COMPARING AND CONTRASTING THE DYNAMICS INFLUENCING URBAN AND ECONOMIC LAND DEVELOPMENT SURROUNDING DALLAS-FORT WORTH INTERNATIONAL AIRPORT AND DALLAS LOVE FIELD AIRPORT

by

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ABSTRACT

COMPARING AND CONTRASTING THE DYNAMICS INFLUENCING URBAN AND ECONOMIC LAND DEVELOPMENT SURROUNDING DALLAS-FORT WORTH INTERNATIONAL AIRPORT AND DALLAS LOVE FIELD AIRPORT

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With the surrounding layout of both Dallas-Fort Worth (DFW) International Airport and Dallas Love Field (DAL) Airport being shaped by and through differing contributing influences, one intriguing question for this diverse aviation region would be understanding the strategies for the resulting development adjoining both airports. Specifically, the purpose of this study is to create a comprehensive narrative of what dynamics (factors) influenced the development of areas adjoining both DFW & DAL Airports, and to understand how these airport-driven dynamics (factors) affected urban and economic development throughout the Dallas-Fort Worth Metroplex. Through a historical outlook of both airports, this study will reveal how firm and business agglomerations evolved, and how edge cities/communities or corridor businesses
developed around both airports and how and why this has changed the design of the urban cores of the city of Dallas and city of Fort Worth.

This narrative will be conducted through the gathering of past, present and future land development approaches and through utilizing a mixed method of data collection. The mixed-method process will allow a qualitative survey of Dallas-Fort Worth aviation-related professionals and a quantitative comparative case analysis consisting of existing literature on land developments, documents, policies, and activities comprising the peripheral airport-driven urban core growth through various planning, design, and implementation stages. Also, this study has the deliverable of outlining critical development factors to assist future land planning strategies around other airport systems. The results suggest the significance of assessing local and regional development factors along with prevailing theories of land use surrounding airports. The combined outcomes present and suggest the most sustainable peripheral land development methods to help public/private stakeholders in the policy-planning and decision-making process. The conclusion of this research should lead to further analysis of effects that localized factors have, in conjunction with existing theoretical concepts, in establishing future land development surrounding airport systems.
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The paper is organized as follows:

- **Introduction.** Details an introduction, problem statement and significance of the research.

- **Background.** Provides a review of literature on aeronautical and non-aeronautical land development methodologies that became models for on-site and peripheral land developments at DAL and DFW Airports.

- **Historical Non-Aeronautical Land Development Concepts.** Provides a historical review of aviation development at both DAL and DFW Airports and a review of the most relevant dynamics influencing peripheral land development surrounding both airports.

- **Methodology.** Defines the method of research data collection and outlines the critical factors that influence non-aeronautical peripheral land development.

- **Non-Aeronautical Land Development Assessment, Challenges and Recommendations.** Provides non-aeronautical land development assessment, challenges and recommendations as observed by the research.

- **Conclusion.**
INTRODUCTION

Airports have a historic role in shaping the metropolitan form (Freestone R., 2011) with the surrounding areas having emerged as major nodes of economic activity in the 21st century metropolis (Prosperi, 2007). Offices, hotels, warehouses, shopping complexes, and logistics facilities have emerged worldwide in the airports’ regions (Guller, 2003). Although urban land use designs adjoining airports are shaped by and through differing contributing factors and elements, in a globalized world, aviation has cemented its place as a dominant transport dynamic. This aviation dynamic has shown consequent ramifications for the ordering of urban and regional space economies at different scales (Freestone, 2009).

Until recent years, non-aeronautical land development (in regards to land not utilized for general or commercial airport use) consisted of spontaneous, market-driven and entrepreneurial real estate development around airports, seeking to capitalize on the non-aeronautical land value added by the airports’ proximity (Peneda M. R., 2011). However, airports are never static, are constantly evolving in form and function (Kasarda, 2006), and therefore have become new dynamic centers of economic activity, incorporating several commercial and entertainment services inside passenger terminals. Simultaneously, airports are developing their landside areas with businesses such as shopping clusters, hotel accommodations, office complexes, conference centers, exhibition centers, or leisure facilities. Today they are vital logistics and distribution centers, as well as major centers of employment and sites for business contacts. Gradually, they entered the real estate business on the non-aviation landside and proximal area, leading to the emergence of new development concepts that have profoundly defined the adjacent spatial layout design (Peneda M. R., 2011).
The paradigm of airport-driven urban economic growth coincides with the continued expansion of development seen at Dallas-Fort Worth International (DFW) Airport and the latest resurgence at Dallas Love Field (DAL) Airport. Currently, the Dallas-Fort Worth Metropolitan Statistical Area (MSA) is the 4th largest in the USA with some 7.5M population (Bureau, 2018). Also, the Dallas-Fort Worth area has both the 4th busiest US airport in DFW Airport (Administration, 2018) and the #1 rated most favorable US airport in DAL Airport (TripIt, 2018). These factors cause the agglomeration of economies in and around these airports to be critical to the urban growth throughout the Dallas-Fort Worth Metroplex. There is a debate on whether increased aviation activity is a cause or effect of economic and urban growth, but regardless, there is a strong correlation between metropolitan expansion and aviation (Brueckner, 2003). This research examines airport development alongside urban growth patterns surrounding both DFW and DAL Airports to find a direct causal effect relationship.

Prior research concerning spatial growth and agglomeration of economies has been limited in detailing a comparative analysis regarding the impact of DAL and DFW on airport-driven urban development. A study of this type, which combines a large metropolitan area with two of the biggest airports regarding respective classification, will be influential in determining the success and failures of non-aeronautical land development strategies for future airport systems. Specifically, this research features a comprehensive narrative of how the economic landscape of urban communities or regional corridors grew in relationship to airport development. The research also looks at how and why this has changed the surrounding metropolitan land design over time.
In the case of DAL and DFW, the impact of these airports on the surrounding areas can be seen through four factors:

- First, the annual economic impact on the regional and local economies is $6.1B at DAL (Aerospace, 2018) and $37B at DFW (DFW International Airport, 2019).

- Second, in terms of the agglomeration or clustering of business economies, Texas is one of the most important locations for the global aerospace and aviation industry employing more than 135,000 workers at 1,300 companies. In addition, the Dallas-Fort Worth Metroplex is headquarters for two international air carriers, American Airlines and Southwest Airlines (International, 2017).

- Third, airline services and accessibility are factors with DFW Airport being rated the #4 mega airport in the US (Power, 2018) and DAL Airport being rated the #2 large airport in the US (Power, 2018). The vast destinations of airline services and consumer accessibility of both airports are critical elements to the growth of their respective urban areas (Figure 1).

- Fourth, the aspect of location proximity is also critical. With both airports being in close relation to each other (approximately 10 miles apart) (Figure 2), their proximity emphasizes a region’s capacity to implement effective yet diverse peripheral land development strategies. This led to both airports having specific and yet different characteristics regarding accessibility, site location, airport development, and economic clustering. These factors caused the airports to morph, over time, into very diverse aeronautical and non-aeronautical land developments.
Figure 1 - DFW and DAL Airport Comparison (Dallas Economic Development Guide 2019)
Figure 2 - DFW and DAL Airport Proximity (Dallas Airport Systems Google Earth 2019)
PROBLEM STATEMENT AND RESEARCH SIGNIFICANCE

This study will determine what dynamics and factors influenced DAL and DFW Airports’ proximity land development and whether the implementation strategies have created, or will create, long-term sustainable outcome(s). Due to the lack of premeditated planning for resulting non-aviation land development concepts, airport planning systems currently, have no collective or agreed-upon body of criteria that can be employed in the development of peripheral land uses. In addition, planners have neither an evaluation tool nor an assessment guide of which critical factors influence non-aviation land development concepts and how this non-aviation land uses should be planned, implemented, or disregarded due to specific geographical and economic factors. This research, which includes the creation of a critical factor(s) outline, will provide a framework for a decision-making model, which allows aviation/regional planners, city/municipal governments, public/private institutions, public/private stakeholders, etc., to further their attempts in developing surrounding non-aviation land area(s). The result of this research will significantly aid the professional literature concerning land and economic development surrounding airport systems, as future planning opportunities arise regarding the expansion of air travel venues.
DEFINITIONS

To make it clear for the reader, most of the key terms and definitions used in this study are explained below. All of them are frequently used in the aviation field and their understanding is critical to understand the given research.

AERONAUTICAL (AVIATION) LAND USE: On-site development that serves the purpose of functioning at the related airport facility. This includes the infrastructure of the terminal, runways, taxiways, hangars, fixed-based operators (FBOs), air cargo, etc.

CITY-CENTERED (AIRPORT CITY): An airport with all the facilities and services developed in a way that it can function as a well-developed city agglomeration. The concept is grounded in the fact that in addition to their core aeronautical infrastructure and services, major airports have developed significant non-aeronautical facilities, services, and revenue streams. At the same time, they are extending their commercial reach and economic impact well beyond airport boundaries (Kasarda, 2008).

EDGE CITIES/COMMUNITIES: Term for a concentration of businesses, shopping venues, and entertainment outside of a traditional downtown (or central business district) in what had previously been a residential or rural area (Edge city, 2019). A common feature of edge cities is that they have sprouted far from the old downtowns, in localities where years ago, little existed save for hinterlands. They typically evolve adjacent to two or more major highways, usually with shopping areas serving as anchor points. Most edge cities develop at or near existing or planned freeway intersections and are especially likely to develop near major airports (Edge city, 2019). A full-blown edge city contains 1) at least 5 million square feet of leasable office
space; 2) at least 600,000 square feet of retail space (the equivalent of an average mall consisting of three large stores and 80 to 100 shops and boutiques); 3) an increasing population each weekday morning, marking it as primarily a work center, not a residential suburb; and 4) a local perception as a single-end destination for mixed-use jobs, shopping and entertainment (Rosenberg, 2019).

**GREYFIELD LAND DEVELOPMENT:** Land which has been previously developed and used, simply underutilized or vacant properties, ready for reuse while containing outdated and obsolete structures requiring adaptive reuse or demolition. Greyfields possess reusable infrastructure such as parking lots, utility hookups, or structures which may be blighted or in substantial disrepair but have no known or suspected environmental contamination of any significance (What is a Greyfield?, 2019).

**NON-AERONAUTICAL (NON-AVIATION) LAND USE:** Areas that support future facilities or business operations that are not necessarily related to aviation but that could benefit from being located on or near the airport and provide additional revenue opportunities.

**REGIONAL (AEROTROPOLIS):** New urban form that is built from the airport city as a core and outer area with aviation-oriented businesses (Kasarda, 2008). The area surrounding the airport includes the infrastructure and the services, which can be found in a regular city, such as logistics facilities, office buildings, residential areas, leisure and entertainment services, hotels, schools, hospitals, etc. The area is characterized also by outstanding accessibility and connectivity via highways, rail, and extensive public transportation.
URBAN AREA: Spatial concentration of people whose lives are organized around nonagricultural activities (Weeks, 2010). It consists of a few components, such as population size, density, land area, and economic and social organization (Weeks, 2010).
HISTORICAL BACKGROUND

AERONAUTICAL LAND DEVELOPMENT CONCEPTS

The early development timeline of airports can be divided into three phases. Early airports in the first phase were “mono-modal” and were solely concerned with the transport of people and goods from one place to another (Büscher, 2009). Airports were more or less simple terminal buildings that would provide the infrastructure for aviation-related activities, like takeoffs and landings of airplanes. The development of the airports in this era revolved around the plane and there was no proper connection by other modes of transport to the airport (Keen, 2015).

The second phase saw airports then develop into “transport hubs” with the increasing interconnection between different modes of travel (planes, trains, metro, and cars); Le Corbusier especially promoted the airport as a machine for travelers rather than as a field that is oriented to the airplane (Pascoe, 2001). The airports of today are well connected by other modes of transport that allow travelers to reach the airport more economically and efficiently. The airport is no longer isolated and specialized but developed into a “multimodal hub” so that passengers are given, within airport boundaries, the chance to connect seamlessly from air to ground, railway, and sea ferry (Jarach, 2001).

The third phase involved the further quantum leap from the traditional to the commercial airport or what could be termed as a global hub (Jarach, 2001). Airports were transformed into mini-cities where people could socially interact with each other, do business, or sustain family life and friendships. In the airport of the 21st century, multiple services are available for the
benefit of travelers, ranging from tourist services, hotel reservations, taxi reservations, duty-free shops and much more. The life of the traveler has been made very easy as he or she can find anything he needs at the airport ranging from food, drinks, gifts, and clothes to much more (Keen, 2015). In addition, there are many luxury hotels, offices, and guest rooms built near the airport that allow business passengers to stay over and do business and even depart to their home the same day. Airspaces are thus places of meetings – ambivalent places, of multiple forms of transport, commerce, entertainment, experiences, meetings, and events (Büscher, 2009).

During the early development stages, and for many decades, agglomeration economies, or clustering, played an important part in the trend of economics surrounding aviation sites. Clustering is the geographical concentration of firms within a certain area. Marshall’s theory on agglomeration economies focuses on clusters of firms within the same industry (Marshall, 1890). Hoover further developed this framework in which his classification of types of agglomeration economies focuses on three levels: 1) Internal returns to scale, 2) Economies of localization and 3) Economies of urbanization (Hoover, 1948). This clustering exists around airports and provides a vital component for aviation-driven urban growth and a microelement of the greater whole that aids in the overall economic vitality for a city or region.

Airports are a remarkable barometer of the historical dynamism of cities through time (Gordon, 2004). Historically, huge areas around airports were left fallow or were used agriculturally for safety reasons and noise issues (Bednarek, 2000). With the emergence of non-aviation development models, such as the airport city and aerotropolis business models, these areas were discovered as potential major real estate developments by the airports (Cities, 2011). Currently, they are vital logistics and distribution centers, as well as major centers of
employment and sites for business contacts. Moreover, they are key decisive transport infrastructures in the transformation of the metropolitan area, taking on many features of the Central Business District (CBD) and establishing themselves as new regional development poles (Peneda M. R., 2011).

**NON-AERONAUTICAL LAND DEVELOPMENT CONCEPTS**

The literature in this field centers on historical urban land development strategies that would eventually influence non-aeronautical land development. The first focuses on concepts and issues of the metropolitan form. The second focuses on concepts and assertions from the economic clustering theory (Prosperi, 2007). As airports were often located in the outlying areas of cities and the surrounding land use was not viewed as an integral component to the economic vitality of early urban planning, both of these development philosophies would have an impact on how the economic land use designs surrounding DFW and DAL Airports would develop over time.

**METROPOLITAN FORM AND ECONOMIC CLUSTERING**

Early theoretical concepts of urban land use, that later served as airport periphery development models, focused on the regional development of the CBD. These early land development theories included the following:
1) **Concentric Zone Theory** – stated that cities grew outwards from the center in a series of rings (Park, 2019) (Figure 3). This concept would relate to how airport hubs developed over time several layers of 2nd and 3rd tier land developments outside of the aviation core;

2) **Sector Model** – detailed that city growth sectors radiated out from the CBD along transport routes (Hoyt, 1939) (Figure 4). This theory was further developed into the airport corridor model; and

3) **Multiple Nuclei Theory** – stated that as an urban area grows, it develops around several different business centers or nuclei. Each nucleus acts as a growth point from which expansion occurs outwards from each nucleus until they all merge into one large urban area (Harris, 1945) (Figure 5). This strategy would be later emphasized through the regional non-aviation land development model.
Figure 3 - Concentric Model (Planning Tank, 2019. Retrieved from URL https://planningtank.com/settlement-geography/burgess-model-or-concentric-zone-model)
Figure 4 - Sector Model (Planning Tank, 2019. Retrieved from URL https://planningtank.com/?s=Sector+Model)
Figure 5 - Multiple Nuclei Model (Planning Tank, 2019. Retrieved from URL https://planningtank.com/?s=Multiple+Nuclei+Model)
Another early influential land development theory that served as a precursor for the aviation-driven urban growth model was that of the Single Nuclei Theory (Figure 6). This theory, although similar to that of the Multiple Nuclei Theory, argues that instead of there being several economic catalysts, there is one primary catalyst that serves as the central source of outward growth for the larger outlying or urban area. As seen later within this research, growth of the Dallas-Fort Worth Metroplex continued its evolution through the major catalyst transportation hubs of DFW and DAL Airports.

Figure 6 - Single Nuclei Theory (Theories and Concepts of Town Planning, 2011)
CURRENT NON-AERONAUTICAL LAND DEVELOPMENT MODELS

In describing the modern theories regarding external airport spatial or neighboring land use design, in terms of regional (aerotropolis) and city-centered (airport-city), one must first understand how each of these land development concepts is similar and yet different. The land development concept of the airport-city model is where the airport is usually located in or near a city center with transportation access points connected to and from the airport. The airport-city model is more grounded in a metropolitan setting and the city tag denotes the potential diversity of land uses involved (Poungias, 2009) or can be better defined as more or less a dense cluster of operational, airport-related activities, plus other commercial and business concerns, on and around the airport platform (Guller, 2003). The spatial development around the airport-city consists of the first ring of economic development surrounded by a second close ring of residential development. Airport-city non-aeronautical land development usually occurs in the surrounding area of a landlocked airport (e.g. DAL) and the expansion around it has to be well planned with long-term sustainable urban economic growth components.

The more recent non-aeronautical land development theory of the airport corridor model provides a critical link between the airport and the CBD or city. The concept creates a connection between the city airport and the host city through developing residential, commercial, industrial, logistical and leisure areas, structured along highways and/or railways (Peneda, 2010) (Figure 7). The strength and vitality of the airport corridor model are driven by many factors such as airport size and geographic monopoly, landside transportation connectivity, land availability, leadership from the airport or the city or in a coalition, the makeup of the regional economy, institutional arrangements, and development vision (Freestone, 2011). The airport
The airport city plus corridor model, although not initially planned, morphed over time into the current development strategy at DAL Airport.

Figure 7 - Airport Corridor (Golian/Guery, 2016)

The aerotropolis consists of a core airport city at the epicenter of a wider metropolis and is interconnected by dedicated motorways and high-speed rail links (Figure 8). This allows for airport accessibility with outlying aviation-oriented business precincts such as e-commerce
fulfillment centers, business and logistics parks, retail complexes, hotels, and free trade zones (Freestone, 2011). Just as the traditional metropolis is made up of a central city and its commuter-linked suburbs, the aerotropolis consists of extended corridors and economic clusters of non–aeronautical linked businesses and their associated residential developments. Some of these clusters can be observed up to 20 miles from the busiest hub airports with significant economic impacts measured up to 60 miles (Kasarda, 2014).

![Figure 8 - Airport-Centered/Aerotropolis Development Model](Kasarda/Lindsay)

Aerotropolis planning differs from conventional airport city planning by considering 1) inside-the-fence airport development, 2) mutually beneficial outside-the-fence development, and 3) last mile (close to airport or destination) costs holistically (Kasarda, 2014). To achieve this
regional approach to spatial land development, the aerotropolis development must be a fundamentally collaborative venture among landowners, investors, developers, and infrastructure & aviation service providers, including government bodies and airline carriers. This aerotropolis or regional approach has been more closely related to DFW Airport and how it’s on-site and off-site land development method has developed over time. DFW Airport is globally seen as the current model for any regional or aerotropolis planned development.

Although these two different development patterns offer important orientations for planners, both concepts are interrelated over the three phases of non-aeronautical land development. The first phase relates primarily to the commercial growth of the airport. The second phase concerns the path of broader urban development. This path is where airport cities grow outward from the passenger and cargo terminals as the levels of passenger and cargo traffic increase. Due to this increase, greater sizes of facilities are needed to meet the expanding volumes of activity, thereby exhausting available terminal space and therefore leading to the airport city. The third phase relates to air traffic growth with increasing numbers of commercial and logistics support activities. Some of those activities can profitably exist further away from passenger and cargo terminals, therefore leading to the regional aerotropolis (Kasarda, 2014).

Every aviation region unfolds differently over time, depending upon their airline routes, passenger demography and volume, cargo demand, airport and airport area land availability, surface transportation infrastructure, regional industry structure and economic conditions, local labor resources, real estate markets, and other factors. Therefore, the mix and location of commercial and residential facilities can vary significantly as the airport takes physical form (Kasarda, 2014). At the same time, because airports are parts of broader spatial economic
entities, the path of airport-driven urban development has a significant effect on the timing, nature, and process of urban expansion. This study illustrates how DFW and DAL Airports have seen their respective regions evolve through a typology of urban and architectural forms which coincidentally resulted in concert with the rising demand for air travel accompanying urban population growth.
HISTORICAL AVIATION DEVELOPMENT – DALLAS

METROPOLITAN AREA

DALLAS LOVE FIELD AIRPORT HISTORY

Figure 9 - Dallas Love Field (Wikipedia, 2019)
The history of Dallas Love Field (Figure 9) dates to 1914 and World War I when the U.S. Army believed the airplane could play a vital role in the French campaign in Europe. The Army Signal Corps began a major pilot training program, so a group of men in the Dallas Chamber of Commerce, negotiated with the Signal Corps to establish a training field in the Dallas area. The Chamber of Commerce located an acceptable site seven miles northwest of downtown Dallas, on the south side of Bachman Lake, comprising approximately 600 acres of land, which was purchased from local farmers for a cash payment of $15,000 and $250 per acre (Dallas, 2019). The then Dallas Chamber of Commerce also negotiated a lease with 20 farmers whose lands were included in the selected site. The citizens of Dallas contributed $60,000 to assist in the establishment of the flying field (Dallas, 2019). On October 19, 1917, the Army announced the new School of Aeronautics at Dallas. It was officially named Love Field in honor of Lt. Moss Lee Love, who was killed during a training flight at San Diego, California, on September 4, 1913.

With the end of World War I, pilot training at Love field was shut down. After the war ended in November 1918, the Love Field Development Corporation, composed of several men who had helped acquire the initial land, acquired the airport from the U.S. Government (Figure 10). The public then converted the airport into a commercial field for use and gradually Love Field became a magnet for barnstorming pilots and an oasis for aviation activity in the early 1920s.
In 1927, the city of Dallas purchased Love Field, which then opened for civilian use. On April 9, 1932, the first paved runways at the airfield were completed and in March 1939, the airfield had 21-weekday airline departures: nine American, eight Braniff, and four Delta (Dallas Love Field, 2019). Being the older airport (with the city of Dallas designation in 1928 as the primary airport), DAL along with Fort Worth Greater Southwest International Airport operated as the commercial airport hubs for the Dallas-Fort Worth area, while other smaller airports, such as Addison, McKinney, etc., serviced smaller private airlines. In 1928 passenger service to San Antonio and Houston began, with three or four passengers on a flight. DAL became an army
field again in 1942 and served during World War II as headquarters for the United States Air Transport Command (Figure 11).

Figure 11 - Dallas Love Field 1949 (Wikipedia, 2019)
The facilities were greatly expanded by the army air corps, and by 1964 DAL was the largest air terminal in the Southwest. During the postwar period, considerable competition for air traffic developed between DAL and Meacham Field in Fort Worth. Attempts to consolidate and establish a regional airport culminated with the establishment of Dallas-Fort Worth International Airport and the sudden reversal of DAL’s prominence (Leatherwood, Handbook of Texas Online).

In the early 1960s, the Federal Aviation Administration (FAA) determined that both DAL and Greater Southwest International would be insufficient to meet the future demand for airline travel within the region. This led to an agreement by both the cities of Dallas and Fort Worth in 1968 to build DFW Airport to accommodate this growing demand in the Dallas-Fort Worth region and to transfer all commercial airline operations to this new airport (Sarmiento, 2010). With the impending construction of the new DFW Airport, Greater Southwest International ceased operation, while Dallas Love Field continued to operate under the restrictions for flight travel imposed by the agreement for the development of DFW Airport.

Southwest Airlines, which was not a party to the DFW Airport agreement, chose to relocate its headquarters to DAL and begin intrastate flights (to Houston and San Antonio) in the summer of 1971. In 1973, with seven million enplanements, Love Field was the sixth busiest airport in the United States (Leatherwood, Handbook of Texas Online) (Figure 12). By the next year, however, it had lost all its carriers except Southwest Airlines to the new Dallas-Fort Worth airport facility.
The Civil Aeronautics Board ordered all carriers to use the new airport. Southwest, an intrastate carrier fought and won the right to remain at DAL when DFW Airport finally opened in 1974. With this victory, Southwest Airlines was still restricted to only servicing intrastate flights within Texas. Before DFW opened in 1974, Love Field had more than 70 gates. Once DFW opened, DAL shut down several of its concourses and drastically reduced its operations. Yet, Southwest flourished at Love Field and began expanding its empire from its new base of operations.
operations, first launching routes to additional cities in Texas in 1975. Because of Southwest’s success, other carriers began to re-negotiate to use Love Field for short-haul routes (Fan, 2018).

As rigorous guidelines subsided within the airline industry in 1978 regarding the deregulation of flight routes and airfares, Southwest Airlines sought to expand its services to bordering states such as Louisiana (New Orleans) amid opposition from DFW supporters. It was through this lobbied support that the U.S. House of Representatives Speaker, Jim Wright (Texas), authored the International Air Transportation Act of 1979 as federal legislation for the protection of DFW Airport from competition at DAL. Under the pretext of protecting DFW, the Wright Amendment restricted passenger air traffic out of Love Field in the following ways: Passenger service on regular mid-sized and large aircraft could only be provided from Love Field to locations within Texas and four neighboring states (Louisiana, Arkansas, Oklahoma, and New Mexico); airlines could not offer connecting flights, through service on another airline, or ticketing beyond the five-state region; and long-haul service to other states was possible, but only on commuter aircraft that carried fewer than 56 passengers (Dallas Love Field, 2019).
Figure 13 - Dallas Love Field Air Service Area 2005 (Swartz, Karl 4 Years Remain of the Wright Amendment. Retrieved from URL http://www.gcmap.com/featured/20101013)

In 1980, Congress passed the Wright Amendment, which severely restricted airline travel at DAL. Subsequent amendments expanded the DAL Service Area to include services to Alabama, Kansas, and Mississippi (Shelby Amendment) beginning in 1997 and Missouri (Bond Amendment) in 2005 (Figure 13). The Wright Amendment became controversial in Dallas; some argued that it unfairly restricted airline competition, while others supported it to mitigate jet noise and protect property values near the airport (Dallas Love Field, 2019). In 2001, the
September 11 attacks and the subsequent recession greatly reduced the demand for air travel in the U.S., especially within the business traveler market (Dallas Love Field, 2019). American Airlines quickly ceased long-haul 56-passenger flights and pulled out of Love Field. Southwest began actively lobbying to have the Wright Amendment fully repealed in 2004. On June 15, 2006, it was announced that American Airlines, Southwest Airlines, Dallas-Fort Worth International Airport, and the cities of Dallas and Fort Worth had all agreed to seek a full repeal of the Wright Amendment (The Five Party Agreement), with several conditions. Among them were: the ban on nonstop flights outside the Wright zone would remain until 2014; through-ticketing to domestic airports (connecting flights to long-haul destinations) would be allowed immediately; Love Field's maximum gate capacity would be reduced from 32 to 20 gates, and; Love Field would handle only domestic flights non-stop (Dallas Love Field, 2019). All told, airports, airlines, and cities spent four full decades lobbying for fairer terms of operation at Love Field until the Wright Amendment was fully repealed on October 13, 2014 (Fan, 2018).

THE WRIGHT AMENDMENT AND EXPIRATION

The economic impact of the expiration of the Wright Amendment, although a recent event, had been widely anticipated and projected for years before the actual termination. The restrictive elements of the Wright Amendment, while in place, hampered the economic prospects of development and growth in and around DAL Airport. Before 2014, Dallas Love Field was a regional airport. With the expiration of the Wright Amendment (Figure 14), Love’s traffic soared more than 70 percent with little impact on DFW Airport travel (Walters, 2018). All associated businesses on-site and off-site have seen revenue increases, which have resulted in increased
economic development impact leading to 2nd and 3rd tier economic influences on the surrounding communities.

Figure 14 - History of the Wright Amendment (The Impact of the Repeal of the Wright Amendment on the Dallas Area Air Travel Market. Retrieved from URL https://commons.erau.edu/cgi/viewcontent.cgi?article=1207&context=discovery-day)
The city of Dallas Department of Aviation member and DAL Executive Director, Mark Duebner, argued that expiration of the Wright Amendment had a dramatic impact on the daily operations at DAL Airport and that government (Federal, State and Local) should be the catalyst for free-market development, rather than a hindrance to economic improvement. Mr. Duebner stated that “the meaning behind the Wright Amendment, in his opinion, should have never been proposed and/or implemented.” Mr. Duebner’s interpretation was that if DFW Airport was such an airline enhancement for the region, then why would air travel restrictions be needed on surrounding airports just to direct and incur airline business travel to DFW airport? He explained that the government, in this case, subjugated one airport (DAL) to ensure that another airport (DFW) would be a political success. “Public (government) intervention, e.g. the Wright Amendment,” according to Mr. Duebner, “was not necessary and made DAL Airport the sacrificial lamb. If left to their own devices, private market forces would have dictated the success of either or both airports.” Mr. Duebner further specified that the same political pressure to restrict airline travel at DAL Airport came under political and consumer scrutiny, which led to the final expiration of the amendment (Duebner, 2016).

Since the expiration of the Wright Amendment, DAL Airport has seen its airline traffic numbers exceed projected expectations. From 2014 to 2018, total airline traffic numbers increased from approximately 9.4 million to 16.2 million (Dallas, 2019). This increase not only caused DAL to become the fastest growing airport in the US over the last 10 years (Figure 15) but also to see a resurgence in the economic position of the surrounding land area.
As seen with new development along Mockingbird Lane, the past few years have seen a significant increase in business travelers and visitors around the Dallas Love Field Corridor (Corral, Dual-Branded Hotel Opens at West Love Development, 2017). Today, the “Love Field Neighborhood” (Figure 16) in Northwest Dallas consists of about 12,500 population, which formerly had community concerns, but has seen new investment as the value of real estate conveniently located near downtown, as Love Field is, has soared. Over the next five years, the population of Love Field Neighborhood is expected to grow by 5.4%. This growth coincides with the number of households, which currently stands at 4,377, is also expected to grow by 6% over the same span (Dallas Neighborhood Guide - Love Field, 2019). Again, the proximity to Downtown Dallas plays an instrumental part in this growth but the resurgence at DAL Airport is also very critical to this renewed economic and residential enthusiasm.

Figure 16 - Love Field Neighborhood (D Magazine, 2019. Retrieved from URL https://neighborhoods.dmagazine.com/dallas/northwest-dallas/love-field/)
DALLAS–FORT WORTH INTERNATIONAL AIRPORT HISTORY

Figure 17 - Dallas-Fort Worth International (Wikipedia, 2019)
The history of the airport now known as Dallas-Fort International (Figure 17) is long and contentious. As early as 1927, before the area had an airport, the city of Dallas proposed a joint airport with the city of Fort Worth. The city of Fort Worth declined the offer and thus each city opened its own airport, Dallas Love Field and Fort Worth Meacham Field (Dallas/Fort Worth International Airport, 2019). Around 1940, a regional airport for the Dallas and Fort Worth area was once again being considered. The Civil Aeronautics Administration (CAA) approached the city of Arlington to sponsor an airport midway between the two larger cities. Both Dallas and Fort Worth were interested since the expansion of Fort Worth Meacham Field and DAL Airport in Dallas would require extensive construction to accommodate increasing air traffic and larger aircraft. Arlington agreed, and with the support of American Airlines and Braniff Airways to deed 1,000 acres of land, the CAA was to build the landing area. A seven-man board would control the overall operation of the field. Construction began in 1942, but a disagreement caused the airport, then called Midway, to be turned over to the city of Arlington in 1943. It was operated during World War II by the military as a training field and for test flights (Leatherwood, Dallas-Fort Worth International Airport, 2019).

In 1946, the city of Fort Worth prepared an airport plan for the city of Arlington; and the next year, it decided to develop Midway as its major airport and renamed it Greater Fort Worth International Airport. Dallas continued to develop DAL Airport. In 1948, the CAA National Airport Plan recommended that Greater Fort Worth International Airport be expanded into the major regional airport. The city of Fort Worth annexed the site and continued to develop the airport with the support of American Airlines. In 1950, the Fort Worth City Council renamed the airport Amon G. Carter Field. The airport officially opened in April 1953 (Figure 18).
During the 1950s, two attempts were made by the city of Fort Worth to convert Carter Field into a joint regional airport with the city of Dallas participating as a full partner. The city of Dallas rebuffed both efforts and expansion of DAL Airport continued. In May 1960 the airport, renamed Greater Southwest International Airport, was purchased by the city of Fort Worth to
compete more successfully with DAL Airport. From 1959 to 1965, the percentage of enplaning passengers from Greater Southwest declined from 6 percent of Texas air traffic to less than 1 percent, while Love Field increased from 40.3 percent to 49.0 percent. The result was the virtual abandonment of Greater Southwest International Airport and serious congestion at Love Field (Leatherwood, Dallas-Fort Worth International Airport, 2019).

Finally, in 1964 the Civil Aeronautics Board ordered the two cities to come up with, in less than 180 days, a voluntary agreement on the location of a new regional airport. Otherwise, the federal government would do it for them. Both cities appointed committees, and by 1965 plans were set for a Dallas-Fort Worth Board which would consist of eleven members—seven from Dallas and four from Fort Worth. The site for an airport, originally called Dallas–Fort Worth Regional Airport, was chosen. The plan received broad support; in December 1968, the ground was broken at the intersection of the towns of Coppell, Euless, Grapevine, and Irving collectively referred to as the Host Cities (Figure 19). The new site included the old Greater Southwest International Airport (Leatherwood, Dallas-Fort Worth International Airport, 2019).
The new airport, now known as the Dallas–Fort Worth Airport, was dedicated in September 1973 and became operational on January 13, 1974. At the time of the opening of the airport, nine airlines and eight commuters operated there. Extensive facilities were in operation, including a 600-room hotel, a post office, and various shops and restaurants. When opened, DFW Airport was the biggest in the world and most expensive, with a final price of $700M. It had three runways (two primary north-south runways on each side in the International Parkway and a single diagonal runway on the east side), 4 terminals, and 56 gates operating flights to 226...
destinations, including Mexico (Bleakley, 2013). As stated earlier, due to the opening of DFW Airport, DAL Airport declined rapidly, falling from close to seven million passengers in 1973 to less than 500,000 in 1975, though it gradually recovered in the 1980s and 1990s (Leatherwood, Dallas-Fort Worth International Airport, 2019).

From the beginning, DFW Airport leadership sought to make the airport not only a prominent national aviation center but a global destination as well. As a result of this progressive business attitude, many corporate headquarters began to see the benefit of relocating to the DFW Airport region. The first and most important relocation was American Airlines, which moved its corporate office from New York to Fort Worth in 1979 and again to just south of the airport in 1983 (Bleakley B. A., 2013). The benefit of American Airlines’ corporate relocation was due to efforts to control costs in the narrow profit margin of deregulation. American Airlines decided to create a hub-and-spoke of routing domestic passengers through a central airport with connecting flights. Since DFW airport is centrally located and often described as four hours from anywhere, this critical factor made it the logical choice for American Airlines’ initial hub (Kiger, 2016). The airport officially changed its name to Dallas-Fort Worth International Airport on January 1, 1985, due to its increased position as an international gateway. During this time, the airport continued its aggressive approach to become the region’s economic catalyst by offering 40 foreign flight destinations and being cited as the main reason 16 Fortune 500 companies relocated to North Texas, all by its 25th anniversary in 1999 (Bleakley B. A., 2013).

With federal airline travel restrictions still in effect at DAL Airport, the cities of Dallas and Fort Worth, the DFW Regional Airport Authority, American Airlines, and Southwest Airlines entered into a Five-Party Agreement in July 2006. This agreement was subsequently
enacted into federal law called the Wright Amendment Reform Act that was signed by the President in October 2007. The Five-Party Agreement and the Reform Act called for the immediate liberalization of the Wright Amendment restrictions and the eventual elimination of all remaining restrictions in 2014. Although the full amendment repeal was realized on October 13, 2014, restrictions on the number of airline gates (20) remained at DAL Airport.

Since the repeal of the Wright Amendment, DFW Airport has sustained its focus to be the major economic engine for the Dallas-Fort Worth Metroplex. DFW Airport management continues its quest to be a national & global destination and economic magnet. The airport now services 190 domestic destinations, more than any other U.S. airport and provides 63 nonstop international destinations while supporting a region that has attracted 24 Fortune 500 companies and ranks in the top 5 metros in 10 out of 12 industry sectors (DFW International Airport, 2019) (Figure 20).
METHODOLOGY

The method utilized to study the critical dynamics and factors that influence urban growth and economic land development around both DAL and DFW Airports focused on a detailed comparative case study. The comparative case study technique is appropriate in that the research process provided the means for qualitative and quantitative analysis, while also employing the collection of data instruments, which gather firsthand knowledge of urban proximity growth. This method outlined and measured DFW and DAL airports and their respective aviation history, restricted flight services, the Wright Amendment, airline expansion and coverage over time and explained their respective characteristics, differences, impacts, etc. In addition, the comparative case study technique evaluated the historical, current, future adjacent land development approaches at each airport and explored what long-term economic impact(s) these non-aeronautical land development strategies had and/or will have on DFW Airport, DAL Airport and the surrounding 3-10 mile Metropolitan Statistical Area (MSA) radius. With this objective in mind, this method served three main purposes: first, discussion of urban economic development concepts surrounding DFW and DAL Airports; second, identification of a correlative effect between airport development and the peripheral land development; and third, assessment of critical factors that influenced the resulting urban economic land development surrounding both DFW and DAL Airports.
LITERATURE REVIEW – CRITICAL FACTORS COMPARISON AND CONTRAST

A two-step process was engaged in conducting the literature review for this research. First, the general literature on the early factors influencing non-aviation land development(s), such as industry books, journals, articles and other published reports were scrutinized and reviewed to establish an analytical framework. Second, documents, policies and activities at each respective airport area that focused on non-aviation land development were also collected, studied and analyzed for this specific inquiry.

In comparing and contrasting aviation development with peripheral economic land use, a few central dynamics will be highlighted. The focus of these areas resulted from prior research regarding airport–driven urban development. These factors will be examined as to their effect on the surrounding non-aeronautical landscapes. The factors are transport accessibility and connectivity, airport landscape, and agglomeration of business economies. As seen in “Airport Cities and the Aerotropolis” (Kasarda, 2006) and “Critical Factors for Development of Airport Cities” (Peneda, 2011), these factors were deemed critical elements that cause peripheral urban land developments around airports to evolve heterogeneously.

TRANSPORT ACCESSIBILITY AND CONNECTIVITY

Accessibility to transport has always shaped the evolution and economic position of cities. First, our major cities largely grew around seaports. Next, urban development took place along rivers that formed the backbone of the industrial revolutions in the United States. Afterward, railroads opened landlocked interiors of nations, fostering a third wave of city growth outward from their main terminals. Then, the expansion of suburban roadway systems created a fourth wave of urban development. We are now well into the fifth wave of transit-oriented development, where large commercial airports have become significant drivers of the business location and urban economic growth. This fifth wave consists of an airport's aeronautical, logistics, and commercial elements, and it connects transportation infrastructure with clusters of aviation-oriented businesses.
and residential developments that continually feed off each other and their proximity to the airport (Kasarda, 2015).

Transport accessibility and connectivity have been revealed as very critical and vital components regarding non-aeronautical land development around airports. These accessibility and connectivity factors concern: 1. The ability of the airport to be reached & approached by airline users or transported from one site or terminal to the next and 2. Where an airport seeks to connect its area to the wider region. This can be via airlines, roads/highways, buses, inter-airport transit lines, or other means of public transportation. It is critical to plan for continued improvements for access and all transport opportunities to a site location and/or region. The better the airport is connected to the broader area, the more attractive the region becomes to its users, thereby improving its competitiveness and urban growth potential. This element of airport connectivity enhances the convenience of its surrounding region, making it vastly more appealing as a destination and as a place to do business and live.

Due to transport access and connectivity, business attraction and agglomeration of economies for a metropolitan area can be directly attributed to the evolution of its major transportation hub. Corporate headquarters are especially gravitating to airport areas. More than 50 percent of Fortune 500 corporate headquarters are located within 10 miles of U.S. hub airports. This compares to 29 percent of all business establishments (Stiwell, 2013).

DFW has five major highways converging at the airport, making it one of the most traveled sectors in the Dallas-Fort Worth Metroplex. The freeways of SH 183, SH 161, SH 360, SH 121, SH 114, and I635 along with two major roadway projects underway near the Airport (the DFW Connector and the North Tarrant Express) provide ample access and strong
north/south accessible entrances for the region (DFW Land Use, 2014) (Figure 21). In addition, due to the Dallas-Fort Worth Metroplex being located in the central part of the United States, which allows for 4-hours travel to any location in the continental USA, it may come as no surprise that accessibility and connectivity of DFW Airport is one of the main reasons why companies choose to migrate to North Texas (Figure 22). According to John Terrell, vice president of commercial development at DFW Airport, “DFW Airport’s accessibility to the rest of the world is either the No. 1 or No. 2 reason for every global or domestic corporate relocation to the region” (Corral, 2017).
Figure 21 - DFW International Accessibility (DFW Land Use, 2014)
Figure 22 - DFW International Airport Connectivity (Dallas Economic Development Guide 2019)
To serve the economic demands of connectivity, speed, and agility, the regional airport development requires localized infrastructure planning. Planning efforts should include dedicated expressway links and high-speed rail efficiently connecting airports to business and residential clusters (Kasarda, 2006). To this effect, DFW Airport added the transport options of the DART Orange Line (rail) (Figure 23), the Trinity Railway Express (rail connector) (Figure 24), DFW Airport Shuttle (bus) and the most recent TexRail Project (high-speed rail)(Figure 25) along with other surrounding road improvements. These added transport options provide the owner cities and host communities more convenience and access to this vital catalyst. This increased accessibility affords the extended area the connectivity required to attract improved employment opportunities via corporate headquarters relocations and various commercial/residential developments that directly promote regional growth.

Due to this accessibility, the connectivity factor for this urban growth has now expanded further than the initial peripheral area. The cities of Plano, Frisco, and upwards toward the city of Denton must now be included in the impacted region of DFW Airport. As seen with the recent headquarter relocations of Toyota, JPMorgan Chase and Liberty Mutual Insurance, along with other Fortune 1000 companies like J.C. Penney, Yum! China Holdings, Alliance Data Systems, Cinemark, Rent-a-Center (Development, 2019), airport accessibility and convenience have influenced growth throughout the Dallas-Fort Worth Metroplex.
Figure 23 - DART Orange Line (DART.org - DFW International Airport Information. Retrieved from URL https://www.dart.org/riding/dfwairport.asp)
Figure 24 - Trinity Railway Express (TRE) (DART.org - Trinity Railway Rail. Retrieved from URL https://www.dart.org/riding/tre.asp)
Figure 25 - TEXRail Project (The Dallas Morning News, 2017. Retrieved from URL
https://www.dallasnews.com/business/airlines/2017/02/14/commuter-rail-from-fort-worth-to-dfw-airport-on-track-for-late-2018/)
In contrast, at DAL Airport, accessibility is primarily limited to one entry access off Mockingbird Lane. Due to this single entry point (Figure 26), in conjunction with DAL airport, being landlocked on the north side, having limited departure gates (20), and having airline travel restrictions, the opportunity for vast growth or expansion lagged behind other comparable airports for years. Although DAL Airport had initial plans in the mid-2000s to bring a DART rail line to the airport terminal for more access and connectivity, those plans were terminated due to the extreme cost of development and the anticipated shutdown of one main runway during the prolonged construction period. This caused city leaders to concede to political pressure and reject the DART rail to the DAL Airport terminal plan. Instead, the city of Dallas approved a DART rail line stop located adjacent to the airport on Denton Drive. This stop allows a rail and bus line connector to the airport terminal but provides limited options for regional air travelers trying to access DAL Airport.

This lack of infrastructure planning for optional transport caused airline traffic to remain static for years. The economic effect on the peripheral land development area around DAL Airport continued to be stagnant and in some instances decline. The properties just south of the airport, along the Mockingbird Lane, had some light office/warehouse buildings but were mainly abandoned or vacated structures with scattered vacant lots. Although just east of the airport, along Lemmon Avenue, some businesses continued as high-end automotive hubs with bordering retail and commercial centers, DAL Airport’s resurgence was needed in conjunction with the hospital district to cause the vital economic infusion for the area.
Figure 26 - DAL Airport Accessibility (Dallas Love Field Master Plan Update, 2018)
With the expiration of the Wright Amendment, which allowed for more airline travel options, the surrounding area finally began to transform. Since 2014, the proximal area around DAL Airport has become viable for development and some of the most valuable economic real estate within the city of Dallas. As seen over the last 5 years since the Wright Amendment expiration, this development area has experienced substantial growth.

Once vacant lots are being purchased for either planned developments, retail establishments or future prospectus properties. Also, plans are currently being discussed and developed for a north road entry off Northwest Hwy., which would provide the secondary ingress and egress needed to allow further growth and economic expansion to the north of DAL Airport. This additional connectivity factor allows adjacent DAL Airport land development to advance and extend to Walnut Hill Lane to the North, Oaklawn Avenue to the South, Dallas North Tollway to the East, and Interstate 35 to the West. This supplementary airport-driven economic opportunity includes the prospects for new office space, technology centers, commercial, residential and retail sites for development.
AIRPORT LANDSCAPE

The progression of a city or regional area tends to grow and develop around major transportation hubs, such as airports (Figure 27). The continued advancement or decline of both airfield and airline operations/services are direct causes of growth or stagnation of the surrounding airport landscape. A critical element of this evolution is the availability of developable land. Ample accessibility of developable land adjacent to an airport hub allows urban spatial development and population/economic growth to take place. If the developable landscape surrounding an airport is sizeable, as in the case of DFW Airport, or limited as with DAL Airport, the long-term implications will be reflected in how and when economic land development evolves.

Figure 27 - Airport Peripheral Development (Rouzbeh Boloukian and Jürgen Siegmann. Transportation Research Procedia 12, 2016)
While some airports have grown on the edge of cities, the Dallas-Fort Worth metropolitan area has grown up around the DFW Airport landscape. Since the airport opened in 1974, the region’s population has surged from 2.5 million to about 7.5 million today (Kiger, 2016). In addition to its terminals and runways, DFW Airport—which sprawls over a nearly 30-square-mile (78 sq km) expanse that is larger than Manhattan—is home to warehouses, factories, three hotels, office space, and a golf course. While it lacks a similar proximity to residential neighborhoods compared to DAL Airport, its periphery has attracted scores of major companies to locate their headquarters nearby and has spawned upscale suburbs that are home to a diverse population, including corporate executives and entrepreneurs. This factor of proximity shows the willingness of persons and companies to pay for the convenience of being minutes away from a flight to just about anywhere in the United States or the world (Kiger, 2016). As referenced earlier, DFW Airport’s accessibility points off Hwy. 183, Hwy. 114, and Hwy. 635, provides sufficient access with great prospects for direct 1st and 2nd tier socioeconomic opportunities for a 10-mile radius. This radius of development includes the edge host communities.

The airport’s landscape allows connectivity to be the main impetus in the development of these edge cities/communities. This connectivity still provides a major economic benefit to these areas as residential and commercial development around DFW Airport continues to prosper. Office buildings, business parks, and airport edge cities thus develop along major highway corridors linking the metropolitan central city to the airport, allowing tenants access to the airport as well as needed inputs the central city offers to their business processes (Kasarda, 2014).
Early on as DFW Airport operations and traffic grew, companies saw the advantages of being located close to the airport landscape. Nearby Las Colinas, a suburb of the city of Irving and DFW Airport, turned into a magnet for corporate headquarters in the ‘80s and ‘90s, with eight of the Fortune 1000 companies moving there to take advantage of proximity and convenience. A master-planned community developed in 1973, Las Colinas has come to epitomize the concept of an airport-driven economy and business agglomeration. After 15 years of existence, this Las Colinas suburb became one of the most prominent centers for businesses and corporate headquarters in the country. Today, due to its airport proximity, 2000 companies are located in Las Colinas including being headquarters to over 15 of the Fortune Top 1000 corporations (Commerce I.- L., 2019).

Not far from DFW’s runways, the upscale suburb of Southlake sprang up and became home to legions of corporate managers and executives—including some who commuted by air to jobs in other cities (Kiger, 2016). Southlake Town Square was developed as a mixed-use complex that included 1.4 million square feet (130,000 sq m) of retail, office, and restaurant space, plus a hotel, a movie theater, and a neighborhood of luxury brownstone residences. Its buildings are linked by public squares, plazas, and parks to create the walking-scale atmosphere of a traditional American town. Property located within a 15-minute drive time of the airport has a lot of eyeballs on it, from corporate to residential. There is a full complement of uses that want to be there. Whether it’s a retail business or restaurant, office or entertainment, a home or a hotel, all those uses benefit from being close to DFW Airport (Kiger, 2016).
The economic development landscape surrounding DAL has transformed during the timeline of the airport. Initially, when the airfield was being utilized by the US military, the city of Dallas population stood at approximately 158,000 residents. During this period the land surrounding the airfield was primarily farmland and perceived to be on the outer banks of the city periphery near Bachman Lake. When Love Field was designated as the official airport of the city of Dallas in 1928, the population stood at approximately 260,000 or a 5% increase from the previous decade but the airport was still viewed as being on the outer boundary in regards to urban growth. During the period of the ‘30s to ‘70s, the city of Dallas allowed the surrounding area to be developed based more on city land needs with some influence by airport/airline needs. This development method caused the airport development radius to remain stagnant and eventually suffer from the opening of DFW Airport.

DAL Airport’s surrounding land development concept of the airport city or corridor was still in its infancy. With the airport site was initially selected on the outer edge of downtown Dallas, once the city limits grew to encompass DAL Airport, residential development and economic expansion followed until 1974. The adjacent economic land development has been relatively stagnant since DFW Airport opened and subsequent passage of the Wright Amendment in 1979. This stagnation in economic growth surrounding DAL Airport continued although being developed with commercial businesses, automobile dealerships, and residential development, just east of the airport, along Lemmon Avenue & alongside Northwest Highway to the Dallas North Tollway and anchored by Southwest Airlines headquarters at Denton Drive., just west of the airport.
This sluggishness of DAL Airport’s adjacent development landscape remained in effect until conversation regarding the repeal of the Wright Amendment emerged in the mid-2000s. This discussion of a repealed Wright Amendment sparked renewed economic development interest around DAL Airport. It was during this period and after, which included the Wright Amendment expiration, that expanded economic land use improvement was realized. Since 2014, the area has seen a re-energized effort to develop this once greyfield landscape area (Table 1).

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<th>Property Type</th>
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<tr>
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<td>250,000</td>
<td>--</td>
<td>2020</td>
<td>Office</td>
<td>KDC Real Estate</td>
</tr>
<tr>
<td>Colony Crossing - Building 3</td>
<td>109,200</td>
<td>--</td>
<td>2020</td>
<td>Industrial</td>
<td>Colony Northstar</td>
</tr>
<tr>
<td>Courtyard &amp; Residence Inn Love Field</td>
<td>150,000</td>
<td>280</td>
<td>2021</td>
<td>Lodging</td>
<td>Civitas Capital</td>
</tr>
<tr>
<td>Freeman - 6500 Hary Hines</td>
<td>200,000</td>
<td>--</td>
<td>2021</td>
<td>Office</td>
<td>Cawley Management</td>
</tr>
<tr>
<td>William P. Clements Hospital expansion</td>
<td>291,000</td>
<td>--</td>
<td>2020</td>
<td>Medical</td>
<td>UT Southwestern</td>
</tr>
<tr>
<td>Vivarium &amp; Research Campus</td>
<td>295,000</td>
<td>--</td>
<td>2020</td>
<td>Medical</td>
<td>UT Southwestern</td>
</tr>
<tr>
<td>Harold C Simmons Cancer Center</td>
<td>590,000</td>
<td>--</td>
<td>2021</td>
<td>Medical</td>
<td>UT Southwestern</td>
</tr>
<tr>
<td>Parland Medical Offices</td>
<td>525,000</td>
<td>--</td>
<td>2021</td>
<td>Medical</td>
<td>Parkland</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,730,495</strong></td>
<td><strong>680</strong></td>
<td><strong>--</strong></td>
<td><strong>--</strong></td>
<td><strong>--</strong></td>
</tr>
</tbody>
</table>

*Table 1 - DAL Peripheral Land Development (JLL, 2019)*
AGGLOMERATION OF BUSINESS ECONOMIES

Airports are considered one of the major factors stimulating the social and economic growth of regions. There is a reciprocal relationship between airport development and regional economic growth. On the one hand, airport operators invest strategically in aviation infrastructure and non-aviation commercial facilities, generating jobs on airport land and in the wider metropolitan area (Graham, 2013). On the other hand, airport expansion is also a result of economic growth and long-distance exchange, as the demand for air transport is positively related to the regional growth of economic activities (McGraw, 2016). Evidence confirms the common view that good airline service is an important factor in urban economic development (Brueckner, 2003). For instance, in the United States, employment within a 2.5-mile radius around the country’s 25 largest airports continues to grow. Additionally, job opportunities in the airport region span across a broad range of industries from manufacturing to service-oriented sectors (Appold, 2013). Studies show that employment in the nontraded business and professional services grew, on average, 3.2 percent more per decade since 1950 in cities with an airport. Studies also seem to suggest that a 10% increase in airline traffic (passengers) causes a 1% increase in service sector employment (McGraw, 2016).

Airports typically move two things: goods and people. However, while both are essential for regional development, moving people is found to be more important. As sources of ideas and talent, people are chief contributors to regional innovation, creativity, and economic growth. This is backed by research concluding that an airport’s ability to move people from one place to another is a key factor in urban economic development (Florida, 2018). This comprises increased
mobility of people, the greater appeal of the region for investors thanks to easier access to global markets, development of tourism, and the creation of primary workplaces (Stangel, 1974).

As seen with Figure 28 and Figure 29, the airport regions have been employment and population clusters, not only within the urban core of the partner cities but also in the peripheral areas of both DFW and DAL airports. As stated before, the accessibility and convenience of airline travel have resulted in the gathering of employment and population density directly related to airport-driven economic factors. The town of Addison, the city of Plano and the city of Frisco are the outliers to these employment and population density patterns. Even though not being in the periphery development radius, these outlier communities directly benefit from the airport-driven economy with accessibility (Dallas North Tollway, I635, Sam Rayburn Tollway, and President George Bush Turnpike) and convenience of both airports being just minutes away.
Figure 28 - DFW Total Population Density (Dallas Economic Development Guide 2019)
Figure 29 - DFW Total Employment Density (Dallas Economic Development Guide 2019)
The region initially attracts or agglomerates aviation-related businesses. Over time, these businesses expand to directly or indirectly impact other aspects of regional livelihood. The impact is multiplied depending on how much those effects are connected with aviation (Figure 30). The effective impacts are classified as either direct impact(s) which are entirely or largely related to the airport operations or indirect impact(s) which results from a business activity outside the airport (Marciszewska, 2010).

Figure 30 - Airport-Driven Economic Impacts
As seen by the airport-driven indicators below (Table 2), DFW and DAL Airports influenced the regional and local economy through both direct and indirect impacts. Those regional and local impact indicators are total employment numbers, all associated payroll contributions, and total economic output. In 2010, the total annual regional economic output for DFW Airport was $15.7B with associated employment of 267,918 employees. At DAL Airport, in 2010, the numbers were $2.8B for a total annual economic output with associated employment of 41,083 employees. In 2018, DFW Airport numbers grew dramatically to reflect $37B in total annual economic output, $12.5B in supported payroll and 228,000 associated employees (DFW International Airport, 2019). The numbers in 2018 for DAL Airport were $6.1 B in total annual economic output, $1.9B in supported payroll and 60,595 associated employees.
Table 2 - DFW and DAL Airport Economic Indicators 2010 & 2018
Texas Aviation Economic Impact Study

Economic Impact of Commercial Airports on Their Local Economies – 2018

Total Employment from Texas Airports – 2018

<table>
<thead>
<tr>
<th>Airport Name</th>
<th>Direct Employment</th>
<th>Multiplier Employment</th>
<th>Total Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dallas Love Field</td>
<td>39,490</td>
<td>21,105</td>
<td>60,595</td>
</tr>
<tr>
<td>Dallas-Fort Worth</td>
<td>155,469</td>
<td>88,037</td>
<td>243,506</td>
</tr>
</tbody>
</table>

Total Payroll from Texas Airports – 2018

<table>
<thead>
<tr>
<th>Airport Name</th>
<th>Direct Payroll</th>
<th>Multiplier Payroll</th>
<th>Total Payroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dallas Love Field</td>
<td>$1,110,672,000</td>
<td>$809,884,000</td>
<td>$1,920,556,000</td>
</tr>
<tr>
<td>Dallas-Fort Worth</td>
<td>$5,413,356,000</td>
<td>$3,879,063,000</td>
<td>$9,292,419,000</td>
</tr>
</tbody>
</table>

Total Output from Texas Airports – 2018

<table>
<thead>
<tr>
<th>Airport Name</th>
<th>Direct Output</th>
<th>Multiplier Output</th>
<th>Total Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dallas Love Field</td>
<td>$3,162,894,000</td>
<td>$2,943,473,000</td>
<td>$6,106,367,000</td>
</tr>
<tr>
<td>Dallas-Fort Worth</td>
<td>$15,574,939,000</td>
<td>$14,341,627,000</td>
<td>$29,916,566,000</td>
</tr>
</tbody>
</table>

Economic Impact of Commercial Airports on Their Local Economies – 2010

<table>
<thead>
<tr>
<th>Airport Name</th>
<th>Impact</th>
<th>Total Output</th>
<th>Total Labor Income</th>
<th>Total Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dallas Love Field</td>
<td>CS</td>
<td>$2,341,640,837</td>
<td>$1,079,122,813</td>
<td>38,863</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>$480,351,680</td>
<td>$167,845,568</td>
<td>2,220</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>$2,821,992,517</td>
<td>$1,246,968,381</td>
<td>41,083</td>
</tr>
</tbody>
</table>

Dallas-Fort Worth International

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CS</td>
<td>$15,626,379,766</td>
<td>$7,373,325,519</td>
<td>267,597</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>$75,075,408</td>
<td>$26,931,636</td>
<td>321</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>$15,701,455,174</td>
<td>$7,400,257,155</td>
<td>267,918</td>
</tr>
</tbody>
</table>
“DFW Airport is a magnet. Many corporations and businesses wouldn’t have located in the area, except for the airport’s presence,” states John D. Kasarda, professor at the Kenan-Flagler Business School at the University of North Carolina at Chapel Hill (Kiger, 2016). This is quantified further by the number of headquarter, regional, and major office relocations throughout the entire Dallas-Fort Worth Metroplex. Since 2010, 126 headquarters (other Fortune 500 and 1000 companies) have relocated to the Dallas-Fort Worth Metroplex (Commerce, 2019). With these relocations, the associated commercial, residential, and social (churches, community centers, parks, schools, etc.) developments became the resulting indirect outcomes. As viewed in Figure 31 and Figure 32, the DFW area is considered one of the nation’s top markets for new and expanded corporate facilities. This high market demand is directly related to having a centralized US location and ease of travel nationally and globally. This corporate business agglomeration, or clustering, heavily influences the partner, host, and other peripheral regions as companies seek available land for office, industrial, and commercial use with the proximity of convenient air service. The reach of this business agglomeration or “corporate headquarter(s) clustering” has extended further than the initial boundaries of the DFW Airport region and the DAL Airport corridor. The effects are shown within the communities of Addison, Denton, Lewisville, Lancaster, Garland, McKinney, etc. which all have become the benefactors of this airport-driven economic element as firms and companies nationally and globally continue to expand their search in the Dallas-Fort Worth Metroplex for relocation opportunities. In addition, the airport-driven economy continues to attract the clustering of assorted economic benefactors, such as the location of sporting organizations, teams, events, all aspects of tourism (major theme/amusement parks, musical venues, etc.), regional and national conventions and gatherings, etc., all dependent on both (DFW and DAL) airports in providing the transport accessibility and connectivity.
required to make this one of the most successful global regions. As the old aviation adage goes, “a mile of highway will take you just one mile, but a mile of runway will take you anywhere” or in the case of the Dallas-Fort Worth Metroplex “a mile of runway brings everyone here”.

Figure 31 - Headquarters Relocations 2010-2018 (Dallas Economic Development Guide 2019)
Figure 32 - Headquarter Relocation to Dallas-Fort Worth Metroplex 2017-18 (Dallas Economic Development Guide 2019)
NON-AERONAUTICAL LAND DEVELOPMENT COMPARISON AND CONTRAST

To further highlight the causal effects of transportation accessibility and connectivity, airport landscape and agglomeration of business economies on the outlying DFW and DAL Airport areas, this research specifies on-site aviation development(s) with resulting off-site (peripheral) non-aeronautical land developments. This development analysis is detailed in 20-year intervals from 1960 to the present. Although already in existence, before 1960, DAL Airport was systematically being utilized for both WWI and WWII efforts which limited its public airline services & development capacity. DFW Airport, before 1970, was only preliminary communication between the FAA and the city of Dallas and the city of Fort Worth about future development.

The development area for observation is a span of 10 miles around DFW Airport (Figure 33) and 3 miles around DAL Airport (Figure 34). This allows this study to determine the immediate relationship of airport-driven economies on the adjacent land development areas. Although the impact of both airports is realized throughout the entire Dallas-Fort Worth Metroplex, for emphasis of this research, the development proximity is limited. This restriction is due to the fact of urban growth that is further removed from the immediate airport area causes other economic factors to have more impact on the evolution and spatial design of the sustainable urban form.
Also, in discussing these dynamics of causal factors, the airline’s traffic numbers must be observed with urban population growth and economic land development. Airport hub cities grew between 9% and 16% faster than non-hub cities between 1990 and 2000 (Green, 2007). As seen in Tables 3 and 5, DFW airport airline traffic has grown from over 7M in 1974 to just over 69M in 2018. Passenger traffic grew 4.1% in FY 2018 and is projected to grow 4.9% in FY 2019 and has grown its destinations more than 25% since 2015, and now ranks 2nd in total destinations among U.S. airports (DFW International Airport, 2019).
This steady increase has coincided with overall growth not only in the partner and host cities areas but the entire Dallas-Fort Worth Metroplex region as well (Table 4). As noted earlier, the transportation hub of DFW Airport has been the main catalyst for spatial urban development since its inception. As John Kasarda states, “DFW Airport doesn’t compete with the downtowns of Dallas and Fort Worth, it complements them” (Kiger, 2016).

Table 3 - DFW Annual Airline Traffic 1974-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Passengers</th>
<th>Year</th>
<th>Passengers</th>
<th>Year</th>
<th>Passengers</th>
<th>Year</th>
<th>Passengers</th>
<th>Year</th>
<th>Passengers</th>
</tr>
</thead>
</table>

Table 4 - DFW Airport Host Cities Population Growth 1960-2018

<table>
<thead>
<tr>
<th></th>
<th>Coppell</th>
<th>Euless</th>
<th>Grapevine</th>
<th>Irving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop.</td>
<td>%±</td>
<td>Pop.</td>
<td>%±</td>
<td>Pop.</td>
</tr>
<tr>
<td>1960</td>
<td>666</td>
<td>4,263</td>
<td>2,821</td>
<td>45,985</td>
</tr>
<tr>
<td>1970</td>
<td>1,728</td>
<td>19,316</td>
<td>7,023</td>
<td>109,943</td>
</tr>
<tr>
<td>1980</td>
<td>3,826</td>
<td>24,002</td>
<td>11,801</td>
<td>109,943</td>
</tr>
<tr>
<td>1990</td>
<td>16,881</td>
<td>353.10%</td>
<td>7,023</td>
<td>97,260</td>
</tr>
<tr>
<td>2000</td>
<td>35,958</td>
<td>24.30%</td>
<td>11,801</td>
<td>155,037</td>
</tr>
<tr>
<td>2010</td>
<td>38,659</td>
<td>58.90%</td>
<td>147.5%</td>
<td>191,615</td>
</tr>
<tr>
<td>2018</td>
<td>41,818</td>
<td>11.50%</td>
<td>11.80%</td>
<td>216,867</td>
</tr>
</tbody>
</table>
In contrast, at DAL airport, the airline traffic fluctuated between 6M to 8M passengers until 2014 when the Wright Amendment expiration started to show signs of increased air travelers at the ticket gates. Since the latter of 2014, airline traffic rose exponentially from 9.4M to 16.2M in 2018. Coincidentally, from 2010 to 2018 the population of the city of Dallas also saw an increase of 12.30% to approx. 1.35M (Table 6).

![Graph showing flight data]

Table 5 - DAL Annual Airline Traffic 2014-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Dallas (City) Pop.</th>
<th>%±</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>679,684</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>844,401</td>
<td>24.20%</td>
</tr>
<tr>
<td>1980</td>
<td>904,078</td>
<td>7.10%</td>
</tr>
<tr>
<td>1990</td>
<td>1,006,977</td>
<td>11.40%</td>
</tr>
<tr>
<td>2000</td>
<td>1,188,580</td>
<td>18.00%</td>
</tr>
<tr>
<td>2010</td>
<td>1,197,816</td>
<td>0.80%</td>
</tr>
<tr>
<td>2018</td>
<td>1,345,047</td>
<td>12.30%</td>
</tr>
</tbody>
</table>

Table 6 - Dallas (City) Population Growth 1960-2018
This dramatic increase in airline traffic also resulted in the surrounding community realizing an economic upturn in land development and increased consumer traffic for the 3-mile radius area. Private developers, Southwestern Health Resources (Medical) and DAL Airport all proactively sought land development opportunities for residential, commercial retail, off-site facilities, and operation(s) expansion. This economic resurgence can be directly attributed to aviation-related activities (Table 7). Again, with all urban growth development factors included, the eventual expiration of the Wright Amendment and subsequent development(s) at DAL Airport has been an integral part of the progression not only of the surrounding airport landscape but the entire Dallas urban core as well.

Figure 34 - DAL Airport Development Radius (Google Earth, 2019)
### Table 7 - DAL Airport Peripheral Development since 2014 (JLL, 2019)

<table>
<thead>
<tr>
<th>Property</th>
<th>Space (SF)</th>
<th>Rooms / units</th>
<th>Built</th>
<th>Renovated</th>
<th>Property type</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT Southwestern Medical Center</td>
<td>1,403,586</td>
<td>--</td>
<td>2014</td>
<td></td>
<td>Hospital</td>
</tr>
<tr>
<td>Parkland Hospital</td>
<td>2,500,000</td>
<td>--</td>
<td>2015</td>
<td></td>
<td>Hospital</td>
</tr>
<tr>
<td>Love Field Airport</td>
<td>2,232,220</td>
<td>--</td>
<td>1970</td>
<td>2015</td>
<td>Airport</td>
</tr>
<tr>
<td>Parking Garage C</td>
<td>1,900,000</td>
<td>--</td>
<td>2018</td>
<td></td>
<td>Airport</td>
</tr>
<tr>
<td>Dallas Love Field Admin</td>
<td>24,500</td>
<td>--</td>
<td>2016</td>
<td></td>
<td>Airport-related office</td>
</tr>
<tr>
<td>WINGs Southwest Airlines</td>
<td>414,000</td>
<td>--</td>
<td>2018</td>
<td></td>
<td>Airport-related office</td>
</tr>
<tr>
<td>Southwest Training Facility</td>
<td>380,000</td>
<td>--</td>
<td>2018</td>
<td></td>
<td>Airport-related office</td>
</tr>
<tr>
<td>Brookhaven Executive Center South Tower</td>
<td>155,945</td>
<td>--</td>
<td>1980</td>
<td>2014</td>
<td>Office</td>
</tr>
<tr>
<td>Brookhaven Executive Center North Tower</td>
<td>155,945</td>
<td>--</td>
<td>1980</td>
<td>2014</td>
<td>Office</td>
</tr>
<tr>
<td>8130 Wyche Blvd</td>
<td>105,161</td>
<td>--</td>
<td>2014</td>
<td></td>
<td>Office</td>
</tr>
<tr>
<td>BioCenter @ SW Medical District</td>
<td>63,000</td>
<td>--</td>
<td>2017</td>
<td></td>
<td>Office</td>
</tr>
<tr>
<td>1300 W Mockingbird Ln</td>
<td>154,785</td>
<td>--</td>
<td>1979</td>
<td>2015</td>
<td>Office</td>
</tr>
<tr>
<td>Locale</td>
<td>350,000</td>
<td>348</td>
<td>2014</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Alta Maple Station</td>
<td>212,632</td>
<td>249</td>
<td>2014</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Century Medical District</td>
<td>300,000</td>
<td>288</td>
<td>2014</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Maple District Lofts</td>
<td>435,000</td>
<td>342</td>
<td>2015</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Bellevue</td>
<td>29,908</td>
<td>36</td>
<td>2016</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>27TwentySeven</td>
<td>145,506</td>
<td>152</td>
<td>2016</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>The Lucas at Cedar Springs</td>
<td>714,076</td>
<td>387</td>
<td>2016</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Martha’s Vineyard Place</td>
<td>60,000</td>
<td>100</td>
<td>2017</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Inwood Station</td>
<td>327,267</td>
<td>347</td>
<td>2017</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>4710 Lake Ave</td>
<td>50,840</td>
<td>110</td>
<td>1976</td>
<td>2017</td>
<td>Apartments</td>
</tr>
<tr>
<td>Jefferson West Love</td>
<td>329,292</td>
<td>369</td>
<td>2018</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Medical District - 2627 Kimsey Dr</td>
<td>14,836</td>
<td>8</td>
<td>2019</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Aura Bluffview</td>
<td>470,000</td>
<td>473</td>
<td>2019</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Jefferson West Love II - under construction</td>
<td>400,000</td>
<td>354</td>
<td>2020</td>
<td></td>
<td>Apartments</td>
</tr>
<tr>
<td>Extended Stay America</td>
<td>65,955</td>
<td>98</td>
<td>1996</td>
<td>2015</td>
<td>Lodging</td>
</tr>
<tr>
<td>Residence Inn</td>
<td>93,857</td>
<td>142</td>
<td>1988</td>
<td>2015</td>
<td>Lodging</td>
</tr>
<tr>
<td>Aloft &amp; Elements</td>
<td>100,000</td>
<td>224</td>
<td>2017</td>
<td></td>
<td>Lodging</td>
</tr>
<tr>
<td>Hawthorn Suites</td>
<td>62,810</td>
<td>98</td>
<td>1979</td>
<td>2017</td>
<td>Lodging</td>
</tr>
</tbody>
</table>

**Total**: 13,731,141 4,114  --  --  --
1960 – 1980 COMPARISON

AIRPORT DEVELOPMENT

DAL AIRPORT

- 1965, April – 8,800 ft (2,682 m) parallel Runway 13R/31L opened.

- 1965 – Braniff Airways, Inc. renamed Braniff International Airways.

- 1971 – Southwest Airlines headquartered and began flying at Love Field.

- 1973 – Love Field reaches the highest gate count, 70+ gates.

- 1973 – Love Field enplanements peak at 6,668,398.

- 1975 – With a decrease to 467,212 enplanements (due to DFW airport opening in 1974), Love Field decommissioned several of its concourses.

- 1978 – Airline Deregulation Act introduces new fare and route competition and permits unrestricted entry into the Dallas air passenger marketplace by new domestic carriers.

DFW AIRPORT

- 1957 – American Airlines began moving its operation installations to Euless.

- 1968 – Development of DFW International Airport begins.
• 1973, September – DFW International Airport dedicated.

• 1974, January 13 – The airport opened for commercial service as Dallas/Fort Worth Regional Airport, for $700 million. When it opened, DFW had four terminals, numbered 2W, 2E, 3E and 4E with two primary north-south runways and one diagonal runway.

• 1979 – American Airlines moved its corporate headquarters to Fort Worth from New York.

**LAND DEVELOPMENT**

**DAL AIRPORT**

DAL began utilization as a full-service airport after years of service for WWI and WWII. This utilization made DAL Airport a very key aviation stop due to its central location and 4-hour travel accessibility to any location within the continental US. DAL Airport terminal expansion programs were fueled by the boom in air travel during the 1960s as American Airlines expanded their concourse in 1968 and Braniff opened its "Terminal of the Future" (Dallas Love Field, 2019). At that time the population of the city of Dallas stood at approximately 680,000 and the agglomeration of economies surrounding the DAL Airport radius consisted primarily along Lemmon Avenue and Mockingbird Lane. Commercial development was mainly along these same routes and the transportation corridor leading to the urban core of Downtown Dallas (Figure 35).
DAL Airport continued to flourish having approximately 7M passengers and having the 6th busiest airline traffic within the United States in 1974. Then when DFW Airport opened and became the primary air servicer for the region, DAL Airport drastically slowed down its operations in 1975, which caused economic business around the airport to decrease as well. Airline traffic declined so dramatically that the main airport terminal was converted into an ice skating rink, movie theater, roller rink, huge video arcade, restaurants, and bowling alley.
attraction for the young adults in the area (Dallas Love Field, 2019). Although Southwest Airlines remained, the rest of the airline carriers transferred to the new airport at DFW International. The economic impact of airline service being transferred to DFW Airport caused significant harm to the economies within the DAL Airport development radius.

DFW AIRPORT

In 1964, DFW Airport was again being considered for development. This ultimately led to an agreement between Dallas and Fort Worth to construct the airport in 1968. DFW International Airport’s location was finally set roughly halfway between the major cities of Dallas and Fort Worth (17 miles in each direction) and spilling across portions of Dallas and Tarrant counties. During this initial development period and until 1970, the host cities/communities populations grew as follows:

<table>
<thead>
<tr>
<th>City</th>
<th>Population Growth</th>
<th>1970 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euless</td>
<td>353.10% to 19,316</td>
<td></td>
</tr>
<tr>
<td>Grapevine</td>
<td>149.9% to 7,023</td>
<td></td>
</tr>
<tr>
<td>Coppell</td>
<td>159.5% to 1,728</td>
<td></td>
</tr>
<tr>
<td>Irving</td>
<td>111.5% to 97,260</td>
<td></td>
</tr>
</tbody>
</table>
Due to the direct cause of anticipated development and the completion of DFW Airport, these population totals would realize substantial increases spanning the next 50 years. These host cities and neighboring communities collectively became known as the Mid-Cities (Figure 36). The Mid-Cities is a suburban region filling the thirty-mile span between Dallas and Fort Worth. These communities included the cities of Irving, Arlington, Grand Prairie, Lewisville, Flower Mound, Grapevine, Southlake, Colleyville, HEB (Hurst, Euless, and Bedford), NRH (North Richland Hills and Richland Hills), Haltom City, Watauga, Keller, and Roanoke (Mid-Cities, 2019). The economic landscape of this Mid-Cities area was primarily rural outlays at the time of initial airport development but its proximity to DFW Airport became the principal reason that land development surged and helped this area to evolve over the following years.
Figure 36 - DFW Airport Partner, Host and Mid-Cities Area (Dallas Economic Development Guide 2019)
In 1974, DFW Airport was opened and immediately began to attract traffic from the now travel-restricted DAL Airport and the surrounding host communities began to show growth by increasing in population and attracting agglomeration of business economies. These adjoining cities grew hotel and airport-related services outside the airport but still within their cities due to their proximity to the airport. It created a large amount of on-airport undeveloped land due to the host cities and owners (Dallas and Ft. Worth) belief that any development that added to the suburban area of the airport was taking the tax base from their cities. During this period, until 1980 and due to the now airport-driven economy, the host cities’ populations grew as follows:

<table>
<thead>
<tr>
<th>City</th>
<th>Increase</th>
<th>1980 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coppell</td>
<td>121.4%</td>
<td>3,826</td>
</tr>
<tr>
<td>Euless</td>
<td>24.3%</td>
<td>24,002</td>
</tr>
<tr>
<td>Grapevine</td>
<td>67.4%</td>
<td>11,801</td>
</tr>
<tr>
<td>Irving</td>
<td>13%</td>
<td>109,943</td>
</tr>
</tbody>
</table>
1981 – 2000 COMPARISON

AIRPORT DEVELOPMENT

DAL AIRPORT


- 1997 – Shelby Amendment passed by Congress, amending the flight restriction of the Wright Amendment.

DFW AIRPORT

- 1983 – American Airlines moved its corporate office to just south of DFW airport.

- 1984 – Two additional parallel runways added to existing north-south runways.

- 1985 – Airport name change to Dallas/Fort Worth International.

- 1986 – One additional parallel diagonal runway added.

- 1996 – 7th runway added to DFW.

- 1997 – Airport changed terminal gates from numbers to letters.

- 1998 – Consolidated Rental Car Facility developed on the south side of the airport.
LAND DEVELOPMENT

DAL AIRPORT

During this period and with the Wright Amendment in full effect, DAL Airport maintained its existence primarily as a regional airline facility. Braniff International Airways had on-again, off-again airline operations at DAL Airport but finally ceased all operations in 1992. Although other airlines operated briefly at DAL Airport, Southwest Airlines was the primary airline operator. This stagnation in airline service expansion at DAL airport caused the surrounding area to have slowed economic growth, although the specialized businesses located just east of the airport along Lemmon Ave., continued to flourish (e.g. automotive dealerships).

DFW AIRPORT

By the 25th anniversary in 1999, DFW Airport had become the major economic catalyst for the area. With 16 Fortune 500 companies (Commerce D. C., 2019) located in the Dallas-Fort Worth Metroplex area, airport connectivity was cited as the primary reason for site location in the region. This led to initiatives to increase economic revenue for the surrounding communities. In 1998, due to the increased airport-driven economic impact on the region, DFW Airport entered into tax-sharing arrangements in collaboration with the owner and host cities. The tax share stipulated that non-constituent municipalities with property in a county or municipal airport to pay constituent agencies two-thirds of excess airport revenue received. Tax revenues that are shared include ad valorem tax, sales and use tax, utility franchise fees, mixed beverage tax, hotel
occupancy tax (HOT), municipal court revenue, and all other general revenue tax levies, including short-term motor vehicle rental tax (Texas, 2001) (Figure 37).

The benefits included:

- Generating tax revenues for the Owner Cities (Dallas, Fort Worth and the Host Cities);
- Increasing economic development and creating job opportunities; and
- Providing an equitable distribution of tax revenues.

- Total annual tax contribution to taxing entities +/- $63,000,000 (Terrell, 2014).

During this period, the Host Cities realized its greatest growth spurt. Due to the now established DFW Airport and its allure as a national and global economic attraction, by 1990 and 2000, the host cities’ populations grew to:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coppell</td>
<td>341.2% to 16,881</td>
<td>113.0% to 35,958</td>
</tr>
<tr>
<td>Euless</td>
<td>58.9% to 38,149</td>
<td>20.6% to 46,005</td>
</tr>
<tr>
<td>Grapevine</td>
<td>147.5% to 29,202</td>
<td>44.0% to 42,059</td>
</tr>
<tr>
<td>Irving</td>
<td>41.0% to 155,037</td>
<td>23.6% to 191,615</td>
</tr>
</tbody>
</table>
Figure 37 - DFW Airport Revenue Share Agreement (Revenue sharing agreements; Texas Transportation Code, 2001)
2001 – CURRENT
AIRPORT DEVELOPMENT

DAL AIRPORT


- 2005 – Bond Amendment passed by Congress, further amending the flight restriction of the Wright Amendment.

- 2006, June – Five Party Agreement signed finalizing the repeal of the Wright Amendment.

- 2009 – Love Field Modernization Plan I (LFMP) a plan to modernize Love Field was announced. The $519 million master plan designed a complete terminal renovation and the addition of a new concourse, ticketing hall, and baggage claim

- 2011 – Runway 18/36 closed.

- 2014 – Airport opened 20 new gates, expanded the main lobby space and baggage claim area and opened a new ticketing/check-in hall.

- 2014, October – Wright Amendment expired.

- 2018, October – competed a new 9 level parking deck with 5,130 parking spaces.
DFW AIRPORT


- 2005 – DFW became the only airport in the world with 4 serviceable paved runways longer than 4,000 meters (13,123 ft) (Dallas/Fort Worth International Airport, 2019).


- 2011, February – DFW Airport began work on the $2.7 billion[38] “Terminal Renewal and Improvement Program” (TRIP), which encompassed renovations of three of the original four terminals (A, B, and E).

- 2014, August – DART Rail Line began service to the airport.

- 2017, January – Terminal A renovations were completed.

- 2017, August – Terminal E renovations were completed.

- 2017, December – Terminal B renovations were completed.

- 2018, December – TEXrail began service to the airport.

- 2025 – Terminal C is slated to be renovated along with the project to construct a new terminal F.
After the September 11, 2001 bombing the entire US aviation industry slowed to a crawl. For most of the remaining decade until 2010, the public confidence in US airline commerce was trying to be restored, which in turn caused all direct or indirect airport businesses to suffer. This
also included the adjacent areas of airports which saw stagnation in economic growth. Starting in 2011 with the modernization of the main terminal (Figure 38) and 2014 with the Wright Amendment expiration, the DAL Airport airline traffic growth during the period of 2014 – 2018 caused an economic boom for the surrounding area along Mockingbird Lane and Lemmon Avenue (Figure 39 and Figure 40). As reference by the real estate firm, JLL Commercial Realty Group, since 2014 the per sq. ft. price for lease space and land development has increased from $25.00 - $30.00 per sq. ft. to $50.00 - $55.00 per sq. ft. (JLL, 2019). The drastic increase in land valuation is a direct correlation to the Wright Amendment expiration and the subsequent increase in passenger traffic at DAL Airport.

Since then, the following developments have taken place within the 1-3 mile radius of DAL Airport:

1. The Braniff Centre @ Lemmon Avenue at Lovers Lane: the historic Braniff International Airways facility renovation at Dallas Love Field, a 25-acre, $140 million mixed-use redevelopment including a boutique automotive Lincoln Dealership.

2. Hotels @ West Mockingbird Lane: 224-room Aloft Dallas Love Field and Element Dallas Love Field hotel at the 37-acre West Love development, mixed-use project development at over $40 million.

3. Additional Hotel @ Northwest Corner of Mockingbird Lane and Forest Park Road: an 8-story, 280-room hotel.

4. High-end Apartments @ Mockingbird Lane: the West Love Development, a new 366-unit apartment complex.
5. Retail @ West Mockingbird at Maple: a Starbucks, Chipotle and Schlotsky’s retail development.

Figure 39 - DAL Airport Peripheral Development since 2014 (JLL 2019)
DFW AIRPORT

The DFW Airport Commercial Real Estate Division has documented continued economic growth not only on-site but also on the peripheral host communities since the opening in 1974. Since 2011, the growth surrounding DFW Airport continues to expand as the concept of “aerotropolis” became synonymous with the regional airport-driven economy. The cities of
Irving, Las Colinas, Grapevine, Grand Prairie, Southlake, and Arlington saw an increase in population growth, residential development, and business recruitment during this period. Today DFW Airport is the epicenter and catalyst for the entire region between Dallas and Fort Worth. Also, corporate headquarters clustering continues. As of 2019, 24 Fortune 500 Companies now call the Dallas-Fort Worth Metroplex home. During this period, the Host Cities continued to gain in population although at a more modest rate than the previous 20-year spans. With DFW Airport still being a national and global economic attraction and due to heavy corporate relocation(s) pushing urban expansion further out in the Dallas-Fort Worth Metroplex, by 2010 and 2018, the host cities’ populations grew to:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coppell</td>
<td>7.5% to 38,659</td>
<td>8.2% to 41,818</td>
</tr>
<tr>
<td>Euless</td>
<td>11.5% to 51,277</td>
<td>11.8% to 57,346</td>
</tr>
<tr>
<td>Grapevine</td>
<td>10.2% to 46,608</td>
<td>16.5% to 53,976</td>
</tr>
<tr>
<td>Irving</td>
<td>12.9% to 216,867</td>
<td>12.0% to 242,242</td>
</tr>
</tbody>
</table>

This current growth surrounding DFW Airport is highlighted with the announcement in 2019 of the construction of Terminal F (Figure 41). This terminal development will accommodate 24 more gates to bring the total passenger gates to 189 with 6 terminals. Terminal C will also be renovated during this period with the anticipated airline traffic growth to surpass 85M by the end of the next decade.
What: Sixth passenger terminal at DFW Airport and the first since Terminal D opened in 2005.
When: Construction could start next year and terminal could open by 2025.
Where: To be built just south of Terminal D on land now used for Express South parking.
Size: Will hold up to 24 gates.
Price: Up to $3.5 billion, including upgrades to Terminal C.
Who pays: Airlines will pay off bonds through landing fees and rents, and customers will contribute through existing passenger facility charges.
Source: DFW Airport

Figure 41 - DFW Airport Terminal F Development (The Dallas Morning News, 2019. Retrieved from URL https://www.dallasnews.com/business/airlines/2019/05/20/american-airlines-dfw-airport-strike-deal-to-build-new-3-billion-terminal/)
SURVEY

My research method also consisted of data collection via a survey to a group of experts from diverse fields from DFW and DAL Airports and the surrounding area. The experts were selected not so much in terms of their title, function, or position, but due to their capacity, familiarity with the field and the capability to envision future perspectives (Power-Erkkila, 2006). The survey was developed from a thorough review of previous academic literature and via data obtained through this research. This survey aimed at contributing to the existing body of knowledge in this area and was structured to provide the following:

1) Assess the respondent’s involvement in non-aeronautical economic land development planning and/or management and what role was played by the respondent in the economic land development surrounding each respective airport system;

2) Access the different local practical understandings of non-aeronautical economic land development concepts;

3) Identify the critical non-aeronautical development components in terms of non-aeronautical planning, economic land development, needed critical transportation infrastructure, and real estate markets; and

4) Evaluate the relevance of different factors in the economic development of non-aeronautical land use.
The survey was sent via email to 50 Dallas–Fort Worth area experts, along with a cover letter explaining the survey’s emphasis and purpose, to gather their professional assessment (See Exhibit 1 and Exhibit 2 in the Appendix). The field of surveyed experts included the city of Dallas, city of Fort Worth, city of Irving, DFW Airport Commercial Division, Corgan Architecture and Urban Design, University of North Texas, Southern Methodist University, James Long LaSalle (JLL) Commercial Real Estate, North Texas Council of Governments, Dallas-Fort Worth Regional Chamber of Commerce, Texas Department of Transportation (Aviation), etc. This field spanned responsibility from public and private entities, local and state agencies, city/county and regional planning organizations, research academic institutions, urban planners and architects, airport operators, aviation consultants, public/private developers, and other respective personnel. The experts gave statements or expressed their respective professional opinions from historical and current leadership perspectives. Opinions were collected through this anonymous method so that the survey research obtained the real opinion of each expert and not an opinion that had been falsified to a greater or lesser extent by peer pressure (Power-Erkkila, 2006). Reminders for the survey were emailed out two weeks after the initial mailing. A total of 30 responses were received. The response rate was 60 percent.

The survey responses showed variation, which came as no surprise, as the peripheral development at DFW and DAL Airports have been viewed through different lenses. The answers emphasized the deviation between theoretical literature and practical knowledge of land development concepts. The results included and accentuated many localized factors, not known in the broader literature, but critical to real-world applicable land development practices.
The technique of development, aerotropolis/regional or airport-city/corridor, was not surveyed but instead the critical factors that influenced the land development strategy that took place at each respective airport region. When asked the most important factors influencing peripheral land development around DFW and DAL Airports over the last 40 years, the DFW Airport responses indicated the Dallas-Fort Worth Metroplex’s central location, the ever-increasing MSA population growth, regional infrastructure access planning and availability of developable land. Major emphasis included accessibility factors of freeways, tollways, and roadways, and rail access. The responses also highlighted continued re-investment in the surrounding transportation network to ensure access and mobility for passengers/freight and adequate capacity for future growth. Responses for DAL Airport included proximity of the urban core, diversity of investment opportunity, and the Wright Amendment expiration.

In regards to critical policies that have impacted adjacent airport land development in the region, the replies included deregulation of the airlines which allowed American Airlines to develop a mega-hub at DFW Airport and Southwest Airlines to increase operations at DAL Airport. Other responses included:

1. The collaborative support from the city of Dallas and the city of Fort Worth in promoting positive investment and growth of commercial development at DFW Airport and both urban cores;

2. Tax revenue-sharing agreements with partner and host cities that encourage commercial development expansion at DFW Airport;
3. Federal and state highway funding of regional transportation networks for the region; and

4. The designation of a Foreign Trade Zone for increased global trade at DFW Airport.

When asked to respond to how airport accessibility, specifically transportation access, has affected the economic land development surrounding the respective aviation region, the consensus indicated that diverse transport access points were a major advantage for DFW Airport’s regional approach. On the contrary, the consensus also revealed that the lack of access and entry points has negatively affected the DAL Airport area. Speed-to-market was positively highlighted as respondents indicated that a successful airline hub in the city drives significant economic growth in the surrounding communities.

The response for the most important public and private investment(s) to the economic development of the DFW & DAL Airport region included the creation of public-private partnerships (P3s) and other vital collaborations. Over time, these collaborations and partnerships have been especially influential to the growth around DFW Airport. P3s allow the airport to collaborate and invest in infrastructure improvements, while private developers participate in the construction development of various economically dynamic facilities. These public/private partnerships have been instrumental in major freeway corridor/managed lane construction projects along SH 183, the NTTA partnership for President George Bush Turnpike (PGBT), the DART Orange Line, the Trinity Railway Express, the TexRail Project, and other surrounding road improvements.
When it came to impact on future adjacent land developments surrounding both airports, the experts again noted the factor of availability of land. DFW Airport focused on future planning for mixed-use destination developments, such as retail and entertainment venues to create the highest and best land use, and more opportunities for economic and tax-sharing benefits for partners and host cities. While at DAL Airport, the responses emphasized a more comprehensive vision for long-term sustainable economic growth, the need for a catalyst project, planning for accessibility factors for a new entrance, and direct DART rail service to the airport.

The survey showed a consensus of responses that identified five critical factors for long-term sustainable peripheral airport land development at both DFW and DAL Airports. These aspects should not be regarded as independent from one another; on the contrary, joint collaborations can be quite influential. The factors were:

1. *Future planning for regional transportation accessibility and connectivity with continued re-investment and infrastructure development.*

2. *Economic development potential of the peripheral airport area.*

3. *Airport region’s commercial development philosophy and model to include political attitude and landscape.*


5. *Creation and formation of stakeholder collaborations and other economically beneficial public-private partnerships (P3s).*
NON-AERONAUTICAL LAND DEVELOPMENT ASSESSMENT, 
CHALLENGES AND RECOMMENDATIONS

DFW and DAL Airports are viewed as primary drivers of urban economic development. Although not originally planned, both their surrounding land development methodologies morphed overtime to represent regional (aerotropolis) and airport-city (corridor) development concepts. While this research highlights the influential developments at and around both DFW and DAL Airports, the resulting analysis of their respective critical airport-driven dynamics can be utilized in planning future boundary aviation regions. This study provides the basis for an assessment of necessary factors in the decision-making process for which land development methods should be implemented for an outlying airport area. As with any non-aeronautical planning effort, challenges will arise that need to be addressed. Along with providing an assessment, this analysis notes potential challenges with vital recommendations required to implement surrounding aviation land development strategies. The factors of assessment, challenges, and recommendations are the following:

A. Location/Landscape

B. Accessibility/Connectivity

C. Economic/Business Agglomeration Opportunities

D. Ownership Structure
LOCATION/LANDSCAPE

ASSESSMENT

The site of the aviation-related facility determines which type of land development concept will be more favorable for urban growth. If the proposed site is a large landmass area, with an MSA of at least 2M in population, and includes multiple owner partners and stakeholders, then the regional or metropolis development approach will be more feasible. This regional or aerotropolis approach allows for expansive land development with extensive opportunities for agglomeration of economies. DFW Airport’s site was selected in an area combining four host communities and between two major US cities. This site was the largest aviation-related land area in the US at the time (Denver International Airport has now surpassed DFW Airport in total landmass area).

If the proposed land site is limited or landlocked with direct access or corridor to a major urban central business district (CBD) and owned by the local municipality or airport authority, then the airport city/corridor development concept will be more realistic. With a population of approximate 2M or less, the airport city/corridor model allows for future planning of additional infrastructure improvements and any unforeseen business developments via political interest to occur in conjunction with future aeronautical expansion. Although potentially being located on the outer boundary of the CBD, the corridor pathway of the airport city development method permits continued growth to and from the city and the airport, along with development business lanes, highways, passages, roads, etc. This direct connectivity from the airport to the CBD, as seen with DAL Airport, allows businesses and residents alike the accessibility and convenience of readily available global travel at an instance.
CHALLENGES

Most airports were initially designed and planned far from major CBDs. Over time and due to urban growth, these airport areas are now located within dense urban/metropolitan areas. This reality can cause conflicts, constraints and struggles over the scarce available land in the airport region. Too often, local communities see the airport more as a nuisance than an opportunity and hence take a “no growth” position regarding airport issues (Ragàs, 2019).

Challenges include:

- Managing local and regional logistics in land use planning.
- Incorporating the airport region into overall MSA planning.

RECOMMENDATIONS

The recommendation for future non-aeronautical planners would be an in-depth analysis of the proposed site location. This in-depth analysis would include who and what stakeholders have a long-term investment in the viability and sustainability of the planned aviation development. Identifying these factors early in the conceptual stage will drive how peripheral land development is focused and to what extent the urban shape takes form.

1. Does the location have a fully mature metropolitan area in proximity to the proposed aviation site location (less than 10 miles) with an overall MSA of 2M or more residents? Or is the MSA growth expected to exceed 2M over the next 10 years? If yes, then advance with the regional development approach. If no, then utilize the airport corridor approach, as the airport will be a complement to the area or region but not the major
catalyst. This airport corridor approach will still allow for the needed connectivity between the CBD and aviation-related operations.

2. Does the proposed aviation site location have a large mass of future developable land on-site and adjacent to proposed airport development? This refers to developable land that can be utilized for any commercial, residential, or retail improvements currently or in the future. If yes, proceed with the regional development approach or if no (landlocked) adopt the airport corridor development concept.

3. With an anticipated increase in airline traffic growth over the next 10 years, is the proposed aviation facility located in a high-volume air traffic area of expected 10M or more passengers? If yes, the regional land development concept would provide the practical development method regarding a location considered a regional hub, with the potential of increasing to a global destination. The airline traffic (passenger) of 10M puts a potential aviation facility in the top 25 (large airport division) of all US airports. This air traffic passenger number allows for regional planning of an aviation facility to be the most effective and efficient development concept for adjacent land use. If airline traffic (passengers) ranges from 5M to less than 10M (medium airport division), then the airport corridor development method for surrounding land use would be the practical method for this mid-size aviation hub.

In addressing the challenges, a collaborative effort regarding land use development for the airport region is recommended. This partnership of stakeholders allows for cooperation and a coordinated planning strategy (infrastructure, site, facilities, transport, off-site, etc.) to connect the airport region with the broader urban area.
ACCESSIBILITY/CONNECTIVITY

ASSESSMENT

The connectivity of the proposed aeronautical facility to the urban core, national and global scale is imperative to what land development approach is better suited for the surrounding non-aeronautical development area. If a planned aviation development has numerous accessible points of ingress/egress or inter-airport travel, the more applicable the land development surrounding the airport will be for regional or aerotropolis development. DFW Airport currently has five major highway entry points leading to the entrances of the airport, whereas DAL Airport has three main streets/avenues feeding to one entry point. This disparity in accessibility causes land development to be impacted quite differently.

In addition, their respective connectivity with the urban core, regarding transport mechanisms to and around aviation facilities, is also drastically dissimilar. As observed at DFW Airport, due to it being in the middle of partner and host cities, the varied transport aspects provide ample connectivity to a wide area and a multitude of travelers. The continued growth at DFW Airport and the surrounding area is primarily due to transport access and the opportunity to continuously add to and improve this accessibility feature. In contrast, at DAL Airport with the current single-entry point, sustainable proximity growth was slow until 2014. Future planning for another access point at DAL Airport is a necessity for any supportable growth and connectivity of business with the CBD to flourish. Accessibility will allow sustainable growth to the non-aeronautical region and enhance the connectivity with the urban core. Understanding the immediate critical accessibility features in conjunction with future surrounding infrastructure
planning will be paramount in how, where, and to what level peripheral airport land development takes place.

**CHALLENGES**

Infrastructure planning for current and future accessibility and connectivity of transport is key in developing non-aeronautical land development(s). Infrastructure planning is not limited to only physical outlays of transport improvements, but also the long-term branding and marketing of connectivity efforts to promote the area as a sustainable yet diverse urban growth region. Challenges include:

- Recognizing the long-term impact of infrastructure planning.
- Coordinating infrastructure planning (airport, roads, railway, etc.) with urban expansion in airport areas.

**RECOMMENDATIONS**

1. Will infrastructure (transportation, landscape, business clustering, etc.) allow for current peripheral development?

2. Is infrastructure planned for future accessibility and transport growth to outlaying regional areas?

3. Does the area include factors for increased accessibility and connectivity planning?
If yes to all three questions, then utilize the regional development approach. This regional development planning will allow any edge cities and communities or future master-planned developments the opportunity to benefit immensely from the proximity of proposed aviation operation. If no, to anyone of three questions, then the airport city plus corridor approach is more feasible. Without the continued planning for new accessibility points and connectivity to the periphery, an airport will rely on existing infrastructure ties with the CBD for urban connection. This is due to a lack of infrastructure or economic improvements, which lead to limited means for sustained land use growth. Although having an airport facility close to a CBD, without planned infrastructure and continued economic improvements, airport traffic numbers will cease to increase and thus opportunities for peripheral residential, commercial and economic growth will become stagnant or decline. The airport city plus corridor approach will allow economic development expansion along the existing infrastructure connecting the highways and roadways to the CBD proximity. In response to the challenges, the cooperation of all stakeholders provides the infusion of diverse positions to overall planning and allows for all regional concerns or issues to be addressed. This includes an approach for future expansion and continued re-investment in infrastructure accessibility and connectivity planning for the airport region and urban core.
ECONOMIC/BUSINESS AGGLOMERATION OPPORTUNITY

ASSESSMENT

The advancement of any airport region will concern the attraction and retention of businesses and their related economic impacts. With this, preparation must be allowed for what type of business environment the city or region currently appeals to and how the airport area will accommodate future business agglomeration(s) needs and resources. Four factors regularly appear concerning an attractive airport business setting. Those factors are 1. Air service, 2. Labor force, 3. Urban centrality and 4. Market demand (Kasarda, 2014). These attributes in the airport region will cause businesses to cluster and agglomerate, not only where they are alike but also where 2\textsuperscript{nd} and 3\textsuperscript{rd} tier impacts will be economically efficient.

Many cities already have legacy airports whose locations were chosen in the era before jet aircraft and which today have only limited acreage around them or within their borders for development (Kiger, 2016). DFW Airport, being originally planned to accommodate larger aircraft (Boeing 747) along with its hundreds of airline passengers, acquired vast amounts of land for anticipated longer runways and larger terminals. Although this effort acquired more land than needed, this move gave the airport supplemental developable land for non-aeronautical land uses (Kiger, 2016).
This planning made DFW Airport ideally located where ample land and the opportunity for business agglomeration were abundant. This abundance of land allowed for businesses to develop within host communities in conjunction with the airport’s arrival. These edge communities had commercial and residential developments prosper as many major corporations and companies flocked to the area, largely due to airline travel convenience, a business-friendly atmosphere, and the social setting advantages of the Dallas-Fort Worth Metroplex.

On the other hand, DAL Airport’s main attraction was not the opportunity for business clustering or agglomeration but proximity and accessibility to the CBD. Although the urban core of Dallas was planned long before DAL Airport, the airport’s location and route corridor allow for the availability of urban core connector businesses. The airport city development planning allows the CBD to be the main impetus for business agglomeration. Major companies and industries will seek to use the convenience of a close airport corridor for travel frequency and ease of commute. If an airport is located within 3 to 5 miles of an urban core, then planning efforts should take advantage of this proximity and market to the demand of urban core accessibility and connectivity. For both airports, being in proximity to urban cores is key. As John Terrell states “the location of the airports in the heart of the Dallas-Fort Worth Metroplex with easy access to anywhere and having the logistics center not just for trucks but for air is very enticing to many industrial users, hotels and other developments” (Curry, 2018).
CHALLENGES

A major issue within an airport region is the transport options for residents for on-site or periphery employment opportunities. Typically, airports have numerous transport links with the CBDs but inferior connections with peripheral residential areas. The attraction and retention of economic business in the airport region must provide low skilled or lower educational job seekers the accessibility for transport to employment opportunities throughout the entire airport region (Ragās, 2019). Challenges include:

- Attracting airport-related employment opportunities and job seekers to the airport region.
- Identifying greater opportunities for low-skilled workers or persons that are transportation limited.
- Improving public transport to neighboring residential areas and access to airport jobs.

RECOMMENDATIONS

1. What is the airline travel market for the surrounding area or region?

2. Does the airport region act as an economic attraction nationally and globally?

3. Do other airport facilities and developments exist in the proximity area (10–15 miles)?

4. Does the entire urban proximity area, to include airport region, have an aggressive pro-business philosophy to attract and retain economic business, enhance commercial/retail development, provide residential improvements, improved transports options (especially for lower-skilled or transportation limited workers), other community enrichments, etc.?
With any proposed airport development, the best approach is to seek all potential partnerships or stakeholder collaborations in planning for peripheral land development strategies. Having both DFW and DAL Airports in such proximity is uncommon for a highly traveled air space. A collaboration or partnership alliance was sought several times between the city of Dallas and the city of Fort Worth but never formalized due to competing political factions and opposing community interest. It was not until the FAA intervened, that a regional airport comprising both cities was finally agreed. Chicago is the only other location, with similar air space factors, in terms of the central location and two airports with high traffic volume (Chicago O’Hare International Airport and Chicago Midway International Airport) that have independent land development methodologies close to each other.

It is most feasible and advantageous for any future airport development region to seek a determined effort to become a national and global marketing attraction for business economies, residential, commercial, and retail development. The best effort for both the regional and airport city/corridor development concepts is to seek critical partnerships and collaborations to accomplish this collective goal for the entire airport region. The buy-in of all partners and stakeholders is critical, as sustainable economic vitality is heavily dependent on the continued attraction and agglomeration of public and private businesses for the urban area. To address the challenges, the planning for the airport region must provide greater public transport linking residential and business in the periphery airport area. This effort is critical for simplifying the access of people living near the airport while promoting employment opportunities to bring them closer to communities around the airport area.
OWNERSHIP STRUCTURE

ASSESSMENT

In planning for which land use development strategy to utilize for a specific peripheral airport area, the ownership structure of the aviation facility severely influences all development methodologies. A collaboration of efforts for both aeronautical development and non-aeronautical land use allows diverse professional experts to methodically plan for existing uses and future growth surrounding the airport area(s). These airport ownership structures can take several forms, although the two most common, the partner/host cities owned or municipal-owned, ordinarily utilize different development strategies.

Airports that have multiple ownership partnerships (partner and host cities) and stakeholders utilize a regional development approach. Since involving multiple parties and usually covering a larger landmass area, the regional development concept allows for all parties (partner cities or communities, regional/state planning agencies, large airline providers, national/global corporations, large private partners, etc.) to be involved in the master planning effort(s) at all levels. This planning approach is a fundamentally collaborative venture among landowners, investors, developers, and infrastructure and aviation service providers, including government bodies and airlines (Kasarda, 2014). The controlling entity is usually vested in an airport authority consisting of members from all partners and host cities/communities and other vested stakeholders. This body provides the direction and leadership needed to implement peripheral land growth surrounding the airport to include any potential sharing of tax revenues regarding the operations of on-site and off-site facilities within the airport region. This
collaboration of all stakeholders is very essential as all elements of infrastructure planning, land use forecasting, and political influence must be incorporated.

It is more often in regional development concepts and collaborative planning efforts that public-private partnerships (P3s) become more viable and economically efficient. This is because airports seek to expand their financial resources and can accomplish this effectively by offering partnerships with private development organizations for on-site and off-site airport improvement projects. The structure of the partnership is where the airport provides resources to develop the critical infrastructure, while the private developer provides the capital for the construction development of the public facility. This P3 agreement allows the airport body to aggressively pursue airport improvement projects while maintaining fiscal constraints of airport budgets and expenditures.

Airports owned and operated by a municipality tend to utilize the airport-city or corridor development approach. With the city airport usually being an extension of the CBD, the municipal-owned airport typically operates as a functional arm of the city or county governing body. The airport corridor model still allows for planned growth but only along the path connecting to the CBD. If airport growth is not in coordination with the planned infrastructure route to the urban core, then commonly, city/county or political forces tend to take precedence over the growth of the airport. Municipal-owned airports are normally viewed as a compliment for urban growth, not the catalyst. Growth for municipal-owned airports comes directly from airport revenues, which are then regenerated back in the development of on-site and off-site aviation facilities. As seen with the expiration of the Wright Amendment at DAL Airport, a municipal-owned airport facility with national appeal and a steady to increasing airline travel
market can successfully create a vibrant proximity area. The regeneration of airport revenues causes the continued infusion of capital improvements required to affect the growth of the surrounding business economies and land use development extending to the CBD.

**CHALLENGES**

- Ascertaining the most significant stakeholders.
- Management of conflicts between the airport and the surrounding region.
- Developing a collective vision for the long-term development of the airport area and how to foster strategic alignment and collaboration among the stakeholders involved.

**RECOMMENDATIONS**

1. Does proposed aviation development have multiple partners or single entity, public or private ownership? If more than two large public owners, then seek a regional approach. If not, or municipal-owned, then airport-centered or corridor development concept.

2. Does the political environment allow for partnerships and collaboration of efforts on a large scale? If yes, seek a regional development model along with P3s. If no, then the city-centered or corridor approach would be more applicable.

In answering the challenges, creating a partnership that brings together most of the stakeholders promotes beneficial discussion while building a common vision for the airport area. These partnerships should move beyond economic promotion and help build consensus on hard
decisions on land use planning, development zoning, incentives, etc. The collaboration of stakeholders should not be limited to just marketing the airport but focused on building an integrated vision for an extended airport area (Ragàs, 2019).
CONCLUSION

In evaluating the critical dynamics that influence peripheral CBD development – elements such as geography, period of development, natural environment, trade practiced, social, political, and economic forces – all play influential roles in shaping an urban spatial core. Due to modern advances, transportation hubs now play the most integral component in the development of an urban area. These transport hubs support economic clusters and business agglomerations; increase productivity; enhance jobs and labor market accessibility; open new markets for businesses and residential opportunities; and enhance supply chain efficiency (Dowell, 2017). Transportation (airport) hubs will shape business location(s) and urban development in the 21st century as much as highways did in the 20th century, railroads in the 19th and seaports in the 18th (Kasarda, 2011). The hub featuring airport-driven economic development and peripheral urban growth in the 21st century has become interwoven and directly reliant upon each other. This growth, both urban and regional, is dependent on the continued investment in a sustainable airport-driven economy by the stakeholder community.

For the Dallas-Fort Worth Metroplex, the location and development of major transportation hubs at DFW and DAL Airports have shown to be immensely critical dynamics and influential factors in shaping the CBDs spanning from the city of Dallas to the city of Fort Worth and the surrounding region. Sustainable DFW metropolitan growth hinges upon the continued evolution and expansion of these airports (DFW and DAL). Regarding sustainable airport-driven urban growth, the following takeaways are outlined by the research:
1. Investment and continual re-investment in transport options (accessibility and connectivity), availability of developable peripheral land area (airport landscape), and aggressive business development methods (agglomeration of business economies) are central factors in non-aeronautical land development planning;

2. Assessment of localized dynamics regarding regional infrastructure improvements, peripheral economic development potential, local political attitude, collaborations and landscape, and long-term growth planning are critical to the success of an airport region; and

3. Building collaborations and public-private partnerships are essential elements to the overall effort of planning for urban economic growth surrounding airport regions.

With both airports being very vibrant, the entire DFW area continues to draw unprecedented levels of air travel passengers. The total airline traffic for 2018 at DFW and DAL Airports was approximately 85M combined. Moreover, as the Dallas-Fort Worth Metroplex is in the central part of the United States, this causes the land and business development in the area to be greatly desired and in demand by the global world. The advantage that the outlying areas around DFW and DAL encompass is that both airports have been integral in the development of their respective areas or region for years. This substantial progression correlates with increased demand by Fortune 500 and 1000 companies for much corporate and residential relocation to urban edge communities like Grapevine, Irving, Las Colinas, Southlake, and even more currently extending to the cities of Plano and Frisco. The market reflects how the attraction of these aviation transportation hubs has benefitted the entire area regarding business recruitment and long-term metropolitan expansion.
This study serves as a basis for further analysis of the airport-driven economic development phenomenon. Further research should include how DFW Airport’s planned development of Terminal F, which will cause a further economic boom for the region. Also, a study should include the possibility of DAL Airport adding more terminal gates and expansion across Bachman Lake (along Northwest Highway) for additional accessibility (parking area, people mover, commercial/office park, etc.) (Studies, 2017). With continued research and discussions, the debate for the causal effect of the airport-driven economy resulting in increased urban growth for the Dallas-Fort Worth Metroplex will become a moot argument. The accomplishment of both these airport areas over time has shown that having a successful airline hub positioned in your city or region directly links to the growth and expansion of an urban core area. Their respective development processes of regional (or aerotropolis) at DFW Airport or airport-city (airport corridor) at DAL Airport, which have been the catalyst for sustainable peripheral economic land use, they now serve as models for existing or future regions seeking to improve or develop similar airport-driven urban economies. Indeed, both DFW and DAL Airports have immensely affected their surrounding communities and, with continued aeronautical improvements, the Dallas-Fort Worth Metroplex area stands to realize substantial future growth and beneficial regional economic and land development opportunities for decades to come.
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APPENDIX

Survey Letter

University of Texas – Arlington College of Architecture, Planning & Public Affairs
Urban Planning and Public Policy Industry Survey
Anthony Chandler, Ph.D. Candidate

Informed Consent for Minimal Risk Studies with Adults

Greetings,

My name is Anthony Chandler and I am reaching out to you in search of your participation in a regional industry study. I am completing my Ph.D. in Urban Planning and Public Policy from the University of Texas-Arlington College of Architecture, Planning and Public Affairs (CAPPA) with an anticipated graduation date of Fall 2019. I am presently in the dissertation phase of course work with my specific title being: *Comparing and Contrasting the Dynamics Influencing Spatial Economic Land-Use Development Surrounding Dallas-Fort Worth International Airport and Dallas Love Field Airport*.

The emphasis of this research will detail how the peripheral economic development that surrounds both Dallas-Fort Worth International (DFW) Airport and Dallas Love Field (DAL) Airport has been shaped and influenced by the overall development at each respective airport.

My research will:

1) Indicate what and how critical factors have influenced documented and sustainable peripheral economic land-use strategies and agglomeration economies adjoining DFW & DAL, in addition to the surrounding urban core;

2) Provide a final analysis for airport planning policy recommendations to allow for sustainable and long-term non-aeronautical economic land-use development techniques; and

3) Create a critical factor framework regarding the relationship of contiguous non-aeronautical development for utilization by future airports in effectively evaluating non-aeronautical economic land-use development efforts. An impact statement will be included for each factor and will outline how the factor influenced the development methodology implemented on the peripheral non-aeronautical land at both DFW & DAL.

A survey of highly respected industry professionals is one additional component that will be beneficial to finalize my dissertation study. From the survey, I will gather information and data regarding spatial economic land development surrounding both DFW & DAL airports.

In my research, your name, organization, and/or professional literature is highly respected in the field of urban and regional land-use development surrounding DFW & DAL airports. I am respectfully requesting your professional response to my survey questions as your qualified knowledge and specialized experience will only aid my research. Your participation in this research survey is strictly voluntary with no possible adverse consequences or risks if you choose not to participate.

Please take the time to review and reply to the attached survey and email back by October 4, 2019. The survey should take you around 30 - 45 minutes to complete. For this research, I am committed to protecting your rights and privacy as a survey participant. While absolute confidentiality cannot be guaranteed, please be assured that every effort will be taken to keep your responses completely confidential to the extent permitted by law. We may publish or present the results but your name will not be used.

IRB Approval Date: 09/20/2019
v.2019-0360
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Also, be informed that by completing this survey, you are giving consent to participate in this research study and you understand there will not be any compensation for your involvement. Upon your request, I can provide you a copy of my final report regarding the critical factors for peripheral non-aeronautical land-use development at DFW and DAL airports.

If you have questions about the research study, you can contact me at 803.735.5214 or chandlera_2000@yahoo.com. For questions about your rights or to report complaints, please contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu. Thank you for your time and thoughtful response.

Respectfully,

Anthony K. Chandler

Anthony K. Chandler, Ph.D. Candidate - 2019
SURVEY

1. What is or has been the most important factor(s) that influenced the spatial economic land-use development of the surrounding area or region at DFW & DAL over the past 40 years?

2. Please list and rank the most important federal/state policies to affect the spatial economic land-use development of your airport region (DFW & DAL).

3. Please list and rank the most important city government policies/initiatives to the economic development of your airport region.

4. Please list and rank the most important public/private investment(s) to the economic development of the DFW & DAL region.

5. What role has the adjoining City or Region had in influencing economic land-use development and spatial design patterns of the DFW & DAL surrounding area?

6. What aspect would you plan differently regarding future peripheral non-aeronautical economic land-use development concepts?

7. Do you think the DFW/DAL economic development region has been successful over time? Why? What, if any, are the catalytic events that led to its success?

8. How has airport accessibility, specifically transportation access, affected the economic land-use development surrounding your respective aviation region?

9. How does the development and expansion of critical transportation infrastructure improvements, i.e., airport accessibility, coincide with regional economic development and business agglomeration?

10. In your opinion, what factors will influence or impact future economic land-use development planning surrounding DFW & DAL?

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EXHIBIT 3
NON-AERONAUTICAL LAND-USE DEVELOPMENT ASSESSMENT, CHALLENGES AND RECOMMENDATIONS GUIDE

CRITICAL FACTORS/DYNAMICS

1. LOCATION LANDSCAPE

The site of the aviation-related facility determines which type of land-use development concept will be most favorable for urban growth.

An in-depth analysis model includes site and spatial dimensions, transportation networks, urban development, and economic opportunities of the planned development area. Identifying these factors in advance can help forecast future potential development is needed and how to maximize the site's potential.

CHALLENGES/ISSUES

Managing local and regional policies and land-use planning
Incorporating the airport's region into OSU/MSA planning

DEVELOPMENT ANALYSIS

1. Does the location have a key role in major metropolitan area?  Is proximity to the proposed location’s air travel accessibility adequate?
   Is the MSA growth expected to 2026 and 2046 above the regional average?

2. Does the analysis suggest that the location could become a major regional economic engine and development?

3. With an estimated revenue of $150M per year, the proposed facility located at high-traffic state route can receive significant tax revenue for economic development.

RECOMMENDATION(S)

If the proposed site is large but distant from urban centers, it may be more suitable for a larger-scale development concept. Examine multi-modal development strategies, either industrial or commercial, and consider an extended range to develop a more feasible site.

If the proposed land site is 3 miles inland with direct access to a major urban area, consider an industrial development strategy that aligns with existing infrastructure and transportation networks. This strategy could include a mixed-use development approach that maximizes land use efficiency.

In addressing the challenges, collaborative decision-making and infrastructure development are essential. The partnership must establish clear terms of cooperation and a coordinated approach to management practices, infrastructure, transportation, and regulatory frameworks to maximize the airport's potential within the urban area.

2. ACCESSIBILITY/CONNECTIVITY

The connectivity of the proposed agricultural facility to the urban fabric and global connectivity is essential for successful development.

Understanding the existing infrastructure planning and development will be critical for how, when, and to what extent the airport can support regional development.

RECOMMENDATION(S)

Recognizing the importance of rail and infrastructure planning
Coordinating infrastructure planning (airport, roads, rail, etc.) for seamless movement of goods

3. ECONOMIC/ BUSINESS AGGREGATION OPPORTUNITY

The development of an agro-area can benefit the attraction and retention of businesses and related economies.

Preparation must be allowed for strategic business environment, the airport area needs to align and support

Airport access and other regional facilities

ATTRACTIVE OF AGRO-AREA EMPLOYMENT OPPORTUNITIES

1. What is the overall market share for the rural area?

2. Does the area have an attractive and skilled labor force?

3. Do other regional factors support the development of businesses?

IMPROVING PUBLIC TRANSPORTATION NEIGHBORHOODS, AREAS AND VILLAGES

4. Does the area have a comprehensive public transportation plan?

5. Does the area have a comprehensive public transportation plan in rural areas?

6. Does the area have a comprehensive public transportation plan in urban areas?

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