

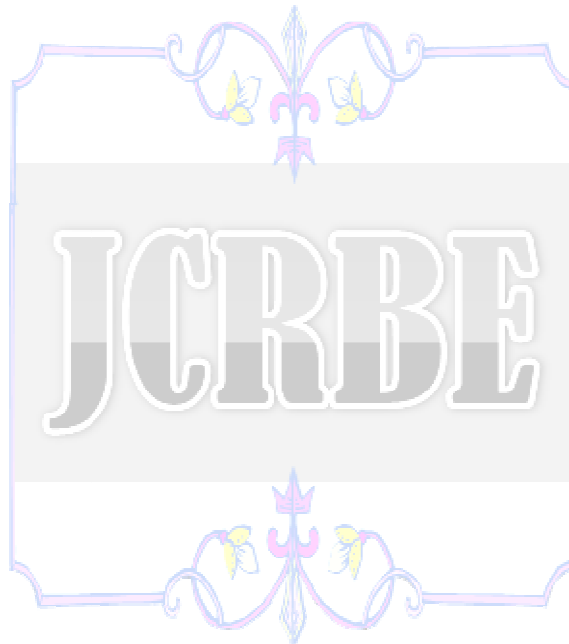
## The U.S. air carrier industry

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### Abstract:

This case provides an historical and economic background for firm specific cases in the air carrier industry, focusing on cost and revenue drivers. The purpose is to provide context for understanding competitive pressures and to be a basis for extended industry analysis. This case is intended for MBA or upper level undergraduate classes in strategic management.

Keywords: airlines, deregulation, Southwest Air, Delta, United



## INTRODUCTION

The contemporary air carrier industry consists of three sets of firms: large legacy or network carriers, low cost carriers, and regional firms. The term “legacy” derives from how these firms were started in the very early days of commercial aviation and survived through the deregulation of the industry. The “network” term comes from how those firms altered their systems by adopting a hub-and-spoke or network operational mode. This set of firms has, since the beginning of the 2000s, consisted of American, United, Delta, Northwestern, Continental, and US Air (though other legacy carriers that emerged from the regulatory era have since failed). Currently, Northwestern and Continental have been acquired or merged into other carriers, leaving only four. The low cost carriers (LCCs) emerged after deregulation in 1978. Southwest is the oldest of these. The regional carriers, such as Alaska or Hawaiian Airlines, serve a limited geography. Many regional firms are often partnered with a large carrier to act as a feeder line. Overall, by 2011, 63 passenger carriers had annual revenues in excess of \$20 million (Bureau of Transportation Statistics (BTS), 2011a). At the same time, the industry has been hit hard by terrorism and economic shocks in the past decade, resulting in operating losses in six of ten years.

## HISTORICAL BACKGROUND

### **The early years: carrying the mail (1916-1936)**

The firms that ultimately became the large, legacy carriers in this industry got their start by delivering mail. The U.S. Post Office originally operated its own planes for mail delivery beginning in 1916 but under pressure from the rail companies (into whose business this government owned entity was intruding), the Kelly Act of 1925 authorized mail carrying to be contracted out to private firms. Early contractors included Henry Ford and Bill Boeing, the latter running a firm started with Pratt & Whitney called Boeing Air Transport (U.S. Centennial of Flight, 2009a). Later, the Air Mail act of 1930 gave Walter Brown, Postmaster General under President Hoover, significant leverage in encouraging small contract mail carriers to merge for efficiency's sake and to carry passengers instead of just mail. This resulted from rules that paid contractors based on the capacity of the plane rather than the amount of mail carried which made larger planes more profitable and made carrying paying passengers more feasible. A second component of the Act permitted carriers to tie up exclusive rights to the route for up to ten years. Finally, the Act granted the Postmaster General a great deal of latitude in consolidating routes. Brown initially authorized three carriers to haul mail: Boeing Air Transport received the northern route, Transcontinental and Western Air (TWA and the result of a merger between two smaller carriers) took the middle U.S. routes and American Airways the southern U.S mail routes (U.S. Centennial of Flight, 2009b; Sampson, 1984).

However, in an environment where President Franklin Roosevelt had radically altered the relationship between government and business, accusations of corruption against Walter Brown led to the mail contracts being removed from the carriers and given to the Army. This experiment failed (due to much higher costs and an appalling fatality rate among Army pilots) and mail contracts were returned to private carriers with the stipulation that no carrier that had previously held a contract could do so in the new system. The original carriers (and some quick followers in passenger service only) simply changed their names and carried on: Boeing Air

Transport became United Airlines, American Airways became American Air Lines, Northwest Airways changed to Northwest Airlines and North American Aviation became Eastern Air Lines. All of these carriers would be significant players in the industry for at least the following fifty years. In a final swipe at the industry, the Air Mail Act of 1934 broke up the industry holding companies that had operated both manufacturing and service firms (such as Bill Boeing and Boeing Air Transport/United Air Lines. Boeing went on with the manufacturing side of the business, naming it Boeing Company, which became the world's largest manufacturer of air planes).

Another carrier that emerged at this time and ultimately became the international face of American air carriers was Pan American Airways (also known as PanAm). This carrier was started up by Juan Trippe to carry mail from Key West, Florida to Havana, Cuba. Trippe quickly expanded the system by creating a Miami-Panama route then a purely Caribbean route between Puerto Rico and Trinidad. Subsequently, either through partnerships with other carriers or through own efforts, Pan Am came to dominate international air travel in North and South America.

### **A regulated industry: the Civil Aeronautics Board (1938- 1984)**

Despite the restructuring of the air carrier industry as a result of the 1934 Mail Act, the industry continued to struggle. One cause was the rule that permitted carriers to enter and serve routes in a competitive bidding approach that led to exceptionally low offers and, subsequently, steep losses for incumbents. After a Congressional panel recommended the creation of an independent agency to control entry, Congress passed the 1938 Civil Aeronautics Act. This authorized the new Civil Aeronautics Authority to manage how routes were assigned and what fares could be charged, thereby stabilizing revenues and profits. In 1940, the agency was divided in two: the Civil Aeronautics Board (CAB) continued in an oversight role on economic issues like fares and routes and market entry and exit (i.e., managing competition to assure that the carries remained solvent) as well as investigating safety issues and the Civil Aeronautics Administration (CAA, predecessor to the current Federal Aviation Administration) was responsible for air traffic control and aircraft and pilot certification (Sampson, 1984; Victor, 1990).

The Air Transport Association of America (ATA) (the industry trade association) commented on the role of the CAB in its 1940 report this way:

“...without a consistent governmental policy for the orderly development of the industry, for curbing rampant and cutthroat competition, for fixing rates and nourishing and protecting the investment painfully expended in building air routes, common carrier transportation would bleed itself to death and so irreparably cripple our national security” (Air Transport Authority (ATA),1940, p.5)

Initially, the agency protected the routes of the existing carriers. The four largest firms at the time of the act were American, United, TWA, and Eastern. The carriers had the most developed and lucrative routes and the routes were protected by the CAB. This allowed these carriers to be dominant in the early years but the CAB strengthened the route systems of smaller firms like Northwest, Continental, Delta, and Northeastern so they too became stronger.

However, the CAB was unable to consistently regulate industry profitability, largely for technological and economic reasons. First, the end of World War II brought a large number of aircraft and trained pilots back to the U.S, and many small carriers were started. Unable to win official approval, they nonetheless continued to operate as “irregulars” and, before the CAB effectively ended their ability to enter in the mid-1950s, controlled as much as 7.5% of passenger traffic (Victor, 1990). Second, advances from aircraft manufacturers in terms of larger, more efficient planes meant carriers were driven to adopt new planes on existing routes. Because the plane changed but the underlying traffic did not, passenger yield (or the number of seats occupied by passengers) declined which eroded unit costs. In the first of these cycles, the CAB intervened to boost yield by restricting competition on many city pairs (40 of the top 100 city pairs had no completion between carriers) and ending new carrier entry. It also imposed rate hikes so as to try to assure profitability (Victor, 1990). This cycle of new technology introduction, adoption, and subsequent over-capacity in the industry occurred again with the introduction of commercial jets and, later, wide-bodied jets (Sampson, 1984).

A complicating factor here in addition to new technology was that business travelers in the late ‘60s-early ‘70s became more demanding about convenient scheduling, leading carriers to add more flights to existing routes which created yet more excess capacity. Ultimately, the CAB placed a near moratorium on new routes to try and control the problem (Borenstein, 1992). By the mid-1970s, the inability of the CAB to effectively manage the industry was clear: a Congressional subcommittee opened hearings on the agency in spring of 1975. In three years, this ultimately led to the 1978 Airline Deregulation Act and six years later, the CAB was dissolved.

### **A volatile industry: deregulation (1979-present)**

The end of regulation coincided with a steep economic recession and predictably intense new competition from new carriers (carrying sharply discounted fares) as well as with existing carriers over routes. Profitability in the industry took a sharp hit and only two carriers actually turned a profit in 1980. Another cause of the losses was the carriers’ own structure. Under the CAB, routes had been awarded in a non-systematic way and all carriers operated a point-to-point route system. As the pressures of competition compelled firms to enter new routes and add city-pairs, this system rapidly became burdensome and costly. In addition, carriers had made decisions about their fleets - which planes and how many - under the old rules and the new route requirements made the fleets inefficient. For example, many large carriers had purchased large jets like the Boeing 707. This works well for long haul, high density routes but is a poor choice for shorter routes and smaller markets. Thus, carriers were forced to add new plane models and obsolete others before their time, increasing costs (Victor, 1990). The response to this was the development of the hub-and-spoke system (for further discussion, see Airports, below)

New entrants found the process relatively easy as the minimum efficient scale and capital costs were low. Since deregulation, at least 200 carriers have entered the industry. However, if entry was easy, survival was not. From 1979 to 2005, 146 carriers entered bankruptcy and only 16 emerged from it as ongoing firms (Hecker, 2005).

The most successful firms since deregulation have been the low cost carriers such as Southwest, jetBlue, and AirTran. By focusing on efficiency both with capital stock and labor, these firms have been able to survive the loss of pricing power for the industry. That is, as prices drop, developing a low cost operation means these firms will be comparatively more profitable.

Indeed, Southwest has been the template for the low cost model and has been imitated in the U.S. and abroad.

### **The roles of the Department of Transportation (DOT) and Federal Aviation Administration (FAA)**

Carrier certification is a complex process where the prospective entrant needs to secure economic authority to operate from the DOT and safety authority from the FAA. Economic authority is granted when an applicant can demonstrate that management has the necessary experience to credibly operate an airline, that the proposed operating and business plans show good understanding of the cost and complexities of running a carrier including the plans or commitments to raise adequate capital, that neither the firm nor its manager have a history of safety violations or fraudulent activity, and that the owners are American citizens. From the DOT's perspective, this means that applicants have to have completed a substantial amount of work – particularly with respect to management and financing - to be able to file a viable application. The DOT advises that the time to process a complete application at a minimum of four months, assuming there are no concerns or particularly complex issues raised around the application (Department of Transportation, 2005).

The FAA is a part of the Department of Transportation that oversees civil flight. The agency's primary responsibilities are safety certification of airlines and aircraft for those carriers, safety assurance, and development and enforcement of rules regarding civil operations. The FAA process, which potential entrants must negotiate at the same time as the DOT process, is complex. It begins with a pre-application statement of intent which is a brief summary of management, the scope of the proposed carrier service area, the equipment that will be used, and a justification for the venture. Once this is approved, but before a full application can be filed, the entrant will need to design safety processes, document all operational systems (such as training or maintenance), company manuals and programs, aircraft data forms, security plans, and so on. Once the pre-application work is prepared, the applicant files this information along with the planned list and timeframe for aircraft, facilities, and activities that have to be acquired or developed to be ready for FAA inspection, the required management personnel data (for directors of operations, maintenance, safety, etc.) and proposed operations specifications. After the application is received, a formal meeting to address omissions or deficiencies is convened. The decision to accept or reject the application follows but the acceptance only means that the process goes forward through subsequent steps of design and performance assessment (Federal Aviation Administration (FAA), 2011a). The duration of the process is quite variable but, as a recent example, Columbus based (and short-lived) Skybus started up in 2003 and received FAA approval to begin operations in May 2007.

The FAA also registers aircraft acquisition and certifies that the planes are airworthy. This latter process also requires that carriers inspect and maintain aircraft. Failure to do so can be costly: in 2009, Southwest was fined by the FAA \$7.5 million for skipping mandatory safety checks (Hughes, 2009).

## INDUSTRY ECONOMICS

### Income

About 96% of revenues in the air carrier industry come from passenger traffic with freight and mail accounting for the rest. Historically, mail was a significant revenue source for airlines. Not until 1934 did passenger revenue exceed mail revenue (ATA, 1943) but by 1945, the revenue contribution of mail had dropped to 15%. In more recent times, the emergence of firms like FedEx and UPS as alternatives for overnight delivery as well as technological alternatives have diminished the impact of mail on carrier revenues.

Passengers are often divided into business and leisure travel segments and the latter can be further divided into pleasure (such as vacations) and personal business (trips made for family, religious, or medical purposes). The bulk of travel over 50 miles for any purpose is done with personal vehicles (see Table 1) but flight is the next most popular choice and the preferred mode in trips over 1,000 miles. Data from the Bureau of Transportation Statistics indicates that in 2001, business purposes account for roughly 40% of air travel trips and pleasure and personal reasons for 60% (Bureau of Transportation Statistics (BTS), 2006). However, the recession of 2008-09 drove the business travel share down to 33% in 2009 and 36% in 2010 (Mouwad, 2011).

Leisure travelers are often described by being most motivated by price with respect to carrier choice, and have generally been regarded as demonstrating relatively high price- and cross-elasticities. That is, the percentage decline in demand is expected to be greater than the percentage increase in prices implemented by carriers and these travelers are judged to be similarly sensitive to changes in the difference between various transportation modes (Doganis, 2010). However, this may not be completely accurate. The first decisions are destination and duration and these are made in the context of trip occasion (e.g., entertainment and sightseeing, family centered, outdoor, or combined leisure and business). Thus, the first cut on which carriers could be used depends on carrier route systems. Second, air travel is used when time en route is more important than ease of getting around the destination. Finally, travelers who choose air transport are equally concerned with convenient scheduling and price (Travel Industry Association, 2005).

Business travelers are usually estimated to have lower demand elasticities because the costs are borne by the firm, not the travelers, and because business purposes are less elective than leisure travel. For this reason, carriers have focused marketing efforts such as frequent flyer programs (FFPs) on these customers. The theory is that the rewards from membership will influence carrier choice so as to maximize those rewards and to some extent this has been true: up to 80% of business travelers agree that membership in an FFP has influenced their travel choices (Charlton, 2004). However, there are limitations. First, as with leisure travelers, the most important criterion in carrier choice is access to the destination. The FFP will not matter if the carrier does not fly where the traveler needs to go. Second, both those who travel infrequently and those who travel frequently are equally indifferent to FFPs as a driver of carrier choice. This was because the infrequent travelers never get enough miles to matter and the frequent travelers had so many, more was not that important (Morrison & Winston, 1995). Third, FFP members are not particularly loyal: only 7% are completely loyal and 45% somewhat loyal to FFP carriers (Whyte, 2004). This is exacerbated by the fact that many business travelers (more than 60%) belong to two or more frequent flyer programs and 30% in three or more (Chin, 2002). Finally, small carriers can offset the FFP effects by charging lower fares (Whyte, 2004).

The presumed inelasticity of business travel has been challenged by the recession of 2008-09. Businesses cut back on travel deeply, moved to the use of low cost carriers when they did fly employees, and also invested strongly in videoconferencing. The latter works especially well for inter-firm meetings (versus sales calls, for example) (Karp, 2009) and may explain, in part, the steep drop in business travel's share of overall traffic.

Air traffic in terms of enplanements tracks the direction of GDP changes fairly closely though the magnitude of changes in traffic levels is greater than the underlying changes in GDP (see Figure 1).

Overall, fares have been declining since 2000 due to excess capacity and damage to demand. Carriers simply cannot exert pricing power and by 2009, fares were nearly 25% lower in constant dollars than a decade before (BTS, 2011b). Still, carriers have been able to reclaim some revenue streams by unpackaging the air travel experience. That is, the price of a ticket used to be packaged or all inclusive: baggage handling, meals, beverages, and other amenities were built into the price. As recently as a decade ago, carriers usually accepted two bags at less than 70 pound at no extra charge but added fess for more bags. In 2007, Spirit Airlines began charging a \$10 fee for the second bag (Singer, 2007), which other airlines quickly imitated. In 2008, American Airlines became the first to charge for the first bag (Stieghorst, 2008). Other firms imitated and also began charging for food, beverages, blankets and pillows. Between these charges and a much stricter line on fees for changing reservations, upgrading, and selecting aisle or window seats, carriers have augmented earnings by nearly \$6 billion in 2010.

## Labor

Labor costs for air carriers have historically been the single largest component of total costs. In the early 2000's, labor accounted for about 35-40% of all costs for carriers. Since then, concessions from workers and the rising impact of oil prices have pushed the percentage of labor costs down.

The air carrier industry is among the most highly unionized in the U.S. About 49% of all airline workers are unionized and 51% in total covered by a collective bargaining agreement (Hirsch, 2007). Workers are represented according to occupation. In general, pilots are the most heavily unionized and most by carrier belong to the Air Line Pilots Association. Pilots at American, USAir, Southwest, and Frontier have firm specific pilot unions. Flight attendants are usually represented by the Association of Flight Attendants. Mechanics, baggage handlers and other ground crew are usually organized under the International Association of Machinists or the Airline Mechanics Fraternal Association. Some customer service and reservations staff are members of the Communications Workers of America but comparatively few of these workers are organized. The carriers also vary widely in how unionized their work forces are. JetBlue does not have any unionized work groups and Delta has only pilots. In the latter case, after the integration with Northwest (which was much more heavily unionized), elections were held in late 2010 to certify unions for flight attendants, baggage handlers, customer service and stock clerks (Alexander, 2010). All four proposals were rejected. At the other end of the spectrum American Airlines is about 75% unionized and Southwest Air, at 87%, is the most heavily unionized major carrier.

Historically, the relationship between labor and management in this industry has been contentious, particularly in the early 2000's as many carriers pursued reorganization though bankruptcy. This resulted in givebacks by unions in wages and benefits as a cost reduction. The

carriers' financial recovery through the end of the decade has led to expectations that the unions will seek to reclaim some of those concessions, which could lead to unrest or strikes which are a serious threat as a strike can shut a carrier down if the pilots are the strikers (as was the case with Spirit Airlines and its five day pilot strike in 2010) or if other unions honor the strike. On the other hand, if there is no support and the carrier can find a way to replace the workers, the threat is diminished. In addition, the right to strike by airline workers is moderated by the National Mediation Board which can intervene to prohibit a stoppage if the effects would cause significant disruption to national transportation. For example, a 2010 strike by flight attendants at American Airlines was prohibited by the National Mediation Board due to the company's weakened financial condition (Hinton, 2011). Overall, strikes against air carriers were common in the 1960's and '70's but have diminished sharply more recently. Since 1991, there have been only five strikes against major American carriers with only one lasting more than 15 days (National Mediation Board, 2011).

Productivity among carrier workers varies widely and is not clearly related to union membership. Table 2 shows productivity on a passengers per employee basis for selected carriers as a percentage of industry averages.

## Fuel

Fuel has always been a significant cost component for air carriers but until recent years it has averaged around 20% of total direct costs. However, volatility in the petroleum markets over the past decade has driven the price of fuel up significantly. In 2008 and 2010, prices spiked to as much as 400% relative to 2000 prices (see Figure 2). There are several reasons firms in the airline industry find it difficult to control fuel costs.

First, carrier jets in the United States use a kerosene fuel called Jet-A which is purchased from contract providers at each airport. Small airports may have one fuel servicer while larger airports may have four or five fuelers. The fuel is produced by most of the major oil companies but airport fuel provision is handled by a somewhat different set of firms. Shell Aviation, Phillips 66 Aviation, and Air BP Aviation are among the large refineries competing in the fuel market but other firms such as Avfuel Corp., Purvis Brothers, and World Fuel Services also sell fuel to the contract fuelers. This means carriers cannot easily negotiate with a provider for a reduced price as there are likely many providers over the range of the carrier's network. Second, especially at hubs, the demand of a large carrier will exceed the capacity of a single fueller (which is why there are usually four to five at these airports). Thus, the carrier's demand is necessarily split among several providers. Third, the demand for jet fuel generally is high and inelastic so providers do not have an incentive to reduce prices.

Another problem comes from the fleet the carrier uses. Older planes are much less fuel efficient than newer planes, which is why American Airlines took the step in summer 2011 of ordering 420 new planes in an order split between Boeing and Airbus: the new planes were expected to be 25% more efficient than the aging MD-80 jets they will be replacing (Ray, Schlangenstein & Rothman, 2011). Other carriers have older fleets as well but may not find it makes economic sense for them to rapidly replace older planes as the cost is high.

Despite the volatility in fuel prices and the problems in reducing that exposure, carriers have developed some techniques for managing fuel costs. Southwest Air, for example, was among the first to hedge fuel prices by buying petroleum product options.



## Aircraft

Commercial aircraft for this industry are separated into two classes based on size. Large commercial aircraft (LCA - those with more than 110 seats or equivalent frame size) account for about 47% of the global civil aerospace industry. These planes are used for both passenger and freight/logistics firms. Regional aircraft are 30-110 seat planes and are usually used as supplements to LCA systems by carrying passengers from small markets to central hubs. Sales in this market account for about 5% of the global market. The major consumers of civil aircraft are commercial passenger firms and account for about 80% of plane sales worldwide. Governments and businesses account for 12% more and freight/logistics companies contribute 10% of the sales (IBISWorld, 2011).

The major (virtually only) firms in LCA production are Airbus and the Boeing Company. Airbus is a consortium of European companies that got its start in the late 1960s. Aerospace firms from France, Germany, Britain, and other countries were all working to design and produce aircraft to compete with American firms which controlled about 80% of LCA production at the time. Rather than face multi-firm competition, the European firms agreed to form the consortium and source production of the first Airbus model (the A300) from the member countries by parts. The cockpit was produced in France, the wings in Britain, forward and rear fuselage sections in Germany, spoilers and flaps in the Netherlands and, eventually, the tailplane in Spain (Airbus, 2011a). Since then, Airbus has grown to be the largest commercial aircraft manufacturer in the world and currently claims about a 45% market share although the company also has a substantial military production capacity for airlift and support functions. Recent product introductions include the A380 (2007) that can carry up to 830 passengers. See Table 4 for Airbus model prices, seating capacity, and range.

The Boeing Company was started by William Boeing in 1916 and has been involved in the production of military and civil aircraft ever since. The civil aircraft manufacturing industry in the United States has had a number of influential firms such as McDonnell-Douglas, Hughes and Lockheed but, following moves to other industries, mergers and acquisitions, and corporate failure, only Boeing remains as a U.S. based LCA producer. In 2010, Boeing's revenues were split about evenly between commercial and military sources (Boeing Company, 2011a) and, historically, about 70% of the firm's commercial aircraft sales come from outside the US (Boeing Company, 2011b). See Table 5 for Boeing model prices, seating capacity, and range.

Regional aircraft production is dominated by Bombardier of Canada and Embraer of Brazil. Bombardier has both a jet and a turboprop offering in the 60-99 seat range and is planning to introduce a 100-149 seat single aisle jet in 2013 that will place it at the small end of the LCA class aircraft (Bombardier Company, 2011). The firm controls about 11% of the commercial aircraft market. Embraer has about a 5% share. The firm offers the ERJ line (models carrying between 33 and 50 passengers) and the E-jet family with two models in the 100 seat range (Embraer, S.A., 2011).

Airplane costs are captured on airline income statements as a depreciation expense if they have been purchased or as a lease/rental expense. Planes have historically been depreciated over a twenty year period but some carriers, anticipating replacing planes on a more frequent basis, use an accelerated schedule. Depreciation has generally amounted to about 10% of total direct costs. However, the most illuminating measures of cost have to do with aircraft utilization. In short, firms that use their planes less effectively than others require more aircraft to perform their

operations. This is an additional cost. The primary measures of aircraft utilization are block hours per day (hours per day allocated to flight time as well as loading and unloading) and departures per day. Table 5 shows departures per day for the ten largest carriers and each carrier's percentage (negative or positive) variance from that average.

## Airports

According to the FAA, there are about 500 commercial service (CS) airports in the United States. CS airports have scheduled service but vary significantly in size. Of the 500 CS airports, 121 have fewer than 10,000 enplanements per year while 29 airports process more than 1% of all US enplanements each (or, roughly 7,000,000 passengers each). Most cities are served by a single large airport though major cities can have primary and secondary airports. For example, Chicago has O'Hare and Midway airports, Dallas has Dallas/Forth Worth and Love Field, Washington, D.C. has Dulles, Reagan National and Baltimore/Washington International, and Los Angeles has Los Angeles International, Ontario International, Palmdale Regional, Van Nuys, and John Wayne/Orange County. New York City is served by three primary airports (John F. Kennedy, Newark and LaGuardia) as well as smaller airports such as Islip on Long Island. Outside these large metropolitan areas, however, commercial service is typically limited to a single airport. See Table 6 for the list of the top 10 US airports in terms of 2010 enplanements.

Airports are owned by civil authorities such as city or county governments. Congress had authorized the privatization of airports in 1997 but thus far, no airport has been taken private. Airports are sometimes operated by the owning government body but more often by independent airport authority organizations or by port authorities. These operators are responsible for the performance and development of the airport including maintenance, concessions, parking and compliance with state and national regulations (ATA, 2011).

Airports generate revenue by leasing space and providing services to air carriers, retailers, rental agencies (such as cars) and parking. With respect to carriers, airports charge for gate and kiosk or counter space for ticketing on a signatory (long term) or non-signatory (as needed) basis. They also charge landing fees based on the weight of the aircraft, apron fees for service on the ground, and rental for baggage claim and waiting areas. As an example, Portland International Airport charges signatory carriers (those with a long term lease) a landing fee ranging between \$3.37 and \$4.53 per 1,000 pounds of airplane weight, \$20-30,000 for apron fees per gate per year, \$274 per square foot per year for ticket counters and departure areas and \$8,323 per month for dedicated baggage claim. Non-signatory carriers incur higher per-use charges but use the facilities less. Airports also collect a passenger facility fee charge of \$4.50 for every passenger using the airport (Port of Portland, 2011).

Some airports are hubs for carriers. That is, the airport serves as a central connecting point for a network of routes. Large airlines adopted this flight management technique after deregulation as the number of routes the carriers served increased significantly which makes the economics of point to point service decline. Hub and spoke networks can serve large numbers of origin and destination (O&D) pairs through segmented flights because the number of routes needed to connect any two points in a single node network is  $n-1$ . In the same network, a fully saturated point to point route structure needs  $n(n-1)/2$  total routes. Thus, for the system in Figure 3, a hub and spoke network needs four routes to connect all points while an O&D system requires 10 routes.

Network carriers seek economies by funneling passengers from smaller airports on smaller planes to the hub for consolidation and transfer to larger planes for service to another major airport or the final destination. In airports that serve as major hubs for a carrier, that carrier can control a majority of the traffic. For example, Delta's main hub is Atlanta Hartsfield, where it controls 60% of passenger traffic and 55% of the gates. American Airlines has its major hub at Dallas/Fort Worth and controls 73% of the passenger traffic and 64% of the gates there. Most of the legacy or national carriers have multiple hubs and even "mini-hubs". The control exerted at these hubs has several effects. First, the primary carriers can extract a "hub premium" in fares as competition is reduced. Second, the primary carriers will lease gate space to other carriers but often at a premium (Ciliberto & Williams, 2010). At non-hub airports, this is not an issue. Finally, gate utilization at peak use periods has been shown to deter entry into those airports (Dresner, Windle & Yao, 2002).

Hubs are designed to handle peak passenger flow which means carriers have invested in many gates, passenger areas, aprons, and the staff to manage those flows efficiently. At peak, the hub system can be cost effective. Conversely, when flows are not at peak, the hubs are still incurring the costs of the assets but not using them. In addition, hubs can be over-utilized or congested which increases costs due to delay and decreased utilization of other assets like planes.

Another of the key characteristics of the airport is slots or the right to land and take off from that airport. These are not considered the property of the airport nor of the carriers but are allocated by the FAA. Usually, this is not a problem in that there are more slots than scheduled flights but at some airports, this is not the case. All three major airports in New York as well as Washington Reagan have slot limitations and other airports are facing them in the near future. This can restrict the ability of competitors, existing or new, to enter that particular airport.

### **Ticketing, sales and promotion**

The costs associated with this category include commissions paid to travel agents, computer reservation services, carrier websites, ticketing, and all marketing costs. Data indicates that on a global level, these costs as a percentage of total costs declined by about one third between 2000 and 2007 (Doganis, 2010).

Several technological factors have helped drive these costs down. First, online ticketing, either through carrier websites or through discount ticket firms, has driven the share of business controlled by traditional travel agents down precipitously. In the late 1990s, the top ten carriers paid about \$5 billion per year in commissions. By 2010, alternative sales outlets have cut these expenditures by about 75% (Airline Data Project, 2011a). Similarly, the advent of e-tickets or paperless tickets has had a significant effect on costs. The cost differential between paper and paperless tickets is about 90% (i.e, paper tickets cost \$10 to process but e-tickets only \$1). Low cost carriers like jetBlue and Southwest pioneered the concept but by 2004, the IATA mandated that all carriers go to ticketless travel. This was accomplished in 2008 (International Air Transport Association, 2008).

### **Industry profitability**

One of the first ATA annual reports (1940) indicates that the U.S. air carrier industry didn't turn a profit until 1939 (ATA, 1940). Profitability was more sustained in the CAB years but over the past two decades, the performance has been much spottier. The industry as a whole

lost money in one year in the 1990s (Inkpen, 2008) and six years in the period from 2000-10 (see Table 7). The 9/11 events caused passenger traffic to fall sharply for two years. The high fixed costs structures of the carriers worked against them as expenses remained high even while revenues dropped. Four major carriers – Delta, Northwest, United and US Air went through Chapter 11 reorganization in this decade and US Air did it twice. Typically, the firms would renegotiate labor and/or pension systems to reduce costs and this seemed to be effective enough as the industry enjoyed a few years of profitability before the spike in oil prices and the financial crisis in 2008-09.

### **Industry consolidation**

One result of the economic pressures of the past decade has been a surge in very large merger and acquisition plays by industry firms. Delta Air Lines acquired Northwest in 2008 in a deal initially valued about \$2.6 billion. For a time, this made Delta (as the new firm would be called) the largest carrier in the world at about \$35 billion in annual revenues. The deal faced at least two significant potential blocks. First, the two firms had to reach agreement with their respective pilots unions about how the two pilot lists would be merged. This would have effects on seniority and compensations and was a contentious issue. Second, the merger had to pass anti-trust assessment by the Department of Justice (DOJ) as the deal could eliminate routes, which could be construed as anti-competitive. The firms cleared both of these hurdles with DOJ approval in October, 2008 and FAA approval for a complete integration in January 2010 (Carey & Prada, 2008; Reed & Adams, 2008; Esterl, 2010a).

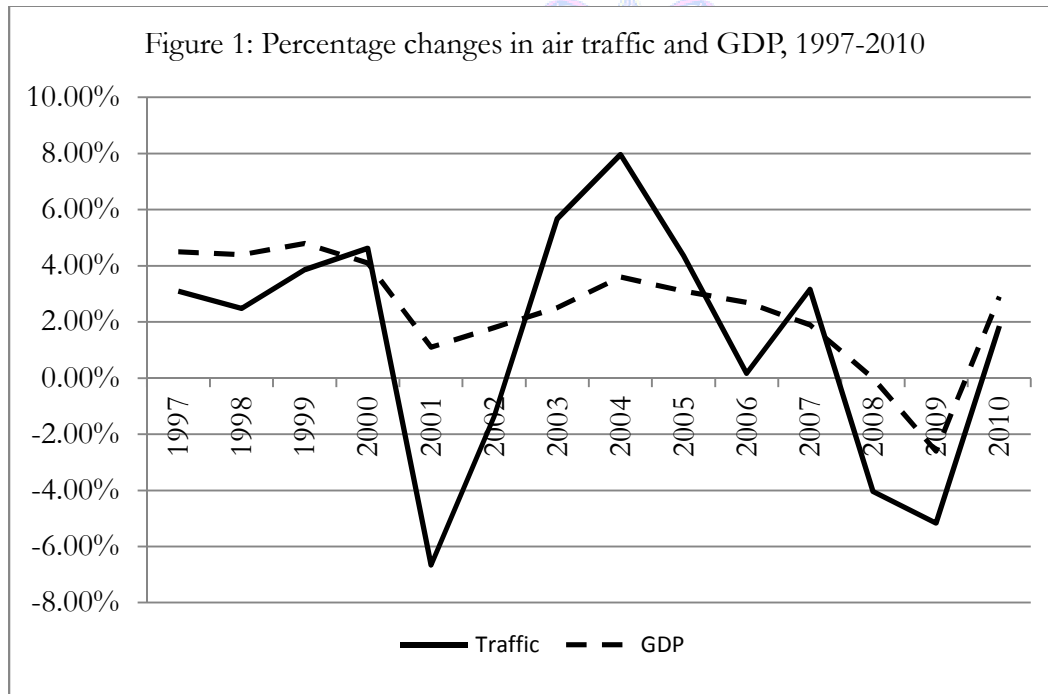
At almost the same time, United Airlines and Continental began merger talks of their own. However, poor financial results for United tabled the deal and the two firms only established a marketing alliance that allowed them to cooperate on international routes. In 2010, after United and US Airlines began merger discussions, Continental resurrected the prospects and the two firms agreed to a deal in May 2010. As in the Delta-Northwest case, securing the agreement of the two pilot groups and clearing DOJ processes were seen as the major issues though the latter was perceived as riskier under the Obama administration compared to the environment Delta faced under the Bush administration. Ultimately, however, approval came quickly and the deal was approved by the DOJ in August, 2010. The new United replaced Delta as the largest carrier in the world though both held a near 20% share of the U.S. market in late 2010 (Baer & MacIntosh, 2008; Carey, 2008; Carey, 2010; Esterl, 2010b).

Finally, in September, 2010, Southwest Air announced it had reached an agreement to merge with AirTran, an Atlanta based LCC competitor in a deal worth about \$1.4 billion. AirTran has its primary hub at Atlanta's Hartsfield-Jackson airport, which is also home to Delta Air Lines. Southwest did not have a presence in that airport and the deal will suddenly pit two of the largest carriers head to head. The deal was approved by the DOJ in April, 2011 with FAA approval for full integration expected to come in early 2012 (Williamson & Sigo, 2010; Martin & Kendell, 2011; Martin, 2011). By 2011, the number of legacy carriers from the era of the CAB will fall to four: United, Delta, American, and US Air. As well, the newer low cost carrier segment will shrink

Table 1: Transportation mode share  
 Percentage of Trips by Mode by Distance

	50-499 miles	500- 749 miles	750- 999 miles	1000- 1499 miles	> 1500 miles
Mode					
Personal auto	95.4	61.8	42.3	31.5	14.8
Air	1.6	33.7	55.2	65.6	82.1
Bus	2.1	3.3	1.5	1.5	1.4
Train	0.8	1.0	0.9	0.7	0.8
Other	0.2	0.1	0.1	0.7	1.0
Total	89.8	3.1	2.0	2.3	2.8

Source: BTS, 2006

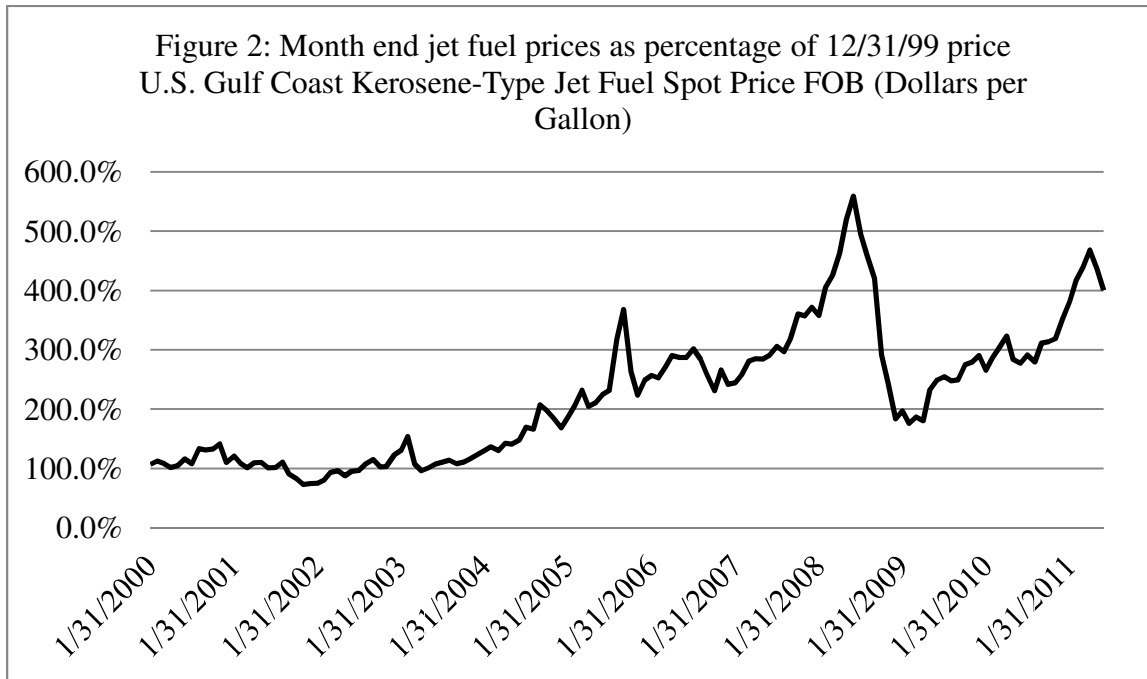


Source: BTS, 2011b; Bureau of Economic Analysis, 2011

Table 2: Variance from industry average, passengers per full time employee equivalent

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Average	1504	1578	1658	1821	1848	1899	1837	1826	1909
American	-52.5%	-47.6%	42.4%	34.7%	32.7%	31.8%	34.8%	35.8%	34.5%
Continental	-47.8%	-49.4%	45.3%	42.7%	40.8%	40.4%	42.4%	43.4%	42.6%
Delta	-30.5%	-28.7%	24.7%	17.8%	19.4%	23.0%	24.7%	27.2%	27.9%
Northwest	-42.1%	-34.7%	28.0%	21.6%	11.0%	-9.6%	16.3%	31.4%	.
United	-54.6%	-47.0%	41.9%	41.2%	37.2%	38.2%	39.0%	40.1%	41.8%
US Air	-25.0%	-23.0%	20.2%	-1.5%	16.6%	15.8%	16.5%	19.0%	16.5%
Southwest	8.4%	11.9%	27.8%	39.9%	49.3%	50.9%	46.5%	44.7%	50.7%
jetBlue	-3.2%	2.9%	0.0%	-1.9%	-0.5%	9.3%	6.8%	5.3%	7.5%
AirTran	2.1%	8.8%	13.1%	28.3%	34.8%	42.6%	48.5%	45.3%	49.5%
Alaska	-30.3%	-25.1%	17.9%	-9.8%	-8.1%	-9.6%	13.0%	13.1%	-5.0%
Hawaiian	1.7%	-1.4%	10.5%	2.0%	-4.6%	6.7%	.	14.3%	10.2%

Source: Airline Data Project, 2011b



Source: Energy Information Administration, 2011

Table 3: Airbus commercial aircraft 2010 list price, capacity, range

	\$MM	seats	range (km)
A318	65.2	107	5950
A319	77.7	124	6850
A320	85	150	6150
A321	99.7	185	5950
A330-200	200.8	253	13400
A330-300	222.5	295	10800
A340-300	238	295	13700
A340-500	261.8	313	16670
A340-600	275.4	380	14600
A350-800	236.6	270	15700
A350-900	267.6	314	15000
A350-1000	299.7	350	15600
A380-800	375.3	525	15400

Source: Airbus, 2011b,c

Table 4: Boeing commercial aircraft 2010 list price, capacity, range

	\$MM	seats	range (km)
737 family			
737-600	56.9	110	3225
737-700	57.9	126	3440
737-800	80.8	162	3115
737-900ER	85.8	180	3265
767 family			
767-200ER	144.1	224	6385
767-300ER	164.3	269	5990
767-400ER	180.6	304	5265
777 family			
777-200ER	232.3	400	7725
777-300ER	262.4	365	7930
787 family			
787-8	485.2	210	8200
787-9	218.1	250	8500

Source: Boeing Company, 2011b, c

Table 5: Variance from industry average departures per day per aircraft flight

	2002	2003	2004	2005	2006	2007	2008	2009
Average	4.89	4.31	4.45	4.40	4.42	4.32	4.14	4.16
American	-31.9%	-25.4%	-26.0%	-27.8%	-28.5%	-26.2%	-24.9%	-25.7%
Continental	-36.6%	-30.5%	-33.2%	-30.7%	-30.1%	-26.2%	-28.0%	-32.4%
Delta	-22.4%	-15.9%	6.8%	2.7%	-4.3%	-19.4%	-18.6%	-24.5%
Northwest	-28.6%	-18.2%	-20.2%	-20.5%	-18.8%	-19.7%	-20.1%	-25.4%
United	-34.5%	-30.7%	-27.1%	-26.0%	-24.0%	-22.9%	-24.2%	-25.0%
US Air	-1.2%	0.8%	-3.7%	-0.5%	-9.1%	-5.3%	-8.5%	-13.7%
Southwest	45.5%	58.8%	49.6%	48.3%	46.8%	47.5%	47.6%	37.3%
JetBlue	-9.5%	-0.8%	-7.1%	-10.3%	-7.5%	-2.8%	-2.7%	-5.7%
AirTran	21.4%	34.2%	28.6%	32.4%	28.7%	25.7%	26.3%	24.4%

Source: Airline Data Project, 2011c



Table 6: Largest U.S. Airports 2010

	Airport Name	2010 Enplanements
1	Hartsfield - Jackson Atlanta	43,130,585
2	Chicago O'Hare International	32,171,831
3	Los Angeles International	28,824,234
4	Dallas/Fort Worth	27,100,656
5	Denver International	25,241,944
6	John F Kennedy International	22,927,237
7	Bush Intercontinental	19,528,627
8	San Francisco International	19,359,003
9	McCarran International	18,980,578
10	Phoenix Sky Harbor	18,897,171

Source: FAA, 2011b

Figure 3: Hub and spoke versus O&D route systems

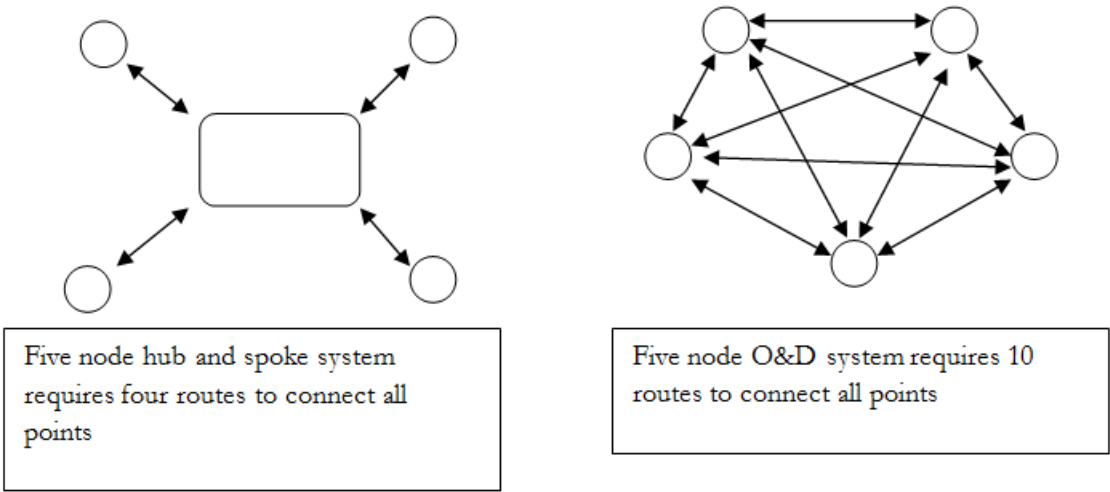


Table 7: Air carrier profitability 2000-10

	Operating revenues	Operating profits
2000	98,899,811	5,350,874
2001	86,519,991	-8,376,363
2002	79,287,478	-7,480,792
2003	88,870,096	-2,650,053
2004	100,902,510	-3,719,166
2005	111,858,063	-2,021,053
2006	120,906,925	4,266,427
2007	124,502,978	4,385,734
2008	129,728,330	-3,652,867
2009	109,680,007	1,225,581
2010	119,073,502	6,041,166

Source: BTS, 2011c,d

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