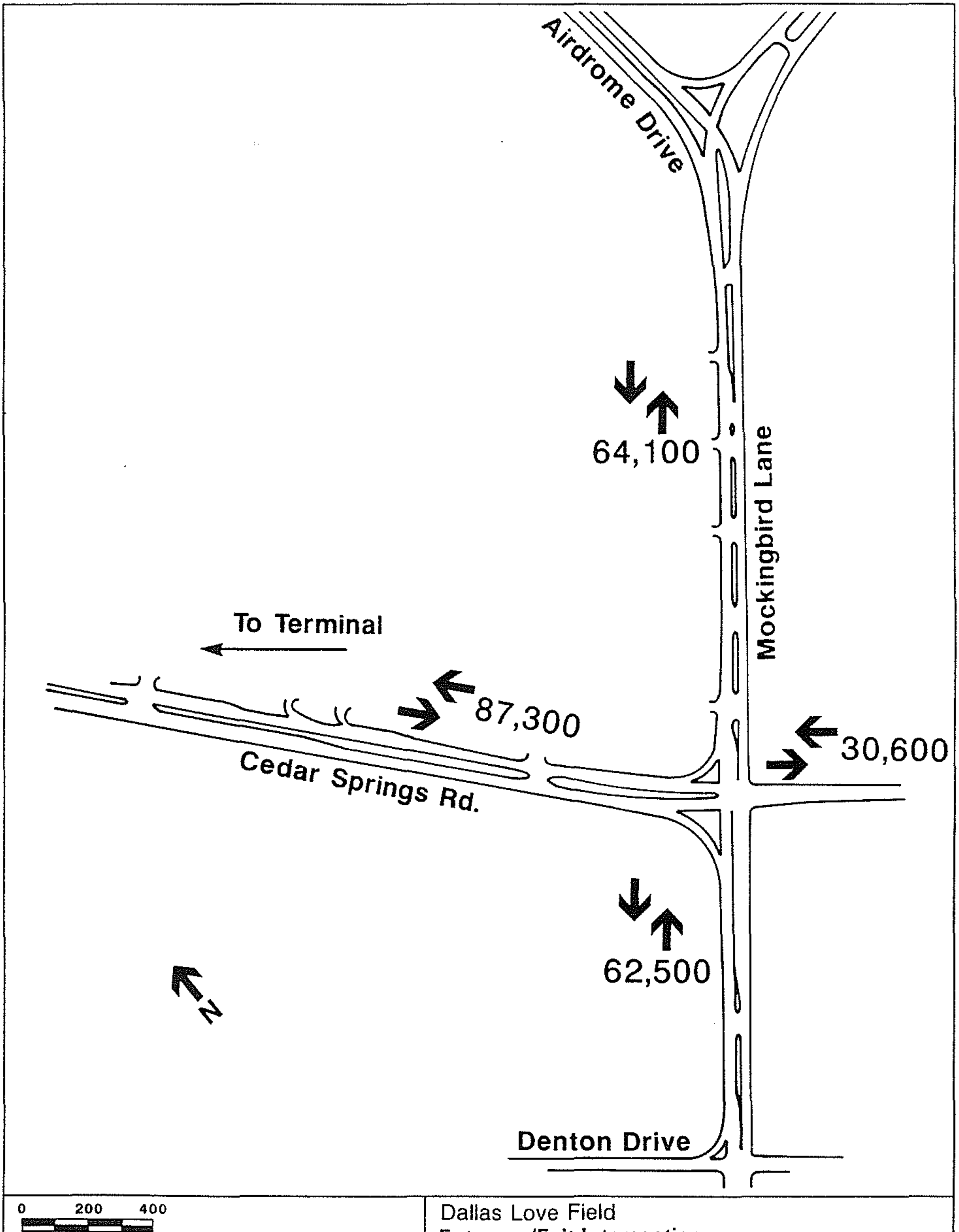
Cedar Springs Road has an estimated peak hour capacity of 50,000 vehicles Average Daily Traffic (ADT) and normal hourly distribution of traffic. The Equal Access scenario would result in traffic demands significantly exceeding that capacity. The capacity limitation of the signalized intersection at Cedar Springs Road and Mockingbird Lane would require modification. Provision of a grade separated intersection with a single lane both for north and south bound traffic going into and out of the airport would provide a capacity of 80,000 vehicles ADT. This would provide for Level of Service E during the peak hour.

Parking requirements at the terminal increase from 4,500 spaces available in 1990 to 13,000 spaces in 2001.

Table 3.24
Equal Access - Vehicular Traffic

	Year 2001 without Love Growth	Year 2001 with Love Growth
Mockingbird Lane north of Cedar Springs	43,800(1)	64,100(3)
Mockingbird Lane south of Cedar Springs	42,600(1)	62,500(3)
Cedar Springs Road east of Mockingbird Lane	20,900(1)	30,600(3)
Cedar Springs Road into terminal	37,500(2)	87,300(3)

Notes:
(1) NCTCOG estimates for 2000 assumed to approximate 2001.
(2) HNTB estimate for 1990.
(3) HNTB estimates.



Source: Dallas Love Field ALP
HNTB Analysis

Dallas Love Field
Entrance/Exit Intersection
Average Daily Traffic
Equal Access Scenario - 2001

Figure 3.22

Noise Analysis

The year 2001 noise analysis for the Equal Access scenario is based on a forecast fleet mix which assumes the growth of air traffic from 1989 levels which would likely occur with the Wright Amendment repealed and equal access given to all carriers. No carriers seek to develop a new major operational base from Love Field. There are changes in aircraft type, compared with 1989, as Stage II air carrier aircraft are phased-out of service as required by national policy. The day and night average daily operations are depicted in Tables 3.25 and 3.26.

The year 2001 Ldn contours (see Figure 3.23) for this scenario are much smaller than the 1989 contours. The reduction in contour size is due primarily to the reduced use of older, more noisy aircraft. The Ldn 65 contour is approximately 50 percent of the size of the Ldn 65 contour for 1989. Table 3.27 shows this comparison.

With the reduction in the size of the noise contour there is a parallel reduction in population impacted by noise. The total population within Ldn 65 for the Equal Access scenario is approximately 5,850 based on 1990 Census data. This is a significant decrease in population impact as compared with 1989 (see Table 3.28) and substantially below the City's 1992 goal of 27,000.

Table 3.25

Equal Access Scenario – 2001 Average Daily Arrivals for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	127.8	10.6	138.4
737–300	88.6	7.3	95.9
757–200	5.2	0.4	5.6
MD–80	39.1	3.2	42.3
Subtotal	260.7	21.5	282.2
Air Taxi/General Aviation –			
Citation	7.7	0.6	8.3
Lear 25	1.2	0.5	1.7
Lear 35	38.8	6.2	45.0
Challenger 600	3.9	0.4	4.3
Gulfstream II	1.0	0.0	1.0
Mitsubishi 300	1.0	0.2	1.2
Saberliner 80	2.5	0.5	3.0
Twin – Turboprop	34.2	3.1	37.3
Twin – Piston	32.5	13.1	45.6
Single – Piston	45.9	9.4	55.3
Subtotal	168.7	34.0	202.7
Total	**429.4**	**55.5**	**484.9**

Source: Apogee and HNTB analysis, May 1991.

Table 3.26

Equal Access Scenario – 2001 Average Daily Departures for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	133.5	4.9	138.4
737–300	92.5	3.4	95.9
757–200	5.4	0.2	5.6
MD–80	40.8	1.5	42.3
Subtotal	272.2	10.0	282.2
Air Taxi/General Aviation –			
Citation	7.9	0.4	8.3
Lear 25	1.3	0.4	1.7
Lear 35	37.7	7.3	45.0
Challenger 600	4.3	0.0	4.3
Gulfstream II	1.0	0.0	1.0
Mitsubishi 300	1.2	0.0	1.2
Saberliner 80	2.8	0.2	3.0
Twin – Turboprop	33.1	4.2	37.3
Twin – Piston	31.7	13.9	45.6
Single – Piston	43.1	12.2	55.3
Subtotal	164.1	38.6	202.7
Total	**436.3**	**48.6**	**484.9**

Source: Apogee and HNTB analysis, May 1991.

Table 3.27
Equal Access - Contour Area
(in square miles)

Year	Ldn 75	Ldn 70	Ldn 65
1989	1.3	3.1	6.8
2001	0.7	1.4	3.4

Source: HNTB analysis.

Table 3.28
Equal Access - Population Impact
(Rounded to the Nearest 10)

Year	Inside Ldn 75	Within Ldn 70-75	Within Ldn 65-70	Total
1989	160	2,760	25,660	28,580
2001	30	270	5,550	5,850

Source: HNTB analysis.

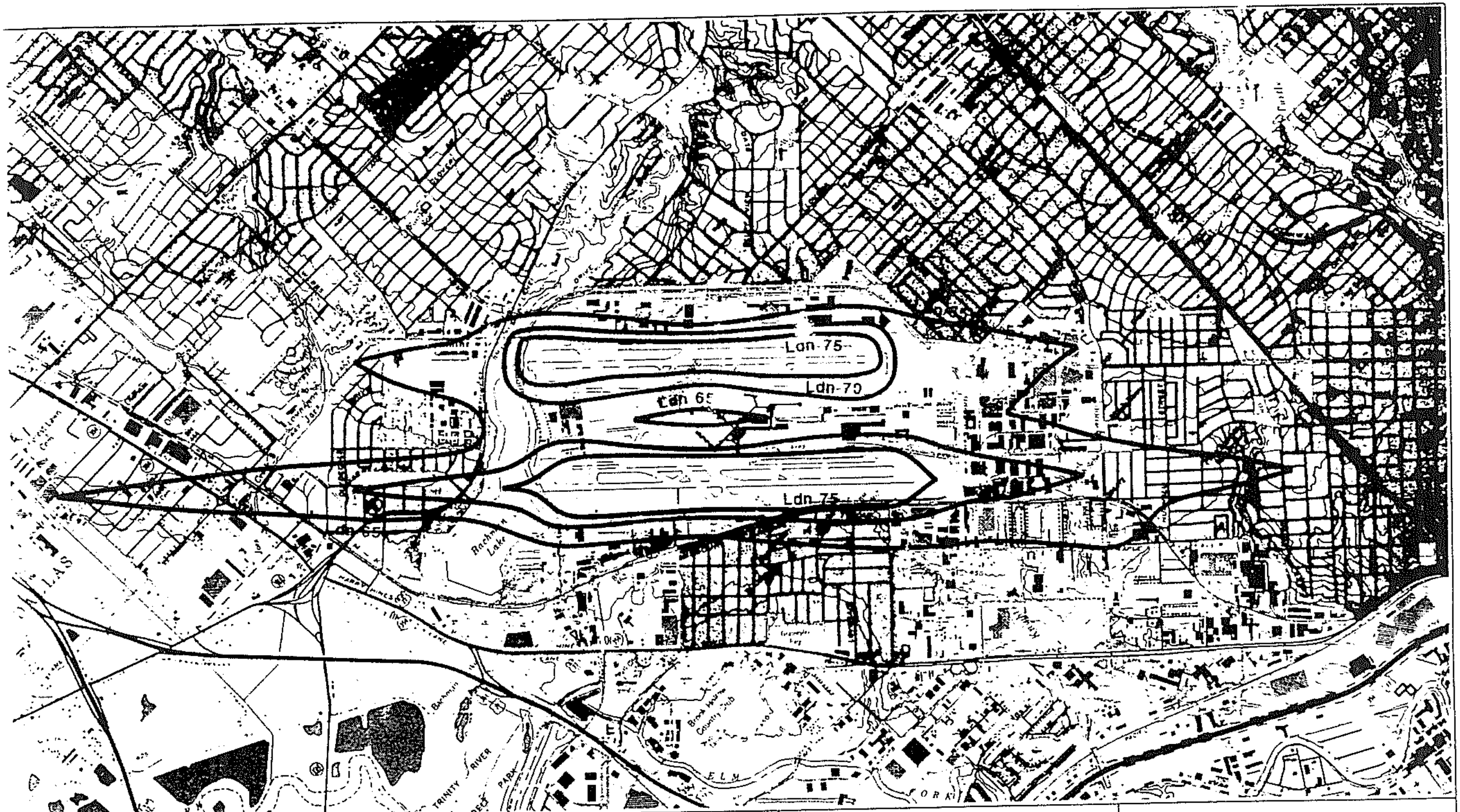


Figure 3.23

Source: HNTB Analysis

Dallas Love Field
Equal Access Scenario
Year 2001 Ldn Contours

Scenario 4: Repeal/Major Origin and Destination

Operations and Enplanements

The Major Origin and Destination (O&D) scenario assumes that, in addition to growth in operations from carriers providing non-stop service to at least one of their hubs, one carrier will establish a large (70 flights daily) operational base at Love Field that serves the major U.S. markets with non-stop service. This would not be a hub operation, although some connecting passengers would be expected. Southwest will likely provide non-stop service to the same markets that it would under the Equal Access scenario. As a result, air carrier operations are expected to grow very rapidly over the first 5 years (19 percent annually through 1996) and subsequently return to the base rate of 2.6 percent annually through 2001. Specifically, operations are projected to rise from 214,200 in 1990 to 346,000 in 1996 and 378,000 in 2001. Enplanements to support this operational level would rise from 3.0 million in 1990 to 8.9 million in 1996 and 10.1 million in 2001.

Terminal and Concourse Space Requirements

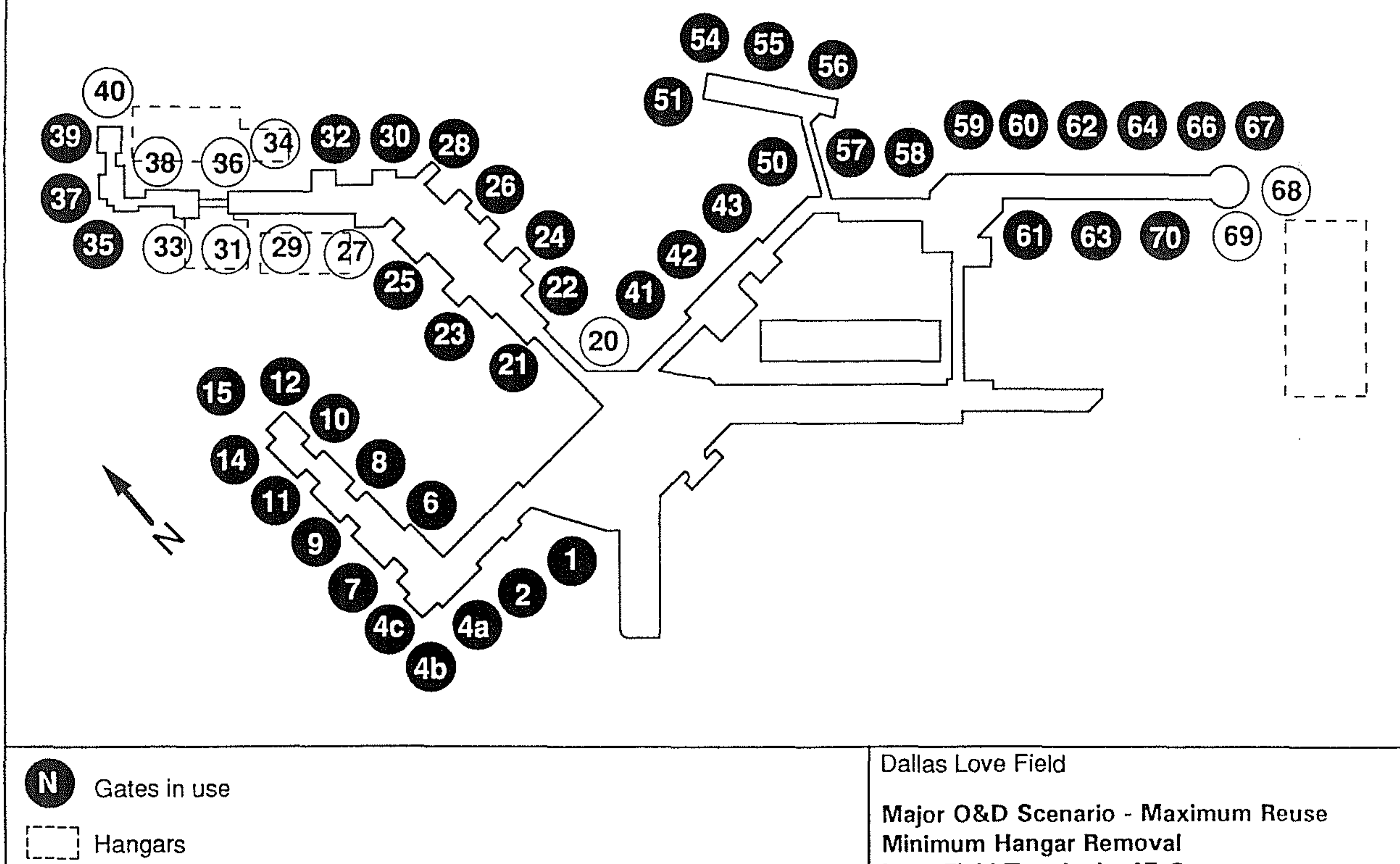
Growth under the Major O&D scenario would ultimately require 45 gates and 1,214,600 square feet of terminal and concourse space by 2001, or about 354,600 square feet more than the total that could be developed in the existing space today. However, because of the more extensive terminal and concourse needs of this scenario, it is assumed under each that the total space available for development (503,800 square feet) would be renovated, and the development requirements of the new structures would depend on the nature of the renovation. Consequently, as was done for the Equal Access scenario, two development options were considered: a Maximum Reuse/Minimum Hangar Removal, and Maximum Use/North Concourse.

Under the Maximum Reuse/Minimum Hanger Removal option, the entire east concourse except for the 2 gates blocked by the K.C. Aviation Hangar might be utilized. The 14 gates on the west concourses will continue to be used. On the north concourse, all gates except those blocked by hangars will be utilized. The 14 gates on the west concourse, 12 on the north concourse and 19 on the east concourse are shown schematically on Figure 3.24.

Renovations of existing space and construction of new facilities would include the conversion of all ground loading gates to loading bridges. Some additional space may be required to compensate for loss of space on the north concourse now used by tenants.

Additional review of the Maximum Reuse/Minimum Hangar Removal indicated the need for an alternative gate utilization schematic. This plan would require the removal of the three hangars on the north concourse and relocation of those tenants. The entire north concourse would be renovated and additional facilities added.

The low-level addition to the east concourse would be removed and eleven gates on that concourse utilized.



Source: HNTB

Schematic not to scale

Dallas Love Field

Major O&D Scenario - Maximum Reuse
Minimum Hangar Removal
Love Field Terminal - 45 Gates

Figure 3.24

The Major Reconstruction/North Concourse would require a detailed terminal area development plan and aircraft movement study since it may be more cost effective to demolish existing structures and to provide new construction for an expansion of this magnitude. A schematic for 45 gates and Maximum Use/North Concourse is shown in Figure 3.25.

Whether the schematic for 45 gates minimizing hangar removal or more full utilization of the north concourse is undertaken, there will be major construction activity in the terminal area. Greater utilization of the north concourse would require a renegotiation of the long-term lease on that concourse, the removal of the three hangars and the relocation of the tenants.

Long-term leases would have to be modified on both the east concourse and the north concourse.

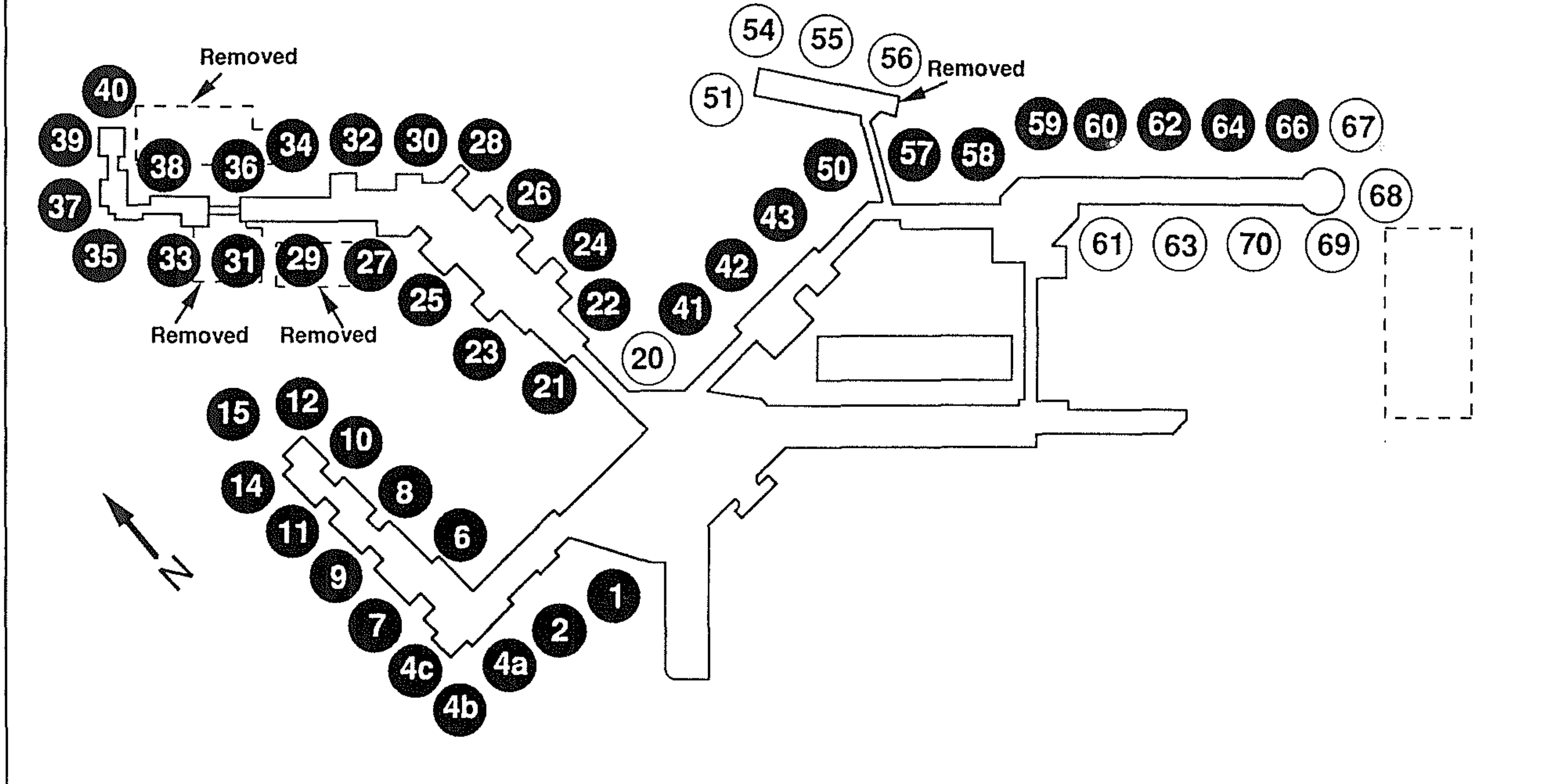
Airfield Capacity and Delay

The percentage of large air carrier aircraft in the fleet increases throughout the planning period. As a result, the VMC mix index (MI) increases from 57 in 1990 to 77 by 2001. Likewise, the IMC mix index increases from 81 in 1990 to 92 by 2001. The projected mix index for the Major O&D scenario is shown in Table 3.29.

With these increasing proportions of large aircraft, an increase in the variability of aircraft speeds are expected in VMC. As a result, IFR aircraft departure capacity in VMC decreases slightly from 63 in 1990 to 58 by 2001, as shown in Table 3.29. Since a large portion of the general aviation fleet is projected not to operate in IMC, a reduction in the variability of aircraft speeds is expected. The IFR aircraft departure capacity in IMC increases slightly from 47 in 1990 to 48 by 2001.

Implementation of the DFW Metroplex Air Traffic System Plan will improve the overall arrival and departure system serving the region but will not significantly increase the IFR aircraft arrival capacity into Love Field. Extremely limited airspace available between Dallas-Fort Worth Airport and Love Field will require controllers to continue to meter all IFR arrivals and merge all arrivals to a common point prior to the final approach. As such, IFR aircraft arrival capacity remains constant in the Major O&D scenario at 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.

The VMC and IMC peak hour demand for IFR aircraft was determined assuming that the monthly, daily, and hourly distribution of demand is held constant through the planning period. As shown in Table 3.29, peak hour arrival demand would increase from 28 in 1990 to 47 by 2001. Likewise, peak hour departure demand would increase from 25 departures in 1990 to 43 departures by 2001. Arrival demand exceeded arrival capacity an average of one hour per day in 1990 in IMC. Arrival demand would exceed arrival capacity for an average of twelve hours per day by 2001 in IMC. Arrival demand would exceed VFR arrival capacity for an average of two hours per day by 2001. The airfield has adequate departure capacity in both VMC and IMC through the planning period.



N Gates in use

Hangars

Source: HNTB

Schematic not to scale

Dallas Love Field

Major O&D Scenario - Maximum Reuse
North Concourse
Love Field Terminal - 45 Gates

Figure 3.25

Table 3.29
Major O & D Scenario:
Summary of Love Field Airfield Capacity and Delay

Fleet Mix Assumptions
Mix Index (a)

Year	VMC	IMC
1990	57	81
1996	76	91
2001	77	92

Demand Vs. Capacity

Year	Arrivals			Departures		
	Peak Demand (b)	Capacity (c)	Hours Exceeded	Peak Demand (b)	Capacity (d)	Hours Exceeded
1990 VFR	28	36	0	25	63	0
1990 IFR	28	24	1	25	47	0
1996 VFR	43	36	2	39	58	0
1996 IFR	43	24	9	39	48	0
2001 VFR	47	36	2	43	58	0
2001 IFR	47	24	12	43	48	0

Aircraft Delays During Peak Hour(e)
(minutes/operation)

Year	Average Aircraft Delay	VMC	IMC
1990	1.0	2.4	4.5
1996	8.1	9.2	63.2
2001	14.4	13.3	77.7

Notes: (a) Based on forecasts provided by Apogee Research, Inc., May 1991.
(b) Forecasts provided by Apogee Research, Inc., May 1991. Includes only IFR aircraft demand (all air carriers, 70 percent of other commercial, military and general aviation operations). Peak demand based on a peak month (9.32%), average day (31 days), peak hour methodology.
(c) Love Field Analysis, FAA Southwest Region, December 10, 1990.
(d) IFR aircraft departure capacity assumes a one-for-one capacity tradeoff with Dallas-Fort Worth Airport departures for 25 percent of all Love Field departures in VMC and 50 percent of all Love Field departures in IMC.
(e) Calculated using FAA Annual Delay Model.

Average aircraft delays are projected to increase from 1.0 minute per operation in 1990 to 14.4 minutes per operation by 2001 (see Table 3.29). Average aircraft delay in the peak hour is projected to increase from 2.4 minutes per operation in 1990 to 13.3 minutes per operation by 2001 in VMC, and increase from 4.5 minutes per operation in 1990 to 77.7 minutes per operation by 2001 in IMC. Since IFR aircraft arrivals are metered into Love Field, arrival delays are incurred by aircraft either in the enroute airspace or at the origination airport.

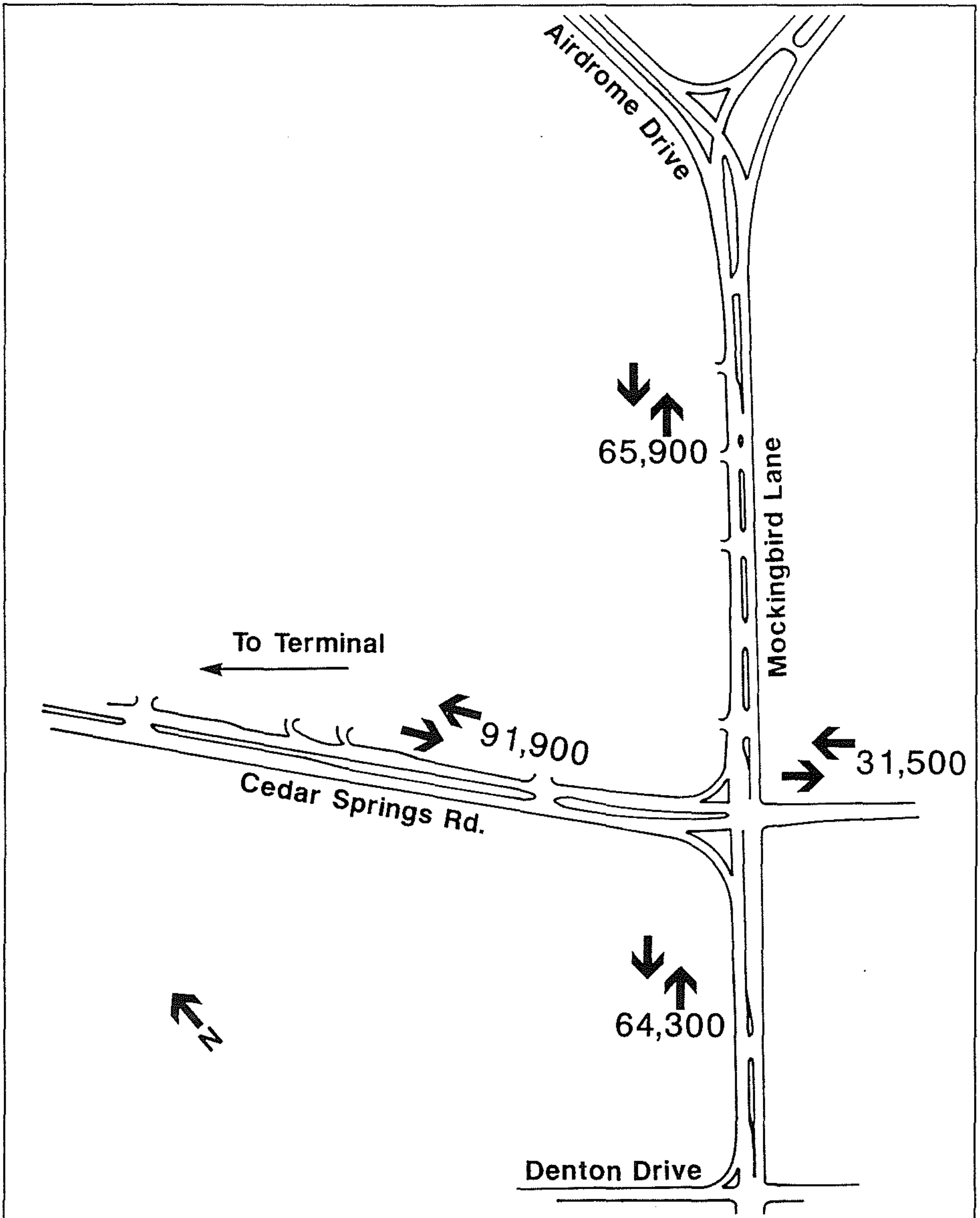
While more efficient movement of aircraft on the ground will not enhance runway capacity, ground movement of aircraft could be enhanced by several possible improvements to taxiways (see discussion under the Equal Access scenario).

Surface Access Analysis

The Major O&D scenario would result in more than a three-fold increase in demand, increasing average weekday vehicular traffic on the Cedar Springs Road access to the airport from 37,500 in 1990 to 91,900 in 2001 (based upon 70 percent of the growth in originating passengers discussed in the Base Case scenario). Table 3.30 shows year 2001 vehicular traffic on Mockingbird Lane north and south of the intersection with Cedar Springs Road, and on Cedar Springs Road east and west of Mockingbird Lane with no growth at Love Field and with the growth at Love Field attributable to the Major O&D scenario. The entrance-exit intersection would have to be substantially modified to accommodate level of traffic. Figure 3.26 shows the two-way vehicular traffic through the intersection in 2001.

Cedar Springs Road into the terminal is estimated to have a peak hour capacity of 50,000 Average Daily Traffic with normal hourly distribution. The capacity limitation is the signalized intersection of Cedar Springs Road and Mockingbird Lane. In the Major O&D scenario, traffic would be at nearly twice the existing capacity of the intersection of Cedar Springs Road and Mockingbird Lane. A two-lane elevated roadway into and out of the airport could provide an intersection with more than ample capacity for the Major O&D scenario, 160,000 vehicles ADT.

Parking requirements at the terminal increase from 4,500 spaces available in 1990 to 13,800 spaces in 2001.



0 200 400

Scale in feet

Source: Dallas Love Field ALP
HNTB Analysis

Dallas Love Field
Entrance/Exit Intersection
Average Daily Traffic
Major O&D Scenario - 2001

Figure 3.26

Table 3.30
Major O&D - Vehicular Traffic

Road Section	Year 2001 without Love Growth	Year 2001 with Love Growth
Mockingbird Lane north of Cedar Springs	43,800(1)	65,900(3)
Mockingbird Lane south of Cedar Springs	42,600(1)	64,300(3)
Cedar Springs Road east of Mockingbird Lane	20,900(1)	31,500(3)
Cedar Springs Road into terminal	37,500(2)	91,900(3)

Notes: (1) NCTCOG estimates for 2000 assumed to approximate 2001.
(2) HNTB estimate for 1990.
(3) HNTB estimates.

Noise Analysis

The year 2001 noise analysis for the Major O&D scenario is based on a forecast fleet mix which assumes the growth of air traffic from 1989 levels which would likely occur with the Wright Amendment repealed and equal access given to all carriers. It is further assumed that an airline will develop a mini hub at Love Field. There are changes in aircraft type, compared with 1989, as Stage II air carrier aircraft are phased-out of service as required by national policy. The day and night average daily operations are depicted in Tables 3.31 and 3.32.

Table 3.31

Major O&D Scenario – 2001 Average Daily Arrivals for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	126.1	10.3	136.4
737–300	88.2	7.3	95.5
757–200	15.8	1.3	17.1
727–200	0.0	3.4	3.4
MD–80	81.9	6.8	88.7
Subtotal	312.0	29.1	341.1
Air Taxi/General Aviation –			
Citation	6.6	0.5	7.1
Lear 25	1.0	0.4	1.4
Lear 35	33.2	5.4	38.6
Challenger 600	3.4	0.3	3.7
Gulfstream II	0.9	0.0	0.9
Mitsubishi 300	0.9	0.1	1.0
Saberliner 80	2.2	0.5	2.7
Twin – Turboprop	29.3	2.7	32.0
Twin – Piston	27.9	11.2	39.1
Single – Piston	39.5	8.0	47.5
Subtotal	144.9	29.1	174.0
Total	**456.9**	**58.2**	**515.1**

Source: Apogee and HNTB analysis, May 1991.

Table 3.32

Major O&D Scenario – 2001 Average Daily Departures for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	131.6	4.8	136.4
737–300	92.1	3.4	95.5
757–200	16.5	0.6	17.1
727–200	0	3.4	3.4
MD–80	85.6	3.1	88.7
Subtotal	325.8	15.3	341.1
Air Taxi/General Aviation –			
Citation	6.8	0.3	7.1
Lear 25	1.1	0.3	1.4
Lear 35	32.3	6.3	38.6
Challenger 600	3.7	0.0	3.7
Gulfstream II	0.9	0.0	0.9
Mitsubishi 300	1.0	0.0	1.0
Saberliner 80	2.4	0.3	2.7
Twin – Turboprop	28.4	3.6	32.0
Twin – Piston	27.2	11.9	39.1
Single – Piston	37.0	10.5	47.5
Subtotal	140.8	33.2	174.0
Total	**466.6**	**48.5**	**515.1**

Source: Apogee and HNTB analysis, May 1991.

The year 2001 Ldn contours (See Figure 3.27) for this scenario are much smaller than the 1989 contours. The reduction in contour size is due primarily to the reduced use of older, more noisy aircraft. The Ldn 65 contour is approximately 63 percent of the size of the Ldn 65 contour for 1989. Table 3.33 shows this comparison.

Table 3.33
Major O&D - Contour Area
(in square miles)

Year	Ldn 75	Ldn 70	Ldn 65
1989	1.3	3.1	6.8
2001	0.9	1.9	4.3

Source: HNTB analysis.

With the reduction in the size of the noise contour there is a parallel reduction in population impacted by noise. The total population within Ldn 65 for the Major O&D scenario is approximately 11,070 based on 1990 Census data. This is a moderate decrease in population impact as compared with 1989 (see Table 3.34), but still substantially below the City's 1992 goal of 27,000.

Table 3.34
Major O&D - Population Impact
(Rounded to the Nearest 10)

Year	Inside Ldn 75	Within Ldn 70-75	Within Ldn 65-70	Total
1989	160	2,760	25,660	28,580
2001	60	970	10,040	11,070

Source: HNTB analysis.

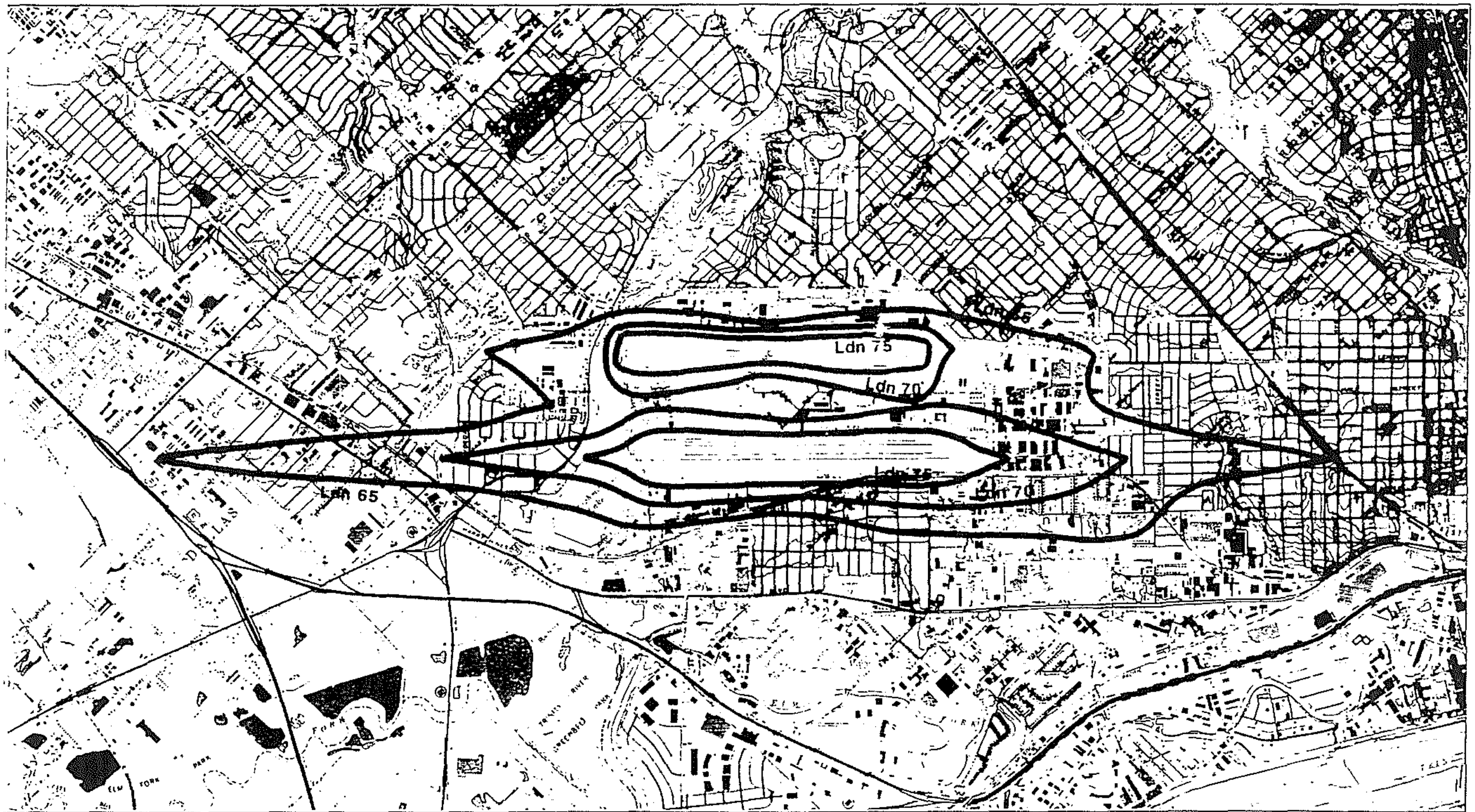


Figure 3.27

Source: HNTB Analysis

Dallas Love Field
Major O&D Scenario
Year 2001 Ldn Contours

Scenario 5: Repeal/Major Hub

Operations and Enplanements

The Major Hub scenario assumes that in addition to growth in operations from carriers providing non-stop service to at least one of their hubs, one carrier will establish a small hub operation (230 flights daily) at Love Field. Southwest would likely provide non-stop service to those markets under the Equal Access scenario. As a result, air carrier operations are expected to grow extremely rapidly over the first 5 years (27 percent annually through 1996) and subsequently return to the base rate of 2.6 percent annually through 2001. Specifically, operations to support this scenario would rise from 214,200 in 1990 to 442,000 in 1996 and 490,000 in 2001. Enplanements to support this operational level would have to rise from 3.0 million in 1990 to 14.1 million in 1996 and 16.0 million in 2001.

Terminal and Concourse Space Requirements and Costs

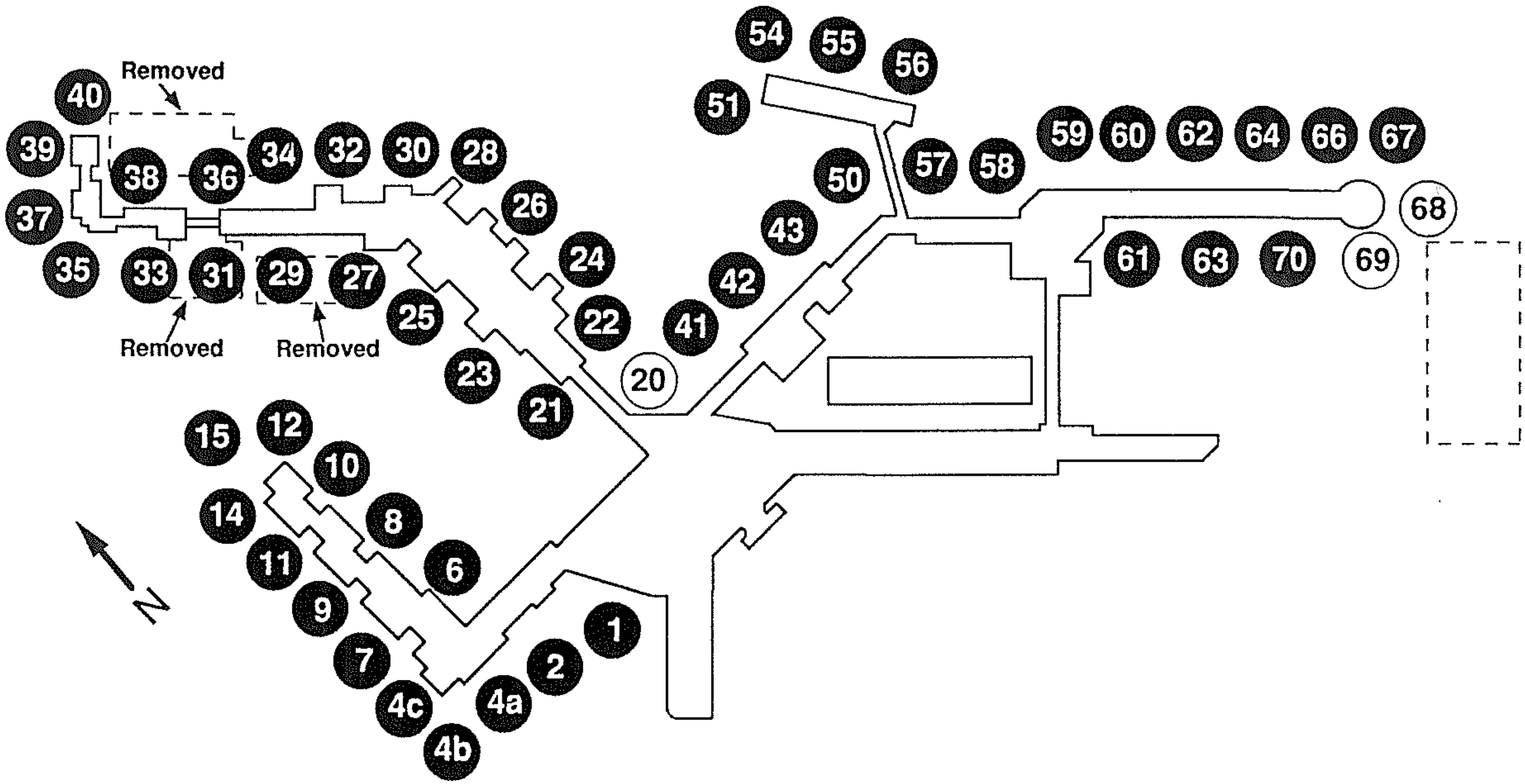
If a hub operation is established at Love Field as contemplated in the Major Hub scenario, enplanements are projected to grow from 2,968,000 in 1990 to 16,024,000 in 2001. This five-fold increase will require 1,922,900 square feet of terminal and concourse space -- more than twice that available in the existing structure -- to support 70 gates -- 17 more than can be provided in the existing terminal area through major renovation.

As was the case for the Equal Access and Major O&D scenarios, two terminal development options were evaluated: Maximum Reuse/ Minimum Hangar Removal and Maximum Use/ North and East Concourse.

Removing three hangars at the north end of the north concourse will permit the use of 20 gates on that concourse. Utilizing all the gates on the east concourse, except numbers 68 and 69 which are blocked by the K.C. Aviation Hangar, would permit utilization of 19 gates on that concourse. Together with the 14 gates on the west concourse, the north and east concourse can provide 53 gates as shown on Figure 3.28.

It is assumed that the large scale renovation and new structure required in the existing terminal area for 53 gates will include conversion of ground loading gates to loading bridges. Seventeen gates with a 476,000 square feet of terminal and concourse space will be required elsewhere on the airport. The new terminal location will result in the displacement of existing tenants on the airport, new air carrier ramp to support the 17 gates and a revised surface access system on the airport.

Long-term leases on the north and east concourses would have to be renegotiated under this scenario. Other leases, depending on the location of the additional terminal, would need renegotiation.



Gates in use

Hangars

Source: HNTB

Schematic not to scale

Dallas Love Field

Major Hub Scenario - Maximum Reuse and Minimum Hangar Removal
Love Field Terminal - 53 Gates
3 Hangars Removed

Figure 3.28

If a more detailed analysis indicates the desirability of removing the K.C. Aviation Hangar, two additional gates could be provided on the east concourse, in which case, only 15 gates would be required at the new terminal. A detailed master planning effort, beyond the scope of this study, would be required to locate the additional terminal and gates.

Additional review of the Maximum Reuse/Minimum Hangar Removal indicates other the following factors of major significance.

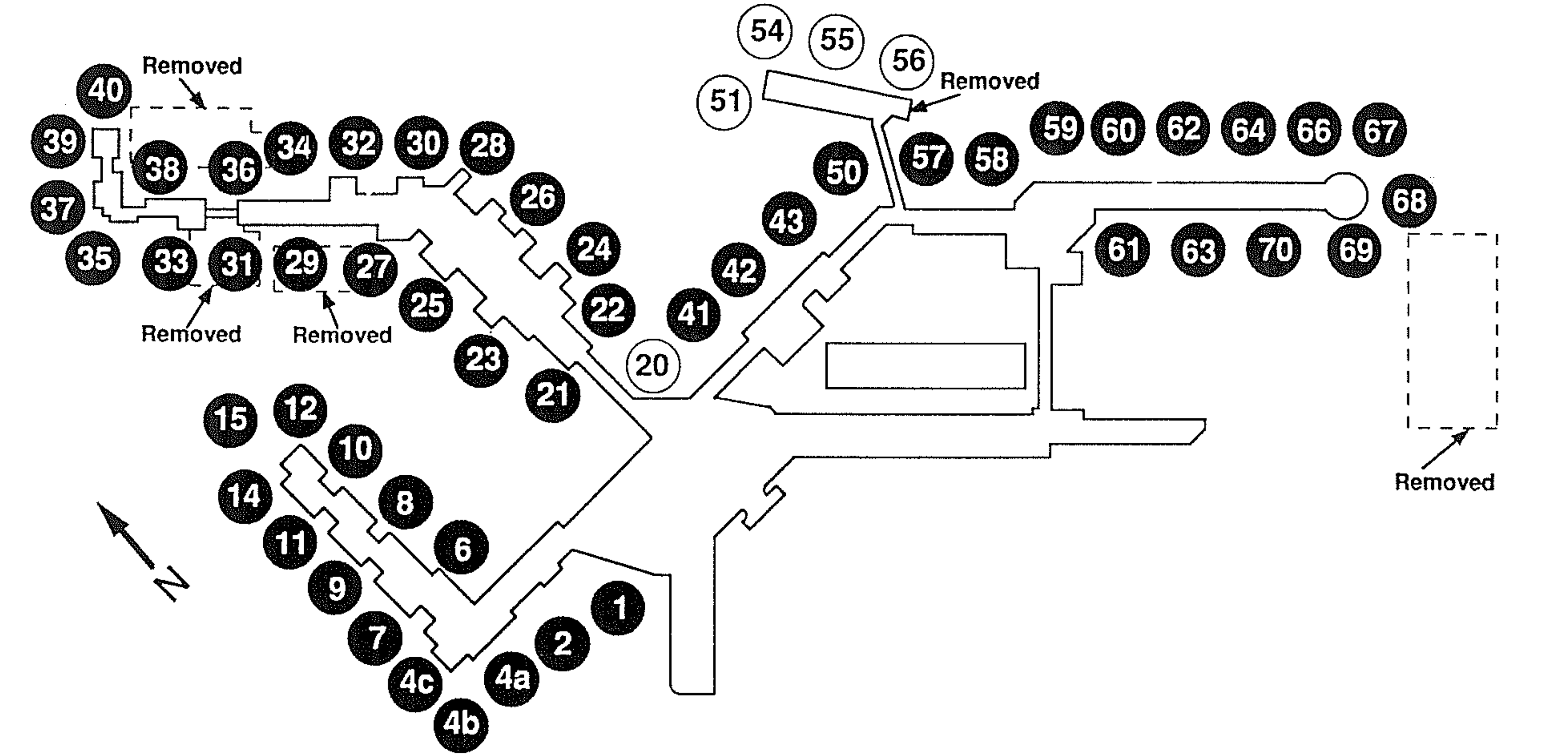
1. The low-level addition to the east concourse would pose aircraft parking location problems and could be a major impediment to efficient aircraft movement in the terminal area. Its present location is an impediment to a dual taxiway on the north side. The value of the structure for reuse is questionable.

2. If there is room to taxi between the end of the east concourse and the K.C. Aviation Hangar, use of gates 61, 63, and 70 may not be desirable for another reason. Aircraft taxiing to and from those gates could cause severe problems for the maintenance activities in the hangar. Availability of ramp for the hangar activities would be severely restricted. Mixing maintenance activities and air carrier movements is undesirable, where large air carrier activity is involved. Use of the south side gates on the east concourse probably should not be attempted until the K.C. Aviation hangar is removed. This hangar contains a large scale maintenance facility. Relocation of that activity would require a detailed planning study.

Therefore, another gate utilization schematic was developed similar to the Major Reconstruction/North Concourse alternative of the Equal Access and Major O&D scenarios. This option requires removal of the K.C. Aviation Hangar and the low-level addition to the east concourse. Prior to undertaking a major reconstruction of the north concourse and the east concourse to accommodate the maximum gates, a detailed terminal area development plan would be necessary and may indicate that it would be more cost effective to demolish the existing structure and provide total new facilities for an expansion of this magnitude.

A schematic showing the removal of the K.C. Aviation Hangar and the low-level structure on the east concourse is shown in Figure 3.29 for 51 gates.

The schematic layout, which shows how 53 gates might be accommodated in the terminal area by renovating previous gates, has major uncertainties. The long-term viability of using gates 61, 63 and 70 with the restricted access area between the K.C. Aviation hangar and the end of the east concourse warrants further study. The utilization of gates 51, 54, 55 and 56 with a modified or new structure in that area is marginal because of aircraft parking problems and aircraft movement on the airport. If the gates at the modified low-level structure could not be used and the K.C. Aviation Hangar was removed, 51 gates might be available (as shown in the second schematic) and a 19-gate terminal located elsewhere. If the low-level structure cannot be modified and used, and the K.C. Aviation Hangar was not moved and it is determined that aircraft would not be able to taxi to the south side of the east concourse, only 46 gates would



N Gates in use	Dallas Love Field
Hangars	**Major Hub Scenario - Maximum Hangar and Low Level Structure Removal**
	Love Field Terminal - 51 Gates
	4 Hangars Removed
Source: HNTB — Schematic not to scale	Figure 3.29

be available, and a 24-gate new terminal would be required elsewhere. As for other scenarios, efficient aircraft movement in the existing terminal area under the development plans would require detailed study.

Airfield Capacity and Delay

The percentage of large air carrier aircraft in the fleet increases throughout the planning period. As a result, the VMC mix index (MI) increases from 57 in 1990 to 85 by 2001. Likewise, the IMC mix index increases from 81 in 1990 to 95 in 2001. The projected MI for the Major Hub scenario is shown in Table 3.35.

With these increasing proportions of large aircraft, an increase in the variability of aircraft speeds are expected in VMC. As a result, IFR aircraft departure capacity in VMC decreases from 63 in 1990 to 57 by 2001, as shown in Table 3.35. Since a large portion of the general aviation fleet is projected not to operate in IMC, a reduction in the variability of aircraft speeds is expected. The IFR aircraft departure capacity in IMC increases slightly to 48 departures per hour.

Implementation of the *DFW Metroplex Air Traffic System Plan* will improve the overall arrival and departure system serving the region but will not significantly increase the IFR aircraft arrival capacity into Love Field. Extremely limited airspace available between Dallas-Fort Worth Airport and Love Field will require controllers to continue to meter all IFR arrivals and merge all arrivals to a common point prior to the final approach. As such, IFR aircraft arrival capacity remains constant in the Major Hub scenario at 36 arrivals per hour in VMC and 24 arrivals per hour in IMC.

The VMC and IMC peak hour demand for IFR aircraft was determined assuming that the monthly, daily, and hourly distribution of demand holds constant through the planning period. As shown in Table 3.35, peak hour arrival demand would increase from 28 in 1990 to 63 by 2001. Likewise, peak hour departure demand would increase from 25 departures in 1990 to 58 departures by 2001. Arrival demand exceeded arrival capacity for an average of one hour per day in 1990 in IMC. Arrival demand would exceed arrival capacity for an average of 16 hours per day by 2001 in IMC. Arrival demand would exceed VFR arrival capacity an average of nine hours per day by 2001. In the Major Hub scenario, peak hour departure demand will exceed departure capacity in both VMC and IMC by the end of the planning period. Arrival demand will exceed arrival capacity an average of one hour per day in VMC, and two hours per day in IMC by 2001.

Average aircraft delays are projected to increase from 1.0 minute per operation in 1990 to 49.5 minutes per operation by 2001 (see Table 3.35). Average aircraft delay in the peak hour is projected to increase from 2.4 minutes per operation in 1990 to 71.9 minutes per operation by 2001 in VMC, and increase from 4.5 minutes per operation in 1990 to 111.0 minutes per operation by 2001 in IMC. Since IFR aircraft arrivals are metered into Love Field, arrival delays are incurred by aircraft either in the enroute airspace or at the origination airport.

Table 3.35
Major Hub Scenario:
Summary of Love Field Airfield Capacity and Delay

Fleet Mix Assumptions
Mix Index (a)

Year	VMC	IMC
1990	57	81
1996	84	95
2001	85	95

Demand Vs. Capacity

Year	Arrivals			Departures		
	Peak Demand (b)	Capacity (c)	Hours Exceeded	Peak Demand (b)	Capacity (d)	Hours Exceeded
1990 VFR	28	36	0	25	63	0
1990 IFR	28	24	1	25	47	0
1996 VFR	57	36	5	52	57	0
1996 IFR	57	24	15	52	48	2
2001 VFR	63	36	9	58	57	1
2001 IFR	63	24	16	58	48	2

Aircraft Delays During Peak Hour(e)
(minutes/operation)

Year	Average Aircraft Delay	VMC	IMC
1990	1.0	2.4	4.5
1996	31.5	63.2	95.2
2001	49.5	71.9	111.0

Notes:
(a) Based on forecasts provided by Apogee Research, Inc., May 1991.
(b) Forecasts provided by Apogee Research, Inc., May 1991. Includes only IFR aircraft demand (all air carriers, 70 percent of other commercial, military and general aviation operations). Peak demand based on a peak month (9.32%), average day (31 days), peak hour methodology.
(c) Love Field Analysis, FAA Southwest Region, December 10, 1990.
(d) IFR aircraft departure capacity assumes a one-for-one capacity tradeoff with Dallas-Fort Worth Airport departures for 25 percent of all Love Field departures in VMC and 50 percent of all Love Field departures in IMC.
(e) Calculated using FAA Annual Delay Model.

While more efficient movement of aircraft on the ground will not enhance runway capacity, ground movement of aircraft could be enhanced by several possible improvements to taxiways (see discussion under Equal Access scenario).

Surface Access Analysis

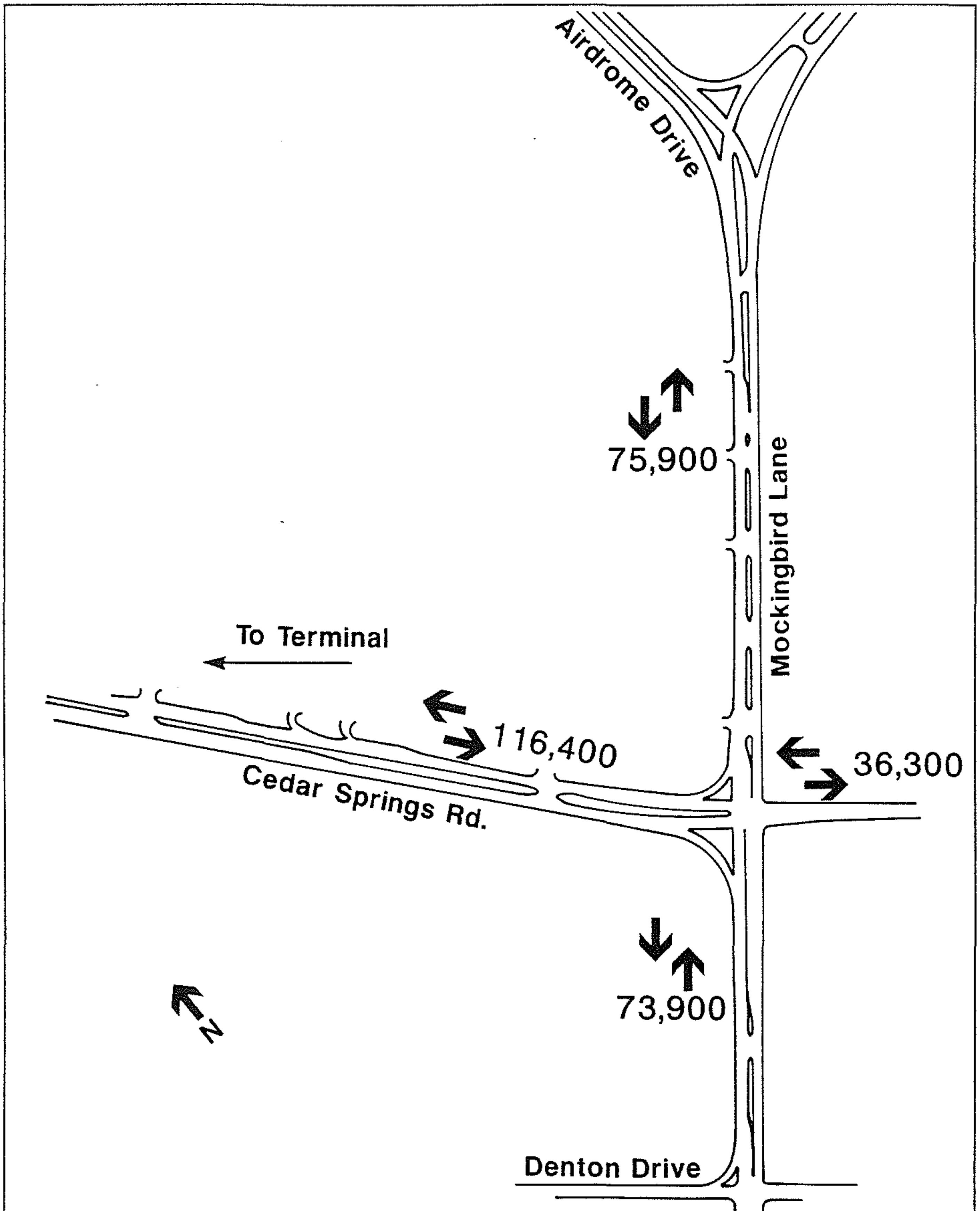
The Major Hub scenario increases passenger originations from 2,355,556 in 1990 to 9,426,000 in 2001. This four-fold increase in originations could increase the average weekday vehicular traffic on the Cedar Springs Road from the airport entrance exit to the terminal from 37,500 in 1990 to 116,400 in 2001 based upon 70 percent of the growth in originating passengers. Table 3.36 shows 2001 average weekday traffic on Mockingbird Lane north and south of Cedar Springs Road and east and west of Mockingbird Lane, with no growth at Love Field and with the growth attributable to the Major Hub scenario. Only 53 gates can be placed in the area occupied by the existing terminal and concourse, when modified. The additional 17 gate terminal required for the Major Hub scenario might be placed elsewhere on the airport. A master planning effort would be required to identify a suitable location for the additional terminal. The Major Hub scenario table assumes that all the traffic would pass through the terminal entrance intersection of Mockingbird Lane and Cedar Springs Road. Figure 3.30 shows two-way vehicular traffic through the intersection in 2001.

The increase in traffic on roads already at Service Levels E and F would cause severe congestion, unless intersections were modified. The at-grade intersection of Cedar Springs Road and Mockingbird Lane would require substantial modification.

Table 3.36
Major Hub - Vehicular Traffic

Road Section	Year 2001 without Love Growth	Year 2001 with Love Growth
Mockingbird Lane north of Cedar Springs	43,800(1)	75,900(3)
Mockingbird Lane south of Cedar Springs	42,600(1)	73,900(3)
Cedar Springs Road east of Mockingbird Lane	20,900(1)	36,300(3)
Cedar Springs Road into terminal	37,500(2)	116,400(3)

Notes: (1) NCTCOG estimates for 2000 assumed to approximate 2001.
(2) HNTB estimate for 1990.
(3) HNTB estimates.



0 200 400
Scale in feet

Source: Dallas Love Field ALP
HNTB Analysis

Dallas Love Field
Entrance/Exit Intersection
Average Daily Traffic
Major Hub Scenario - 2001

Figure 3.30

Cedar Springs Road into the terminal has a peak hour capacity of 50,000 vehicles Average Daily Traffic (ADT) with normal hourly distribution. The capacity limitation is the signalized intersection at Cedar Springs Road and Mockingbird Lane. The Major Hub scenario would add more than twice that level of traffic on the airport access road in the year 2001. Provision of a grade separated intersection with two lanes for both north and south bound traffic into and out of the airport would provide ample capacity (160,000 vehicles ADT) for the Major Hub scenario.

Parking requirements at the terminal would increase from 4,500 spaces available in 1990 to nearly 18,000 spaces in 2001.

Noise Analysis

The year 2001 noise analysis for the Major Hub scenario is based on a forecast fleet mix which assumes the growth of air traffic from 1989 levels likely which would likely occur with the Wright Amendment repealed and equal access given to all carriers. It is further assumed that one airline will develop Love Field as a major hub, operating an average of 230 flights daily from Love Field. There are changes in aircraft type, compared with 1989, as Stage II air carrier aircraft are phased-out of service as required by national policy. The day and night average daily operations are depicted in Tables 3.37 and 3.38.

The year 2001 Ldn contours for this scenario (see Figure 3.31) are much smaller than the 1989 contours. The reduction in contour size is due primarily to the discontinued use of older, more noisy aircraft. The Ldn 65 contour is approximately 79 percent of the size of the Ldn 65 contour for 1989. Table 3.39 shows this comparison.

With the reduction in the size of the noise contour there is a parallel reduction in population impacted by noise. The total population within the Ldn 65 contour for the Major Hub scenario is approximately 12,740 based on 1990 Census data, a decrease in population impact as compared with 1989 (see Table 3.40) and still below the City's 1992 goal of 27,000.

Table 3.37

Major Hub Scenario – 2001 Average Daily Arrivals for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	125.7	10.4	136.1
737–300	91.8	7.6	99.4
757–200	53.2	4.4	57.6
727–200	0.0	5.2	5.2
MD–80	207.9	17.2	225.1
Subtotal	478.6	44.8	523.4
Air Taxi/General Aviation –			
Citation	5.6	0.4	6.0
Lear 25	0.8	0.4	1.2
Lear 35	27.7	4.5	32.2
Challenger 600	2.7	0.3	3.0
Gulfstream II	0.7	0.0	0.7
Mitsubishi 300	0.8	0.1	0.9
Saberliner 80	1.8	0.4	2.2
Twin – Turboprop	24.5	2.2	26.7
Twin – Piston	23.2	9.4	32.6
Single – Piston	32.9	6.7	39.6
Subtotal	120.7	24.4	145.1
Total	**599.3**	**69.2**	**668.5**

Source: Apogee and HNTB analysis, May 1991.

Table 3.38

Major Hub Scenario – 2001 Average Daily Departures for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	131.3	4.8	136.1
737–300	95.9	3.5	99.4
757–200	55.6	2.0	57.6
727–200	0.0	5.2	5.2
MD–80	217.1	8.0	225.1
Subtotal	499.9	23.5	523.4
Air Taxi/General Aviation –			
Citation	5.7	0.3	6.0
Lear 25	0.9	0.3	1.2
Lear 35	27.0	5.2	32.2
Challenger 600	3.0	0.0	3.0
Gulfstream II	0.7	0.0	0.7
Mitsubishi 300	0.9	0.0	0.9
Saberliner 80	2.0	0.2	2.2
Twin – Turboprop	23.7	3.0	26.7
Twin – Piston	22.7	9.9	32.6
Single – Piston	30.9	8.7	39.6
Subtotal	117.5	27.6	145.1
Total	**617.4**	**51.1**	**668.5**

Source: Apogee and HNTB analysis, May 1991.

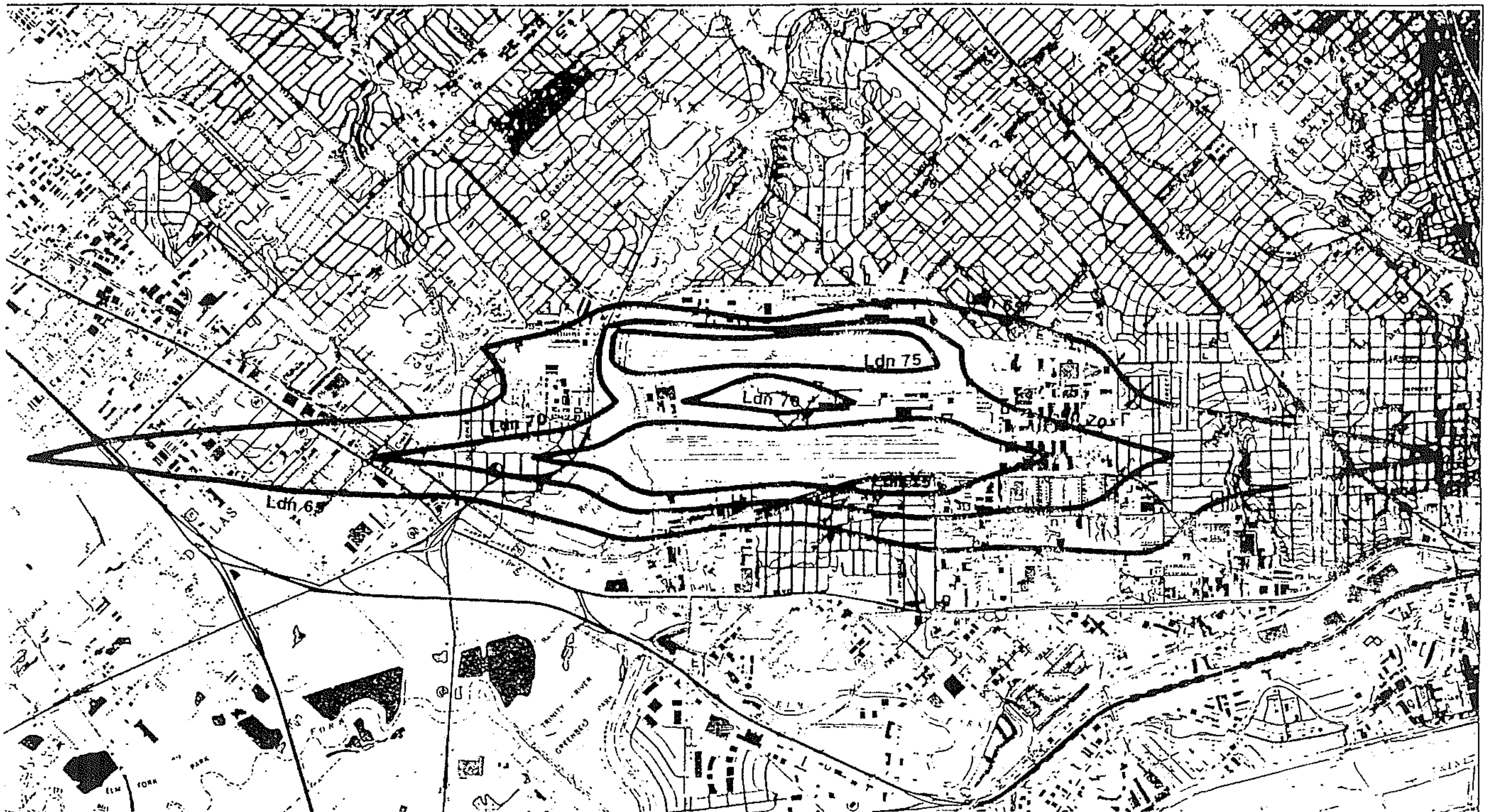


Figure 3.31

Source: HNTB Analysis

Dallas Love Field
Major Hub
Year 2001 Ldn Contours

Table 3.39
Major Hub - Contour Area
(in square miles)

Year	Ldn 75	Ldn 70	Ldn 65
1989	1.3	3.1	6.8
2001	1.1	2.5	5.4

Source: HNTB analysis.

Table 3.40
Major Hub - Population Impact
(Rounded to the Nearest 10)

Year	Inside Ldn 75	Within Ldn 70-75	Within Ldn 65-70	Total
1989	160	2,760	25,660	28,580
2001	240	1,680	10,280	12,740

Source: HNTB analysis.

APPENDICES

APPENDICES

APPENDIX A:

Entities and Individuals Interviewed by The Study Team

APPENDIX A:
ENTITIES AND INDIVIDUALS INTERVIEWED BY THE STUDY TEAM

Regional Representatives:

FAA S.W. Region
City of Dallas Department of Aviation
City of Dallas Highway Dept
Councilman Bartos
Councilwoman Palmer
Councilwoman Myers
Dallas Love Field Tower and Airport representatives
North Central Texas Council of Governments
DFW Tower and Tracon representatives
EPA (Regional Office)
Dallas Love Field Fixed Base Operators (FBOs)
DAL Pilots
Love Field Citizens Action Committee
City of Fort Worth
DFW International Airport Bond Council
DFW International Airport Staff

Airlines:

America West Airlines
American Airlines
Delta
Northwest
Southwest Airlines
United Airlines
USAir

APPENDIX B:

Alternative Scenarios to Those Examined

APPENDIX B: ALTERNATIVE SCENARIOS TO THOSE EXAMINED

Additional scenarios which were considered for evaluation but not examined for a variety of reasons include:

"Trinity 3" Noise Mitigation Procedure

Trinity 3 is a noise mitigation procedure that limits use of one runway and controls departure routes between 9:00 p.m. and 6:00 a.m. Should Trinity 3 be relied on either in a slightly expanded time frame or, as has been proposed, on a 24-hour basis, it would significantly reduce Metroplex airspace capacity. The analysis for this report assumed no change to the existing procedures.

Non-signatory access only at Love

This scenario would prohibit carriers at DFW from serving Love Field if they had agreed with DFW to provide no interstate service at Love Field. The only carriers that would then be eligible to serve Love Field would be Alaska Airlines and America West. However, several legal opinions received by the study team indicated that the DFW signatory agreements restricting Love Field service would not likely be enforceable should the Wright Amendment be repealed.

No through-ticketing under modified Wright

A scenario that does not allow through-ticketing or through-service to or from Love Field was not evaluated because Love Field would then not be useful under the present hub and spoke system used by most airlines.

Development of an airline hub at Love Field under Modified Wright

It is unlikely that an airline would attempt to develop a hub at Love Field under the Modified Wright scenario, but American Airlines has suggested this possibility. This scenario was not examined because the capacity implications would be similar to those of the Major Hub scenario.

High-speed rail system

The development of high speed rail in Texas could eventually have an impact on demand for air service in the Metroplex region. However, because it will not be operational in Texas until the end of the decade (at the earliest), it was not within the time frame of this analysis.

Impact of Carswell Air Force Base closure/use as a commercial airfield

The closure of Carswell Air Force Base in Fort Worth would only have an impact on Love Field if it subsequently opens to commercial traffic. However, Carswell, scheduled to close in September 1993, is expected to become a general aviation reliever airport. General Dynamics and a U.S. Air Force reserve unit are current tenants and will continue to use the base. The City of Fort Worth established a Carswell Reuse Office in January 1992 and has issued a request for proposals for an airport master plan. The FAA recently issued a grant for this master plan.

Southwest Airlines Moves to DFW

Southwest Airlines does not provide service at DFW, even though it was given the opportunity to move its operations there in the past. This appears to be largely because quick turn-around time is a key component of Southwest's low-cost operations. Quick turn-around is not possible at DFW, because of its large size. Thus, Southwest appears unlikely to be interested in serving DFW in the future.

APPENDIX C:

Commercial Aviation Base Forecasts for DFW and Love Field

APPENDIX C: COMMERCIAL AVIATION BASE FORECASTS FOR DALLAS-FORT WORTH INTERNATIONAL AND DALLAS LOVE FIELD

COMMERCIAL AVIATION BASE FORECAST FOR DALLAS-FORT WORTH INTERNATIONAL

For the base case (no change in the Wright Amendment), domestic passenger traffic at Dallas-Fort Worth International (DFW) is forecast to grow on average 3.0 percent per year from 1991 to 2001. This average reflects growth of 3.8 percent per year from 1991 to 1996 and 2.2 percent per year from 1996 to 2001. This forecast is based on the July 1990 FAA Terminal Area Forecast for DFW.

COMMERCIAL AVIATION BASE FORECAST FOR DALLAS LOVE FIELD

For the base case (no change in the Wright Amendment), domestic passenger traffic from the Dallas Love Field is forecast to grow 2.6 percent per year from 1991 to 2001. This forecast is lower than the forecasts by KPMG (3.1 percent), the FAA (7.1 percent), and Reese (10.5 percent). The KPMG and FAA forecasts do not assume repeal of the Wright Amendment; the Reese forecast does.

Our forecast is based on Dallas employment projections and on a linear time-series model that estimates the time trend of demand at Dallas Love Field:

$$Q_D = \beta_0 + \beta_1 t + \beta_2 D_1 + \beta_3 D_2$$

where:

Q_D = Initiating Passengers
β_0 = Constant Term
β_1 = Time Coefficient
t = Time (Calendar Years)
β_2 = First Dummy Variable Coefficient
D_1 = Dummy Variable Indicating the 1982-1983 Price War
β_3 = Second Dummy Variable Coefficient
D_2 = Dummy Variable Indicating the Presence of Transtar

This model was estimated using data from the first quarter of 1980 through the third quarter of 1990. Results of the Dallas Love Field regression are as follows (t-statistics shown in parentheses):

$$\begin{array}{lllll} Q_D = & -23638292 & + 12153\,t & + 311957\,D_1 & + 149554\,D_2 \\ & (-5.51) & (5.62) & (11.19) & (9.56) \end{array}$$

$R^2 = 89.9\%$ D.W. = 0.86

A classical time series model was chosen because attempts to develop econometric demand models for Dallas Love Field based on fares, income, population, and per capita income did not yield statistically valid results.

- The reported O&D fare data for Love Field were particularly chaotic in appearance and poorly related to demand. We also discovered that Southwest airlines' O&D fare data are not based on the DOT's ten percent survey of coupons, rather they are based upon Southwest's published fares, adjusted by Southwest to be consistent with both its traffic data and its Form 41 revenues. These different methods of data collection almost certainly explain the apparent poor correlation between fares and demand.

- Income and per capita income data were available only through 1988. Because demand at Love Field generally fell from 1982 through 1987, correlations with these data do not fully reflect the more recent growth in traffic at Love Field from the second quarter of 1987 through the third quarter of 1990. A time-series model is better able to fully incorporate this more recent data.

APPENDIX D:

Legislation (The Wright Amendment)

Public Law 96-192
96th Congress

An Act

To amend the Federal Aviation Act of 1958 in order to promote competition in international air transportation, provide greater opportunities for United States air carriers, establish goals for developing United States international aviation negotiating policy, and for other purposes.

Feb. 15, 1980
[S. 1300]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "International Air Transportation Competition Act of 1979".

International Air Transportation Competition Act of 1979. 49 USC 1301 note.

Love Field, Tex.

SEC. 29. (a) Except as provided in subsection (c), notwithstanding any other provision of law, neither the Secretary of Transportation, the Civil Aeronautics Board, nor any other officer or employee of the United States shall issue, reissue, amend, revise, or otherwise modify (either by action or inaction) any certificate or other authority to permit or otherwise authorize any person to provide the transportation of individuals, by air, as a common carrier for compensation or hire between Love Field, Texas, and one or more points outside the State of Texas, except (1) charter air transportation not to exceed ten flights per month, and (2) air transportation provided by commuter airlines operating aircraft with a passenger capacity of 56 passengers or less.

(b) Except as provided in subsections (a) and (c), notwithstanding any other provision of law, or any certificate or other authority heretofore or hereafter issued thereunder, no person shall provide or offer to provide the transportation of individuals, by air, for compensation or hire as a common carrier between Love Field, Texas, and one or more points outside the State of Texas, except that a person providing service to a point outside of Texas from Love Field on November 1, 1979, may continue to provide service to such point.

(c) Subsections (a) and (b) shall not apply with respect to, and it is found consistent with the public convenience and necessity to authorize, transportation of individuals, by air, on a flight between Love Field, Texas, and one or more points within the States of Louisiana, Arkansas, Oklahoma, New Mexico, and Texas by an air carrier, if (1) such air carrier does not offer or provide any through service or ticketing with another air carrier or foreign air carrier, and (2) such air carrier does not offer for sale transportation to or from, and the flight or aircraft does not serve, any point which is outside any such State. Nothing in this subsection shall be construed to give authority not otherwise provided by law to the Secretary of Transportation, the Civil Aeronautics Board, any other officer or employee of the United States, or any other person.

(d) This section shall not take effect if enacted after the enactment of the Aviation Safety and Noise Abatement Act of 1979.

Effective date. *Post*, p. 50

Approved February 15, 1980.

APPENDIX E:

Detailed Economic Analysis

APPENDIX E: DETAILED ECONOMIC ANALYSIS

FARE IMPACTS OF REPEAL OF THE WRIGHT AMENDMENT

Competitive analysis suggests that, if the Wright Amendment were repealed, Southwest may expand at Dallas Love Field to several new non-stop markets,

- Birmingham,
- Kansas City,
- Memphis,
- Phoenix, and
- St. Louis.

Southwest might enter these markets because of its preference for short-haul markets while avoiding stub-end markets. (A stub-end market is a market that a carrier serves from only one city.)

In order to assess the impact on fares and traffic of Southwest Airlines' entry into these markets, we examined 26 city-pair markets which Southwest entered in the 1980s. These city-pairs are shown in Table E.1.

In examining the 26 markets, we calculated descriptive statistics to estimate the historical impacts of Southwest entry on:

- Real Fares (1982 $) and
- Total Domestic Passengers.

The weighted average of these impacts are shown in Figures E.1. and E.2. Figure D.1 shows an average decrease in real fares of approximately 22 percent over the five-year period following Southwest's entry. Figure E.2 shows that there was an increase in passengers of approximately 50 percent over the same period.

Initially, to estimate more precisely the price and income sensitivities of each market, we performed econometric regressions with the equation:

$$Q_D = ß_0 P^{ß1} Y^{ß2}$$

where:

Q_D = O&D Passengers
$ß_0$ = Constant Term
$ß_1$ = Price Elasticity of Demand
Y = Market Income (composed of the sum of both cities' total personal income)
$ß_2$ = Income Elasticity of Demand

TABLE E.1.

CITY–PAIR MARKETS EXAMINED FOR ANALYSIS OF FARE AND THROUGH–TICKETING IMPACTS

NONSTOP MARKETS

	ABBREVIATION	NAME
1	BHM–BNA	BIRMINGHAM–NASHVILLE
2	CH–BNA	CHICAGO–NASHVILLE
3	CH–DT	CHICAGO–DETROIT
4	CH–MK	CHICAGO–KANSAS CITY
5	CH–SZ	CHICAGO–ST. LOUIS
6	DT–BNA	DETROIT–NASHVILLE
7	HO–BNA	HOUSTON–NASHVILLE
8	HO–SZ	HOUSTON–ST. LOUIS
9	IND–SZ	INDIANAPOLIS–ST. LOUIS
10	LAS–PX	LAS VEGAS–PHOENIX
11	MK–PX	KANSAS CITY–PHOENIX
12	MK–TUL	KANSAS CITY–TULSA
13	PX–SZ	PHOENIX–ST. LOUIS
14	SAN–LAS	SAN DIEGO–LAS VEGAS
15	SAN–PX	SAN DIEGO–PHOENIX
16	SAN–SF	SAN DIEGO–SAN FRANCISCO
17	SZ–LIT	ST. LOUIS–LITTLE ROCK

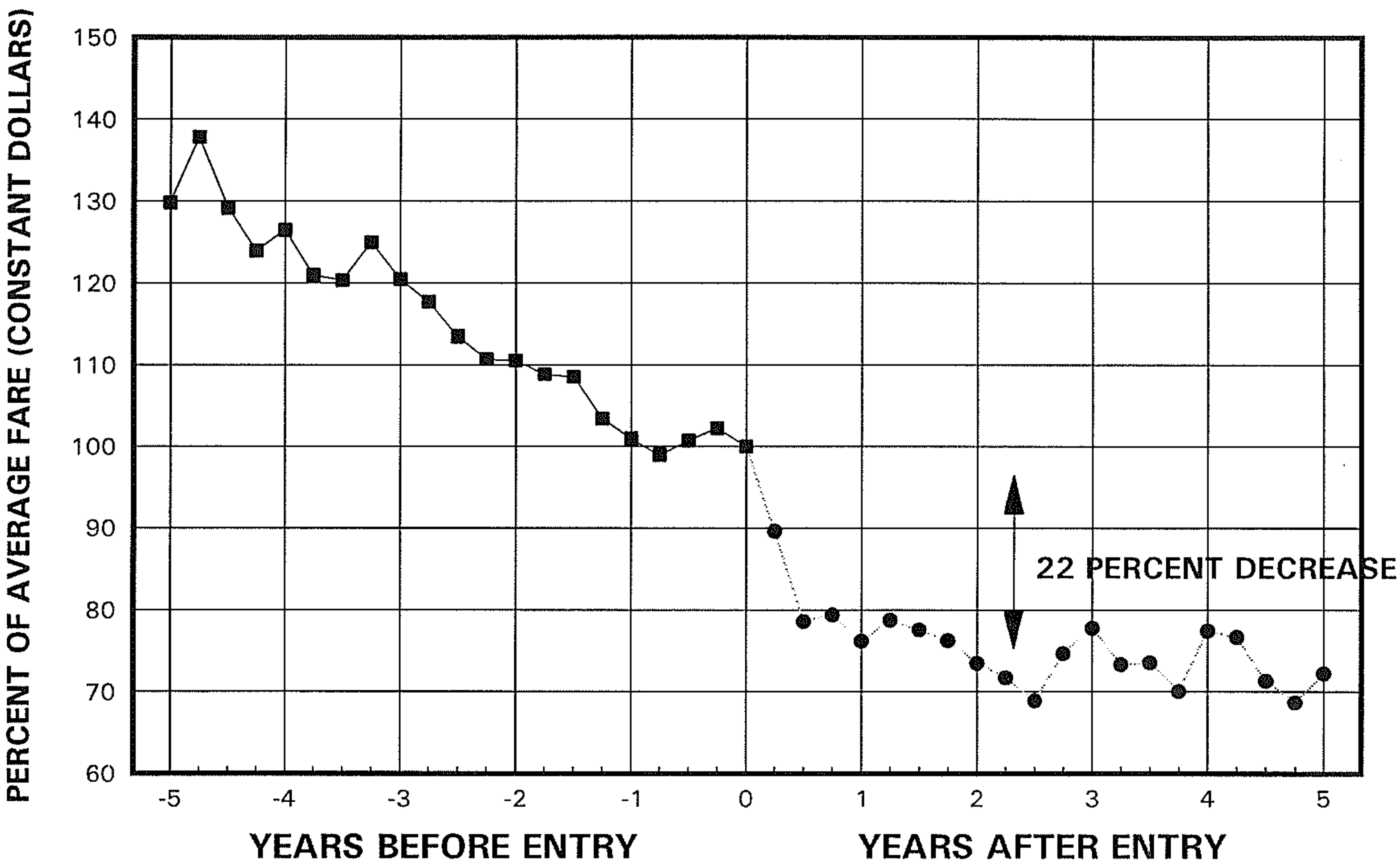
MULTI–STOP MARKETS

	ABBREVIATION	NAME
1	CH–HO	CHICAGO–HOUSTON
2	CH–PX	CHICAGO–PHOENIX
3	DT–HO	DETROIT–HOUSTON
4	DT–LA	DETROIT–LOS ANGELES
5	DT–MK	DETROIT–KANSAS CITY
6	DT–PX	DETROIT–PHOENIX
7	HO–LIT	HOUSTON–LITTLE ROCK
8	HO–OA	HOUSTON–OAKLAND
9	HO–SF	HOUSTON–SAN FRANCISCO

NOTE: Two–digit city codes are used instead of three–digit airport codes for cities with more than one airport.

SOURCES: Apogee Research, Inc.; O&D Plus Aviation Database (TM)

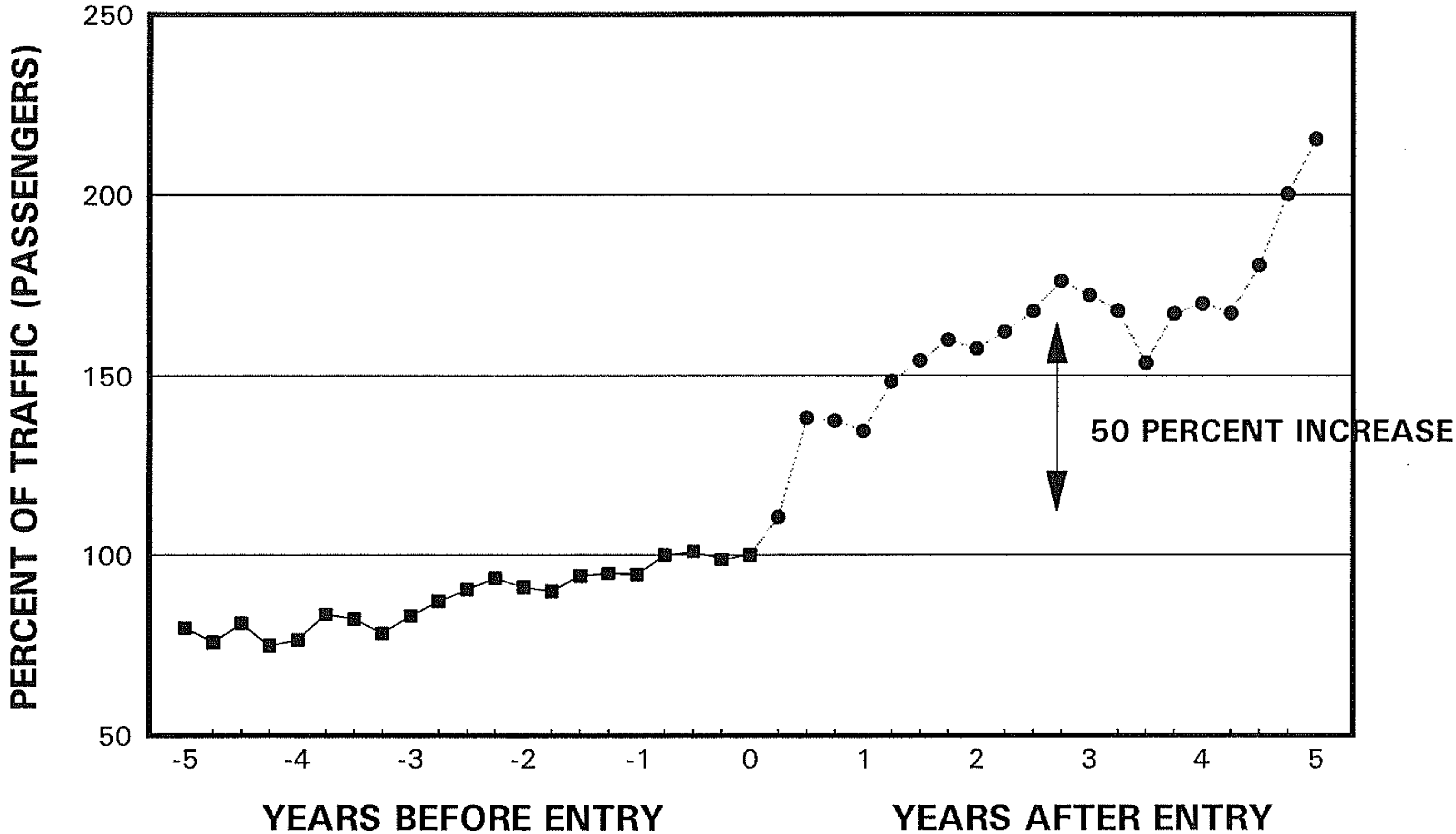
FIGURE E.1.
EFFECT OF SOUTHWEST ENTRY ON FARE



SOURCE: Apogee Research based on 26 markets.

FIGURE E.2.

EFFECT OF SOUTHWEST ENTRY ON TRAFFIC



SOURCE: Apogee Research based on 26 markets.

The results of these regressions are shown in Table E.2. Excluding one outlier and the four markets in which the price- and income-elasticity estimates were not both of the correct sign, they indicate an average price elasticity of -.54. Estimates of the incorrect sign indicate the presence of other, overriding influences on demand.

However, these fare elasticities were too small to fully reflect the increased growth that we observed in the graphs and descriptive statistics. This could be caused by under-specification of the econometric model. It is possible, for example, that an additional explanatory variable, such as the level-of-service (i.e., frequency of flights), would in combination with fares more fully account for the increases in passengers observed in the graphs and descriptive statistics. In the absence of time-series data for such an explanatory variable, however, we instead base our fare/service elasticity directly on time-series regressions which assist in the interpretation of our descriptive statistics and graphs. These time-series regressions are illustrated by the trend lines shown in Figures E.1 and E.2. As noted above, Figure E.1 shows that there was an average decrease in real fares of approximately 22 percent over the five-year period following Southwest's entry. Figure E.2 shows that there was an average increase in passengers of approximately 50 percent over the same period. Therefore, we calculate the average fare/service elasticity to equal 50/22 = 2.27. This method has the advantage of allowing the fare impacts to fully reflect the passenger impacts observed.

Fare impacts were estimated as the weighted average based on descriptive statistics of markets comparable to those which we assume Southwest might enter if the Wright Amendment were repealed. The selection of these comparable markets involved consideration of stage length; traffic density; nonstop versus multi-stop service; hub versus non-hub city-combinations; the sizes of the two cities in the city-pair; the sizes, numbers, and competitive strategies of the carriers serving the market; and regional considerations, such as whether or not the market was a California market.

These combined fare impacts and fare/service elasticity imply the passenger impacts presented in Table E.3. Together, they indicate a fare-induced increase of 544 thousand annual passengers in 1996. They also imply average savings of approximately $51 per ticket, resulting in total fare-induced savings of $75.5 million in constant 1991 dollars.

TABLE E.2.

REGRESSION RESULTS

	COEFFICIENTS		STD.ERRORS		T-STATISTICS		
MARKET	FARE	INC	FARE	INC	FARE	INC	R2
BHM-BNA	-0.46	4.23	0.57	1.43	-0.8	3.0	39.6%
CH-BNA	-0.46	4.91	0.20	0.54	-2.3	9.1	82.4%
CH-DT	-0.69	3.50	0.21	0.56	-3.3	6.2	78.9%
CH-MK	-0.44	3.73	0.16	0.73	-2.7	5.1	81.3%
CH-PX	-0.28	2.02	0.16	0.86	-1.8	2.3	71.2%
DEN-HO	-0.27	1.14	0.24	1.13	-1.1	1.0	25.7%
DEN-PX	-0.29	1.89	0.17	0.49	-1.7	3.8	72.5%
DT-LA	-0.49	0.17	0.21	0.74	-2.3	0.2	46.2%
DT-MK	-0.81	3.18	0.19	0.92	-4.1	3.4	79.6%
DT-PX	-0.59	1.09	0.13	0.52	-4.4	2.1	79.4%
HO-BNA	-1.63	0.97	0.35	1.07	-4.6	0.9	65.2%
HO-OA	-1.13	14.89	0.96	4.31	-1.2	3.5	56.4%
HO-SF	-0.35	0.72	0.18	0.78	-1.9	0.9	43.6%
HO-SZ	-0.21	2.88	0.13	0.63	-1.7	4.6	74.6%
LAS-PX	-0.80	2.23	0.20	0.43	-4.0	5.2	81.3%
MK-PX	-0.39	1.94	0.16	0.48	-2.5	4.0	78.5%
MK-TUL	-0.45	3.71	0.46	3.15	-1.0	1.2	37.1%
PX-SZ	-0.27	1.32	0.22	0.63	-1.2	2.1	58.1%
SAN-LAS	-0.37	2.04	0.17	0.24	-2.2	8.4	75.3%
SAN-PX	-0.54	2.29	0.18	0.39	-3.0	5.9	83.4%
SZ-LIT	-0.50	1.83	0.16	0.55	-3.1	3.3	66.0%
MIN	-1.63	0.17	0.13	0.24	-4.64	0.23	0.26
MAX	-0.21	14.89	0.96	4.31	-0.81	9.06	0.83
MEAN	-0.54	2.89	0.26	0.98	-2.42	3.63	0.66
STD.DEV.	0.32	2.94	0.19	0.95	1.14	2.35	0.17
CH-HO	-0.51	-0.57	0.12	0.66	-4.3	-0.9	45.6%
CH-SZ	0.00	2.69	0.08	0.31	0.1	8.8	80.3%
DT-BNA	2.42	9.91	1.31	3.73	1.8	2.7	16.4%
DT-HO	-0.78	-0.87	0.22	1.19	-3.6	-0.7	39.2%
HO-LIT	-2.21	-1.25	0.23	1.24	-9.7	-1.0	75.7%
IND-SZ	-0.01	-1.15	0.09	0.26	-0.2	-4.4	38.1%
SAN-SF	0.23	3.81	0.38	0.77	0.6	4.9	64.3%
MIN	-2.21	-1.25	0.08	0.26	-9.73	-4.39	0.16
MAX	2.42	9.91	1.31	3.73	1.85	8.81	0.80
MEAN	-0.12	1.80	0.35	1.17	-2.18	1.34	0.51
STD.DEV.	1.29	3.81	0.40	1.10	3.72	4.10	0.21

TABLE E.3.

ESTIMATED FARE-INDUCED IMPACTS OF SOUTHWEST ENTRY INTO NEW MARKETS UNDER REPEAL OF THE WRIGHT AMENDMENT, 1996

MARKET	1996 TOTAL PASSENGERS	FARE IMPACT	FARE/SERVICE ELASTICITY	PASSENGER IMPACT
DFW-BHM	60,000	-17%	-227%	23,000
DFW-MCI	209,000	-27%	-227%	128,000
DFW-MEM	113,000	-25%	-227%	64,000
DFW-PHX	263,000	-27%	-227%	161,000
DFW-STL	295,000	-25%	-227%	168,000
TOTAL	940,000	-25%	-227%	544,000

MARKET	1991 AVERAGE FARE	FARE IMPACT	AVERAGE SAVINGS	TOTAL SAVINGS
DFW-BHM	$222	-17%	$38	$3,126,000
DFW-MCI	$199	-27%	$54	$18,066,000
DFW-MEM	$189	-25%	$47	$8,375,000
DFW-PHX	$198	-27%	$53	$22,682,000
DFW-STL	$201	-25%	$50	$23,244,000
TOTAL	$200	-25%	$51	$75,493,000

SOURCES: Apogee Research, Inc.; D.O.T. 10% Sample of Coupons; FAA Terminal Area Forecasts

THROUGH-TICKETING IMPACTS OF REPEAL OF THE WRIGHT AMENDMENT

Competitive analysis suggests that, if the Wright Amendment were repealed, Southwest may offer direct or connecting service from Love Field and beyond points to:

- Nashville,
- Burbank,
- Chicago,
- Detroit,
- Indianapolis,
- Las Vegas,
- Oakland,
- Ontario, California,
- Reno,
- San Diego, and
- San Francisco.

This reflects Southwest's current markets and assumes that more rapid expansion by 1996 would be limited by Southwest's fleet size and planned purchases.

The estimated impacts of through-ticketing by Southwest are presented in Table E.4. They indicate an increase of 769 thousand annual passengers in 1996. They also imply average savings of approximately $34 per ticket, resulting in total through-ticketing induced savings of $107.6 million in constant 1991 dollars.

Because of its low-fare, high-frequency manner of operation, the impacts of through-ticketing by Southwest are comparable to the impacts of its entry into a market, with one modification: Southwest's fare impacts are smaller in multi-stop markets than in nonstop markets.

Fare impacts were estimated as the weighted average based on descriptive statistics of markets comparable to those which we assume Southwest might enter if the Wright Amendment were repealed. All of them were selected from markets with multi-stop service. When possible, markets were chosen that included the city in question. For example, there are two one-stop markets which include Chicago: Chicago-Houston and Chicago-Phoenix. Therefore, the Chicago fare impacts and price elasticities represent the average of those estimated for these two markets. Otherwise, the average multiple-stop fare impacts are used.

The relevant through-ticketing population would be the passengers from these cities who connect through airports that would compete with Love Field for connecting traffic. Because of the difficulty of estimating this population, a conservative proxy is assumed: the direct O&D passengers between each of these cities and the Metroplex.

TABLE E.4.

ESTIMATED IMPACTS OF THROUGH–TICKETING BY SOUTHWEST UNDER REPEAL OF THE WRIGHT AMENDMENT, 1996

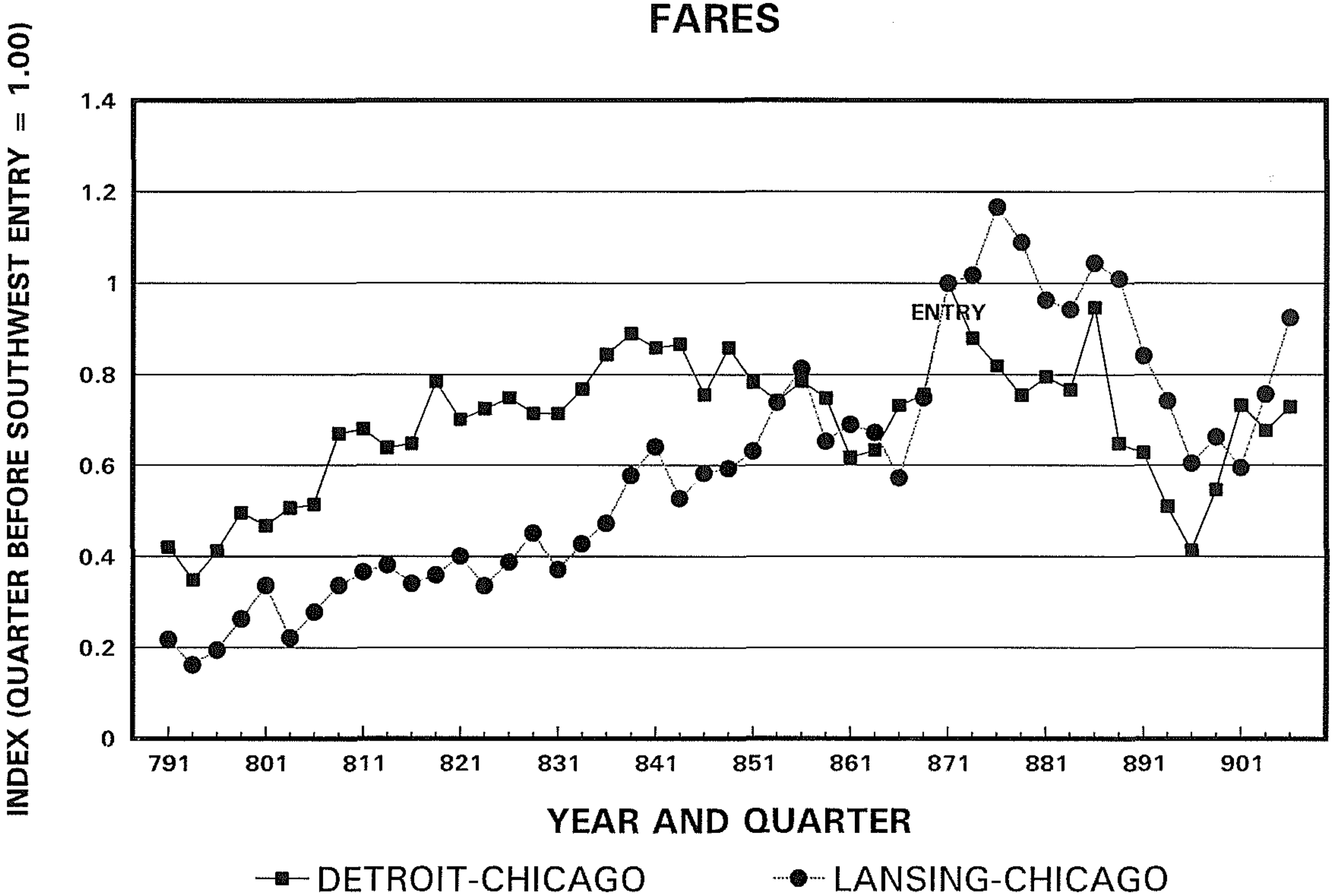
MARKET	1996 TOTAL PASSENGERS	FARE IMPACT	FARE/SERVICE ELASTICITY	PASSENGER IMPACT
DFW–BNA	133,000	–10%	–227%	30,000
DFW–BUR	64,000	–10%	–227%	15,000
DFW–CH	817,000	–18%	–227%	334,000
DFW–DT	292,000	–8%	–227%	53,000
DFW–IND	128,000	–10%	–227%	29,000
DFW–LAS	216,000	–10%	–227%	49,000
DFW–OAK	79,000	–19%	–227%	34,000
DFW–ONT	122,000	–10%	–227%	28,000
DFW–RNO	53,000	–10%	–227%	12,000
DFW–SAN	185,000	–10%	–227%	42,000
DFW–SFO	299,000	–21%	–227%	143,000
TOTAL	2,388,000	–15%	–227%	769,000

MARKET	1991 AVERAGE FARE	FARE IMPACT	AVERAGE SAVINGS	TOTAL SAVINGS
DFW–BNA	$208	–10%	$21	$3,393,000
DFW–BUR	$273	–10%	$27	$2,157,000
DFW–CH	$221	–18%	$40	$45,753,000
DFW–DT	$196	–8%	$16	$5,397,000
DFW–IND	$213	–10%	$21	$3,337,000
DFW–LAS	$175	–10%	$18	$4,645,000
DFW–OAK	$276	–19%	$52	$5,918,000
DFW–ONT	$253	–10%	$25	$3,792,000
DFW–RNO	$212	–10%	$21	$1,380,000
DFW–SAN	$240	–10%	$24	$5,439,000
DFW–SFO	$284	–21%	$60	$26,361,000
TOTAL	$231	–15%	$34	$107,572,000

SOURCES: Apogee Research, Inc.; D.O.T. 10% Sample of Coupons; FAA Terminal Area Forecasts

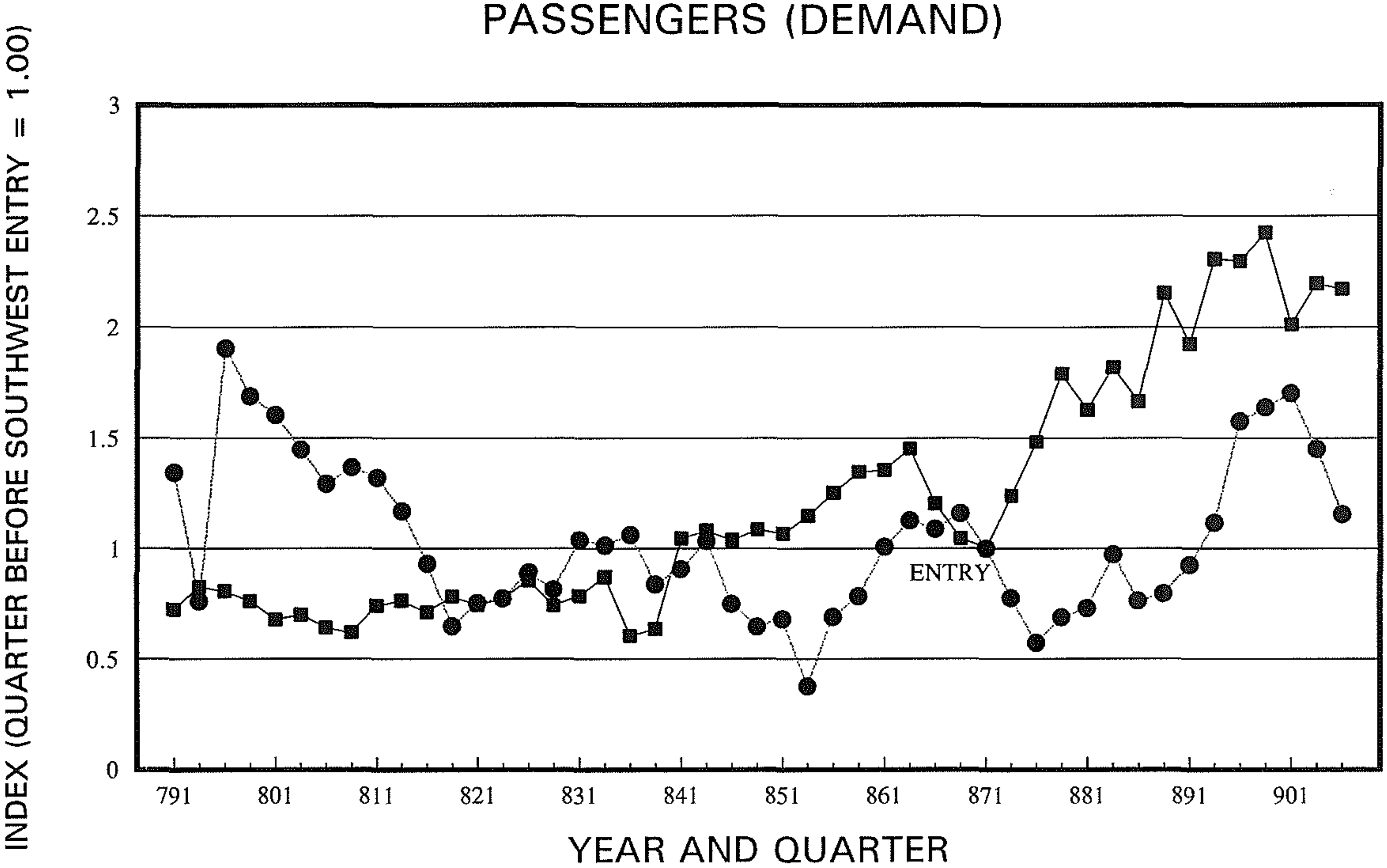
Data Supporting Halo Effect
Fare and Passenger Analyses

FIGURE E.3.
HISTORICAL IMPACT OF SOUTHWEST ENTRY
FARES



SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.4.
HISTORICAL IMPACT OF SOUTHWEST ENTRY
PASSENGERS (DEMAND)

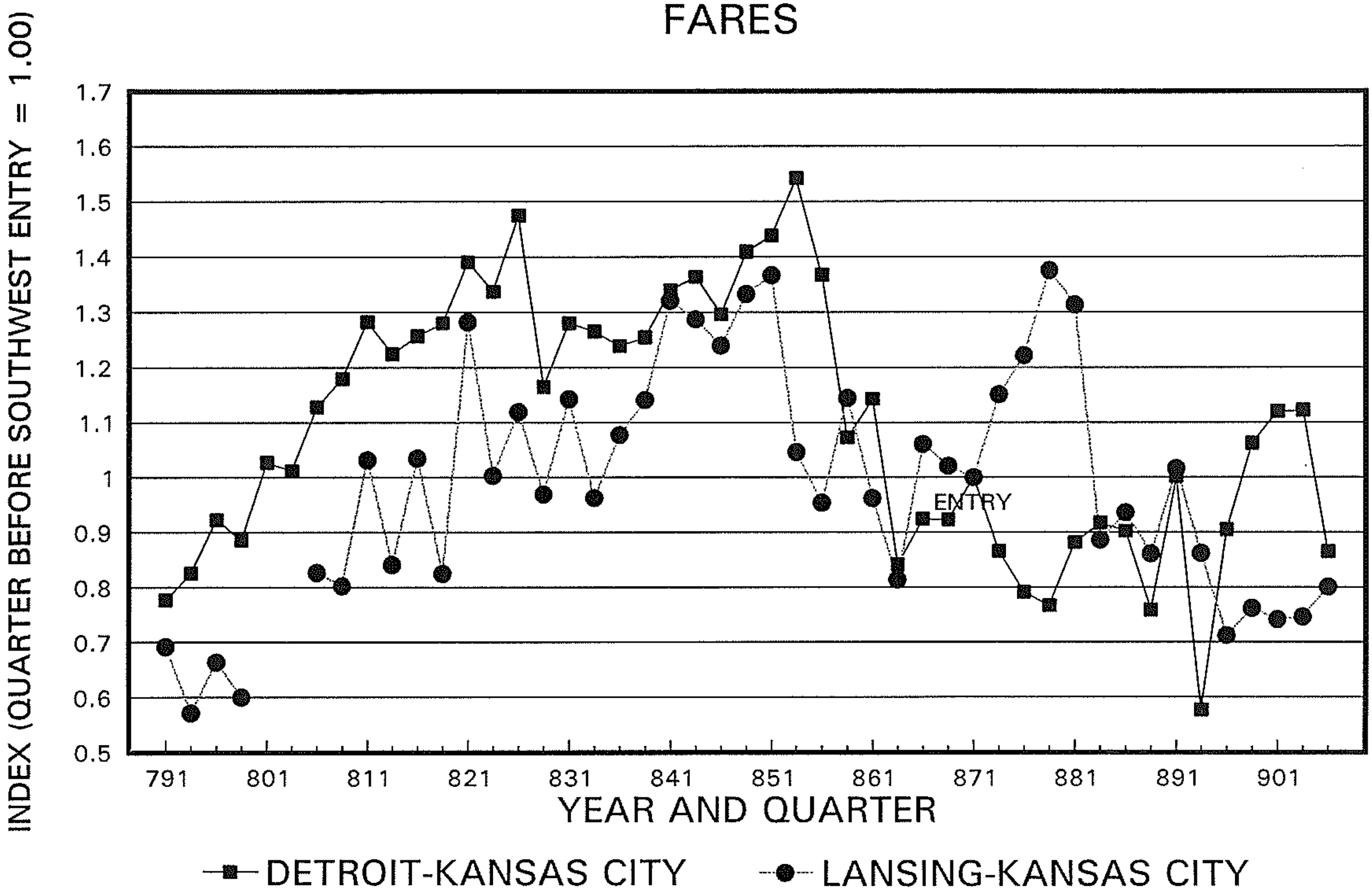


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.5.

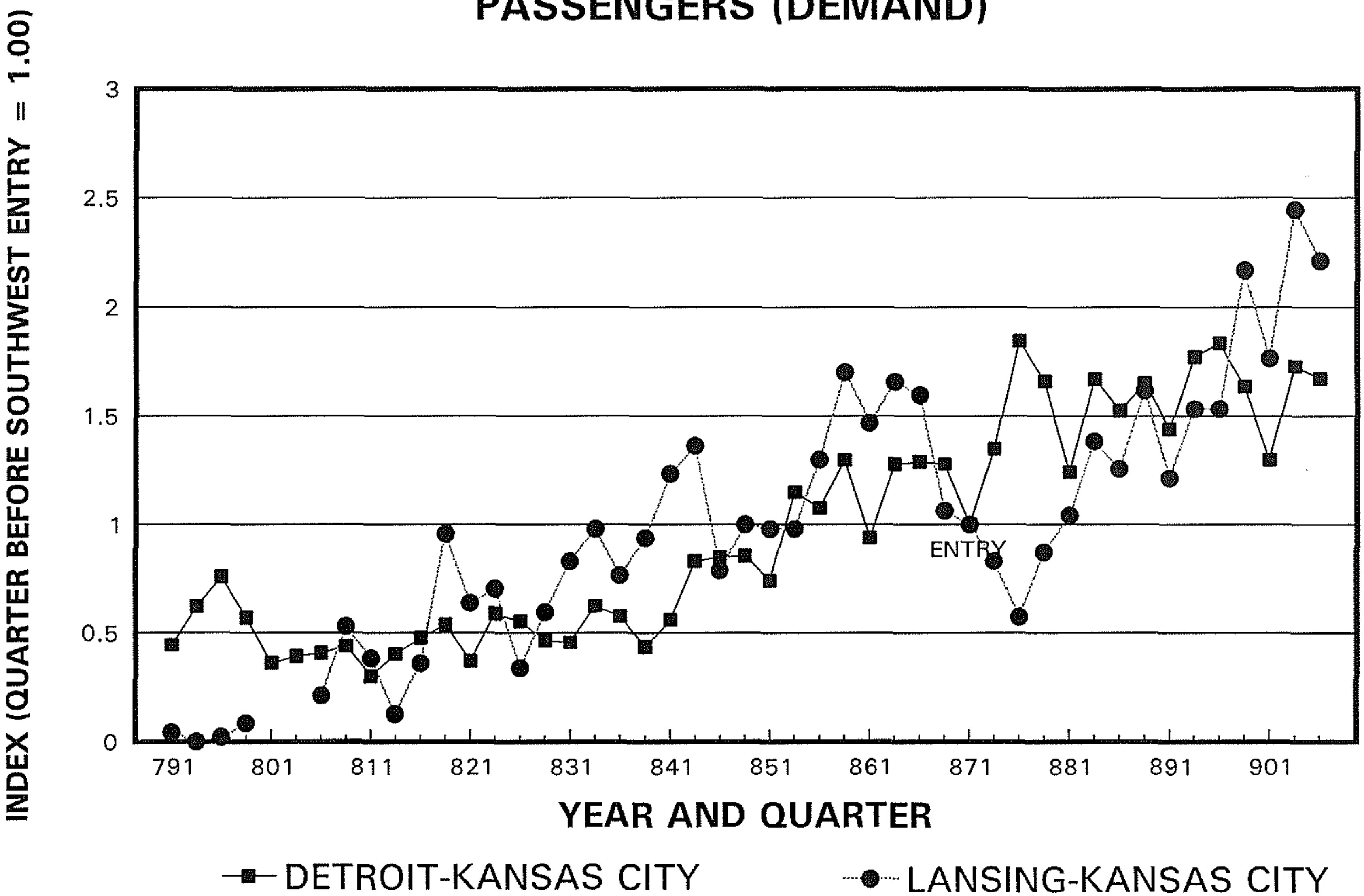
HISTORICAL IMPACT OF SOUTHWEST ENTRY

FARES



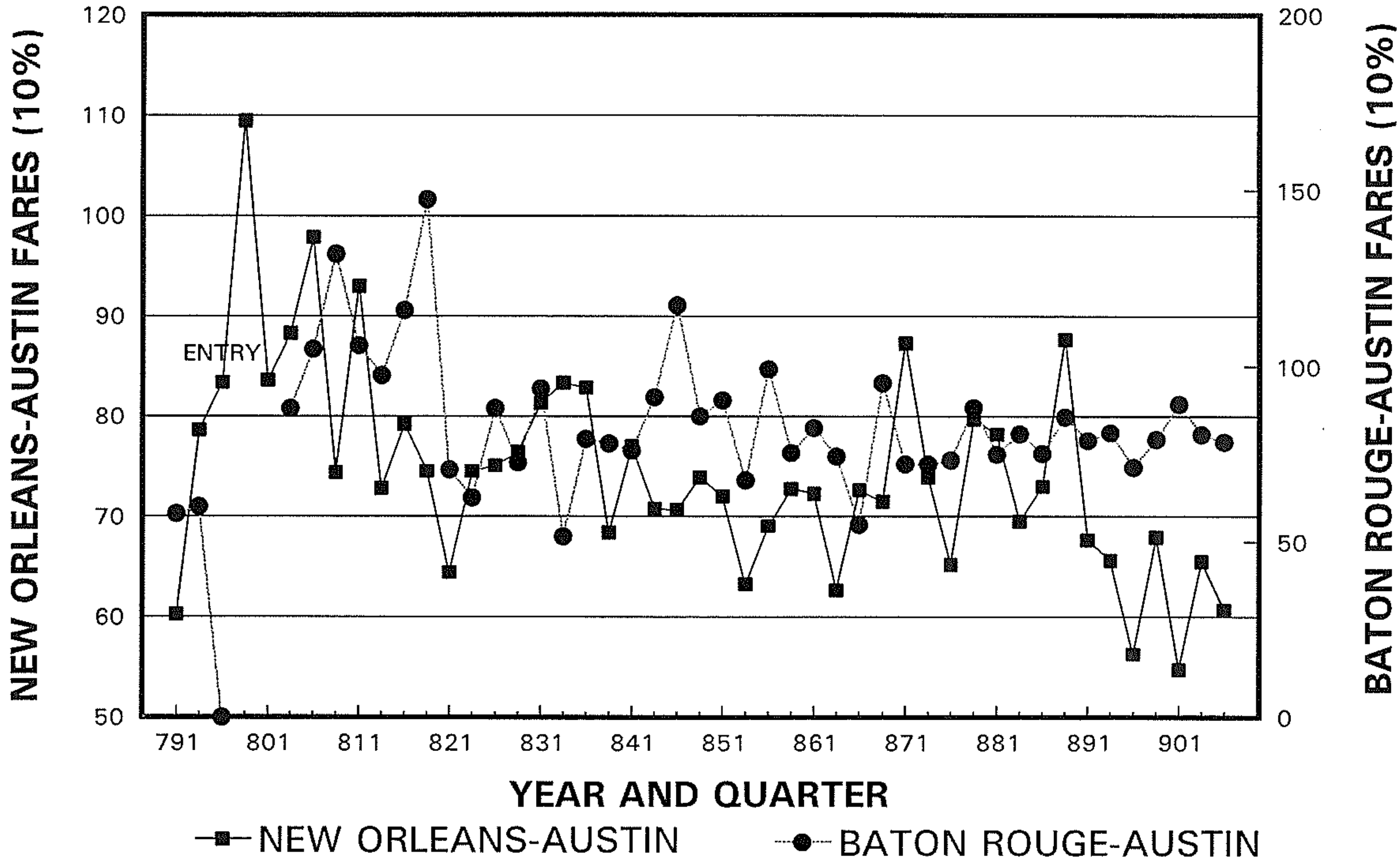
SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.6.
HISTORICAL IMPACT OF SOUTHWEST ENTRY
PASSENGERS (DEMAND)



SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.7.
HISTORICAL IMPACT OF SOUTHWEST ENTRY
FARES

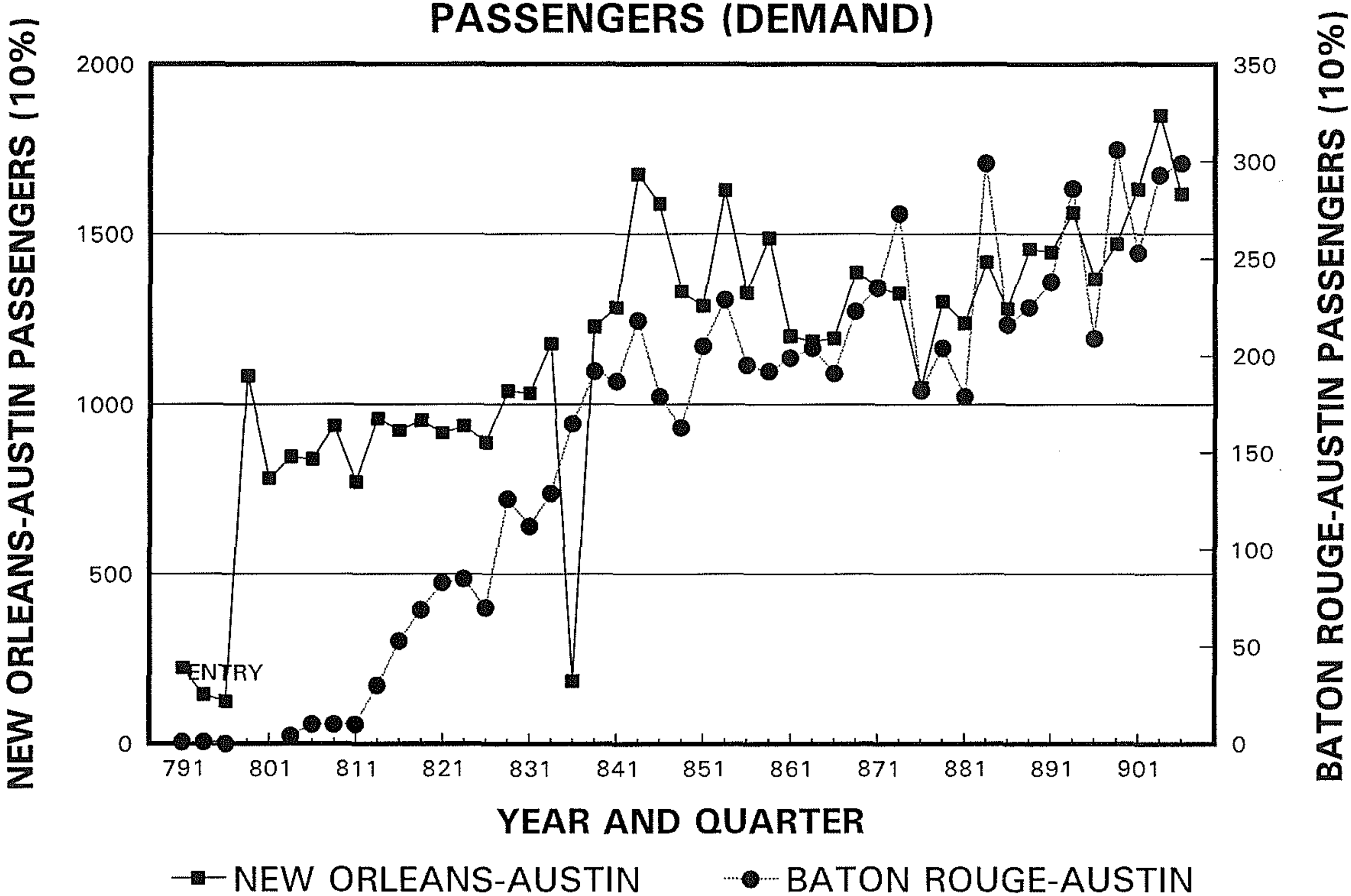


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.8.

HISTORICAL IMPACT OF SOUTHWEST ENTRY

PASSENGERS (DEMAND)

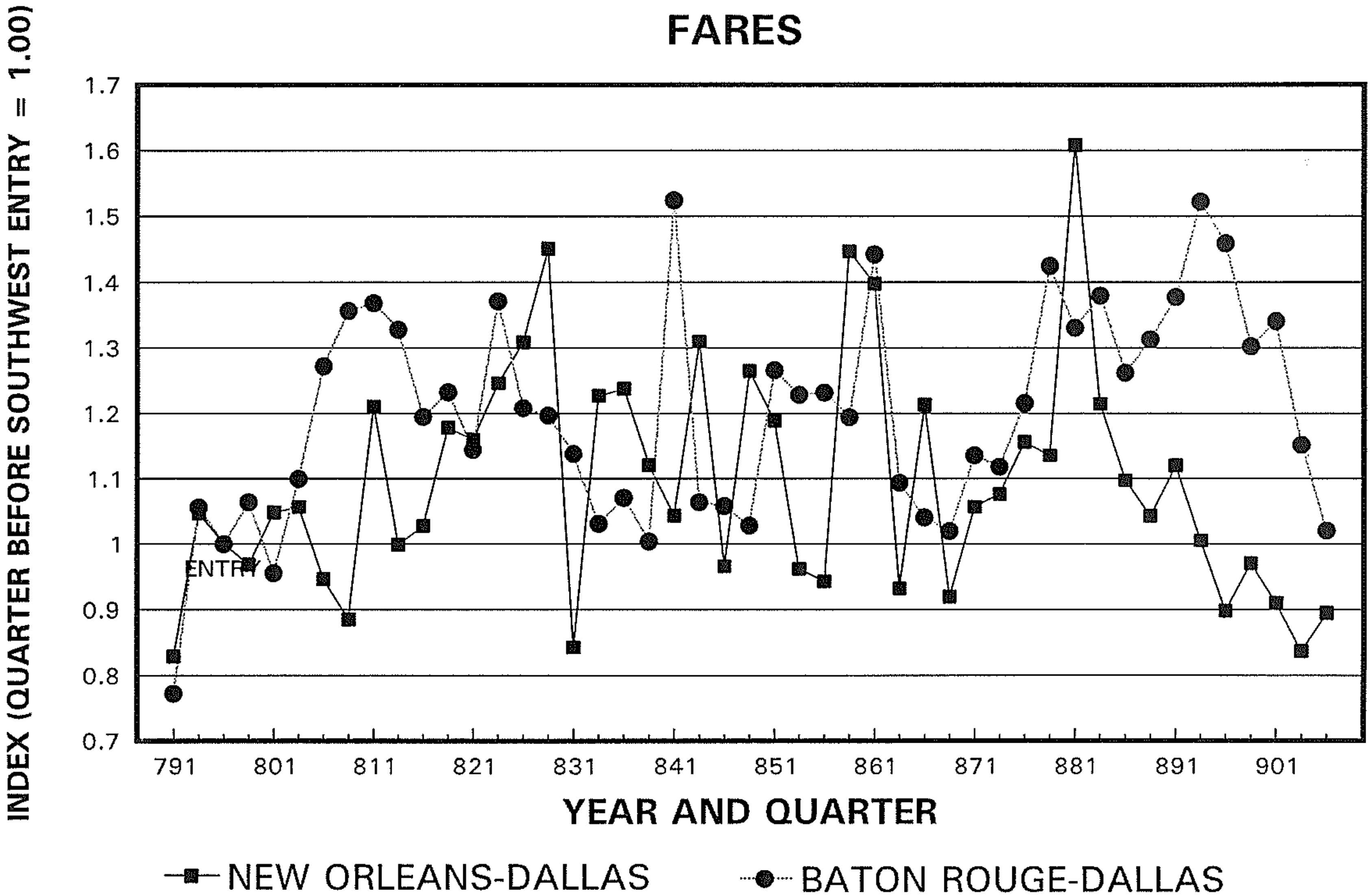


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.9.

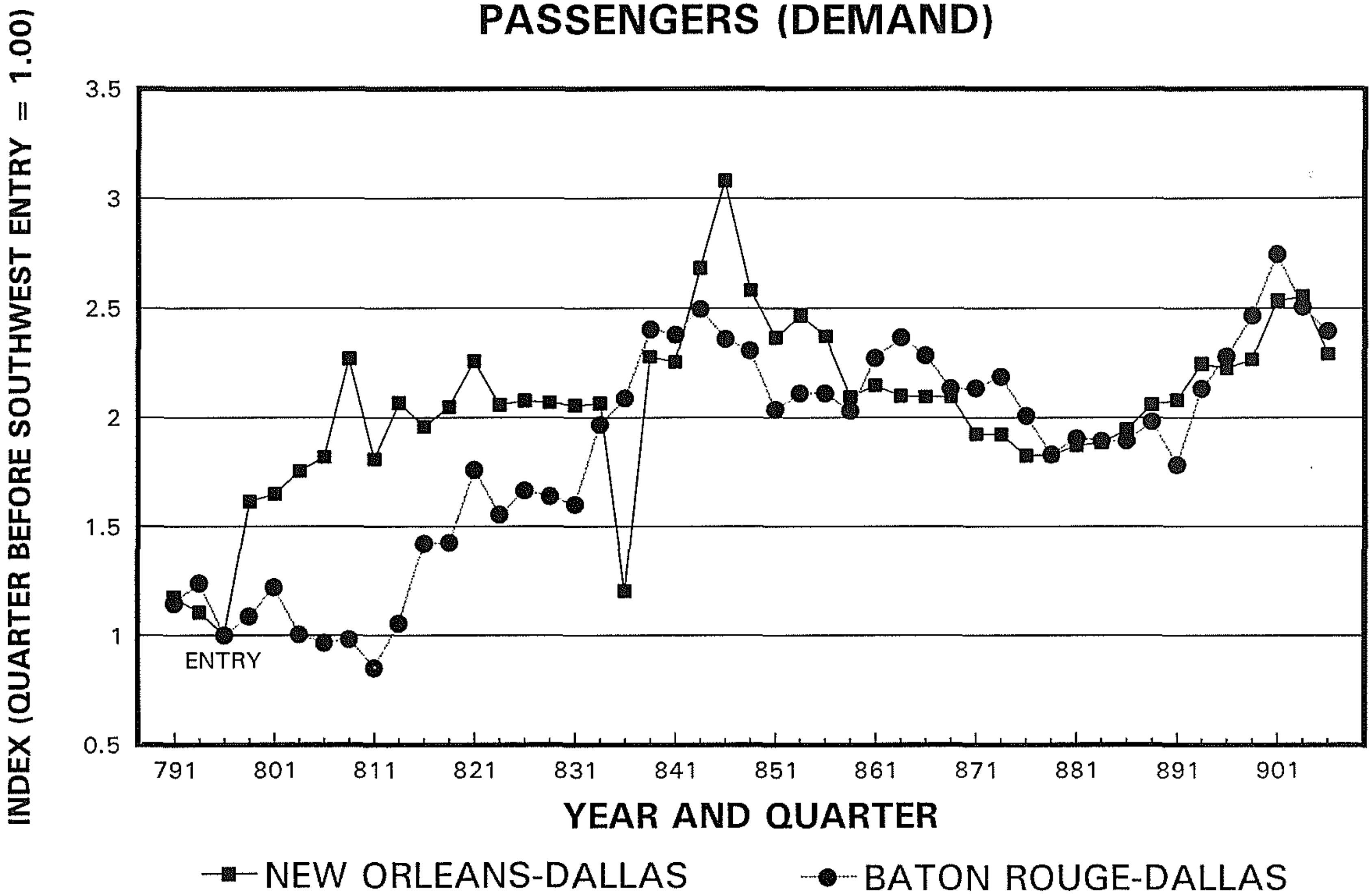
HISTORICAL IMPACT OF SOUTHWEST ENTRY

FARES



SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.10.
HISTORICAL IMPACT OF SOUTHWEST ENTRY
PASSENGERS (DEMAND)

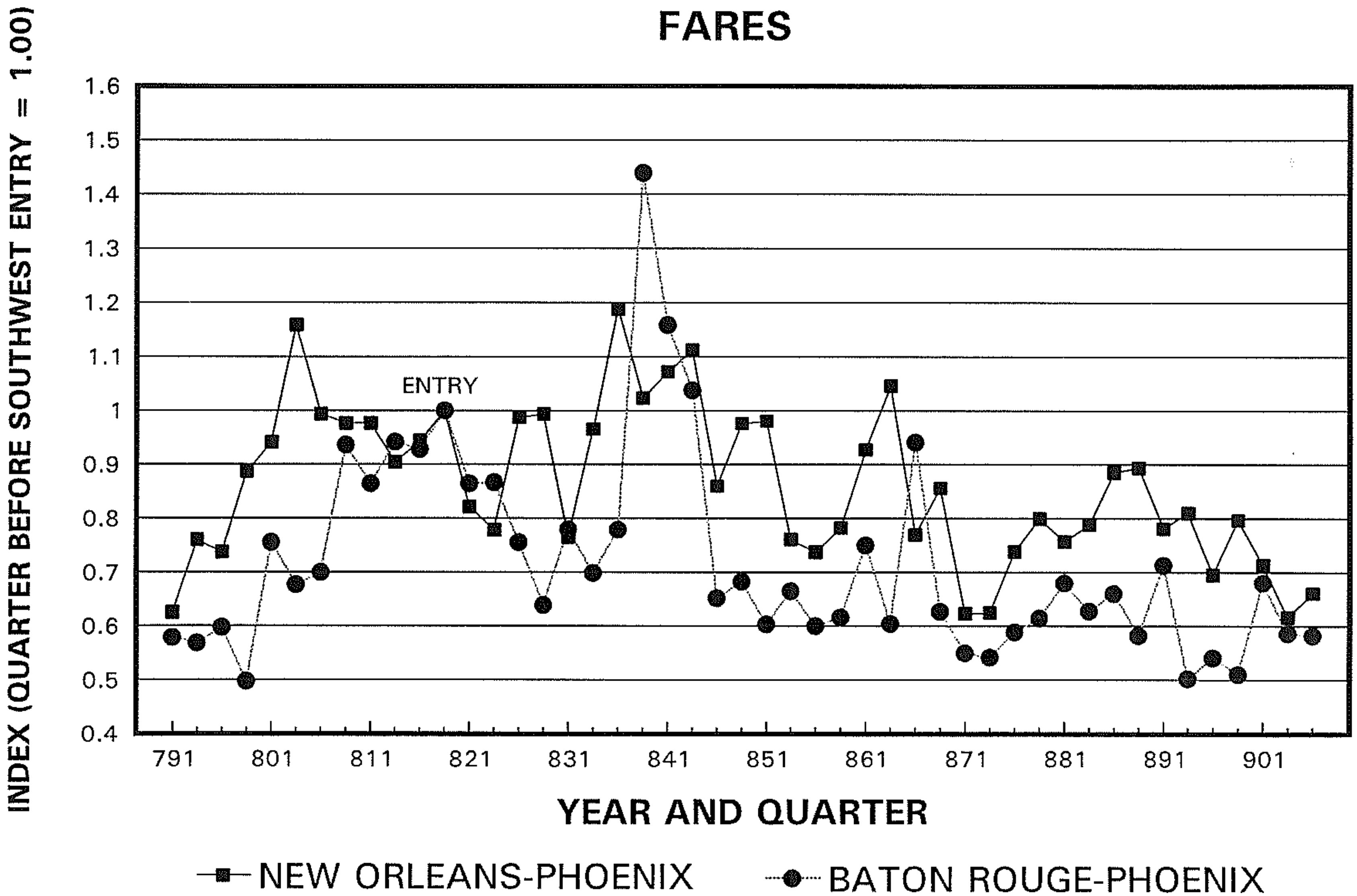


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.11.

HISTORICAL IMPACT OF SOUTHWEST ENTRY

FARES

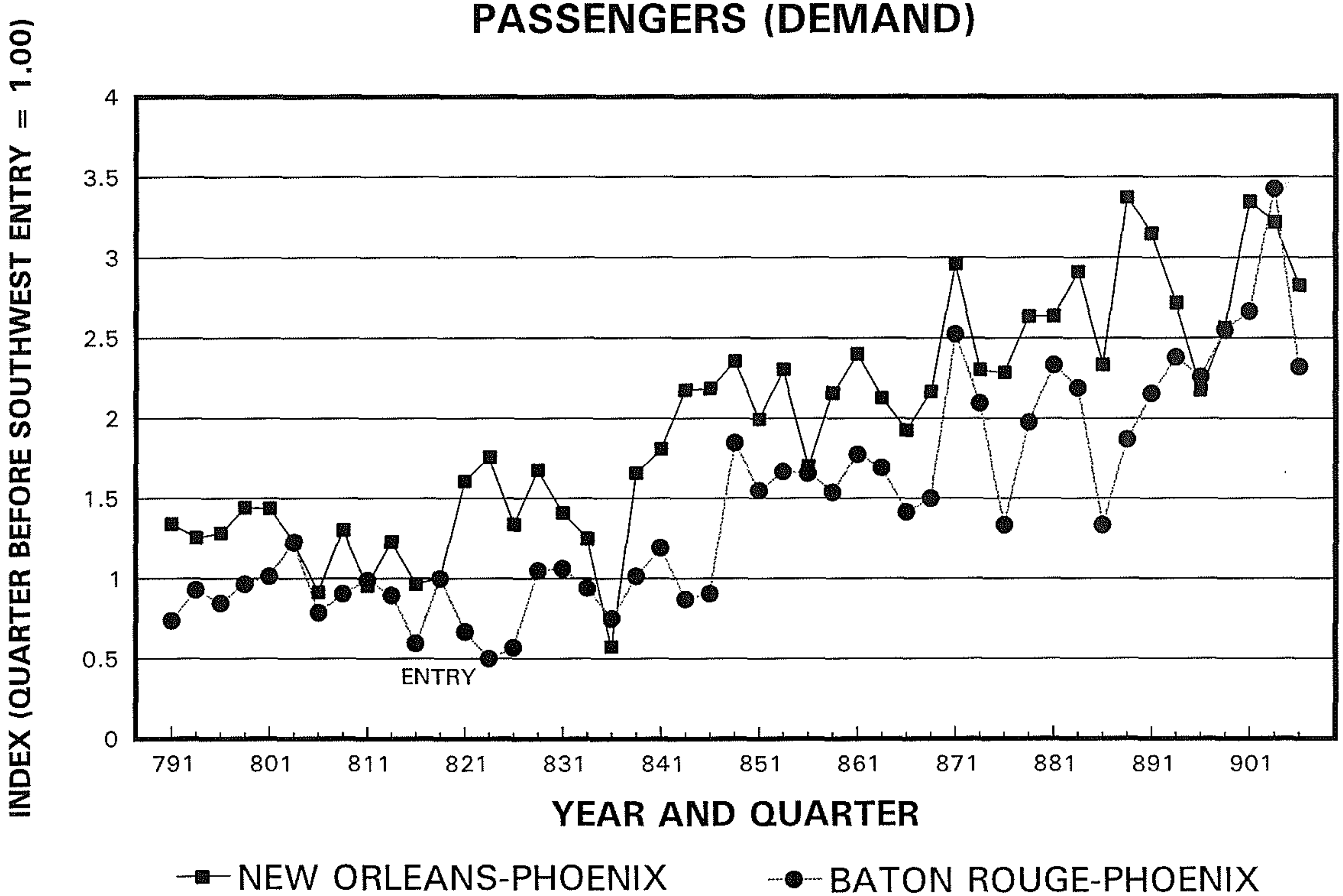


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.12.

HISTORICAL IMPACT OF SOUTHWEST ENTRY

PASSENGERS (DEMAND)

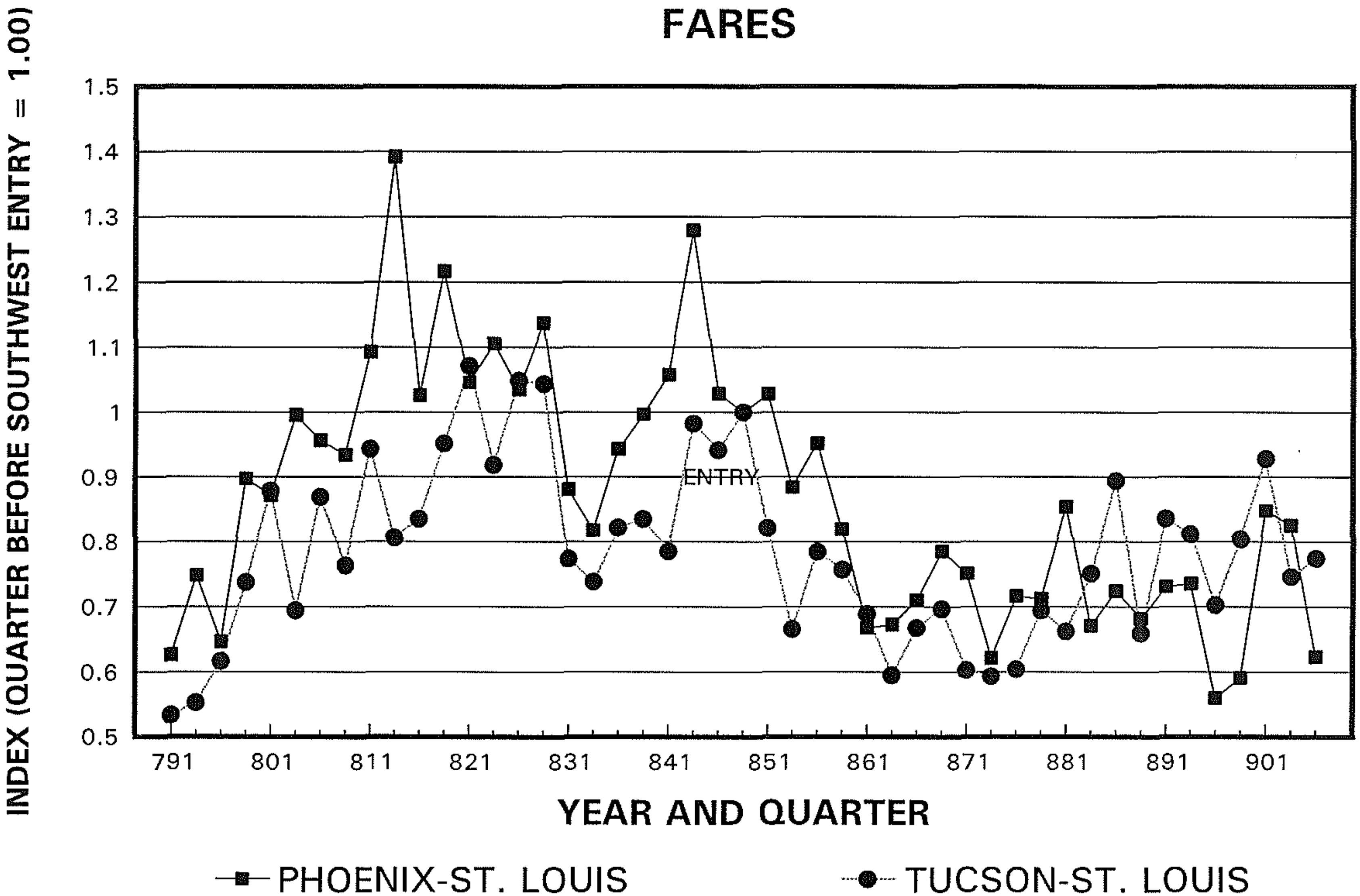


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.13.

HISTORICAL IMPACT OF SOUTHWEST ENTRY

FARES

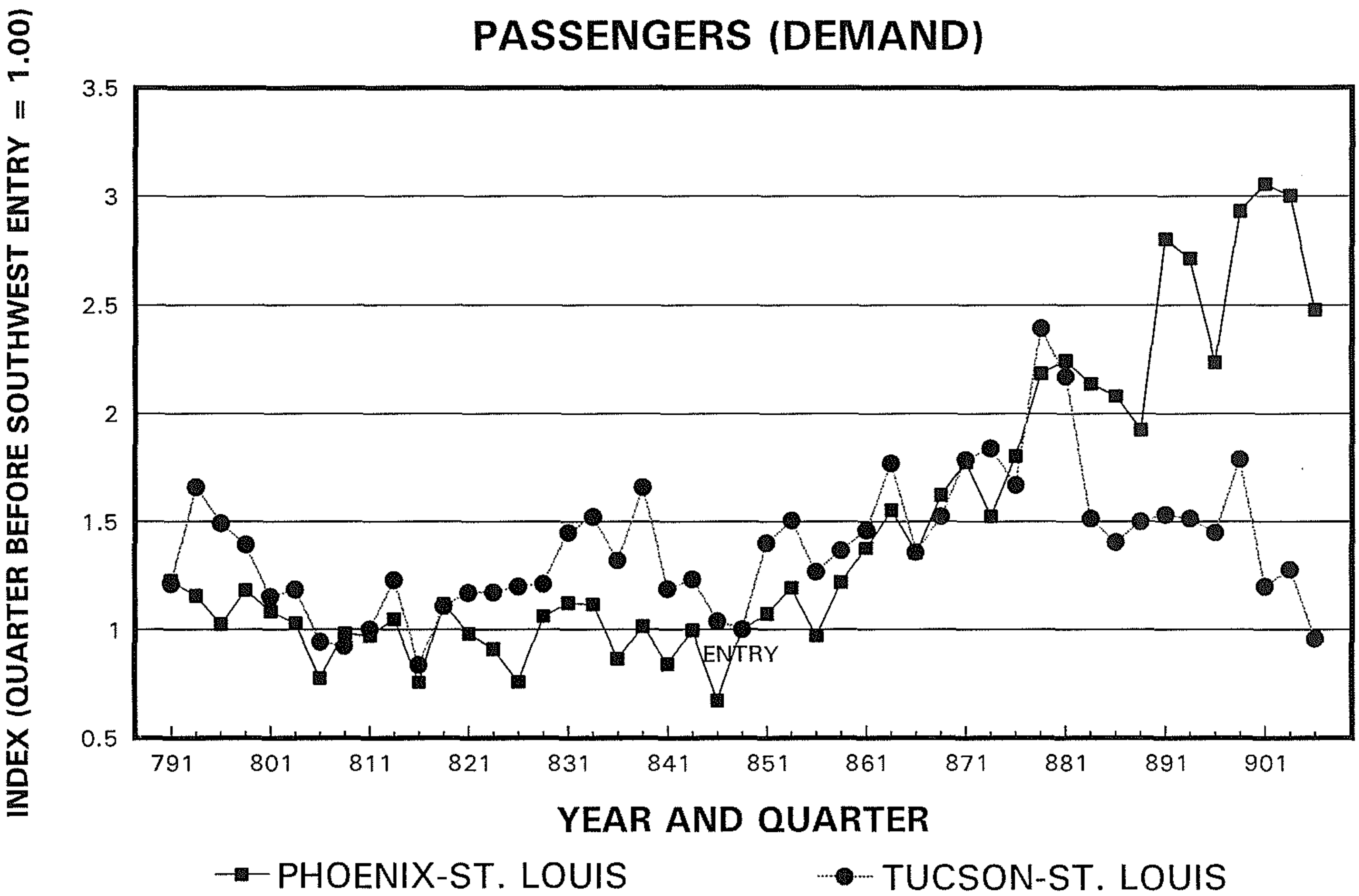


SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

FIGURE E.14.

HISTORICAL IMPACT OF SOUTHWEST ENTRY

PASSENGERS (DEMAND)



SOURCE: DOT TEN-PERCENT SAMPLE OF COUPONS

APPENDIX F:

Financial Analysis

TABLE F.1
REVENUES
(IN MILLIONS)

	1990	1989	1988	1987	1986
AMERICAN	11,719.60	10,479.60	8,824.30	7,198.00	6,018.20
AMERICA WEST	1,315.80	993.40	775.70	575.40	328.90
CONTINENTAL**	5,557.40	N.A.	N.A.	N.A.	N.A.
DELTA	8,585.20	8,089.50	6,915.40	5,318.20	4,460.10
MIDWAY*	655.40	493.50	412.00	346.90	261.40
SOUTHWEST	1,186.80	1,015.10	860.40	778.30	768.80
TWA	4,606.10	4,507.30	4,361.10	N.A.	N.A.
UNITED	11,037.50	9,793.60	8,981.70	8,305.00	7,119.20
USAIR	6,558.60	6,251.60	5,707.00	3,001.00	1,835.00

* Source: AVIATION DAILY 5/24/91 for 1990 Data
** Excludes EASTERN AIRLINES

TABLE F.2
OPERATING INCOME
(IN MILLIONS)

	1990	1989	1988	1987	1986
AMERICAN	124.00	744.00	806.50	461.10	410.90
AMERICA WEST	(31.60)	48.10	18.10	(35.40)	4.00
CONTINENTAL	N.A.	N.A.	N.A.	N.A.	N.A.
DELTA	419.50	678.30	497.10	404.50	34.50
MIDWAY*	(89.00)	(20.00)	10.90	23.80	11.00
SOUTHWEST	81.90	97.60	86.00	30.40	89.00
TWA	(162.30)	24.30	259.30	N.A.	N.A.
UNITED	(36.30)	464.50	664.90	247.30	90.40
USAIR	(501.10)	21.50	433.60	319.00	169.00

* Source: AVIATION DAILY 5/24/91 for 1990 Data

TABLE F.3

REVENUE YIELD PER RPM
(IN CENTS)

	1990	1989	1988	1987	1986
AMERICAN	12.64	12.03	11.66	10.80	10.17
AMERICA WEST	11.17	11.79	10.44	9.66	9.90
CONTINENTAL	N.A	11.18	10.06	9.15	N.A
DELTA	13.63	13.56	13.15	12.81	13.72
MIDWAY*	12.70	13.26	12.85	12.98	12.96
SOUTHWEST	11.49	10.49	10.79	9.65	10.05
TWA	11.24	10.95	10.66	N.A	N.A
UNITED*	12.61	12.22	11.10	10.30	10.00
USAIR	16.18	16.50	16.18	14.91	14.93

* Source: AVIATION DAILY 5/24/91 for 1990 Data

TABLE F.4

COST PER ASM
(IN CENTS)

	1990	1989	1988	1987	1986
AMERICAN	8.84	8.01	7.59	7.50	7.28
AMERICA WEST	7.37	6.89	6.21	5.92	6.14
CONTINENTAL	N.A.	8.25	7.62	6.85	N.A.
DELTA	8.46	8.17	7.48	7.12	8.30
MIDWAY	N.A.	8.16	7.36	7.17	7.58
SOUTHWEST	6.73	6.20	5.82	5.61	5.41
TWA	N.A.	N.A.	N.A.	N.A.	N.A.
UNITED	9.60	8.90	8.20	N.A.	N.A.
USAIR	10.84	10.46	9.40	8.90	8.74

TABLE F.5

REVENUE PER RPM - COST PER ASM
(IN CENTS)

	1990	1989	1988	1987	1986
AMERICAN	3.80	4.02	4.07	3.30	2.89
AMERICA WEST	3.80	4.90	4.23	3.74	3.76
CONTINENTAL	N.A.	2.93	2.44	2.30	N.A.
DELTA	5.17	5.39	5.67	5.69	5.42
MIDWAY	N.A.	5.10	5.49	5.81	5.38
SOUTHWEST	4.76	4.29	4.97	4.04	4.64
TWA	N.A.	N.A.	N.A.	N.A.	N.A.
UNITED	3.01	3.32	2.90	N.A.	N.A.
USAIR	5.34	6.04	6.78	6.01	6.19

TABLE F.6

LONG TERM DEBT AND CAPITAL LEASES

($ IN MILLIONS)

	1990	1989	1988	1987	1986
AMERICAN	$3,271.90	$2,305.80	$2,749.50	$2,781.00	$2,412.00
AMERICA WEST	620.70	474.90	384.80	369.20	254.80
CONTINENTAL	N.A.	N.A.	N.A.	N.A.	N.A.
DELTA	1,315.20	703.00	729.50	1,018.40	868.60
MIDWAY	N.A.	142.50	71.50	77.90	29.80
SOUTHWEST	327.00	354.10	370.00	251.10	339.10
TWA	2,464.79	2,672.48	N.A.	N.A.	N.A.
UNITED	1,249.00	1,334.09	2,060.20	1,711.60	1,323.00
USAIR	2,262.90	1,468.30	N.A.	N.A.	N.A.

TABLE F.7

DEBT/EQUITY RATIO

	1990	1989	1988	1987	1986
AMERICAN	87.78%	61.23%	83.37%	98.22%	96.14%
AMERICA WEST	2936.01%	544.60%	663.68%	804.95%	439.75%
CONTINENTAL	N.A.	N.A.	N.A.	N.A.	N.A.
DELTA	50.23%	26.84%	33.03%	52.55%	66.72%
MIDWAY	N.A.	129.55%	86.82%	103.22%	53.63%
SOUTHWEST	54.06%	60.30%	65.13%	48.83%	66.24%
TWA*	-346.17%	-775.41%	N.A.	N.A.	N.A.
UNITED	74.69%	85.17%	167.64%	N.A.	N.A.
USAIR	126.27%	65.24%	N.A.	N.A.	N.A.

* TWA Has Negative Equity

TABLE F.8

TOTAL LIABILITIES/ASSET RATIO

	1990	1989	1988	1987	1986
AMERICAN	72.09%	65.38%	66.32%	66.39%	66.67%
AMERICA WEST	98.19%	89.57%	90.93%	91.98%	84.97%
CONTINENTAL	197.58%	108.14%	N.A.	N.A.	N.A.
DELTA	63.77%	59.60%	61.57%	63.73%	65.61%
MIDWAY	N.A.	76.52%	70.40%	N.A.	N.A.
SOUTHWEST	58.89%	58.50%	56.64%	50.68%	51.78%
TWA	N.A.	N.A.	N.A.	N.A.	N.A.
UNITED	79.08%	78.26%	81.66%	N.A.	N.A.
USAIR	72.74%	62.92%	N.A.	N.A.	N.A.

TABLE F.9

TOTAL LIABILITIES/EQUITY RATIO

	1990	1989	1988	1987	1986
AMERICAN	2.58	1.89	1.97	1.98	2.00
AMERICA WEST	54.12	8.59	10.03	11.48	5.65
CONTINENTAL*	(2.02)	(13.29)	N.A.	N.A.	N.A.
DELTA	1.76	1.48	1.60	1.76	1.91
MIDWAY	N.A.	3.26	2.38	N.A.	N.A.
SOUTHWEST	1.43	1.41	1.31	1.03	1.07
TWA*	(5.60)	(11.91)	N.A.	N.A.	N.A.
UNITED	3.78	3.60	4.45	N.A.	N.A.
USAIR	2.67	1.70	N.A.	N.A.	N.A.

* Equity is negative

TABLE F.10

CURRENT RATIO

	1990	1989	1988	1987	1986
AMERICAN	0.55	0.60	N.A.	N.A.	N.A.
AMERICA WEST	0.73	0.91	N.A.	N.A.	N.A.
CONTINENTAL	0.95	N.A.	N.A.	N.A.	N.A.
DELTA	0.56	0.84	N.A.	N.A.	N.A.
MIDWAY	N.A.	0.64	0.83	N.A.	N.A.
SOUTHWEST	0.70	1.04	N.A.	N.A.	N.A.
TWA	0.74	0.96	N.A.	N.A.	N.A.
UNITED	0.70	0.85	0.75	1.03	0.47
USAIR	0.66	0.61	N.A.	N.A.	N.A.

TABLE F.11

NET CASH PROVIDED BY OPERATING ACTIVITIES
(IN MILLIONS)

	1990	1989	1988	1987	1986
AMERICAN	$685.80	$1,325.50	$1,598.70	N.A.	N.A.
AMERICA WEST	66.60	79.80	93.50	N.A.	N.A.
CONTINENTAL	(80.50)	(397.20)	(19.30)	N.A.	N.A.
DELTA	803.80	1,092.00	675.70	N.A.	N.A.
MIDWAY	N.A.	26.70	47.00	48.50	N.A.
SOUTHWEST	111.90	168.00	177.60	N.A.	N.A.
TWA	(317.10)	(104.70)	N.A.	N.A.	N.A.
UNITED	715.90	658.50	771.80	N.A.	N.A.
USAIR	90.80	399.20	508.60	N.A.	N.A.

TABLE F.12

NET CASH PROVIDED BY OPERATING ACTIVITIES
AS A PERCENT OF REVENUE

	1990	1989	1988	1987	1986
AMERICAN	5.85%	12.65%	18.12%	N.A.	N.A.
AMERICA WEST	5.06%	8.04%	12.06%	N.A.	N.A.
CONTINENTAL	1.26%	7.61%	5.94%	N.A.	N.A.
DELTA	9.37%	13.50%	9.77%	N.A.	N.A.
MIDWAY	N.A.	5.41%	11.40%	13.98%	N.A.
SOUTHWEST	9.43%	16.55%	20.64%	N.A.	N.A.
TWA	-6.88%	-2.32%	N.A.	N.A.	N.A.
UNITED	6.49%	6.72%	8.59%	N.A.	N.A.
USAIR	1.38%	6.39%	8.91%	N.A.	N.A.

TABLE F.13

OWNED AIRCRAFT AS A PERCENT OF TOTAL FLEET
(DOES NOT INCLUDE COMMUTER AIRCRAFT)

	1990	1989	1988	1987	1986
AMERICAN	42.93%	N.A.	N.A.	N.A.	N.A.
AMERICA WEST	21.15%	N.A.	N.A.	N.A.	N.A.
CONTINENTAL	28.65%	31.36%	N.A.	N.A.	N.A.
DELTA	60.28%	N.A.	N.A.	N.A.	N.A.
MIDWAY	N.A.	24.39%	N.A.	N.A.	N.A.
SOUTHWEST	60.38%	N.A.	N.A.	N.A.	N.A.
TWA	133 LEASED*	N.A.	N.A.	N.A.	N.A.
UNITED	56.06%	N.A.	N.A.	N.A.	N.A.
USAIR	454 A/C TOTAL	N.A.	N.A.	N.A.	N.A.

* Two A/C Unavailable for Purchase Upon Expiration of Lease in Oct. 1991

TABLE F.14

TIMES INTEREST EARNED

	1990	1989	1988	1987	1986
AMERICAN	0.62	3.58	3.94	N.A.	N.A.
AMERICA WEST	-0.35	1.35	0.65	N.A.	N.A.
CONTINENTAL	N.A.	N.A.	N.A.	N.A.	N.A.
DELTA	15.71	17.45	7.62	6.53	0.62
MIDWAY	N.A.	-2.54	1.61	3.65	N.A.
SOUTHWEST	4.90	4.91	4.86	N.A.	N.A.
TWA	-0.38	0.21	1.29	N.A.	N.A.
UNITED	0.71	3.46	3.57	N.A.	N.A.
USAIR	-3.11	0.26	3.62	N.A.	N.A.

TABLE F.15
PERCENTAGE CHANGE OF REVENUES

	1990	1989	1988	1987
AMERICAN	11.83%	18.76%	22.59%	19.60%
AMERICA WEST	32.45%	28.06%	34.81%	74.95%
CONTINENTAL	N.A.	N.A.	N.A.	N.A.
DELTA	6.13%	16.98%	30.03%	19.24%
MIDWAY	32.81%	19.78%	18.77%	32.71%
SOUTHWEST	16.91%	17.98%	10.55%	1.24%
TWA	2.19%	3.35%	N.A.	N.A.
UNITED	12.70%	9.04%	8.15%	16.66%
USAIR	4.91%	9.54%	90.17%	63.54%

TABLE F.16
PERCENTAGE CHANGE OF OPERATING INCOME

	1990	1989	1988	1987
AMERICAN	-83.33%	-7.75%	74.91%	12.22%
AMERICA WEST	-165.70%	165.75%	-151.13%	-985.00%
CONTINENTAL	N.A.	N.A.	N.A.	N.A.
DELTA	-38.15%	36.45%	22.89%	1072.46%
MIDWAY	345.00%	-283.49%	-54.20%	116.36%
SOUTHWEST	-16.09%	13.49%	182.89%	-65.84%
TWA	-767.90%	-90.63%	N.A.	N.A.
UNITED	-107.81%	-30.14%	168.86%	173.56%
USAIR	-2430.70%	-95.04%	35.92%	88.76%

TABLE F.17
PERCENTAGE CHANGE IN
REVENUE YIELD PER RPM

	1990	1989	1988	1987
AMERICAN	5.07%	3.17%	7.96%	6.19%
AMERICA WEST	-5.26%	12.93%	8.07%	-2.42%
CONTINENTAL	N.A.	11.13%	9.95%	N.A.
DELTA	0.52%	3.12%	2.65%	-6.63%
MIDWAY	-4.22%	3.19%	-1.00%	0.15%
SOUTHWEST	9.53%	-2.78%	11.81%	-3.98%
TWA	2.65%	2.72%	N.A.	N.A.
UNITED	3.19%	10.09%	7.77%	3.00%
USAIR	-1.94%	1.98%	8.52%	-0.13%

TABLE F.18

PERCENTAGE CHANGE IN
COST PER ASM

	1990	1989	1988	1987
AMERICAN	10.36%	5.53%	1.20%	3.02%
AMERICA WEST	6.97%	10.95%	4.90%	-3.58%
CONTINENTAL	N.A.	8.27%	11.24%	N.A.
DELTA	3.55%	9.22%	5.06%	-14.22%
MIDWAY	N.A.	10.87%	2.65%	-5.41%
SOUTHWEST	8.55%	6.53%	3.74%	3.70%
TWA	N.A.	N.A.	N.A.	N.A.
UNITED	7.87%	8.54%	N.A.	N.A.
USAIR	3.63%	11.28%	5.62%	1.83%

TABLE F.19

PERCENTAGE CHANGE IN
REVENUE PER RPM - COST PER ASM

	1990	1989	1988	1987
AMERICAN	-5.47%	-1.23%	23.33%	14.19%
AMERICA WEST	-22.45%	15.84%	13.10%	-0.53%
CONTINENTAL	N.A.	20.08%	6.09%	N.A.
DELTA	-4.08%	-4.94%	-0.35%	4.98%
MIDWAY	N.A.	-7.10%	-5.51%	7.99%
SOUTHWEST	10.96%	-13.68%	23.02%	-12.93%
TWA	N.A.	N.A.	N.A.	N.A.
UNITED	-9.34%	14.48%	N.A.	N.A.
USAIR	-11.59%	-10.91%	12.81%	-2.91%

TABLE F.20

PERCENTAGE CHANGE IN
LONG TERM DEBT AND CAPITAL LEASES

	1990	1989	1988	1987
AMERICAN	41.90%	-16.14%	-1.13%	15.30%
AMERICA WEST	30.70%	23.41%	4.23%	44.90%
CONTINENTAL	N.A.	N.A.	N.A.	N.A.
DELTA	87.08%	-3.63%	-28.37%	17.25%
MIDWAY	N.A.	99.30%	-8.22%	161.41%
SOUTHWEST	-7.65%	-4.30%	47.35%	-25.95%
TWA	-7.77%	N.A.	N.A.	N.A.
UNITED	-6.38%	-35.24%	20.37%	29.37%
USAIR	54.12%	N.A.	N.A.	N.A.

TABLE F.21

PERCENTAGE POINT CHANGE IN
DEBT/EQUITY RATIO

	1990	1989	1988	1987
AMERICAN	26.55	-22.14	-14.85	2.08
AMERICA WEST	2,391.41	-119.08	-141.28	365.20
CONTINENTAL	N.A.	N.A.	N.A.	N.A.
DELTA	23.40	-6.19	-19.53	-14.16
MIDWAY	N.A.	42.73	-16.40	49.59
SOUTHWEST	-6.24	-4.83	16.30	-17.41
TWA	429.25	N.A.	N.A.	N.A.
UNITED	-10.48	-82.48	N.A.	N.A.
USAIR	61.03	N.A.	N.A.	N.A.

TABLE F.22

PERCENTAGE POINT CHANGE IN
TOTAL LIABILITIES/ASSET RATIO

	1990	1989	1988	1987
AMERICAN	6.71	-0.94	-0.07	-0.28
AMERICA WEST	8.62	-1.37	-1.05	7.02
CONTINENTAL	89.44	N.A.	N.A.	N.A.
DELTA	4.17	-1.98	-2.15	-1.88
MIDWAY	N.A.	6.12	N.A.	N.A.
SOUTHWEST	0.39	1.86	5.96	-1.10
TWA	N.A.	N.A.	N.A.	N.A.
UNITED	0.82	-3.40	N.A.	N.A.
USAIR	9.82	N.A.	N.A.	N.A.

TABLE F.23

POINT CHANGE IN
TOTAL LIABILITIES/EQUITY RATIO

	1990	1989	1988	1987
AMERICAN	0.69	-0.08	-0.01	-0.03
AMERICA WEST	45.53	-1.44	-1.45	5.82
CONTINENTAL	11.26	N.A.	N.A.	N.A.
DELTA	0.29	-0.13	-0.15	-0.15
MIDWAY	N.A.	0.88	N.A.	N.A.
SOUTHWEST	0.02	0.10	0.28	-0.05
TWA	6.30	N.A.	N.A.	N.A.
UNITED	0.18	-0.85	N.A.	N.A.
USAIR	0.97	N.A.	N.A.	N.A.

TABLE F.24

POINT CHANGE IN
CURRENT RATIO

	1990	1989
AMERICAN	-0.05	N.A.
AMERICA WE:	-0.19	N.A.
CONTINENTAI	N.A.	N.A.
DELTA	-0.28	N.A.
MIDWAY	N.A.	-0.18
SOUTHWEST	-0.34	N.A.
TWA	-0.22	N.A.
UNITED	-0.15	N.A.
USAIR	0.05	N.A.

TABLE F.25

PERCENTAGE CHANGE IN
NET CASH PROVIDED BY OPERATING ACTIVITIES

	1990	1989
AMERICAN	-48.26%	-17.09%
AMERICA WEST	-16.54%	-14.65%
CONTINENTAL	79.73%	-1958.03%
DELTA	-26.39%	61.61%
MIDWAY	N.A.	-43.19%
SOUTHWEST	-33.39%	-5.41%
TWA	-202.87%	N.A.
UNITED	8.72%	-14.68%
USAIR	-77.25%	-21.51%

TABLE F.26

POINT CHANGE IN
TIMES INTEREST EARNED

	1990	1989	1988	1987
AMERICAN	-2.96	-0.36	N.A.	N.A.
AMERICA WEST	-1.69	0.70	N.A.	N.A.
CONTINENTAL	N.A.	N.A.	N.A.	N.A.
DELTA	-1.75	9.83	1.09	5.91
MIDWAY	N.A.	-4.16	-2.04	N.A.
SOUTHWEST	-0.01	0.05	N.A.	N.A.
TWA	-0.59	-1.08	N.A.	N.A.
UNITED	-2.74	-0.12	N.A.	N.A.
USAIR	-3.36	-3.36	N.A.	N.A.

APPENDIX G:

Data Supporting Carrier Impacts Analysis

APPENDIX G: DATA SUPPORTING CARRIER IMPACTS ANALYSIS

Two impact analyses were conducted for this study. Each rely on the econometrically derived historical relationship between fare, service and demand. The results of the first were based solely on the origin and destination demand, forecast forward as needed based on the baseline Metroplex growth rate (described in Chapter 2 and Appendix H).

The second approach was to estimate the total number of passengers potentially affected based on existing service levels for affected markets. These service levels were based on the *Official Airlines Guide*. The results of that analysis, coupled with the average fare and traffic stimulus data, are presented in Tables G.1. through G.5. Because airline schedules change rapidly and would be expected to change dramatically following market entry by Southwest, this second analysis is intended to provide a sense of the relative impacts by carrier, but is not intended to provide a definitive estimate of the financial impacts by carrier. Thus, although these data are presented for one year's operations, the actual impacts are not expected to be of this magnitude over the course of an entire year. This analysis does not address the potential cost ramifications of service or equipment (aircraft type) changes.

In short, the mathematical approach to deriving this estimate was straightforward. First, based on the *Official Airlines Guide* schedules and detail on individual carrier aircraft configurations, an average daily number of seats by carrier between each market was calculated and summed (Tables G.1 and G.2). Second, for each of the connecting markets, the average historical relationship between connecting fares and originating fares was established (Table G.3). This data, coupled with historical data on demand and an assumed total connecting traffic level of 67 percent (Tables G.4.A & B) provided the information necessary to support an estimated total revenue to the carriers for each market, then reduced to the new incremental forecast revenue reduction for that market based on the potential fare impacts of Southwest entry (Table G.4.C). Table G.5 summarizes these findings by carrier.

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
BHM	8		AA	M80	142	A	0	7	142	
	8		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	568
			DL	D9S	98	A	0	7	98	
			DL	D9S	98	A	0	7	98	
			DL	M80	142	A	1	7	142	
			DL	757	187	A	1	7	187	525
BUR	9		AA	M80	142	A	0	7	142	
	9		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
		SNA	AA	757	194	A	0	7	194	620
		SLC	DL	757	187	A	0	7	187	187
		PHX	HP	733	131	X7	0	6	112	
		PHX	HP	733	131	A	0	7	131	
		PHX	HP	733	131	A	0	7	131	
		PHX	HP	733	131	A	0	7	131	505
CHI	38		AA	M80	142	A	0	7	142	
	39		AA	M80	142	4	0	5	101	
			AA	72S	150	A	0	7	150	
			AA	72S	150	X6	0	6	129	
			AA	72S	150	A	0	7	150	
			AA	72S	150	A	0	7	150	
			AA	757	194	A	0	7	194	
			AA	757	194	A	0	7	194	
			AA	767	204	A	0	7	204	
			AA	D10	290	5	0	5	207	
			AA	D10	290	A	0	7	290	
			AA	D10	290	A	0	7	290	
			AA	D10	290	X4	0	6	249	
			AA	D10	290	A	0	7	290	
			AA	D10	290	2	0	5	207	2,947
		IAH	CO	D9S	108	A	0	7	108	
		IAH	CO	D9S	108	X67	0	5	77	
		IAH	CO	733	130	A	0	7	130	
		IAH	CO	733	130	A	0	7	130	
		IAH	CO	M80	146	X6	0	6	125	
		IAH	CO	72S	149	X6	0	6	128	698
			DL	D9S	98	A	0	7	98	
			DL	D9S	98	A	0	7	98	
			DL	72S	148	A	0	7	148	
			DL	72S	148	X67	0	5	106	
			DL	72S	148	A	0	7	148	598
			ML	D9S	78	A	0	7	78	

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
			ML	D9S	78	A	0	7	78	
			ML	D9S	78	A	0	7	78	
			ML	D9S	78	A	0	7	78	
			ML	D9S	78	X7	0	6	67	379
			UA	73S	109	X7	0	6	93	
			UA	72S	147	A	0	7	147	
			UA	72S	147	A	0	7	147	
			UA	72S	147	A	0	7	147	534
		DAY	US	D9S	128	A	0	7	128	
		DAY	US	D9S	128	X23	0	5	91	
		DAY	US	D9S	128	7	0	5	91	
		DAY	US	D9S	128	X67	0	5	91	402
DTT	26		AA	M80	142	A	0	7	142	
	26		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	568
		IAH	CO	D9S	108	X67	0	5	77	
		IAH	CO	D9S	108	A	0	7	108	
		IAH	CO	733	130	X6	0	6	111	
		IAH	CO	72S	149	6	0	5	106	403
			DL	73S	107	A	0	7	107	
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	0	7	142	391
			ML	D9S	78	X7	0	6	67	67
			NW	D9S	111	A	0	7	111	
			NW	D9S	111	X6	0	6	95	
			NW	D9S	111	X7	0	6	95	
			NW	D9S	111	A	0	7	111	412
		STL	TW	DC9	73	A	0	7	73	
		STL	TW	D9S	102	A	0	7	102	
		STL	TW	D9S	102	A	0	7	102	
		STL	TW	D9S	102	A	0	7	102	
		STL	TW	D9S	102	A	0	7	102	481
		DAY	US	D9S	128	X6	0	6	110	
		DAY	US	D9S	128	A	0	7	128	
		DAY	US	D9S	128	X67	0	5	91	
		DAY	US	D9S	128	145	0	3	55	
		DAY	US	D9S	128	A	0	7	128	512
IND	13		AA	72S	150	A	0	7	150	
	13		AA	72S	150	A	0	7	150	
			AA	72S	150	A	0	7	150	450
			DL	73S	107	A	0	7	107	
			DL	M80	142	A	0	7	142	249
		MEM	NW	D9S	111	A		7	111	
		MEM	NW	D9S	111	X6		6	95	206

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
		STL	TW	DC9	73	A		7	73	
		STL	TW	D9S	102	A		7	102	
		STL	TW	D9S	102	A		7	102	
		STL	TW	D9S	102	A		7	102	
		STL	TW	D9S	102	A		7	102	481
		DAY	US	D9S	128	X6		6	110	110
MKC	13		AA	M80	142	A	0	7	142	
	13		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	X6		6	122	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	1,116
			DL	D9S	98	A	0	7	98	
			DL	73S	107	A	0	7	107	
			DL	733	128	A	0	7	128	
			DL	733	128	A	0	7	128	
			DL	M80	142	A	0	7	142	603
LAS	18		AA	M80	142	A	0	7	142	
	18		AA	M80	142	A	0	7	142	
			AA	757	194	X6		6	166	
			AA	D10	290	A	0	7	290	
			AA	D10	290	A	0	7	290	
			AA	D10	290	A	0	7	290	1,320
			DL	733	128	A	0	7	128	
			DL	72S	148	A	0	7	148	
			DL	72S	148	A	0	7	148	
			DL	767	204	A	0	7	204	
			DL	767	204	A	0	7	204	832
			HP	73S	122	A	0	7	122	
			HP	73S	122	A	0	7	122	
			HP	733	131	A	0	7	131	
		PHX	HP	733	131	A		7	131	
		PHX	HP	733	131	A		7	131	
		PHX	HP	733	131	A		7	131	
		PHX	HP	320	148	A		7	148	916
MEM	14		AA	M80	142	A	0	7	142	
	14		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	72S	150	A	0	7	150	576
			DL	D9S	98	A	0	7	98	
			DL	D9S	98	A	0	7	98	
			DL	D9S	98	A	0	7	98	

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
			DL	73S	107	A	0	7	107	
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	1	7	142	
			DL	M80	142	A	1	7	142	827
			NW	DC9	78	A	0	7	78	
			NW	D9S	111	A	0	7	111	
			NW	D9S	111	X6	0	6	95	284
BNA	11		AA	M80	142	A	0	7	142	
	11		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	757	194	A	0	7	194	904
			DL	D9S	98	A	0	7	98	
			DL	73S	107	A	0	7	107	
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	0	7	142	489
		STL	TW	D9S	102	A		7	102	102
OAK	14		AA	M80	142	X7	0	6	122	
	14		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	72S	150	7	0	5	107	513
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	0	7	142	
		LAS*	DL	72S	148	X6		6	127	
		SLC	DL	757	187	A		7	187	
		SLC	DL	757	187	A		7	187	785
		LAS	HP	73S	122	A		7	122	
		PHX	HP	733	131	A		7	131	
		PHX	HP	733	131	X7		6	112	
		LAS	HP	733	131	X6		6	112	
		PHX	HP	320	148	A		7	148	626
ONT	18		AA	M80	142	A	0	7	142	
	18		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	757	194	A	0	7	194	762
			CO	73S	102	A	0	7	102	102
			DL	733	128	A	2	7	128	
			DL	M80	142	A	1	7	142	
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	0	7	142	
			DL	72S	148	A	0	7	148	844

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
		LAS	HP	73S	122	A		7	122	
		PHX	HP	733	131	A		7	131	
		PHX	HP	733	131	A		7	131	
		PHX	HP	733	131	A		7	131	
		LAS	HP	733	131	X6		6	112	
		PHX	HP	320	148	A		7	148	775
PHX	14		AA	M80	142	A	0	7	142	
	14		AA	72S	150	A	0	7	150	
			AA	72S	150	X6	0	6	129	
			AA	72S	150	A	0	7	150	
			AA	72S	150	A	0	7	150	
			AA	D10	290	A	0	7	290	1,011
			DL	72S	148	A	0	7	148	
			DL	72S	148	A	0	7	148	
			DL	72S	148	A	0	7	148	
			DL	757	187	A	0	7	187	631
			HP	733	131	A	0	7	131	
			HP	733	131	A	0	7	131	
			HP	733	131	A	0	7	131	
			HP	320	148	A	0	7	148	541
RNO	14		AA	72S	150	A	0	7	150	
	14		AA	72S	150	A	0	7	150	
			AA	72S	150	A	0	7	150	450
			DL	73S	107	A	2	7	107	
			DL	72S	148	A	0	7	148	
			DL	72S	148	A	0	7	148	
		SLC	DL	757	187	A		7	187	
		SFO*	DL	757	187	A		7	187	777
		LAS	HP	73S	122	X7		6	105	
		LAS	HP	73S	122	A		7	122	
			HP	733	131	A	1	7	131	
			HP	320	148	X7	1	6	127	484
			UA	73S	109	A	1	7	109	
		SFO	UA	72S	147	A		7	147	256
SAN	15		AA	757	194	A	0	7	194	
	15		AA	757	194	A	1	7	194	
			AA	757	194	A	0	7	194	
			AA	767	204	A	0	7	204	786
		DEN	CO	73S	102	A		7	102	
		DEN	CO	73S	102	A		7	102	
		DEN	CO	D9S	108	X6		6	93	
			CO	72S	149	A	1	7	149	446
			DL	M80	142	A	1	7	142	
			DL	M80	142	A	0	7	142	

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
			DL	72S	148	A	0	7	148	
		LAS	DL	72S	148	A		7	148	
			DL	757	187	A	0	7	187	
			DL	757	187	A	0	7	187	954
			HP	73S	122	A	0	7	122	122
SFO	32	RNO*	AA	M80	142	X6		6	122	
	32		AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	X7	0	6	122	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	72S	150	7	0	5	107	
			AA	757	194	7	0	5	139	
			AA	757	194	X7	0	6	166	
			AA	767	204	A	0	7	204	
			AA	767	204	A	0	7	204	
			AA	D10	290	A	0	7	290	
			AA	D10	290	A	0	7	290	2,353
		DEN	CO	73S	102	A		7	102	
		DEN	CO	73S	102	A		7	102	
		DEN	CO	D9S	108	X6		6	93	
		DEN	CO	72S	149	A		7	149	446
			DL	M80	142	A	0	7	142	
			DL	M80	142	A	0	7	142	
		LAS*	DL	72S	148	X6		6	127	
			DL	757	187	A	0	7	187	
			DL	757	187	A	0	7	187	
			DL	767	204	A	0	7	204	
			DL	767	204	A	0	7	204	
		SLC	DL	763	254	A		7	254	
			DL	763	254	A	0	7	254	1,701
		PHX	HP	733	131	X7		6	112	
		PHX	HP	733	131	A		7	131	
		PHX	HP	733	131	A		7	131	
		PHX	HP	320	148	A		7	148	522
			UA	72S	147	A	0	7	147	147
STL	16		AA	M80	142	A	0	7	142	
	16		AA	M80	142	A	0	7	142	
			AA	M80	142	X6	0	6	122	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	
			AA	M80	142	A	0	7	142	832
			AD	SWM	13	X67	3	5	9	
			AD	SWM	13	X67	3	5	9	19

TABLE G.1

FLIGHTS TO DFW FROM KEY MARKETS, AUGUST 1991

Originating City, Connecting City, Frequency and Equipment by Carrier

Flight From	Frequency (Daily)	Connecting City	Carrier	Aircraft Type	No. of Seats	Flight Days	No. of Stops	Days/ Week	Average Seats/ Day	Total Seats/ Day
			TW	DC9	73	A	0	7	73	
			TW	D9S	102	A	0	7	102	
			TW	D9S	102	X67	0	5	73	
			TW	D9S	102	A	0	7	102	
			TW	D9S	102	A	0	7	102	
			TW	D9S	102	X6	0	6	87	
			TW	D9S	102	A	0	7	102	
			TW	D9S	102	X67	0	5	73	714

* Includes interline connection.

TABLE G.2
SEATS PER AIRCRAFT BY CARRIER

Carrier	Code	Aircraft	Seating: 1st Class	Coach	TOTAL
AA	72S	Boeing 727-200	12	138	150
AA	757	Boeing 757-200	12	182	194
AA	767	Boeing 767	24	180	204
AA	D10	DC 10	34	256	290
AA	M80	MD 80	12	130	142
AD	SWM	Fairchild (Swearingen) Metro/Merlin	0	13	13
AS	M80	MD 80	10	125	135
CO	72S	Boeing 727-200	14	135	149
CO	73S	Boeing 737 (All 200/200C Series)	10	92	102
CO	733	Boeing 737-300	10	120	130
CO	D9S	DC 9 (30/40/50 Series)	8	100	108
CO	M80	MD 80	16	130	146
DL	72S	Boeing 727-200	12	136	148
DL	73S	Boeing 737 (All 200/200C Series)	12	95	107
DL	733	Boeing 737-300	8	120	128
DL	757	Boeing 757-200	16	171	187
DL	767	Boeing 767	18	186	204
DL	763	Boeing 767-300/30ER	24	230	254
DL	D9S	DC 9 (30/40/50 Series)	12	86	98
DL	M80	MD 80	14	128	142
HP	320	Airbus A320	10	138	148
HP	73S	Boeing 737 (All 200/200C Series)	0	122	122
HP	733	Boeing 737-300	8	123	131
HP	757	Boeing 757-200	14	176	190
ML	D9S	DC 9 (30/40/50 Series)	8	70	78
NW	DC9	DC 9 (10/20 Series)	8	70	78
NW	D9S	DC 9 (30/40/50 Series)	12	99	111
TW	72S	Boeing 727-200	12	103	115
TW	DC9	DC 9 (10/20 Series)	8	65	73
TW	D9S	DC 9 (30/40/50 Series)	12	90	102
TW	M80	MD 80	12	130	142
UA	72S	Boeing 727-200	12	135	147
UA	73S	Boeing 737 (All 200/200C Series)	8	101	109
UA*	146	BA 146	0	97	97
US	J31	BA Jetstream 31	0	14	14
US	733	Boeing 737-300	8	120	128
US	D9S	DC 9 (30/40/50 Series)	8	120	128

Source: Official Airlines Guide, August 1991.

TABLE G.3
CONNECTING FARE RATIOS

City Pair	Air Carrier	Connection	Connecting Fare (1990 $)	Average Originating Fare (1990 $)	Fare Ratio
DFW-BHM	AA			225	
	DL			225	
DFW-MCI	AA			176	
	DL			176	
DFW-MEM	AA			182	
	DL			182	
	NW			182	
DFW-PHX	AA			211	
	DL			211	
	HP			211	
DFW-STL	AA			204	
	AD			204	
	TW			204	
DFW-BNA	AA			210	
	DL			210	
	TW	STL	204	210	1.03
DFW-BUR	AA			294	
	DL	SLC	213	294	1.38
	HP	PHX	211	294	1.39
DFW-CH	AA			233	
	CO	IAH	56	233	4.15
	DL			233	
	ML			233	
	UA			233	
	US	DAY	222	233	1.05
DFW-DT	AA			190	
	CO	IAH	56	190	3.40
	DL			190	
	ML			190	
	NW			190	
	TW	STL	204	190	0.93
	US	DAY	222	190	0.86

TABLE G.3
CONNECTING FARE RATIOS

City Pair	Air Carrier	Connection	Connecting Fare (1990 $)	Average Originating Fare (1990 $)	Fare Ratio
DFW-IND	AA			210	
	DL			210	
	NW	MEM	182	210	1.15
	TW	STL	204	210	1.03
	US	DAY	222	210	0.95
DFW-LAS	AA			158	
	DL			158	
	HP	PHX	211	158	0.75
DFW-OAK	AA			301	
	DL	SLC	213	301	1.41
	HP	PHX/LAS	211	301	1.42
DFW-ONT	AA			257	
	CO			257	
	DL			257	
	HP	PHX/LAS	211	257	1.22
DFW-RNO	AA			195	
	DL			195	
	HP	LAS	187	195	1.04
	UA			195	
DFW-SAN	AA			239	
	CO	DEN	198	239	1.21
	DL			239	
	HP			239	
DFW-SFO	AA			274	
	CO	DEN	198	274	1.38
	DL			274	
	HP	PHX	211	274	1.30
	UA			274	

Sources: D.O.T. 10% Sample of Coupons and Official Airline Guide (08/91).

TABLE G.4 (A)

AIR CARRIER SEATS AND PASSENGERS

Market Pair DFW -	Air Carrier	Average Daily Seats	Annual Passengers	Originating Passengers	Connecting Passengers
BHM	AA	568	124,392	41,464	82,928
	DL	525	114,975	38,325	76,650
MCI	AA	1116	244,341	81,447	162,894
	DL	603	132,057	44,019	88,038
MEM	AA	576	126,144	42,048	84,096
	DL	827	181,113	60,371	120,742
	NW	284	62,227	20,742	41,485
PHX	AA	1011	221,315	73,772	147,543
	DL	631	138,189	46,063	92,126
	HP	541	118,479	39,493	78,986
STL	AA	832	182,145	60,715	121,430
	AD	19	4,067	1,356	2,711
	TW	714	156,397	52,132	104,265

TABLE G.4 (A)

AIR CARRIER SEATS AND PASSENGERS

Market Pair DFW -	Air Carrier	Average Daily Seats	Annual Passengers	Originating Passengers	Connecting Passengers
BNA	AA	904	197,976	65,992	131,984
	DL	489	107,091	35,697	71,394
	TW	102	22,338	7,446	14,892
BUR	AA	620	135,780	45,260	90,520
	DL	187	40,953	13,651	27,302
	HP	505	110,658	36,886	73,772
CH (City)	AA	2947	645,362	215,121	430,241
	CO	698	152,862	50,954	101,908
	DL	598	130,899	43,633	87,266
	ML	379	82,970	27,657	55,313
	UA	534	117,040	39,013	78,027
	US	402	88,101	29,367	58,734
DT (City)	AA	568	124,392	41,464	82,928
	CO	403	88,257	29,419	58,838
	DL	391	85,629	28,543	57,086
	ML	67	14,642	4,881	9,761
	NW	412	90,291	30,097	60,194
	TW	481	105,339	35,113	70,226
	US	512	112,128	37,376	74,752
IND	AA	450	98,550	32,850	65,700
	DL	249	54,531	18,177	36,354
	NW	206	45,145	15,048	30,097
	TW	481	105,339	35,113	70,226
	US	110	24,027	8,009	16,018

TABLE G.4 (A)

AIR CARRIER SEATS AND PASSENGERS

Market Pair DFW -	Air Carrier	Average Daily Seats	Annual Passengers	Originating Passengers	Connecting Passengers
LAS	AA	1320	289,143	96,381	192,762
	DL	832	182,208	60,736	121,472
	HP	916	200,604	66,868	133,736
OAK	AA	513	112,316	37,439	74,877
	DL	785	171,884	57,295	114,589
	HP	626	137,000	45,667	91,333
ONT	AA	762	166,878	55,626	111,252
	CO	102	22,338	7,446	14,892
	DL	844	184,836	61,612	123,224
	HP	775	169,788	56,596	113,192
RNO	AA	450	98,550	32,850	65,700
	DL	777	170,163	56,721	113,442
	HP	484	106,090	35,363	70,727
	UA	256	56,064	18,688	37,376
SAN	AA	786	172,134	57,378	114,756
	CO	446	97,580	32,527	65,053
	DL	954	208,926	69,642	139,284
	HP	122	26,718	8,906	17,812
SFO	AA	2353	515,401	171,800	343,601
	CO	446	97,580	32,527	65,053
	DL	1701	372,488	124,163	248,325
	HP	522	114,381	38,127	76,254
	UA	147	32,193	10,731	21,462

SOURCES: Apogee Research, Inc.; D.O.T. 10% Sample of Coupons; Official Airline Guide

TABLE G.4 (B)

FARE ANALYSIS

Market Pair DFW -	Air Carrier	Average Originating Fare (1990 $)	Connecting Fare Ratio	Average Connecting Fare (1990 $)
BHM	AA	$225		$225
	DL	$225		$225
MCI	AA	$176		$176
	DL	$176		$176
MEM	AA	$182		$182
	DL	$182		$182
	NW	$182		$182
PHX	AA	$211		$211
	DL	$211		$211
	HP	$211		$211
STL	AA	$204		$204
	AD	$204		$204
	TW	$204		$204

TABLE G.4 (B)
FARE ANALYSIS

Market Pair DFW -	Air Carrier	Average Originating Fare (1990 $)	Connecting Fare Ratio	Average Connecting Fare (1990 $)
BNA	AA	$210		$210
	DL	$210		$210
	TW	$210	103%	$216
BUR	AA	$294		$294
	DL	$294	138%	$404
	HP	$294	139%	$408
CH (City)	AA	$233		$233
	CO	$233	415%	$966
	DL	$233		$233
	ML	$233		$233
	UA	$233		$233
	US	$233	105%	$244
DT (City)	AA	$190		$190
	CO	$190	340%	$648
	DL	$190		$190
	ML	$190		$190
	NW	$190		$190
	TW	$190	93%	$178
	US	$190	86%	$164
IND	AA	$210		$210
	DL	$210		$210
	NW	$210	115%	$242
	TW	$210	103%	$216
	US	$210	95%	$199

TABLE G.4 (B)
FARE ANALYSIS

Market Pair DFW -	Air Carrier	Average Originating Fare (1990 $)	Connecting Fare Ratio	Average Connecting Fare (1990 $)
LAS	AA	$158		$158
	DL	$158		$158
	HP	$158	75%	$118
OAK	AA	$301		$301
	DL	$301	141%	$424
	HP	$301	142%	$428
ONT	AA	$257		$257
	CO	$257		$257
	DL	$257		$257
	HP	$257	122%	$313
RNO	AA	$195		$195
	DL	$195		$195
	HP	$195	104%	$202
	UA	$195		$195
SAN	AA	$239		$239
	CO	$239	121%	$289
	DL	$239		$239
	HP	$239		$239
SFO	AA	$274		$274
	CO	$274	138%	$379
	DL	$274		$274
	HP	$274	130%	$355
	UA	$274		$274

SOURCES: Apogee ReseaiSOURCES: Apogee Research, Inc.;
D.O.T. 10% Sample of Coupons;
Official Airlines Guide

TABLE G.4 (C)
REVENUE ANALYSIS

Market Pair DFW -	Air Carrier	Average Originating Revenue (1990 $)	Average Connecting Revenue (1990 $)	Total Route Revenue (1990 $)	Fare Impact	POTENTIAL REVENUE IMPACT (1990 $)
BHM	AA	$9,342,675	$18,685,350	$28,028,024	-17%	($4,764,764)
	DL	$8,635,395	$17,270,790	$25,906,184	-17%	($4,404,051)
MCI	AA	$14,336,826	$28,673,652	$43,010,478	-27%	($11,612,829)
	DL	$7,748,495	$15,496,989	$23,245,484	-27%	($6,276,281)
MEM	AA	$7,654,363	$15,308,726	$22,963,089	-25%	($5,740,772)
	DL	$10,989,858	$21,979,716	$32,969,574	-25%	($8,242,393)
	NW	$3,775,925	$7,551,849	$11,327,774	-25%	($2,831,943)
PHX	AA	$15,583,723	$31,167,446	$46,751,169	-27%	($12,622,816)
	DL	$9,730,464	$19,460,929	$29,191,393	-27%	($7,881,676)
	HP	$8,342,601	$16,685,202	$25,027,803	-27%	($6,757,507)
STL	AA	$12,380,648	$24,761,296	$37,141,944	-25%	($9,285,486)
	AD	$276,449	$552,897	$829,346	-25%	($207,337)
	TW	$10,630,515	$21,261,030	$31,891,546	-25%	($7,972,886)

TABLE G.4 (C)

REVENUE ANALYSIS

Market Pair DFW -	Air Carrier	Average Originating Revenue (1990 $)	Average Connecting Revenue (1990 $)	Total Route Revenue (1990 $)	Fare Impact	POTENTIAL REVENUE IMPACT (1990 $)
BNA	AA	$13,849,035	$27,698,070	$41,547,105	-10%	($4,154,710)
	DL	$7,491,347	$14,982,695	$22,474,042	-10%	($2,247,404)
	TW	$1,562,612	$3,216,349	$4,778,961	-10%	($477,896)
BUR	AA	$13,284,802	$26,569,604	$39,854,406	-10%	($3,985,441)
	DL	$4,006,868	$11,040,592	$15,047,460	-10%	($1,504,746)
	HP	$10,826,807	$30,087,742	$40,914,549	-10%	($4,091,455)
CH (City)	AA	$50,016,389	$100,032,779	$150,049,168	-18%	($27,008,850)
	CO	$11,847,008	$98,393,886	$110,240,894	-18%	($19,843,361)
	DL	$10,144,879	$20,289,759	$30,434,638	-18%	($5,478,235)
	ML	$6,430,263	$12,860,526	$19,290,789	-18%	($3,472,342)
	UA	$9,070,744	$18,141,489	$27,212,233	-18%	($4,898,202)
	US	$6,827,911	$14,327,138	$21,155,049	-18%	($3,807,909)
DT (City)	AA	$7,895,414	$15,790,827	$23,686,241	-8%	($1,894,899)
	CO	$5,601,852	$38,103,452	$43,705,304	-8%	($3,496,424)
	DL	$5,435,047	$10,870,094	$16,305,141	-8%	($1,304,411)
	ML	$929,339	$1,858,679	$2,788,018	-8%	($223,041)
	NW	$5,730,926	$11,461,853	$17,192,779	-8%	($1,375,422)
	TW	$6,686,081	$12,487,024	$19,173,105	-8%	($1,533,848)
	US	$7,116,993	$12,230,420	$19,347,413	-8%	($1,547,793)
IND	AA	$6,890,214	$13,780,427	$20,670,641	-10%	($2,067,064)
	DL	$3,812,585	$7,625,170	$11,437,755	-10%	($1,143,775)
	NW	$3,156,374	$7,273,644	$10,430,018	-10%	($1,043,002)
	TW	$7,364,873	$15,151,171	$22,516,044	-10%	($2,251,604)
	US	$1,679,900	$3,179,961	$4,859,861	-10%	($485,986)

TABLE G.4 (C)

REVENUE ANALYSIS

Market Pair DFW -	Air Carrier	Average Originating Revenue (1990 $)	Average Connecting Revenue (1990 $)	Total Route Revenue (1990 $)	Fare Impact	POTENTIAL REVENUE IMPACT (1990 $)
LAS	AA	$15,214,164	$30,428,327	$45,642,491	-10%	($4,564,249)
	DL	$9,587,458	$19,174,916	$28,762,375	-10%	($2,876,237)
	HP	$10,555,423	$15,775,444	$26,330,866	-10%	($2,633,087)
OAK	AA	$11,252,982	$22,505,964	$33,758,946	-19%	($6,414,200)
	DL	$17,221,137	$48,591,134	$65,812,271	-19%	($12,504,332)
	HP	$13,726,130	$39,061,159	$52,787,289	-19%	($10,029,585)
ONT	AA	$14,304,591	$28,609,182	$42,913,773	-10%	($4,291,377)
	CO	$1,914,788	$3,829,576	$5,744,363	-10%	($574,436)
	DL	$15,843,930	$31,687,861	$47,531,791	-10%	($4,753,179)
	HP	$14,553,996	$35,434,681	$49,988,677	-10%	($4,998,868)
RNO	AA	$6,390,020	$12,780,040	$19,170,060	-10%	($1,917,006)
	DL	$11,033,434	$22,066,869	$33,100,303	-10%	($3,310,030)
	HP	$6,878,907	$14,316,563	$21,195,470	-10%	($2,119,547)
	UA	$3,635,211	$7,270,423	$10,905,634	-10%	($1,090,563)
SAN	AA	$13,709,284	$27,418,567	$41,127,851	-10%	($4,112,785)
	CO	$7,771,584	$18,790,924	$26,562,509	-10%	($2,656,251)
	DL	$16,639,512	$33,279,025	$49,918,537	-10%	($4,991,854)
	HP	$2,127,904	$4,255,808	$6,383,712	-10%	($638,371)
SFO	AA	$47,019,728	$94,039,456	$141,059,183	-21%	($29,622,428)
	CO	$8,902,181	$24,655,958	$33,558,139	-21%	($7,047,209)
	DL	$33,981,843	$67,963,686	$101,945,529	-21%	($21,408,561)
	HP	$10,434,875	$27,039,093	$37,473,967	-21%	($7,869,533)
	UA	$2,936,949	$5,873,898	$8,810,847	-21%	($1,850,278)
						(330,212,532)

SOURCES: Apogee ReseaSOURCES: Apogee Research, Inc.;
D.O.T. 10% Sample of Coupons;
Official Airlines Guide

APPENDIX H:

Analysis of Population, Households, Employment, and Income Levels of Metroplex Region by Travel Time to DFW and Love Field

TABLE H.1. AIRPORT PREFERENCE ANALYSIS
DALLAS LOVE FIELD
Data by Contour Interval

1986

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area (Mi. x 1,000)
0-15	20,760	16,083	35,236	25,943	9,389	40,631	75,963	9,653
15-30	24,531	299,063	683,887	299,543	118,691	407,195	825,429	235,343
30-45	31,857	545,955	1,431,613	276,629	129,273	269,117	675,019	1,020,445
45-60	27,402	290,897	794,618	119,466	64,712	142,571	326,749	1,138,130
60+	27,344	132,692	343,744	63,318	35,800	58,905	158,023	812,076
Regional Totals		1,284,750	3,289,239	789,267	359,100	924,294	2,072,661	3,218,331

2010

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area (Mi. x 1,000)
0-15	20,904	16,186	33,402	24,542	11,988	56,580	93,110	9,653
15-30	26,646	343,101	746,526	328,247	179,211	630,411	1,137,869	236,220
30-45	32,244	797,980	1,960,507	368,853	221,883	480,807	1,071,543	921,448
45-60	28,396	516,689	1,345,959	196,997	125,157	272,471	594,625	1,330,269
60+	28,187	189,853	466,681	86,997	58,447	116,725	262,169	718,057
Regional Totals		1,863,871	4,553,209	1,009,719	598,075	1,563,606	3,171,400	3,218,331

TABLE H.2. AIRPORT PREFERENCE ANALYSIS
DALLAS LOVE FIELD
Percent of Regional Total By Contour Interval

1986

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	1.3%	1.1%	3.3%	2.6%	4.4%	3.7%	0.3%
15-30	N/A	23.3%	20.8%	38.0%	33.1%	44.1%	39.8%	7.3%
30-45	N/A	42.5%	43.5%	35.0%	36.0%	29.1%	32.6%	31.7%
45-60	N/A	22.6%	24.2%	15.1%	18.0%	15.4%	15.8%	35.4%
60+	N/A	10.3%	10.5%	8.0%	10.0%	6.4%	7.6%	25.2%

2010

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	0.9%	0.7%	2.4%	2.0%	3.6%	2.9%	0.3%
15-30	N/A	18.4%	16.4%	32.5%	30.0%	40.3%	35.9%	7.3%
30-45	N/A	42.8%	43.1%	36.5%	37.1%	30.7%	33.8%	28.6%
45-60	N/A	27.7%	29.6%	19.5%	20.9%	17.4%	18.7%	41.3%
60+	N/A	10.2%	10.2%	8.6%	9.8%	7.5%	8.3%	22.3%

TABLE H.3. ***AIRPORT PREFERENCE ANALYSIS***

DALLAS LOVE FIELD

Cumulative Percent of Regional Total By Contour Interval

1986

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	1.3%	1.1%	3.3%	2.6%	4.4%	3.7%	0.3%
15-30	N/A	24.5%	21.9%	41.2%	35.7%	48.5%	43.5%	7.6%
30-45	N/A	67.0%	65.4%	76.3%	71.7%	77.6%	76.1%	39.3%
45-60	N/A	89.7%	89.5%	91.4%	89.7%	93.0%	91.8%	74.7%
60+	N/A	100.0%	100.0%	99.4%	99.7%	99.4%	99.4%	99.9%

2010

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	0.9%	0.7%	2.4%	2.0%	3.6%	2.9%	0.3%
15-30	N/A	19.3%	17.1%	34.9%	32.0%	43.9%	38.8%	7.6%
30-45	N/A	62.1%	60.2%	71.5%	69.1%	74.7%	72.6%	36.3%
45-60	N/A	89.8%	89.7%	91.0%	90.0%	92.1%	91.4%	77.6%
60+	N/A	100.0%	100.0%	99.6%	99.8%	99.6%	99.6%	99.9%

TABLE H.4. AIRPORT PREFERENCE ANALYSIS
DALLAS/FT WORTH INTERNATIONAL AIRPORT
Data by Contour Interval

1986

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area (Mi. x 1,000)
0-15	32,722	79,038	192,893	47,843	16,300	41,567	105,710	152,244
15-30	29,552	362,629	882,420	389,803	132,723	425,585	948,111	516,751
30-45	26,972	663,568	1,715,766	276,979	177,588	395,090	849,657	1,190,040
45-60	30,437	174,707	485,191	66,028	29,308	57,857	153,193	1,291,315
60+	30,078	4,808	12,969	876	681	1,399	2,956	64,499
Regional Totals		1,284,750	3,289,239	789,267	359,100	924,294	2,072,661	3,218,331

2010

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area (Mi. x 1,000)
0-15	40,552	159,554	366,361	83,541	45,102	106,949	235,592	170,005
15-30	29,432	571,978	1,346,211	466,328	227,805	637,617	1,331,750	612,326
30-45	27,889	915,579	2,255,868	394,824	282,531	744,274	1,421,629	1,359,565
45-60	29,507	216,760	584,769	54,609	40,130	71,815	166,554	1,072,941
60+	0	0	0	0	0	0	0	11
Regional Totals		1,863,871	4,553,209	1,009,719	598,075	1,563,606	3,171,400	3,218,331

TABLE H.5. AIRPORT PREFERENCE ANALYSIS

DALLAS/FT WORTH INTERNATIONAL AIRPORT

Percent of Regional Total By Contour Interval

1986

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	6.2%	5.9%	6.1%	4.5%	4.5%	5.1%	4.7%
15-30	N/A	28.2%	26.8%	49.4%	37.0%	46.0%	45.7%	16.1%
30-45	N/A	51.6%	52.2%	35.1%	49.5%	42.7%	41.0%	37.0%
45-60	N/A	13.6%	14.8%	8.4%	8.2%	6.3%	7.4%	40.1%
60+	N/A	0.4%	0.4%	0.1%	0.2%	0.2%	0.1%	2.0%

2010

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	8.6%	8.0%	8.3%	7.5%	6.8%	7.4%	5.3%
15-30	N/A	30.7%	29.6%	46.2%	38.1%	40.8%	42.0%	19.0%
30-45	N/A	49.1%	49.5%	39.1%	47.2%	47.6%	44.8%	42.2%
45-60	N/A	11.6%	12.8%	5.4%	6.7%	4.6%	5.3%	33.3%
60+	N/A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

TABLE H.6. AIRPORT PREFERENCE ANALYSIS
DALLAS/FT WORTH INTERNATIONAL AIRPORT
Cumulative Percent of Regional Total By Contour Interval

1986

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	6.2%	5.9%	6.1%	4.5%	4.5%	5.1%	4.7%
15-30	N/A	34.4%	32.7%	55.4%	41.5%	50.5%	50.8%	20.8%
30-45	N/A	86.0%	84.9%	90.5%	91.0%	93.3%	91.8%	57.8%
45-60	N/A	99.6%	99.6%	98.9%	99.1%	99.5%	99.2%	97.9%
60+	N/A	100.0%	100.0%	99.0%	99.3%	99.7%	99.4%	99.9%

2010

Interval (Minutes)	Median Income	Households	Population	Employment Basic	Retail	Service	Total	Area
0-15	N/A	8.6%	8.0%	8.3%	7.5%	6.8%	7.4%	5.3%
15-30	N/A	39.2%	37.6%	54.5%	45.6%	47.6%	49.4%	24.3%
30-45	N/A	88.4%	87.2%	93.6%	92.9%	95.2%	94.2%	66.6%
45-60	N/A	100.0%	100.0%	99.0%	99.6%	99.8%	99.5%	99.9%
60+	N/A	100.0%	100.0%	99.0%	99.6%	99.8%	99.5%	99.9%

APPENDIX I:

Current Conditions

Table I.1

DALLAS LOVE FIELD

Department of Aviation
Tenant List
November 1990

Name	Address
AOA Office	8008 Cedar Springs
Aero Dynamics	8111 Lemmon
Aero Instruments	7515 Lemmon
Air Dallas Instruments	8008 Cedar Springs
Air Exchange	8008 Cedar Springs
Air/Ground Equipment	7515 Lemmon
Allied Fuel Storage	2437 Brookfield
Alpha Aviation	8111 Lemmon
American Liberty	7515 Lemmon
ARCO	8601 Lemmon
Art Ronan	7515 Lemmon
Associated Air Center (FBO)	8321 Lemmon
Associated Corp.	7515 Lemmon
Aviall (FBO)	7515 Lemmon
Aviall	7515 Lemmon
Aviation Gallery	8008 Cedar Springs
Avis Rent Car	7020 Cedar Springs
Barron Thomas	7515 Lemmon
Bassco	2643 Myrtle Spring
Blake Tucker	7363 Cedar Springs
Budget Rent Car	3127 Mockingbird
Campbett Tagaert	8623 Lemmon
Citijet (FBO)	8111 Lemmon
Clark Bros.	7515 Lemmon
Cleo Thompson	7515 Lemmon
Coastal Cookie	8008 Cedar Springs
Dalfort	8008 Aviation Pl.
Daljet	8605 Lemmon
Direct Couriers	8008 Cedar Springs
Dobbs House	8008 Cedar Springs
Dresser Industries	8405 Lemmon
EDS	9301 Weiss
Ensearch Corp.	7344 Aviation Pl.
First Republic	9309 Cedar Springs
Flight Proficiency	3250 Shorecrest
General Rent Car	8008 Cedar Springs
Halliburton Co.	7515 Lemmon
Heflin Oil Co.	7515 Lemmon
Hertz Rent Car	7212 Cedar Springs
Holly Corp.	7515 Lemmon
Hunt Oil Company	8629 Lemmon
Jet East (FBO)	7363 Cedar Springs
Jet Fleet	8605 Lemmon

Table I.1

DALLAS LOVE FIELD

Department of Aviation
Tenant List
November 1990

Name	Address
KC Aviation	7440 Aviation Pl.
King Aviation	LB2, LF Terminal
LLM	3351 Tom Braniff
Lerch Bates	8008 Cedar Springs
Lindsley Avionics	8008 Cedar Springs
Lone Star Steel	7515 Lemmon
Marquis Messengers	8028 Aviation Pl.
Martinaire West	2850 Burbank
Maxxis/Diamond Shamrock	9415 weiss
Midway Aviation	9415 Weiss
Mobile Oil	7515 Lemmon
Mobile Pipeline	7515 Lemmon
Mustang Couriers	8008 Cedar Springs
National Gypsum	7515 Lemmon
Naitonal Rent Car	6800 Ansley
Nicholas Avia	7515 Lemmon
Omega Audio	8034 Aviation Pl.
Penrod Drilling	7515 Lemmon
Republic Bank	3355 Tom Braniff
Republic Gypsum	7515 Lemmon
Sabine Corp.	7515 Lemmon
Sedco	7515 Lemmon
Servion	8008 Aviation Pl.
Shelter Park	7236 Cedar Springs
Southland Corp.	8111 Lemmon
Southwest Airlines Sta. Mgr.	8008 Cedar Spirngs
Southwest Hangar	2832 Shorecrest
Southwestern Bell/SBC	8001 Lemmon
Texas Aero Tech	6911 Lemmon
Texas Industries (FBO)	8350 Denton Drive
Texas Instruments	8121 Lemmon
Texas Oil & Gas	7515 Lemmon
Texas Quarter Horse	8008 Cedar Springs
Texas Utilities	7515 Lemmon
Thompson Co.	8001 Lemmon
Three D Distributions	7336 Aviation Pl.
Vee's Barber Shop	8008 Cedar Springs
Video Post	8036 Aviation Pl.
W.P. Wills	8008 Cedar Springs
Web Thomas	8008 Cedar Springs
Wyatts Cafe	7515 Lemmon

Source: Dallas Aviation Department

Table I.2

DALLAS LOVE FIELD

Average Daily Operations for October 1990

Day	Air Carrier	General Aviation	Total Operations
Monday	250	375	625
Tuesday	251	479	730
Wednesday	253	464	717
Thursday	253	506	759
Friday	255	503	758
Saturday	161	265	426
Sunday	211	251	462

Source: Dallas Aviation Department

Table I.3

DALLAS LOVE FIELD

Average Hourly Operations for Thursdays, October 1990

Local Time	Air Carrier	General Aviation	Total Operations
00:00	0	18	18
01:00	0	10	10
02:00	0	14	14
03:00	0	1	1
04:00	0	3	3
05:00	0	6	6
06:00	3	26	29
07:00	20	28	48
08:00	22	32	54
09:00	14	23	37
10:00	15	21	36
11:00	13	23	36
12:00	13	23	36
13:00	15	23	38
14:00	15	30	45
15:00	18	34	52
16:00	21	36	57
17:00	13	35	48
18:00	19	39	58
19:00	17	18	35
20:00	13	16	29
21:00	13	21	34
22:00	12	17	29
23:00	1	13	14

Source: Dallas Aviation Department

Table I.4

DALLAS LOVE FIELD
Percentage Utilization of Runways by Jet Aircraft, Year Ending June 1989

	Departures		Arrivals	
Runway	Day	Night	Day	Night
Air Carrier:				
13R	65	57	63	67
13L	0	10	3	0
31L	31	33	33	33
31R	4	0	1	0
Total	100	100	100	100
General Aviation and Air Taxi Jets:				
13R	21	45	23	50
13L	45	21	43	17
31L	9	8	10	8
31R	25	25	24	25
Total	100	100	100	100

Source: Table 5;
1989 Noise Contour Update, October 1989,
Harris Miller Miller & Hanson, Inc.

Note: Totals may not not add due to rounding.

Table I.5

DALLAS LOVE FIELD
1989 Fleet Mix

Aircraft Type	Classification	Total Average Daily Arrivals & Departures	Percent of Total
Air Carrier			
737-200	C	70.6	12.0%
737-300	C	138.8	23.6%
DC9-15	C	2.6	0.4%
727-200	C	2.6	0.4%
727-100	C	0.4	0.1%
Air Taxi/General Aviation			
Citation	C	15.2	2.6%
Lear 25	C	26.8	4.6%
Lear 35	C	58.8	10.0%
Challenger 600	C	3.4	0.6%
Gulfstream G-2	C	6.2	1.1%
Mitsubishi 300	C	2.2	0.4%
Saberliner 80	C	5.4	0.9%
Twin - Turboprop	C	68.4	11.6%
Twin - Piston	B	83.8	14.3%
Single - Piston	A	102.0	17.4%
Total		587.2	100.0%

Source: Harris Miller Miller & Hanson, Inc. Report Number 290420.

Table I.6

DALLAS LOVE FIELD
Aircraft Classifications

Aircraft Classification	Takeoff Weight (pounds)	Types of Aircraft	Estimated Approach Speed
A	12,500 or less	Small single-engine aircraft (such as Piper PA-23, Cessna C-180, Cessna C-207)	95
B	12,500 or less	Small twin-engine aircraft and some Learjets (such as Piper PA-31, Beech BE-55, Cessna C-310, Learjet LR-25)	120
C	12,500 to 300,000	Large aircraft (such as Gulfstream VI, Beechcraft King Air, B-737-200,B-737-300)	130
D	300,000 or more	Heavy aircraft (such as B-767, L1011, DC-8-62)	140

Source: FAA Advisory Circular 15(Airport Capacity and Delay.

Table I.7

DALLAS LOVE FIELD
Hourly Demand

Time	Arrivals	Departures	Total
12:00 - 12:59 a.m.	6	3	9
1:00 - 1:59 a.m.	2	2	4
2:00 - 2:59 a.m.	5	1	6
3:00 - 3:59 a.m.	2	0	2
4:00 - 4:59 a.m.	1	1	2
5:00 - 5:59 a.m.	4	2	6
6:00 - 6:59 a.m.	0	17	17
7:00 - 7:59 a.m.	15	17	32
8:00 - 8:59 a.m.	16	25	41
9:00 - 9:59 a.m.	14	18	32
10:00 - 10:59 a.m.	18	15	33
11:00 - 11:59 a.m.	11	19	30
12:00 - 12:59 p.m.	18	15	33
1:00 - 1:59 p.m.	18	18	36
2:00 - 2:59 p.m.	16	19	35
3:00 - 3:59 p.m.	28	16	44
4:00 - 4:59 p.m.	20	25	45
5:00 - 5:59 p.m.	24	19	43
6:00 - 6:59 p.m.	22	20	42
7:00 - 7:59 p.m.	13	17	30
8:00 - 8:59 p.m.	13	12	25
9:00 - 9:59 p.m.	16	11	27
10:00 - 10:59 p.m.	16	4	20
11:00 - 11:59 p.m.	4	4	8

Source: HNTB analysis.

APPENDIX J:

Air Traffic, Capacity, and Delay at Dallas Love Field and Studies Reviewed for Airspace Analysis

APPENDIX J:
AIR TRAFFIC CAPACITY, AND DELAY
AT DALLAS LOVE FIELD
AND STUDIES REVIEWED FOR AIRSPACE ANALYSIS

AIR TRAFFIC AT LOVE FIELD

An aircraft approaching Love Field may be on an IFR (Instrument Flight Rules) flight plan, a VFR (Visual Flight Rules) flight plan, or no flight plan at all. If operating on an IFR flight plan, it will be passed from Fort Worth Center to the TRACON, and then to Love Field Tower for landing. If the aircraft is on a Visual Flight Plan, or has no flight plan, the pilot must call TRACON to obtain a clearance to enter the TCA for control. Once within the TCA, the aircraft will be sequenced for approach and provided with separation before being cleared for landing. Within the TCA, the VFR aircraft is provided sequencing and separation.

All aircraft landing or departing, either from Love Field or DFW, are recorded as instrument operations. All departures must have clearances from Air Traffic Control since they will penetrate the TCA. The Terminal Control Area extends upward to 10,000 feet and is centered over DFW.

Within the TCA, all aircraft are sequenced and separated. Due to the significant number of general aviation aircraft using Love Field, favorable weather conditions allow VFR traffic and traffic without flight plans to be sequenced for landing in a manner that increases the acceptance rate of the airport. However, all air carrier aircraft, jet aircraft, and most corporate business operators, will operate on instrument flight plans. Sixty percent of the operations at Love Field are by jet aircraft. Of the remaining 40 percent of operations, one-quarter of them or 10 percent or more will also be aircraft on instrument flight plans. Therefore, it is reasonable to assume that only 30 percent or less of the operations are aircraft on VFR flight plans, or no flight plans at all.

About 80 percent of the time, weather is good enough that aircraft on IFR flight plans may be provided visual separation. This condition permits a greater capacity for arrivals and departures than when weather conditions require continuous radar separation. During visual weather conditions certain aircraft, usually propellored aircraft, can execute approaches to or departures from Runway 18-36, thus further enhancing Love Field capacity.

There are two constraints on airspace use at Love Field, apart from those common to the DFW Terminal area itself: 1) the distance between DFW and Love Field and their orientation to each other; and 2) the noise abatement procedures. The center of Love Field is 12 miles southeast of the center of DFW. Love Field's main runways are 13-31, while DFW's are 17-35. The dissimilar runway alignments between the two airports cause the final approach courses to converge northwest of Love Field in south-flow conditions. As a result, arrivals to Love Field are constrained to a single stream because of limited airspace and the interaction between DFW and Love Field arrival traffic.

The separation of Love Field's two parallel runways (2,950 feet) is such that dependent parallel ILS approaches with 2-nautical mile staggered approaches are theoretically possible but very difficult. Since south flow traffic exists two-thirds of the time, this constraint is a significant factor. The same short distance from turn on to the final to the runway end can limit the visual approach sequencing on the two parallel runways.

At the present time, departures from Love Field climb straight ahead until reaching 3,000 feet or higher. This procedure provides some noise abatement, but prevents simultaneous departures from both runways. It prohibits turning one stream of traffic 15 degrees to provide separation from the other. In south flow, traffic departing from Runway 13L cannot be turned 15 degrees left because of the approaching stream of traffic to Love Field and DFW. A turn to the right from Runway 13R would interact with DFW traffic.

Love Field Limitations

Air traffic at Dallas Love Field is limited both by airspace-interaction constraints and noise-abatement constraints.

There are two types of airspace interactions: arrivals and departures. The FAA has developed ATC procedures to operate DFW and Love Field simultaneously, in order to minimize the airspace interactions between the two airports.

All arrivals enter into the terminal airspace system from the enroute airspace system over four "cornerpost" VORTACS. Traffic inbound to DFW is separated vertically from traffic inbound to the satellite airports. Because it is possible to vertically separate the traffic inbound to DFW from the traffic inbound to the satellite airports, there is an indirect airspace interaction, albeit minimal. Traffic to DFW can, for the most part, be handled independently from traffic to the satellite airports.

All IFR aircraft departures from the DFW area are radar vectored through one of four departure gates located between the four cornerpost VORTACs. There are three departure routes to the east and west and two departure routes to the north and south. Propeller aircraft are radar vectored through the airspace to the departure routes and handed off to the enroute center at 8,000 feet. Turbojet departures initially climb to 10,000 feet. When clear of all other arrival and departure routes, turbojet departures climb to 17,000 feet where they are handed off to the enroute center.

All DFW IFR departures and satellite airport IFR departures share the same departure route and gate structure. Aircraft assigned common routes are radar vectored by the DFW TRACON to exit the departure gates at 17,000 feet (turbojet aircraft) and in-trail spacing of at least five nautical miles. Since IFR departures from DFW and satellite airports share the same departure routes, there is a direct airspace interaction between airports. More controller coordination is required for departures than for arrivals. The result is a reduction of departure capacity at all airports in the Metroplex during peak departure periods.

Love Field is also limited by its role as a satellite airport. Because of the large number of arrival and departure streams into and out of DFW, airspace constraints prohibit multiple arrival and departure streams into and out of the satellite airports, including Love Field. Current separation between the parallel runways is 2,975 feet. Simultaneous IFR departures are permitted with this separation. However, only one IFR departure stream can be effectively handled from Love Field, since the departure routes from the airport are coupled with many of the departure routes from DFW.

The primary restriction on Love Field is the runway configuration. A parallel runway separation of 2,975 feet does not permit the use of simultaneous IFR arrival streams into the airport. A potential use of this parallel runway configuration is staggered dependent IFR arrival streams in which a 2.0 nautical mile diagonal separation must be maintained between successive arrivals.

A further limitation for Love Field is its close proximity to DFW. Staggered dependent IFR runway procedures cannot be effectively utilized because only one arrival stream can be fitted into the airspace. When operations are in a south flow, arrival aircraft to Love Field are radar vectored east of the airport.

Airspace interaction also occurs between Love Field turbojet Runway 3lL-31R departures and DFW turbojet arrivals to Runway 31R in visual conditions. DFW runway 31R turbojet arrivals conduct a noise abatement visual approach procedure (the Stadium Visual Approach, Runway 31R) which causes aircraft to maneuver towards Love Field. This maneuvering results in Love Field turbojet departure delays during peak DFW arrival demand periods because Love Field turbojet departures are sequenced between, as opposed to independent of, DFW Runway 31R turbojet arrivals.

Arrivals from the south may be vectored west of Love Field and east of DFW for a right turn to Runway 13R in VMC. Aircraft are kept east of DFW to reduce the interaction between arrivals to DFW and arrivals to Love Field. There is not sufficient distance between the extended centerlines of Runways 13R and 13L and the arrival stream to

Runway 17L at DFW to have longer final approach segments into Love Field. Controllers cannot take advantage of the dependent IFR approach capabilities to Runways 13R and 13L without longer final approach segments. In this regard, IFR arrival capacity into Love Field is limited to a single runway.

The Trinity 3 Departure also acts as a constraint on air traffic. Southerly departures from Love Field are on a converging flight path with eastbound departures from DFW. The Trinity 3 Departure calls for aircraft departing from Runways 13R or 13L to turn right to intercept the 140 degree radial of the Love Field VOR. This causes the interaction between departing traffic from Love Field and DFW to occur sooner and over a longer period of time, because this procedure turns Love Field departing traffic towards DFW departing traffic. Since DFW and Love Field share the same departure routes, departures must be merged onto the same routes, have proper in-trail separation, and be at proper altitudes before being handed off to Fort Worth Center. The interaction between aircraft from the two airports requires increased controller coordination between successive departures and could result in departure delays at both airports if it were used during peak departure demand periods.

AIR CAPACITY AND DELAY AT DALLAS LOVE FIELD

The calculation of airfield layout, capacity, and delay is key to the evaluation of the adequacy of the runway and taxiway system. These factors determine whether Love Field can meet existing and future airport activity in the event of a modification or repeal of the Wright Amendment. This section describes the existing 1990 demand/capacity relationship and resulting aircraft delays at Love Field.

Air Capacity

Airfield capacity is defined as the maximum number of aircraft that an airfield configuration can accommodate (typically during a one hour time interval) over a period of continuous demand for service (i.e., an aircraft is always waiting to depart or land). Airfield capacity and delay computations were made using FAA Advisory Circular AC 150/5060-5, *Airport Capacity and Delay Manual*, and the FAA Annual Delay Model.

The capacity of the existing runway system depends on a number of factors including aircraft mix, runway configuration, incidence of instrument meteorological weather conditions (IMC), and the existence of airspace constraints.

Flight Rules and Fleet Mix

The spacing that is maintained between aircraft affects the capacity of both the airspace and airfield. Generally, the less spacing that can be maintained between arriving and departing aircraft, the greater the capacity. The types of aircraft that are operating within the airspace system or at an airport, the type of flight rules that aircraft operate under, and the prevailing weather conditions influence the separation maintained between aircraft. Two of these factors, flight rules and fleet mix, are described in this section. The prevailing weather conditions at Love Field are discussed in the next section.

Flight Rules. The FAA prescribes two basic types of flight rules: visual flight rules (VFR) and instrument flight rules (IFR). Aircraft flying under IFR require Air Traffic Control assignment of specific altitudes and routes and minimum separation of aircraft flying both at the same altitude and in the same direction. IFR aircraft are under positive ATC control during all phases of flight. Aircraft flying under VFR are not under positive ATC control during flight. VFR aircraft are allowed to fly on a "see and be seen" principle. VFR pilots have the responsibility to maintain safe separation from other aircraft.

The distinction between IFR aircraft and VFR aircraft is important because the separation distance required between IFR aircraft is greater than that for VFR aircraft. Airports that primarily accommodate VFR traffic, therefore, tend to have a higher airfield capacity than airports that primarily accommodate IFR traffic.

In general, all major and regional airlines, air taxis, and corporate business operators operate under IFR. Review of FAA Air Traffic Activity Reports for 1990 indicates that 30 percent or less of the operations at Love Field are by VFR aircraft.

Fleet Mix. Fleet mix affects separation in two ways: First, light aircraft must be adequately separated from heavy aircraft to avoid the consequences associated with wake vortices. Second, faster aircraft must be adequately separated from slow aircraft to maintain minimum spacing requirements between the aircraft. When possible, air traffic controllers assign different arrival and departure routes within a controlled airspace to the faster turbojet aircraft than to the slower propeller aircraft to maintain adequate separation.

The 1990 fleet mix for Love Field was obtained from the airport's 1989 noise report.[1] Average daily arrivals and departures, developed from annual operations statistics, are shown in Table H.5 in Appendix H. As shown in Table J.1, 57 percent of the 1989 fleet mix at Love Field was large, or Category C, aircraft.

In poor weather conditions, aircraft must operate under IFR. For this analysis, all commercial activity (i.e., air carrier, commuter, and air taxi operations) are assumed to have instrument capability, therefore, commercial activity is the same in both good and poor weather conditions. The effect of weather on general aviation traffic varies for the different

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[1] Dallas Love Field 1989 Noise Contour Update, Harris Miller Miller & Hanson, Inc., October 1989.

Table J.1.
1989 Mix Index (MI)
for Love Field

Aircraft Class	Visual Meteorological Conditions (VMC)	Instrument Meteorological Conditions (IMC)
A[1]	17%	0%
B[2]	26%	19%
C[3]	57%	81%
D[4]	0%	0%
Mix Index	**57%**	**81%**

[1] Small single-engine aircraft with a takeoff weight of 12,500 pounds or less (for example, Piper 2A, Cessna C-180, and Cessna C-207).
[2] Small twin-engine aircraft and some Learjets with a takeoff weight of 12,500 pounds or less (for example, Piper PA-31, Beech BE-55, Cessna C-310, and Learjet LR-25).
[3] Large aircraft with a takeoff weight between 12,500 pounds and 300,000 pounds (for example, Gulfstream IV, Beechcraft King Air, B-737-200 and -300).
[4] Heavy aircraft with a takeoff weight of 300,000 pounds or more (such as B-767, L-1011, and DC-8-62).

Source: HNTB analysis.

aircraft classifications. Overall, 100 percent of Class A activity and 50 percent of class B activity is expected to drop during poor weather. The resulting 1989 fleet mix during IMC is also shown in Table J.1.[2]

Meteorological Conditions

The FAA defines two basic types of weather conditions: visual meteorological conditions (VMC), and instrument meteorological conditions (IMC). VMC conditions are weather conditions such that an aircraft can maintain safe separation by visual means. IMC conditions prevail when the visibility or ceiling falls below those minimums prescribed for VFR conditions. VFR minimums are generally 1,000 feet ceiling above airport elevation, three nautical miles visibility and clear of clouds. During periods of IMC, all aircraft must operate under IFR flight plans and operating patterns become the responsibility of Air Traffic Control. Based on meteorological data from the National Climatic Center, VFR conditions exist 91.3 percent of the time and IFR conditions 8.7 percent of the time in the Dallas area.

Since the majority of traffic in the Metroplex is operated under instrument flight rules, ATC controllers, in an effort to increase capacity in both the airspace and at airports, will provide visual separation between IFR aircraft, rather than standard IFR separation (minimum: generally three nautical miles), when weather permits. A previous airspace/airfield study for DFW assumed that visual approaches can be conducted on any runway at DFW when the cloud ceiling is at least 3,500 feet and the visibility is at least five miles. (These conditions of a ceiling of 3,500 feet and visibility of 5 miles, it should be noted, exceed the minimum ceiling of 1,000 feet and the minimum visibility of 3 miles that are needed to operate under VFR.) The study indicates that weather conditions permit visual approaches to DFW approximately 81 percent of the time between the hours of 6 a.m. and 11 p.m.[3] Discussions with Love Field air traffic control personnel confirmed that visual approaches are conducted at the airport when these ceiling and visibility minimums are in effect.

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[2] The capacity methodology in FAA Advisory Circular 150/5060-5 defines the types of aircraft that use a runway in terms of al mix index (MI). The mix index is simply an indication of the level of aircraft in the fleet with takeoff weights greater than 12,500 pounds. It is derived using the equation MI = C + 3D, where lC is the percentage of Class C aircraft in the fleet and D is the percentage of Class D aircraft in the fleet mix. The 1989 mix indices for Love Field are also presented in Table J.1.

[3] Airport Development Plan - Phase II, Technical Memorandum 1, Existing Airside Facilities and Operational Procedures at Dallas/Fort Worth International Airport. KPMG Peat Marwick, March 1988.

Airfield Capacity

FAA Advisory Circular AC 150/5060-5, Airport Capacity and Delay, was used to estimate the runway capacity of Love Field under VFR and IFR weather conditions. The use of AC 150/5060-5 was supplemented by a series of discussions with FAA ATC specialists in the FAA Southwest Region, the DFW TRACON facility, and the Love Field Air Traffic Control Tower (TRACAB).

Hourly capacities for Love Field are shown in Table J.2. Three sets of capacities are provided: mixed operations capacities (50% arrivals, 50% departures), departure priority capacities (40% arrivals, 60% departures), and arrival priority capacities (60% arrivals, 40% departures). Each type of capacity was further grouped into theoretical arrival and departure capacity: IFR aircraft arrival and departure capacity, and VFR aircraft arrival and departure capacity.

Theoretical capacities were obtained from FAA Advisory Circular AC 150/5060-3, Airport Capacity and Delay. The airfield capacity methodology requires inputs on aircraft mix, runway use strategies, level of touch-and-go activity, and the incidence of poor weather. The theoretical capacities are those of the physical layout and represent parallel use of the northwest/southwest runways, the maximum capacity runway use configuration. Existing air traffic control procedures and weight restrictions limit the use of the north/south runway.

At Love Field in IMC, controllers can conduct only very limited dependent parallel approaches (2 nautical miles, staggered) to the parallel runways. FAA Southwest Region estimates an hourly IFR aircraft arrival capacity of 36 arrivals an hour when weather conditions equal or exceed a 3,500-foot ceiling and five miles visibility. Hourly IFR aircraft arrival capacity is reduced to 24 arrivals per hour when weather conditions are at a 200-foot ceiling and 1/2 mile visibility. The difference in arrival capacity is the result of the spacing maintained by controllers. ATC controllers generally must use a greater separation distance during IMC conditions to assure that required minimum separation is maintained.

IFR aircraft departures reflect the constraints of noise abatement departure procedures and potential airspace interactions with departures from DFW and arrivals at DFW and Love Field. The IFR aircraft departure capacities shown in Table J.2 are the theoretical departure capacities adjusted to account for the estimated 25 percent of all Love Field departures that have direct interaction.

As shown, IFR aircraft departure capacity ranges between 37 and 63 departures per hour in VMC, depending on the arrival/departure mix. In theory, IFR aircraft departure capacity would range between 20 and 47 departures per hour in IMC, in the absence of any arrival capacity constraints. However in all cases, departure capacity in IMC will approach the departure priority capacity of 47 departures, regardless of the arrival/departure mix since the actual (constrained) arrival capacity in every instance is less than the theoretical arrival capacity.

Table J.2.
Existing Hourly Capacities

Weather Condition	Arrival/Departure Priority	Theoretical Airfield Capacity (1)		Actual Airfield Capacity			
				IFR Aircraft		VFR Aircraft (3)	
		Arrivals	Departures	Arrivals (2)	Departures (6) (7)	Arrivals	Departures
VFR (4)	Departure	48	72	36	63	12	9
VFR (4)	Mixed	56	56	36	49	20	7
VFR (4)	Arrival	64	42	36	37	28	5
IFR (5)	Departure	41	62	24	47	0	0
IFR (5)	Mixed	41	41	24	47	0	0
IFR (5)	Arrival	41	27	24	47	0	0

Notes: (1) Figures 3.10 and 3.50, FAA AC 150/5060-5, Airport Capacity and Delay. Capacities are based on the assumption that there are no constraints to operations at Love Field.
(2) Love Field Analysis, FAA Southwest Region, December 10, 1990.
(3) Total airfield capacity less IFR capacity.
(4) VFR weather is defined as cloud ceiling at least 3,500 feet and visibility at least five miles. Such conditions occur about 80 percent of the time.
(5) IFR weather is defined as cloud ceiling less than 3,500 feet and visibility of less than five miles. Such conditions occur about 20 percent of the time.
(6) IFR aircraft departure capacity assumes a one-for-one capacity tradeoff with DFW departures from 25 percent of all Love Field departures in VMC and 50 percent of all Love Field departures in IMC.
(7) The airfield can operate at departure priority capacity in IMC regardless of arrival/departure mix due to a constrained airfield arrival capacity with DFW during VMC and the estimated 50 percent of all Love Field IFR aircraft departures that have interaction with DFW departures. The analysis assumes that every interaction is a one-for-one capacity tradeoff with departures from DFW.

VFR aircraft capacity is an indication of the level of traffic, beyond IFR aircraft demand, that can be accommodated at Love Field. Love Field's location in an Airport Radar Service Area (ARSA) requires that all VFR aircraft are sequenced and separated. Under appropriate weather conditions, VFR traffic may be segregated from IFR traffic and sequenced in a manner that significantly increases the acceptance rate of the airfield. Love Field TRACAB has recorded peak hour activity counts of over 100 operations, indicating that the actual acceptance rate of the airfield closely approximates the theoretical capacity of the airfield.

The critical element of the airfield capacity analysis is the IFR aircraft capacity. Aircraft delays under IFR conditions will increase as the demand approaches and exceeds the IFR aircraft capacity at Love Field.

Potential Capacity Improvements

The capacity of the airfield system can be improved above levels described in two ways: physical improvements and changes in air traffic control procedures.

Physical improvements include the addition of taxiways and improved navigational facilities. Additional high speed taxiway in the 3,500- to 6,500-foot range for both Runways 13R and 31L would increase the arrival capacity at Love Field in VMC. Approximately five additional arrivals per hour are possible, if these taxiway improvements are made.

In addition to physical improvements, technical and research programs directed to the improvement of airfield capacity through improved handling of air traffic are being conducted by the FAA. Also, the FAA Southwest Region is in the process of implementing the DFW Metroplex Air Traffic System Plan, which is designed to provide procedures for the DFW terminal area through 2005.

The principal points of the plan include:

- Parallel arrival routes to DFW over all cornerposts, regardless of flow. (The use of parallel arrival routes is contingent upon runway availability and traffic demand requirements),
- Parallel arrival routes to satellite airports based on destination,
- Four turbojet departure routes: north, south, east, and west,
- Separate arrival and departure altitudes for a selected group of high performance turboprop aircraft,
- Increased arrival capacity for both DFW and satellite airports,

- Increased departure capacity for both DFW and satellite turbojet departures,
- A 30 nautical mile terminal control area based on the DFW VORTAC,
- Development of a real-time traffic management system for the DFW terminal area, and
- Development of four simultaneous ILS approach procedures at DFW.

A great deal of planning and coordination effort has been expended on this plan. Major programming actions are underway by the FAA to implement the airspace restructuring and provide required air traffic control facilities for the plan. One minor airspace procedural change has been accomplished. Most of the other actions necessary to program completion are anticipated by 1996.

The benefits of the Metroplex Plan to satellite airports are as follows:

<u>Increased capacity</u>

- Separate arrival routes for east and west satellite airports,
- Additional departure routes, and
- Separate arrival and departure system for high performance turboprops.

<u>Reduced User Delays</u>

- Increased capacity of arrival and departure route system,
- Segregation of traffic based on destination, and
- Savings in operating costs.

<u>Improved Safety</u>

- Segregation of traffic based on type of aircraft and
- Expanded TCA.

STUDIES REVIEWED FOR AIRSPACE ANALYSIS

The following studies considered the impact of the proposed new runways at DFW on Love Field capacity.

1. **Study:** *Evaluation of the Potential Effects of Changing the Air Service Restrictions at Love Field*, KPMG Peat Marwick, March 1990.

   Purpose: To analyze the implications of changing the existing restrictions at Love Field on all the air carrier airports serving the Metroplex.

   Conclusion: "The FAA has developed innovative ATC procedures for operating DFW and Love Field simultaneously, and the procedures would be modified only slightly to accommodate the planned new runways at DFW."

2. **Study:** *Effects of a Second New Runway at DFW*, MITRE Corporation, September 1990.

   Purpose: Presents results of the extension of the National Airspace System Performance Analysis Capability (NASPAC) analysis of the DFW Metroplex Plan. The original analysis completed in April 1990 included the effects of a single new runway at DFW. This study considers the effects of a second new runway.

   Conclusion: Love Field will be both positively and negatively impacted by the plan.

   - Technical Delay Decrease - VMC
   - Technical Delay Increase - IMC1
   - Effective Arrival Delay Increase - IMC1
   - Technical Delay Decrease - IMC2

   Technical delay is delay absorbed by aircraft while waiting for ATC resources. Effective arrival delay measures the difference between scheduled and actual arrival times, regardless of cause. IFR1 conditions are in effect when cloud ceiling is less than 1,000 feet or visibility is less than three miles, but cloud ceiling is at least 200 feet or visibility is at least one half a mile. IFR2 conditions are in effect when cloud ceiling is less than 200 feet or visibility is less than one half a mile.

3. **Study:** *Dallas/Fort Worth Metroplex Air Traffic Analysis*, ATAC Corporation, March 1990.

   Purpose: This report documents technical efforts accomplished in applying the Airport and Airspace Simulation Model (SIMMOD) in support of planning efforts of the Southwest Region of the Federal Aviation Administration (FAA), which involved addressing capacity and delay problems in the Dallas/Fort Worth (DFW) Metroplex area.

Conclusion: The study reached several conclusions including:

"The new airspace will result in delay savings for traffic associated with Dallas Love Field and other satellite airports, as well as DFW Airport. Under VFR conditions, delay savings due to the new airspace will average 22 hours per day in 1990, rising to 54 hours per day for year 2000 traffic demand. Under IFR conditions, delay savings due to the new airspace are greater, with savings averaging 27 and 67 hours per day in years 1990 and 2000, respectively."

"Substantial delay savings result from using routings and procedures that minimize airspace interactions between DFW Airport and Dallas Love Field departures. Use of airspace routings that uncouple DFW Airport and Dallas Love Field departures during South Flow operations, except at night for noise abatement, result in daily delay reductions of 21, 102, and 1283 hours per day for year 1990, 2000, and 2010 demand levels, respectively. These delay savings equate to annual aircraft operating cost savings of $9 million, $44 million, and $556 million, respectively."

APPENDIX K:

Trinity-3 Departure Analysis

APPENDIX K: TRINITY-3 DEPARTURE ANALYSIS

A SIMMOD (the FAA Airport and Airspace Simulation Model) analysis of the effect of the Trinity-3 noise abatement procedure at Love Field was reported in the results of the DFW Air Traffic Analysis[1]. The base year for air traffic was 1987, and the forecast then available for 1990, 2000, and 2010 was utilized.

The Trinity-3 departure was analyzed using SIMMOD for nighttime use and for 24-hour use. The Metroplex system improvements were assumed to be in place and the analysis was undertaken for VFR weather conditions. Proposed airport improvements at DFW were assumed to be in place by 1990. The analyses included two levels of air traffic at Love Field: the then existing nominal forecast and an increased level of air traffic at Love Field commencing in 1990.

The impact of using Trinity-3 departure 24 hours a day versus nighttime only is shown in Table K.1 in terms of percentage of departures delayed ten minutes or more. From this table it is clearly evident that the impact on DFW is greater in the earlier years. In the latter years (2010), over one half of the departures from the east side runways of DFW would be impacted to the point where delays are ten minutes or more. On the other hand, the increased traffic at Love Field in 2010 with the nominal forecast was such that 80 percent of the departures from Love Field would be delayed 10 minutes or more. This table also shows that, whereas nighttime use of the Trinity-3 departure has a minimal impact on Love Field traffic, the impact on DFW is much greater. For example in 1990 seven percent of DFW eastside departures would have been delayed more than 10 minutes by the use of nighttime Trinity-3 at Love Field.

A level of air traffic at Love Field increased about 40 percent over the level of traffic then forecast for Love Field, was also included in the analysis. Air carrier traffic was increased and general aviation decreased as shown on Table K.2. It is obvious from the table that the level of air traffic that had been forecast for 1990 was substantially in excess of the actual 1990 traffic. However, for the purposes of comparing the effect of substantially increased air carrier traffic at Love Field, the results of the analysis are useful. The results of this comparison are shown on Table K.3. Increasing air traffic at Love Field to the extent indicated in Table K.2 drastically increases the impact of the Trinity-3 departure when its use is extended to 24 hours. As may be seen, when the Trinity-3 departure is used 24 hours a day at Love Field, with the forecast level of air traffic it produces a total of 10 hours daily delay for aircraft departing Love Field. When air traffic at Love Field is increased, as shown in Table K.2, the delay attributable to the use of Trinity-3 departure 24 hours a day increases the daily delay at Love Field ten fold.

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[1]Dallas-Ft. Worth Air Traffic Analysis, ATAC Corporation, March 1990.

Table K.1

DALLAS LOVE FIELD

Percent of Departures Delayed at Least Ten Minutes at DFW and DAL Airports

Airport	% of Departures Delayed at Least 10 Minutes		
	Demand Year	Using Trinity–3 at Night only	Using Trinity–3 24–hours
DFW	1987	5	10
	1990	7	13
	2000	6	21
	2010	19	54
DAL	1987	0	0
	1990	0	0
	2000	0	23
	2010	1	80

Source: Dallas/Ft. Worth Metroplex Air Traffic Analysis, March 1990, ATAC Corporation; Table 5–17.

Table K.2

DALLAS LOVE FIELD

Forecast and Increased Level of Operation for Dallas Love Field

Total Number of Operations per Year by Aircraft Category		
Aircraft Category	**Forecast 1990**	**Increased 1990**
Air Carrier	101,000	265,647
Air Taxi	57,000	57,000
General Aviation	213,000	194,319
Military	2,000	2,000
Total	373,000	518,966

Source: Dallas/Ft. Worth Metroplex Air Traffic Analysis, March 1990, ATAC Corporation; Table 5–18.

Table K.3

DALLAS LOVE FIELD

Daily Delay Without Increased Traffic Demand Level at Dallas Love Field

Daily Arrival and Departure Delay in Hours

Trinity–3 Procedure Run 24–hrs	DFW Airport Operations	DFW Airport Delay	DAL Airport Operations	DAL Airport Delay	Total Daily Delay
No	1,979	84	622	7	91
Yes	1,979	102	622	10	112

Daily Delay With Increased Traffic Demand Level at Dallas Love Field

Trinity–3 Procedure Run 24–hrs	DFW Airport Operations	DFW Airport Delay	DAL Airport Operations	DAL Airport Delay	Total Daily Delay
No	1,979	84	955	35	119
Yes	1,979	142	955	103	245

Source: Dallas/Ft. Worth Metroplex Air Traffic Analysis, March 1990; Tables 5–19 and 5–20.

The Trinity-3 departure at Love Field has a greater impact on DFW traffic than on Love Field traffic. Increasing air traffic at Love Field will greatly increase the effect of Trinity-3 departures at Love Field.

The use of Trinity-3 departure at Love Field 24 hours a day increases the daily delay at DFW about 20 percent as compared to when Trinity-3 is used at Love Field for nighttime only. Increasing air traffic at Love Field does not increase delay at DFW when Trinity-3 is used at night only. When traffic is increased at Love Field and Trinity-3 departure is used 24 hours a day at Love Field, daily delay at DFW increases about 70 percent over the daily delay when Trinity-3 is used only at night at Love Field.

From this analysis it appears that the use of Trinity-3 departure 24 hours a day at Love Field has such a severe impact on DFW delay that such use should not be contemplated.

APPENDIX L:

Dallas Love Field 1989 Ldn Contours

APPENDIX L: DALLAS LOVE FIELD - 1989 LDN CONTOURS

The Ldn noise index was developed under the auspices of the U.S. Environmental Protection Agency (EPA) for use in describing aircraft noise impacts and other environmental noise impacts. Ldn is the index preferred by the Federal Aviation Administration (FAA). Ldn is the logarithmic average of sound levels measured in decibels weighted to closely approximate the sensitivity of the human ear. It is based upon the yearly average for a 24-hour Equivalent Sound Level (Leq) and is weighted to account for increased noise sensitivity between 10:00 p.m. and 7:00 a.m. with a 10 dBA penalty applied to noise events during that nighttime period.

The 1989 Ldn noise contours were produced using the FAA's latest version of the Integrated Noise Model - INM 3.9. The contour set represents a base case from which comparison of alternative scenarios will be derived. The procedure for modeling aircraft noise takes into account flight path, number of operations, and the flyover noise associated with a given aircraft on a given plight path corrected for the duration of the sound. Contours of equal Ldn value are then developed and mapped, reflecting the average noise of takeoffs and landings over a year's time.

In 1989, the firm of Harris Miller Miller & Hanson, Inc. developed noise contours for Dallas Love Field using a NOISEMAP program. NOISEMAP was developed for military use and is now approved by the FAA for civilian airport use. Much of the data used to generate these 1989 INM Ldn noise contours was taken from HMMH reports. Below is a summary of the process and assumptions used to develop the INM contours.

1. Traffic Mix

The mix of aircraft utilized for the 1989 Ldn contours reflects the average daily operations developed by HMMH. Monthly FAA Air Traffic Control (ATC) counts for the period of July 1988 to June 1989 were used to determine annual and daily operations by air carrier, air taxi, and general aviation. Specific aircraft types were further identified, and their average daily operations determined using the Official Airline Guide (OAG) and analysis of ATC flight strip records. The average daily mix, depicted in Tables L.1 and L.2, includes 215 daily air carrier operations (takeoffs and landings combined) and 372 air taxi/general aviation operations. Air taxi and general aviation operations of the same aircraft type were combined.

2. Runway Use

Runway use figures were obtained from the Dallas Love Field 1989 Noise Contour Update prepared by HMMH in October 1989. The data is based on analysis of ATC flight strip records and is adjusted for unusual variations. The airport operates with a southerly flow approximately two-thirds of the time as shown in Table L.3.

Table L.1.

DALLAS LOVE FIELD

1989 Average Daily Departures for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	35.3	0.1	35.3
737–300	68.4	1.0	69.4
DC9–15	0.0	1.3	1.3
727–200	0.0	1.3	1.3
727–100	0.0	0.2	0.2
Subtotal	103.7	3.9	107.5
Air Taxi/General Aviation –			
Citation	7.2	0.4	7.6
Lear 25	10.4	3.0	13.4
Lear 35	24.6	4.8	29.4
Challenger 600	1.7	0.0	1.7
Gulfstream 2	3.1	0.0	3.1
Mitsubishi 300	1.1	0.0	1.1
Saberliner 80	2.5	0.2	2.7
Twin – Turboprop	30.3	3.9	34.1
Twin – Piston	29.1	12.7	41.9
Single – Piston	39.8	11.3	51.0
Subtotal	149.8	36.3	186.0
Total	**253.5**	**40.2**	**293.5**

Source: Harris Miller Miller & Hanson, Inc., October 1989.

Table L.2.

DALLAS LOVE FIELD

1989 Average Daily Arrivals for Ldn Contours

Aircraft Type	Day	Night	Total
Air Carrier –			
737–200	32.8	2.5	35.3
737–300	66.5	2.9	69.4
DC9–15	0.0	1.3	1.3
727–200	0.0	1.3	1.3
727–100	0.0	0.2	0.2
Subtotal	99.3	8.2	107.5
Air Taxi/General Aviation –			
Citation	7.0	0.5	7.6
Lear 25	9.3	4.1	13.4
Lear 35	25.3	4.1	29.4
Challenger 600	1.6	0.2	1.7
Gulfstream 2	3.1	0.0	3.1
Mitsubishi 300	1.0	0.1	1.1
Saberliner 80	2.3	0.5	2.7
Twin – Turboprop	31.3	2.8	34.1
Twin – Piston	29.9	12.0	41.9
Single – Piston	42.4	8.6	51.0
Subtotal	153.2	32.9	186.0
Total	**252.5**	**41.1**	**293.5**

Source: Harris Miller Miller & Hanson, Inc., October 1989.

Table L.3.

DALLAS LOVE FIELD

Departure Runway and Track Use

Runway	Track (1)	Air Carrier % of Use Day	Air Carrier % of Use Night	Air Taxi+Gen. Avia. % of Use Day	Air Taxi+Gen. Avia. % of Use Night
13L	1	0.0	10.0	9.0	4.2
	2	0.0	0.0	5.4	2.5
	3	0.0	0.0	9.5	4.4
	4	0.0	0.0	12.1	5.7
	5	0.0	0.0	9.0	4.2
Subtotal		0.0	10.0	45.0	21.0
13R	6	14.9	0.0	4.8	0.0
	7	7.2	5.1	2.3	4.1
	8	5.2	0.0	1.7	0.0
	9	14.9	0.0	4.8	0.0
	10	10.4	0.0	3.4	0.0
	11	2.0	0.0	0.6	0.0
	12	6.5	0.0	2.1	0.0
	13	3.9	25.6	1.3	20.6
	14	0.0	1.1	0.0	0.9
	15	0.0	12.0	0.0	9.7
	16	0.0	12.0	0.0	9.7
	17	0.0	0.6	0.0	0.5
	18	0.0	0.6	0.0	0.5
Subtotal		65.0	57.0	21.0	46.0
31L	19	2.2	2.3	0.6	0.6
	20	3.4	3.6	1.0	0.9
	21	4.0	4.3	1.2	1.0
	22	3.1	3.3	0.9	0.8
	23	1.5	1.6	0.4	0.4
	24	3.1	3.3	0.9	0.8
	25	7.8	8.3	2.3	2.0
	26	5.9	6.3	1.7	1.5
Subtotal		31.0	33.0	9.0	8.0
31R	27	0.0	0.0	9.3	9.3
	28	0.0	0.0	1.7	1.7
	29	2.0	0.0	5.3	5.3
	30	2.0	0.0	6.0	6.0
	31	0.0	0.0	2.7	2.7
Subtotal		4.0	0.0	25.0	25.0
Total Use By Type		**100.0**	**100.0**	**100.0**	**100.0**

Source: Harris Miller Miller & Hanson, Inc., October 1989.

3. Flight Tracks

Flight track geometry was developed from information provided by HMMH. This data includes "center of gravity" analysis of FAA radar tracings. Arrival tracks were assigned as straight-in approaches because the noise generated beyond final approach does not affect Ldn calculations as shown on HMMH's actual 1989 contours. Tables L.4 and L.5 show the percentage use for each track by runway end. During the development of flight track inputs for noise analysis, HMMH accounted for the use of Trinity-III noise abatement procedure during the hours 9:00 p.m. to 6:00 a.m. These data were not changed.

4. Departure Profiles

The departure profiles for the air carrier jet aircraft used in the INM were modified to model the actual thrust settings and cutback points used by Southwest Airlines. Profiles were developed for the DC9, B727, and B737 aircraft based on performance data supplied by the airline to HMMH.

5. 1989 Ldn Contours

Figure L.1 represents the INM baseline Ldn contours for 1989. These contours are slightly different from those generated by NOISEMAP. The Ldn 65 contour encompasses approximately 6.8 square miles.

Dallas Love Field Population Counts Methodology

In order to determine approximate numbers of people impacted by noise due to aircraft at Dallas Love Field, 1990 census population figures at the tract and block level were obtained from the City of Dallas Planning Commission. A census tract and block map was also obtained.

Noise contours generated using the FAA's Integrated Noise Model (INM) were superimposed on the census tract and block map (scale 1"=2,000 ft.). The percentage of the area of each census block contained within each noise contour was estimated and the corresponding percentage population within each block calculated. Using this methodology, total block populations were subjectively calculated for Ldn noise contours, 65-70, 70-75, and 75+, respectively.

Table L.6 shows the population included within the contours. It also compares the 1990 population within the contours with the Dallas 1992 goal as set forth in the 1989 noise update for Love Field by HMMH.

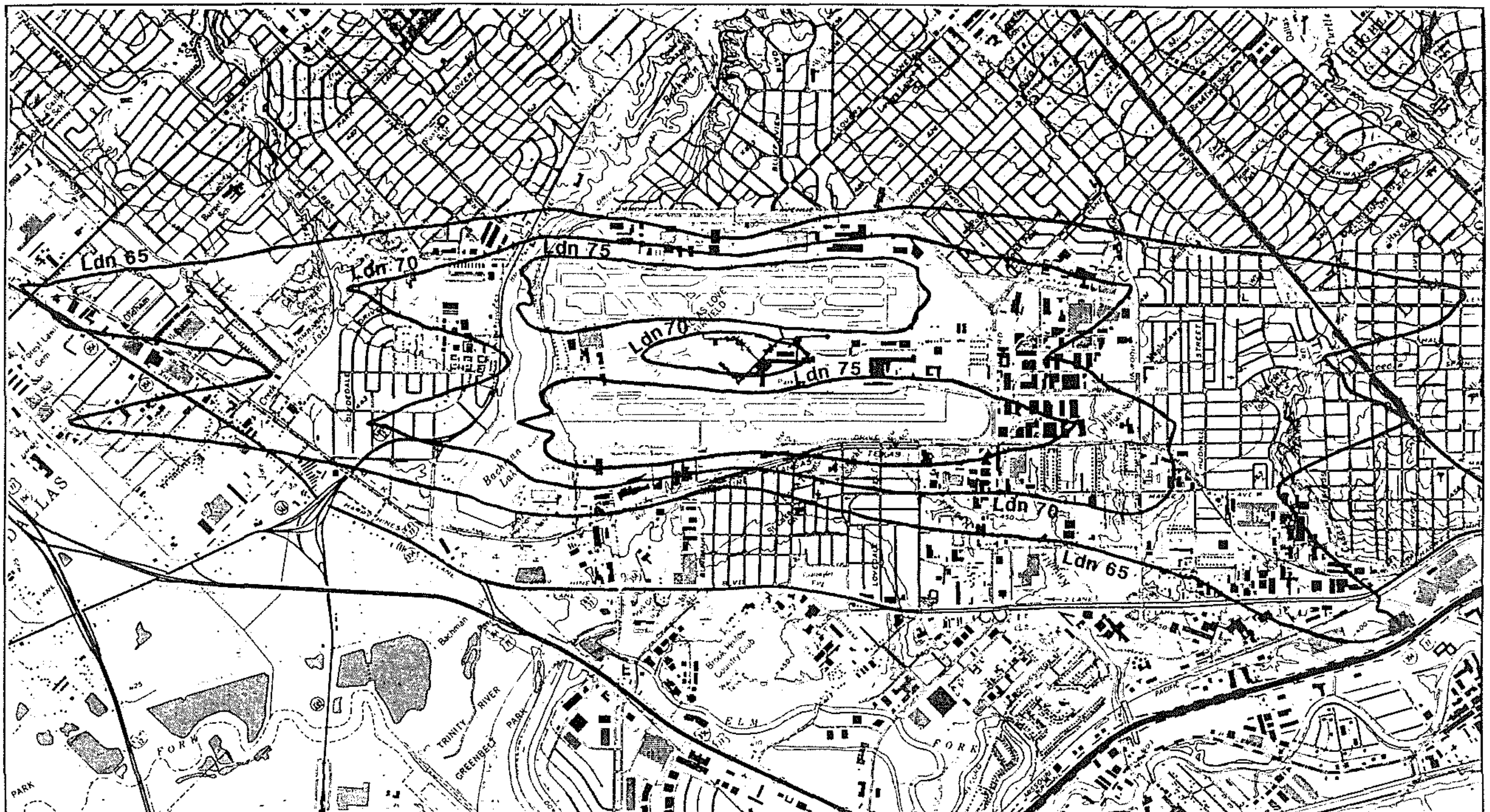
Table L.4.

DALLAS LOVE FIELD

Arrival Runway and Track Use

Runway	Track (1)	Air Carrier % of Use Day	Air Carrier % of Use Night	Air Taxi+Gen. Avia. % of Use Day	Air Taxi+Gen. Avia. % of Use Night
13L	1	3.0	0.0	43.0	17.0
13R	2	63.0	67.0	23.0	50.0
31L	3	33.0	33.0	10.0	8.0
31R	4	1.0	0.0	24.0	25.0
Total Use By Type		100.0	100.0	100.0	100.0

Source: Harris Miller Miller & Hanson, Inc., October 1989.



Source: HNTB Using INM 3.9

Figure L.1

Dallas Love Field
1989 Ldn Contours

Table L.5.

DALLAS LOVE FIELD

Dallas Love Field Ldn Contour Population Count

Ldn	Population	
	1989 Contours	1992 Goal
65 to 70	25,663	20,000
70 to 75	2,755	6,000
inside 75	164	1,000
Total 65 or greater	**28,582**	**27,000**

Source: HNTB calculations.

APPENDIX M:

Methodology for Computing Terminal/Concourse Space Requirements for Love Field

APPENDIX M: METHODOLOGY FOR COMPUTING TERMINAL/CONCOURSE SPACE REQUIREMENTS FOR LOVE FIELD

FAA AC 150/5300-13 Planning and Design Guidelines for Airport Terminal Facilities indicates that 0.08 to 0.12 square feet per annual enplanement is required. Experience has indicated that 0.12 square feet per enplanement is the minimum. Therefore the annual enplanements are obtained from the forecast and multiplied by 0.12 to provide an estimate of the total space required in the terminal and concourses. It is assumed that the west concourse and portions of the terminal currently being utilized provide the space required to meet the 1990 enplanements, and that this space does not need to be renovated. Using 0.12 sq. ft. per enplanement, the 1990 space is estimated at 356,000 sq. ft. The space to be renovated is equal to the difference between the space calculated for 1990 and the required space calculated for the scenario, until the space available in the terminal and concourses is exceeded. New structure is equal to the difference between total space required according to the calculations and total space available in the terminal and concourses in 1990.

This methodology cannot take into account the situation where some portion of the available terminal or concourse space is in the wrong place. It also cannot take into account the situation where it may be more efficient to provide new construction rather than modification of the existing structure. Adapting a structure such as the Love Field terminal and concourses, most of which were last used for air carrier activities years earlier, is fraught with uncertainties. A detailed terminal area development plan should be undertaken if more than a general examination of cost implications of the reuse of gates and space requirements is desired.