

**Strategic Long-Term Planning Considerations
to Supplement
The Piedmont Triad International Airport
Master Plan Update**

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Strategic Long-Term Planning Considerations to Supplement The Piedmont Triad International Airport Master Plan Update

Introduction and Overview

Airport master plans aid airport operators to prepare for and help meet, in cooperation with airlines and other service providers, air service development needs for passenger air travel and air cargo transport service. Such needs are on-going and often require large capital investments in runways and facilities that are amortized over payback periods reaching over several decades. Aviation activity forecasts of expected demand therefore form the basis for airport master plans, including the related capital improvement plans. Typical aviation activity forecasts provide the foundation for air facility and on-airport land use planning over a five-, ten- and 20-year period. But land use planning and acquisition of land outside of airport boundaries for eventual airport expansion require a longer planning horizon. The nexus between the more immediate (10- to 20-year) air transport demand and the need for longer term planning for eventual airport expansion and land acquisition is our focus here.

The Changing Forecasting Context

Aviation activity forecasts for specific airports, in this case Piedmont Triad International Airport, are generally based on expectations for the aggregate demand for air transport services and an estimation of the regional market share of these services. The best source of information for these forecasts is, unavoidably, past trends in air service.

Forecasts based on past trends may perform adequately to support airport master plans in most situations during normal times. These are not normal times for air transport, however. Nor are these normal times for Piedmont Triad International Airport. The airport is facing a future that – by any account – will be markedly different from its past as a result of the opening of the FedEx mid-Atlantic hub. Specific events and trends affecting both national demand and the new regional role of Piedmont Triad International Airport suggest that it is prudent to look beyond traditional forecasts when planning for airport expansion and predicting future airport uses. We discuss factors affecting national demand because estimates of national demand often provide one basis for forecasts of regional demand, and we discuss the factors affecting the regional role because that provides another basis for forecasts of regional demand.

Most broadly, a national shift in the relationship between production, transportation, and consumption is underway. Goods are produced further from their point of consumption than in the past. Long supply and distribution chains imply that consumers can access least-cost producers and producers can tap increased economies of scale. Further, with individual professional careers increasingly tied to multi-establishment firms, families are increasingly far-flung. Vacations are now more likely to be spent at a distant resort than, for example, at a nearby mountainside. These geographic shifts are predicated on and, in turn, create additional demand for air transport.

The implication for forecasting models is that the traditional relationship between overall revenue passenger miles and GDP or between revenue freight tons and GDP is changing. The rapid shift of U.S. consumption to rely on Asian, especially Chinese, suppliers over the past decade has generated a disproportionate

increase in the demand for cargo air transport services and, to a lesser extent, passenger services. This shift may not yet be absorbed by standard forecasting models. What was once a constant in aviation activity forecasting models now needs to be a variable. That is, there is an increased, and the authors believe, a growing reliance on air transport in contemporary supply chains that has downstream effects on business and leisure passenger travel.

As a consequence, the relationship between overall revenue passenger miles and fuel cost and between revenue freight tons and fuel cost is also changing. To be sure, fuel costs have and will continue to have an important impact on the cost of – and therefore demand for – air transport services, but the magnitude of the impact over the medium- and long-term is likely changing. The authors expect the strength of the relationship between fuel costs and demand for air transportation to continue to change.

Watershed Changes in the Piedmont Triad

With respect to the Piedmont Triad Region, several major events promise to change the role of the region in the national economy and its centrality in the national system of air transport. Therefore, the PTI share of national air transport demand is likely to increase. With such watershed changes, the corresponding increase in the PTI share of the national air transportation market cannot be predicted solely on the basis of past trends. The airport's new infrastructure represented by the recently opened FedEx mid-Atlantic hub and the airport's increased capacity created by the construction of a 9,000-foot parallel runway must be taken into account.

The decision of FedEx to locate a regional sort hub at PTI will be the most immediate factor changing the airport's regional role within the nation's air transport

system. Expectations for the impact of the FedEx facility itself have been incorporated into the PTI Master Plan Update. FedEx's location decision, though operation is currently delayed and scaled back due to the current recession, will unavoidably change the region's long-term economic role. The FedEx presence will make the Piedmont Triad region a more attractive location for not only air-intensive industries but other sectors as well. The indirect impact (catalytic effect) of the FedEx facility on air service demand through its influence on additional firm location and expansion decisions may be underestimated in current forecasts. The Honda Aircraft Company investments and related restructuring of the Piedmont Triad economy will also have direct and indirect effects on the demand for air transport services.

These national and regional changes could not be adequately addressed in the traditional approach to aviation activity forecasts at PTI, but nevertheless deserve to be taken into consideration when undertaking strategic airport master planning.

There are additional trends that were intentionally not captured by the forecasts that the Piedmont Triad Airport Authority should consider. With respect to *non-FedEx cargo*, the discussion of past trends notes a decline in activity at PTI over the past several years. There may be a possibility for PTI to reverse this recent trend and capture a stable or growing share of non-integrated cargo. Many of the busiest cargo airports are facing sometimes severe capacity constraints due to congested airspace, limited take-off and landing slots, and restricted cargo processing space. Increasing non-integrated cargo at PTI will involve market influence related to inherent economies of scale at established air cargo centers and creating similar economies at PTI. The opportunities for non-integrated cargo growth and the corresponding challenges should be contemplated or considered as a possibility in

connection with this aspect of the forecast. For example, if congestion at busy airports leads to a shift to PTI, the volume of cargo processed by PTI may take a substantial jump and grow at an above-average annual rate.

In addition, the *sectoral mix of manufacturing* in the Piedmont Triad is changing. The industries which have come to be seen as “traditional” for the region, furniture, textiles, and tobacco, have been shedding employment and will likely continue to do so. At the same time, new industries have been gaining ground. “Mid-tech” industries, the production segment of high technology value chains, have been gaining ground as has aerospace. These latter industries have different shipment patterns from the traditional industries.

Much of the anticipated economic growth will have different air passenger demands as well. New goods-producing establishments will often be branches of large multi-establishment firms that rely heavily on passenger air transportation to facilitate management coordination. Almost all of them will have geographically extensive supply and distribution trends, requiring air travel for negotiation and synchronization.

Summary

There are two conclusions that can be drawn from this brief overview of traditional and non-traditional approach to aviation activity forecasts. First, traditional aviation activity forecasts cannot take into account single events that may have significant impacts on airport usage and are limited in their time frame and reach. Past experience can only be projected so far into the future with any expectation of accuracy.

Second, and more immediately, any possible catalytic impact of the FedEx mid-Atlantic sort hub at PTI on the demand for air traffic caused by firms attracted to the area is beyond the typical scope of the FAA-approved aviation activity forecasting. Let us look more closely at these effects.

The Potential Catalytic Effects Associated With the FedEx Sort Hub at PTI

The importance of cargo transportation is in its impact on production, trade, and ultimately consumption – and thus human welfare. “Transport is demanded to bridge the consumer-producer gaps ... A catalyst – as those who studied chemistry will remember – is a component which enables some other process to be carried on more quickly and efficiently. Transport in many ways acts as a *catalyst*, raising the level of economic activity in an economy” (emphasis added).¹ The additional transportation capacity that the FedEx region is bringing to the Piedmont Triad Region will result in additional economic activity.

The additional activities made possible by transport – a mix of productivity enhancements and regional redistribution – are sometimes grouped together under the term, “catalytic effects,” and are central in understanding the economic impact of air freight activities on regions and the nation. One broad definition of economic catalytic effects is “The net economic effects (e.g., on employment, incomes, government finances, etc.) resulting from the contribution of air transport to tourism and trade (demand-side effects) and the long run contribution to productivity and GDP of growth in air transport usage (the supply-side performance of the economy).”² More germane to PTI, catalytic effects represent the revenues,

¹ Benson, Don, Ralph Bugg, and Geoffrey Whitehead. 1994. *Transport and Logistics*. New York: Woodhead-Faulkner, page 17.

² Cooper, Adrian and Phil Smith. 2005. *The Economic Catalytic Effects of Air Transport in Europe*. EUROCONTROL Experimental Centre, Bretigny sur Orge, EEC/SEE/2005/004, page 12.

employment and earnings generated by aviation-oriented firms locating in the airport area because of the accessibility the airport provides to their suppliers, enterprise partners, or customers. Since they are aviation-oriented to begin with (and hence attracted to the hub), firms locating in the PTI region as a consequence of FedEx' mid-Atlantic hub will generate additional cargo and passengers for the airport down the road.

Decisions on transport infrastructure investments are often made on the basis of their anticipated benefit to existing traffic and existing users. The siting of a transportation facility can have an effect on the subsequent location decisions of firms, however. These add to the traffic processed by the facility and can lead to an increased concentration of employment near the transport infrastructure. The operation of the FedEx mid-Atlantic sort facility will likely have such an effect on firms' location decisions, and, as we just noted, future cargo and passenger flows above that predicted by models that exclude such catalytic effects.

To gain a better understanding of their importance, we will discuss two types of direct cargo catalytic effects and the resulting induced passenger catalytic effects. The direct cargo catalytic effects can be functional, symbolic, or, more probably, a mix of the two. *Functional catalytic effects* are those that have a significant effect on the operational costs and effectiveness of firms. Certain types of firms are more heavily dependent upon air transport than others and thus will be more likely to be influenced by the advantages offered. The more extensive the FedEx route structure and the more frequent the service, the greater the sort hub's attraction to shippers and consignees will be.

The strength of these effects will be difficult to judge until FedEx begins operations and establishes a track record. There may be a significant lag between the

opening of the sort facility and its effects on location decisions. When the economy as a whole is not expanding (or, as at present, contracting), firms are less likely to make major new capital investments, such as investments in new facilities – even if a more recent vintage of equipment and operating procedures would be more efficient in the long run.

The strength of the functional catalytic effect will depend upon the cost savings and efficiency enhancements made possible by the transport infrastructure, the FedEx hub. To the extent that the FedEx facility services an area that can be reached via overnight trucking, its attractive power will be more limited. In that case, shippers would be more likely to opt for lower cost surface transport. Given the cost advantages, many e-commerce fulfillment centers, like the nearby Dell plant, use surface transportation whenever possible and choose air shipments primarily for emergencies.

If and to the extent that FedEx decides to include long distance routes to destinations such as Chicago, the West Coast, and international destinations – Europe and Latin America or straight through service to Asia, the influence on the location decisions of firms that might use the services will be stronger. Firms making location decisions now are likely to discount those possibilities in their decision-making heavily until FedEx establishes a trustworthy track record in this location.

Adding busy long distance routes to the sort hub's portfolio, if that occurs, will be an important factor affecting firm location decisions. Right now, New York's Kennedy Airport is one of the nation's largest ports. Newark Airport is also an important international port as well as a key FedEx facility. While New York offers a very attractive nearby market, the limited cargo-processing space on the airports, the congestion, and the land and labor costs discourage its use for goods with a non-New

York destination or origin. The Piedmont Triad Region suffers from none of those disadvantages but is nevertheless excellently situated to serve much of the eastern portion of the U.S.

Although international air cargo is now heavily concentrated in the New York area, like the Atlantic Ocean sea trade, air trade may move away from the crowded largest metro areas. New York may become an air cargo “spoke” rather than “gateway hub,” if a decision is made to route international FedEx shipments to and from the East Coast through PTI. Possibly not even FedEx officials can make a realistic assessment of this prospect at this moment. Prospective users will need to watch and wait and much of the potential effects on business location decisions will follow the establishment of FedEx route patterns.

In addition to the effects on firm production (or cost) functions, the FedEx sort facility can have *symbolic catalytic effects*. These are a result of the increased visibility that the Piedmont Triad receives simply as a result of the FedEx decision. The more visible and the larger a firm facility investment is – and FedEx is very visible – the stronger the symbolic catalytic effect will be.

The FedEx decision implies an underlying desirability of a Piedmont Triad location that may not be immediately apparent from commonly available information sources. A large competent firm such as FedEx would be expected to complete full due diligence supporting an investment decision as large as the sorting hub. That means that FedEx would have carefully considered the region’s labor force availability and quality as well as the business climate in general and come to a favorable decision. Other firms which are considering investing in a new facility will not necessarily decide upon a site located in the Piedmont Triad region but, seeing the

FedEx decision, might include the region on their “short list” more readily than they otherwise would.

Despite the decreasing manufacturing employment, the Piedmont Triad region is a region in transition, not decline. The growth of employment in new sectors, often the production phase of high technology industries, does not yet outweigh the losses in the older sectors. The Piedmont Triad region has many of the attributes that goods-processing sectors value in making location decisions – whether or not those sectors rely on air shipments for their normal operations. The Piedmont Triad has a strong blue collar labor force with a proven work and skill development track record. The costs are reasonable and the region has a developing record of training workers to fit company skill needs.

It is difficult to rigorously apportion new firms locating in the region into groups that are reacting to the FedEx decision and those that are locating here without being influenced by FedEx’s presence in the Piedmont Triad. The symbolic catalytic effects are those that might have occurred anyway. Nevertheless, spokespersons for several firms have attributed their company’s location decision, in part, to the FedEx decision. Few firms are seeking new sites right now but as the overall economy improves, we should see the region’s market share (or capture rate) of new facility sitings increase.

The FedEx facility is not the only attractor at Piedmont Triad International. The Honda Aircraft Company investments continue to deepen. Honda Aircraft Company’s presence is likely to influence the decisions of other firms in the aircraft manufacturing sector even if they have no direct relationship with the firm. Honda and the region’s labor force are likely to have an even stronger pull once the Spirit facility in Kinston begins operations in earnest. While supply chains in the aircraft

manufacturing industry are generally long and the Spirit facility may not attract suppliers *per se*, firms considering a new facility will likely find the Piedmont Triad labor market deeper and more skilled than that of Eastern North Carolina.

While it is possible to analytically separate operational from symbolic effects, it may be difficult to do so empirically. For many firms, both influence mechanisms will operate to affect their location and subsequent production decisions.

New goods producing facilities will not only create new regional employment and new cargo shipping demand but will create *induced catalytic effects* by generating new passenger demand. Many of the facilities will be parts of far-flung multi-establishment firms. These types of establishments generally use air travel at a high rate to facilitate organizational coordination. Because managers and skilled staff personnel often need to relocate for the new facility, their placement tends to generate air travel to visit friends and family. Because those same personnel are highly paid, their employment spawns additional vacation travel.

Right now, the operation of catalytic effects is nearly frozen. FedEx has put expansion plans on hold. Moreover, the depressed state of the economy has firms looking to consolidate and close facilities, not open new facilities. At the moment, there is little basis for predicting the magnitude of the catalytic effects at PTI which generally operate over the medium to long term. Nevertheless, these catalytic effects, reflecting PTI's future enhanced centrality in the air transport network and therefore new role the national economy, will begin to function in earnest once the FedEx facility is operating at capacity and the global economy recovers.

On-Airport Commercial and Industrial Development

Piedmont Triad International Airport, together with the FedEx sort hub, has the potential to become the “Central Business District” of a vibrant industrial region boasting an economy based on high technology production and rapid-response logistics. Two previous reports outlined a general vision for a Piedmont Triad Region Aerotropolis, specified the functional needs for the aerotropolis, and recommended needed steps towards implementation.³ We will not repeat the substance of those reports, much of which goes beyond the mandate of the Master Plan Update, though pertinent material will be incorporated into the Update. In addition, we will highlight some of the most promising prospects for on-airport commercial and industrial development. We are chiefly concerned with those that have the greatest potential to leverage the Piedmont Triad Airport Authority’s and the Federal Aviation Authority’s investments in aviation infrastructure. In addition, proposed surface transportation facilities, including relocated highways, access roads, a potential PART inter-modal rail and bus terminal, and an inland port, while not all on airport grounds are all planned for the immediate area. We will cover these and potential Aerotropolis commercial functions on land near the airport. All commercial and industrial development at PTI must conform to the Authority’s statutory authorization, which limits such development to that “related to, developed for, or facilitates further airborne commerce and cargo and passenger traffic.” NCGS 63-53(6)

Selected Present PTI Land Uses

As illustrated in Exhibit 1, Piedmont Triad International Airport already houses a significant amount of on-airport fixed base operator employment and aircraft

³ “Leveraging Piedmont Triad International Airport and other Regional Assets for Piedmont Triad Regional Competitive Advantage,” June 2007 and “The Piedmont Triad Aerotropolis Plan: From Guidelines to Implementation,” September 2008.

maintenance employment. As of 2008, fifty companies with nearly 4,500 employees had already located on the PTI campus, the largest being TIMCO, an MRO complex. These were discussed in prior reports. These can be expected to expand incrementally as general aviation expands. With the forthcoming operations of FedEx's and Honda Aircraft Company's facilities, total PTI campus employment could reach 6,000 by 2012. The airport also has retail, restaurant, and hotel facilities. These may expand as passenger traffic at PTI increases.

Possible Future Commercial and Industrial Development

At the moment, the largest potential for on-airport development is probably the *aircraft manufacturing industry*.⁴ Honda is already committed and has deepened its investment in its Piedmont Triad International Airport location with a headquarters, research and development facility, and major assembly plant. As noted above, the Spirit airframe assembly plant to be established in Kinston, could well add to the demand for on-airport industrial space at PTI, given the Triad's labor market depth with the potential to support a significant aircraft parts manufacturing sector. Should any firm consider establishing a new facility in North Carolina to serve the Spirit Kinston facility, the Piedmont Triad region would be an attractive possibility. North Carolina's emerging aerospace clusters are synergistic and PTI should benefit as a result of this emergence.

Given the proposed overnight route structure developed by FedEx, there is also a good possibility for a PTI *cool chain facility (perishables center)*. These do not necessarily need to be located on the airport grounds but most existing facilities have been well-served by such locations. The possibility for a cool chain facility is

⁴ Kenan Institute of Engineering, Technology, and Science. 2008. "Ready to Soar: Aviation and Aerospace in North Carolina." North Carolina State University.

discussed more extensively in a prior report.⁵ We review that discussion here because it would be a new activity for PTI and because it would very directly leverage the recent infrastructure investments, the FedEx operation, and other regional assets.

The Piedmont Triad Region may have the potential to play two complementary roles in the transport of sensitive perishables. The first is as an inward transfer point for food and fresh-cut flowers to consumer markets to the Piedmont Triad area. The second is as an outward transfer point for the pharmaceutical and biotechnology industries which are increasingly making their homes in North Carolina.

The Piedmont Triad Aerotropolis is excellently placed to receive fresh-cut flowers from Europe and South America, the two largest sources of flowers for the U.S. It is also equally well-placed to receive shipments of fresh fruits and vegetables from South America, which is a growing source of U.S. produce. The U.S. now imports approximately one-third of its produce by air. Produce loses much of its value after harvest if temperatures are not carefully controlled to prevent deterioration. With the appropriate investments in facilities, the Piedmont Triad could be well-positioned should trade increase.

Biotechnology and pharmaceuticals continue to be growth industries in North Carolina from the laboratories of the Research Triangle Park to the emerging center in Kannapolis to the production plants sprinkled around the periphery of the Triangle region. These industries are likely to continue to grow in employment and output. They are, in general, reliant on air transport but some specialized products need to be kept within very well-controlled temperature bounds.

⁵ “The Piedmont Triad Aerotropolis Plan: From Guidelines to Implementation,” September 2008.

An estimated 2.6 million tons of perishables was air freighted in 2008. Perishable commodities amount to nearly 8 percent of all air cargo shipped. Time, temperature and treatment are crucial and the integrity of the cold chain must be maintained in order to prevent irreversible damage. Aside from the cool chain facilities at Stockton, Houston and Atlanta have perishables centers with 60,000 and 42,000 square feet of climate controlled space, respectively. New Orleans has a 15,000 square foot facility. Overseas, Amsterdam, Brisbane, Dubai, and Frankfurt have, or are building, substantial facilities.

PTI is well-placed to act as a gateway serving the East Coast for perishables from Latin America and Europe. Miami, now the busiest Latin American gateway, is far from most major East Coast markets. Atlanta suffers from heavy congestion. The New York airports are also congested, making them excellent for serving the large New York market but unattractive as gateways for onward shipments.

Given the industrial trends in North Carolina and in the Piedmont Triad Region, PTI has solid potential for outward cool chain shipments. Of the more than \$650 billion of pharmaceutical products sold worldwide in 2005, over ten percent (\$65 billion) were biopharmaceuticals. The U.S. share of these markets was approximately \$200 billion and \$20 billion, respectively. Approximately 40 percent of the total pharmaceutical market is temperature sensitive and 100 percent of the biopharmaceutical market is temperature sensitive.

Between 2004 and 2005, the biopharmaceutical market grew by 17.1 percent, significantly faster than the traditional pharmaceutical market. The expectations are that the market will grow exponentially. Moreover, climate controlled logistics have the potential to significantly improve the operations of several ends of the

biopharmaceutical industry where temperature and humidity deviations cause large costs because drugs may become ineffective or even harmful.

In addition to aeronautical manufacturing and perishables processing, PTI may be able to attract e-commerce fulfillment centers and, particularly if cargo airlines find it advantageous to provide services, third-party logistics providers. Both of these latter may rely on FedEx for at least a portion of their air transportation needs. PTI might also attract additional hotel, exhibition, and office facilities related to air commerce.

The Guilford Tech Community College (GTCC) Aviation Campus is a special asset for PTI air logistics and Aerotropolis development now and will grow in significance as aviation-related facilities expand. In collaboration with Embry-Riddle Aeronautical University, GTCC is able to offer two and four-year degrees, providing education and training support for all aspects of the aerospace industry, including manufacturing, maintenance, and air logistics. Complete skills and career development support will be available right on airport grounds. As noted in a prior report, the Piedmont Triad region is fortunate to have a full range of cooperating educational institutions supporting all aspects of Aerotropolis development.

Regional Surface Transportation Infrastructure

Accommodating future aviation-related industrial and commercial development will very likely require altering regional transportation infrastructure. Some of the needed changes are already incorporated into regional planning. As part of the regional transportation improvement plan, I-73 will be extended to the southwest along the current Bryan Boulevard and a right-of-way corridor for the future I-73 located north of the airport. Once the interstate is extended, portions of

Bryan Boulevard can be removed to allow development of land areas west of the new parallel runway to their highest and best revenue potential and aviation-related use.

To provide surface access to these land areas, a new surface access tunnel beneath or overpass over I-73 must be constructed along with a new north-south roadway corridor between NC 68 and points north of the airport. The development of a support road would require that the development of an overpass or tunnel system through the I-73 right-of-way would need to be part of the initial design considerations of the Interstate. This corridor should be developed west and parallel of Runway 5L-23R at an offset distance of approximately 2,150 feet.

In addition, there is a possibility for high-speed rail service with an intermodal center serving the airport. The intermodal center could include a people mover serving the PTI passenger terminal and other on-airport destinations. Being centrally located in the region, the PTI area will be increasingly seen as a preferred location for aviation and non-aviation functions and will require the corresponding surface transportation.

Competing Land Uses

Aside from the potential for additional on-airport commercial and industrial development leveraging the airside infrastructure and the surface transportation improvements that will support or complement airport facilities, the airport area is increasingly attractive to non-complementary economic activities ranging from residences to consumer retail. The spatial structure of the Piedmont Triad Region has evolved from that of three proximate yet distinct cities to an increasingly spatially and functionally-integrated single metropolitan region. While PTI's location may be

somewhat peripheral to downtown Greensboro, it is centrally located within the region.

PTI and its immediate environs, especially those with easy access to I-40, will also be increasingly sought out as sites for commercial and industrial developments that are not necessarily closely tied to aviation. That has two important implications for the airport. First, PTI needs to guard against developments that could encroach upon future needed airport expansion. While well-served, air service expansion is precluded in several major metropolitan areas, including Boston and San Diego. At the very least, encroachment may preclude later commercial and industrial developments that complement the airport. Second, if the Airport Authority and other land use authorities in surrounding jurisdictions manage the local real estate development process carefully, they can preserve long term options for aviation-related economic activities, contributing to the airport's emerging role as the Central Business District of the Piedmont Triad Aerotropolis. Doing so would enhance the future well-being of the region and contribute to Aerotropolis development objectives.

Land Uses near PTIA

The Master Plan Update discusses the present land uses on and near the airport. Here, we highlight the issue of residential encroachment and reiterate the ever-growing threat of conflicting commercial encroachment that could hamper long-term airport expansion to the detriment of Aerotropolis development and the overall Piedmont Triad Region.

Much of the land to the south and west of the airport is either used for commercial, office, or industrial uses or is zoned for such uses. Further, the land to the northeast of the airport along the flight path of the main existing runway is

devoted to commercial and office uses. Three of the four approach/departure paths of the two parallel runways are free from residences, as are the paths for the cross runway. Unfortunately, most of the land to the north and east of the airport is used for residential development. Future residential development could interfere but that depends on its location and the night-time traffic pattern. Fortunately, most of the land near the airport is not zoned for residential use.

The business park to the northwest of the airport and the hotel and office complex near the intersection of I-40 and NC 68 are the most promising complementary developments in the immediate off-airport area. Further afield, I-40 acts as a regional corridor attracting office, industrial, hotel, and other commercial developments to the west of Greensboro and north of High Point. The I-40 corridor also contains major shippers such as Dell Computers and is home to a large number of distribution centers and trucking firms.

Some of the land near the Piedmont Triad International Airport is vacant. The airport needs to work in close cooperation with Guilford County and the cities of Greensboro and High Point to ensure that non-complementary uses do not occupy that land and that the long-term highest and best use of airport area land as a whole is preserved. One way to accomplish that goal is for the airport to purchase additional land near the airport.

Recommendations for Acquiring Land

Airport land acquisition can allow the region to make the steps between the present situation and the full aviation-oriented complex of activities envisioned for full airport build out. Our provisional initial assessment is that the PTAA should

proceed with a carefully considered land acquisition strategy along the lines suggested by the master plan prepared by URS and elaborated by us above.

The potential cost to the community will be substantial if land for airport growth is not acquired or protected. The airport must acquire and/or surrounding communities must protect sufficient land to accommodate a potential third parallel runway.

If the airport does not accumulate the specified land and it turns out that there is a demand for airport expansion, the region's growth potential could be restricted. This prospect is real and has already constrained air service expansion in several metropolitan areas.

To some extent, reserving land for a possible future third parallel runway can be subsidized by leasing land to firms which need an inside the fence location, such as those summarized above. The airport already owns a significant tract of land to the northwest of the new parallel runway. A first phase of land acquisition could include filling in 200 acres of "missing pieces" in that area and additional parcels around the airport grounds as they are now defined. Additional acquisitions might include 35 acres on the north side of Bryan Boulevard, 12 acres to the east, 5 on the southeast, 49 acres in the southwest corner of the airfield and 47 acres to the west.

Those acquisitions will serve to rationalize airport boundaries and provide flexibility in allocating on-airport land to its best use. A larger acquisition, spanning the present route of NC 68 and reaching to its proposed new route would allow for the construction of a third parallel runway, should it some day be needed. That second phase would complete the airport footprint as it can be envisioned today.

Piedmont Triad International Airport should also consider acquiring land to prevent residential encroachment. With the possibility of expanding night-time

operations and with complaints often stemming from far beyond the usual noise barriers, PTI could find itself facing strong resident reaction if proper steps are not taken to minimize future residential development in nighttime approach and departure paths.

Conceptual Airport Land Use Possibilities

The socio-economic projections performed as part of the Environmental Impact Assessment for the second parallel runway calculated that Piedmont Triad Regional employment would increase from a baseline expectation of 900,500 to a total of 911,250 within approximately 20 years. The additional 10,700 jobs (an additional 1.2 percent over the baseline projections) were expected to increase to a net additional 17,510 jobs (1.7 percent more than otherwise projected). FedEx will account for approximately 15 percent of the additional employment directly with another 5 percent being direct spin-off results of its operation. The large majority of the new employment will be in facilities that supply and accept the cargo made possible by the new capacity and by the induced effects of the retail and service spending of the additional employment. We have not calculated the portion of the catalytic effects that would be located on the airport property.

URS in cooperation PTI management provided us with working maps of potential property acquisitions and airside investment over the long term. We add a potential land use allocation of the total property. Our exposition is as an aid to practical thinking. As noted earlier in this report, the present projections of activity do not allow for rigorous planning nor have we calculated the space needs of the specific activities or the Competitiveness of the Piedmont Triad airport in attracting these activities. In the exposition that follows, we assume that FedEx expands its

route structure in a manner discussed above, that PTI is successful in attracting a high level of non-integrated cargo, and that the Piedmont Triad region is seen as competitive for the activities described. These assumptions are for planning purposes. Whether these developments will occur, and the extent and timing of these developments are uncertain.

For future PTI development contributing to the planning and implementation of the Piedmont Triad Aerotropolis, we will present 21-year (2030) and 41-year (2050) conceptual plans. Both plans will assume that by 2030, roadways will have been realized as discussed above and that PTI will have acquired all land designated above as well. The acquired land, in addition to the existing PTI campus would constitute the footprint for expanded and diversified PTI functions.

Even with the anticipated catalytic effects of the FedEx mid-Atlantic hub and other drivers, it is unlikely that sufficient cargo and passenger traffic would justify a third parallel runway by 2030. (The Forecasts predict a number of operations just slightly higher than in the late 1990s.) Yet, with the additions discussed above, PTI may well have sufficient cargo and passenger volume to require a third runway by 2050. Therefore, for the period between now and 2030, the authors (and URS) are proposing an extended taxiway to the center of the acquired property northwest of the new runway for activities requiring runway access. This taxiway, along with its apron, could later provide access to a future third parallel runway should it be demanded at some point after 2030.

Exhibit 2 illustrates the potential land use and facility makeup of PTI in 2030 on this expanded footprint. Also shown is the extended cargo transport system to the new aviation-related areas and a potential site for a regional commuter rail and bus terminal which could eventually be connected by a people mover to the PTI passenger

terminal. We repeat that its placement is for conceptual purposes only and does not represent a recommendation or an endorsement of that location.

By 2030, only a portion of the PTI campus will have been developed. Additional hotels, offices, a potential exhibition complex and medical and wellness facilities along with mixed-use commercial and some yet-to-be-identified special uses might emerge. As noted above, we also expect to see some additional aircraft parts and assembly develop near the GTCC campus along with a possible EDI/telecom facility for advanced tracing, tracking, and controlling of product movements.

A small portion of the “T” taxiway extension could have e-commerce fulfillment and third-party logistics functions, should any desire an on-airport location. On the northwest side of the second parallel runway, near the extended taxiway, a new shared central cargo facility would be built to expeditiously serve non-FedEx airlines, if significant non-integrated cargo service is attracted to PTI. A state-of-the-art perishables/cool chain facility could be located adjacent to the new central cargo facility with nearby third-party logistics facilities and related fulfillment centers.

Under ideal conditions, full buildout of the PTI Airport City might be possible by 2050. This build out is illustrated conceptually in Exhibit 3. The potential third parallel runway may well be justified by this date, so it is shown in the exhibit. (If it is not yet justified, the “T” shown in Exhibit 2 can be extended as needs require with additional cargo and logistics functions located along and near it.)

By mid-century, PTI may have emerged as a significant aircraft parts and assembly cluster, attracting a number of new parts and aircraft equipment manufacturers. PTI’s logistics and e-commerce fulfillment activities may also have expanded considerably as may its other activities. It is possible that by 2050 more

than 20,000 people could be employed on PTI grounds, making it one of the largest employment centers in North Carolina.

While the above strategic visioning is only conceptual, it points out what could emerge if appropriate planning, land acquisition, and development take place at PTI consistent with aerotropolis principles. If such planning and land acquisition does not take place, this special opportunity could be lost forever.

Land Development Outside of the Fence

Taking the land acquisition steps recommended in the Master Plan Update and outlined above will require adjustments in the focus and operation of the Piedmont Triad Airport Authority. Yet such adjustments are not without precedent. Coordinated airport expansion and real estate development, while not ubiquitous, is common. The real estate development at or near airports may include hotels, convention centers, office buildings, or industrial facilities. Contrary to conventional wisdom, the Federal Aviation Administration has long been sympathetic to such development and has at times even promoted the idea on efficiency grounds.⁶ There is a long precedent for FAA support for industrial and commercial development across types of airports, ownership and governance structures, and modes of property acquisition. Such efficiency-enhancing developments improve the welfare of the citizenry, boost airport-specific catalytic effects, and help support regional air service, the FAA's prime concern.

We review governance and ownership structures of airport-related business and industrial developments, making reference to selected cases for illustration. In doing so, we exclude the air transport support activities, such as cargo processing,

⁶ For example, Federal Aviation Authority Advisory Circular AC 150/5070-3 *Planning the Airport Industrial Park*, September 30, 1965 which reviewed current and best practice while describing such developments at a sample of 11 airports.

terminal retail, hotels, and automobile rentals, commonly found on commercial airports. We then discuss the several routes to airport land acquisition and real estate expansion.

Ownership and Governance Options

There are a number of governance and ownership structures for such coordinated real estate developments which depend upon state laws regulating public enterprise and accidents of land acquisition and development history. The airport and commercial real estate may be under separate ownership (as when a private firm develops property adjacent to a public airport), under common ownership (as when a municipal aviation department operates an airport and a municipal economic development agency owned by the same municipality develops contiguous land), or part of the same organization (often a department in or agency of a municipal government).

Looking across airports, whether coordinated real estate development is inside or outside the airport fence, is often an accident of developmental history. For example, the Irvine Company, which has developed much of the land in Orange County, designed an industrial complex to fill 2,600 acres surrounding Orange County Airport (now John Wayne Airport). The airport was built on land that was originally owned by the Irvine Company but was deeded to the County before the plans for the Industrial Complex were drawn up. Alliance Airport has a somewhat similar history. Alliance Airport is managed by the same company (Hillwood) as the surrounding industrial and commercial land. While the Irvine Industrial Complex was designed to accommodate runway access to a subset of the parcels, they appear to be not in use.

While both the Irvine and Alliance developments were initiated by private developers, airport owners sometimes recruit private firms to leverage aviation assets. In 1963, the City of Hayward entered into an agreement with Airport Investors and Developers, Inc. to operate the municipal airport which was a decommissioned airfield from the Second World War. Five years later, after obtaining permission from the FAA to change the terms of the original property transfer agreement, 167 acres were sold for the Cabot, Cabot, and Forbes Industrial Center.⁷ With the impending departure of the National Guard, the airport intends to split the freed space between aviation and non-aviation uses. Van Nuys' airport business park is also privately managed.

In other cases, an airport-related industrial park may be operated by an industrial development authority. The Accomack Airport in the Eastern Shore region of Virginia is owned by the municipality but the Accomack Airport Industrial Park is operated under the direction of the municipality's industrial authority. The Chamber of Commerce/Economic Development Partnership manages the Corvallis Airport Industrial Park. Kingman Airport Authority leases the airport and adjacent industrial park from the municipality and operates both on a non-profit basis for the municipality. Big Rapids Township MI operates both the airport and the industrial park. The same situation is found in Missoula MT where the airport industrial park accommodates over 50 tenants. Ponca City OK Airport's and Rock Hill SC Airport's industrial parks are operated by local economic development offices.

Some airport industrial or business parks are operated by the airport itself. That is the case for the Colorado Springs Airport Business Park. More than 300 acres of that park's nearly 1,000, have direct runway access. Spokane International Airport

⁷ Having developed much of Boston's Route 128, Cabot, Cabot, and Forbes, a firm with more than a century of real estate development service was perhaps the design and market leader in developing facilities for post Second World War electronics and high technology companies.

operates nine real estate areas totaling over 1,000 acres. Some but not all of these boast direct runway access. Orlando Sanford Airport operates a 395 acre industrial and business park with over 90 tenants. The Fort Wayne Airport Authority operates two parks within its fence. The first is a 110-acre shovel-ready tract oriented towards offices and light industry. The other is a 450-acre parcel at the opposite end of the airport which serves cargo and heavy industrial uses.

In Duncan OK, the airport industrial park is operated by a foundation created expressly for that purpose. Among a sample of approximately 300 airport-linked business and industrial parks, management was split approximately equally among airports, industrial development authorities, non-airport government departments, non-profit organizations, and private developers.

Routes to the Acquisition of Airport Industrial and Commercial Land

Land for commercial real estate development is acquired in several ways, some with Federal support, some without. One method whereby airports come to own land that is available for commercial development may be the downgrading of aviation-related land. While many airports are pressed for space, some airports, such as Dallas-Fort Worth International and Kansas City International were built in an era of great uncertainty about future land needs. Runway length requirements had recently doubled with the introduction of jet aircraft and there was the possibility that they might double again with the introduction of the then-anticipated inter-continental transporters. As it became apparent that such aircraft, even if they could be built, would be of limited use because few overseas airports could accommodate them, the excess land at several of these airports has been converted to non-aviation uses.

Other airports also have excess land that will very likely never be needed for aviation. Dayton Airport has recently been granted permission to release land for non-aviation use that because of its relationship to prevailing winds and runway placement is inconvenient for aeronautics. The funds generated as a result of the conversion will help support the airport. Gadsden's airport will be supported by the industrial development of over 1,000 acres of airport land released by the FAA for non-aviation uses.

Other land is acquired after the airport begins operation. Some of the land acquisition is to relieve homeowners of noise disamenity and a portion of the acquisition is to prevent development of parcels of land in a way that would interfere with airport operations. Much of this acquisition is supported by funds from the Airport Improvement Program. From Fiscal Years 1982 through 2003, the FAA granted \$3.8 billion in Airport Improvement Program funds for airport noise mitigation projects. Of these funds, \$1.8 billion was directed towards noise-related land acquisitions. (AIP funding has continued to grow but we have not compiled the funding allocation.)

FAA regulations require that airports receiving these funds either use the land for aviation purposes or dispose of the land once no longer needed. FAA leadership has not pressed airports to dispose of the lands for two reasons. First, they argue that some of the acquired land has little value for non-aviation purposes. Often the land is poorly accessible and lacks adequate services for commercial use. Second, they argue that the costs of re-acquisition, should the need for expansion arise, could easily outweigh the short-term benefits of a sale. In practice, the FAA is also satisfied with leasing arrangements by which airports earn income that can be repaid to the AIP or used for other noise amelioration purposes. In some cases, land acquired with Airport

Improvement Funds is transferred to another unit of local government for management. This is the case with Wayne County's Pinnacle Park outside of Detroit Metro Airport. The parcels for many airport-related business and industrial parks in our database, mentioned above, were originally assembled for noise mitigation purposes.

Some, such as Indianapolis Airport, prefer that the assembled tracts be developed by private developers. In the case of Indianapolis Airport, which is in the midst of an extensive land acquisition program, some of the acquired land is inconveniently located for aviation purposes. That city also has a history of aggressive privatization of all possible municipal functions. The airport has, however, recently retaken direct control over the management of its passenger terminal.

Allegheny Airport Authority, serving the county in which Pittsburgh is located, has taken the opposite tack. At its establishment in 1999, the authority gained control over several outside the fence properties near Pittsburgh International Airport that had been under county government ownership. The resulting improved coordination with the airport and clarified responsibilities has resulted in rapidly progressing development of what had been languishing properties.

Airports also purchase land for incorporation inside the fence. Most of the development possibilities discussed for PTI above are inside the (expanding) fence. FAA regulations permit the use of Federal funds to support land banking but, unfortunately, only for a period of time that is insufficiently long for most situations. In those cases, state and local funding can pay for the entire purchase price of the land. Some states support airport land acquisition for aviation purposes and airport-related industrial development. Localities can incorporate airport land acquisition into their Comprehensive Plans. Once in the Comprehensive Plan, land acquisition

can be included in a Capital Improvement Plan and arrangements made for financing land purchase. Some localities draw funds for these purposes from their General Fund. Others commit a specific component of their tax collection, such as a portion of the sales tax, to airport capital improvements.

Under some conditions, it may be possible to use Passenger Facilities Charges to support airport land acquisition. This source requires FAA approval and might not apply to uses that do not have an immediate impact on passenger travel. In other cases, local tax abatements and foreign trade zone status are used to induce firms to choose an airport location. Funds generated by leasing can be used to help defray land acquisition costs.

In some cases, airports acquire land incidentally. For example, the Metropolitan Washington Airport Authority (MWAA) could only purchase the land needed for aviation purposes by acquiring a larger parcel than was necessary. Given the increasing encroachment of residential subdivisions in the airport's noise zone they have been reluctant to release the land to private developers. At least until the recent lull in the real estate market, they had been considering developing 400 acres of the acquired the land in the form of a public-private partnership with a master developer for control and mutual benefit.

The airport will also need to ensure compatible uses within the obstacle and noise control zones of the potential third parallel runway. Careful coordination with officials in the Cities of Greensboro and High Point should reduce long term resistance to the opening of a third runway. Zoning and tax incentives are two possible methods of ensuring land use compatibility.

As a practical matter, airport real estate development often requires an agreement between the airport and the surrounding localities to share tax revenues, or

the tax revenues that would have been generated by the class of use of the relevant portion of the airport property. A good example of this is Dallas-Fort Worth International airport where commercial revenues are shared with the two counties and four municipalities which the airport occupies. DFW has also actively engaged in land swaps with at least one of the municipalities.

Conclusion and Recommendations

The Piedmont Triad International Airport now finds itself in a very promising, but difficult, situation. One of the airport's ultimate responsibilities is to support the regional and national economy. It is faced with making long term plans for a future which, due to the shifting nature of the global economy, the related changes in the relationship of air transport to final demand, and recently unfolding events specific to the region which will unavoidably alter the region's role in the national economy, will not be a simple continuation of past trends.

Our professional opinion is that the airport needs to plan for the region's emerging future while fully recognizing the uncertainties inherent in planning for that future. Doing so requires an ambitious vision of PTI operations at full build out and taking steps to realize that future as demand requires. Our understanding of current and emerging trends in commercial aviation and aerotropolis development, while not guaranteeing that such a vision will come to fruition, are sufficiently viable to warrant a full consideration of the possibilities.

On a practical level, the Piedmont Triad Airport Authority needs to take steps now in order to preserve future options for the region. It needs to ensure that land is available for aviation-linked needs as they emerge. Zoning and tax abatements to

discourage inappropriate uses is recommended. The FAA generally supports such initiatives.

Those steps, however, do not provide the security afforded by land ownership. The airport authority should proceed with plans to acquire land in the near future to ensure against the encroachment of conflicting or otherwise non-complementary land uses and to preserve its ability to develop a third parallel runway. The development of the acquired land for aviation-related commercial and industrial uses can help support the needed land acquisition even as it leverages existing investments in infrastructure and provides the airport with a source of income that is not directly tied to operations.

There are of course risks to any ambitious capital development program. Only a portion of the envisioned demands may materialize. Prudent management of costs and a periodic review of airport and regional development trends will reduce downside risk while preserving upside potential.

Exhibit 1. Major Facilities on PTI Campus, 2009

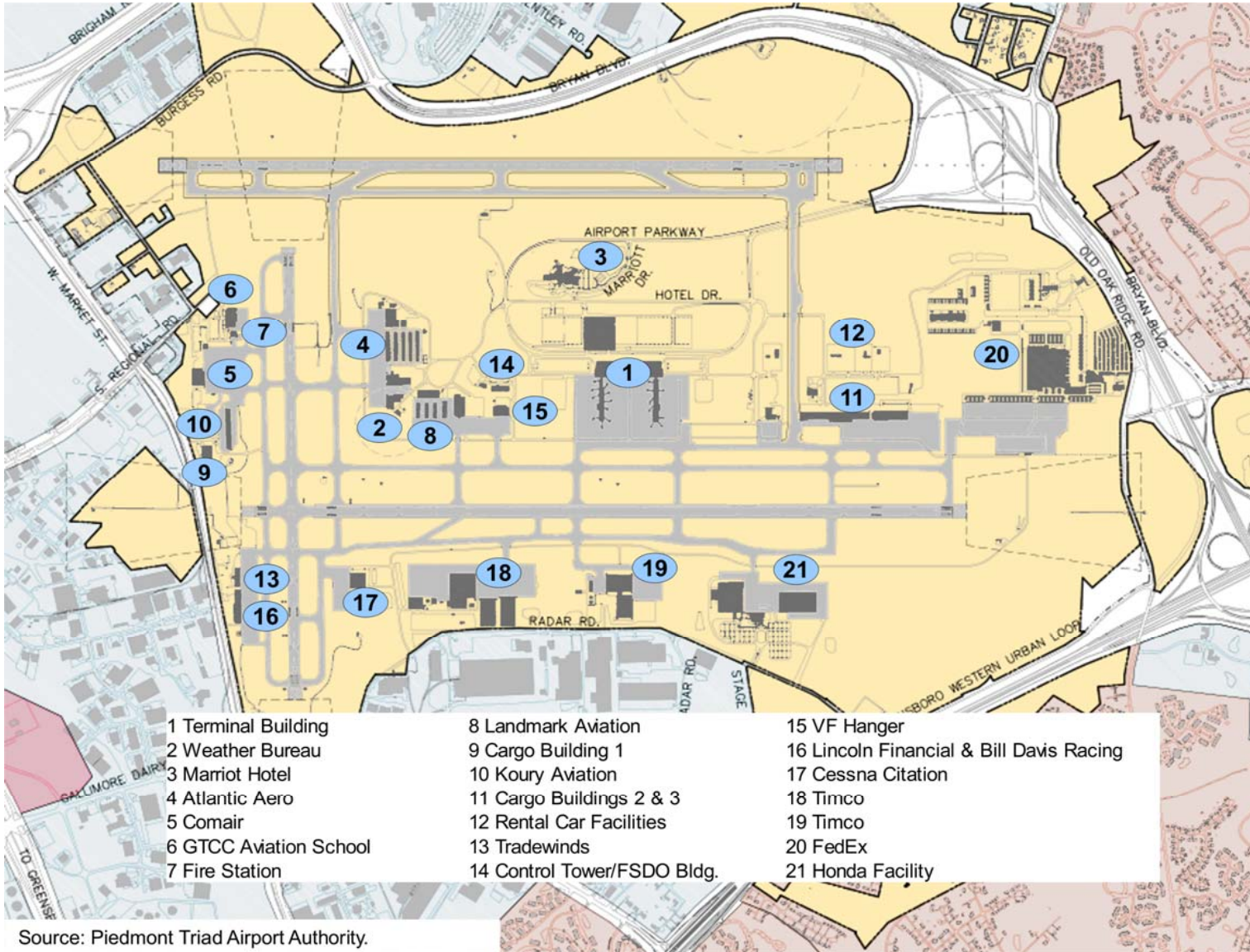


Exhibit 2. PTI Airport City 2030 Conceptual Plan

