



**NORTH CAROLINA  
STATEWIDE  
MULTIMODAL  
FREIGHT PLAN**  
*Planning for the Future of Freight Movement*

**AIR CARGO PROFILE - FINAL**



North Carolina Statewide Multimodal Freight Plan

Air Cargo Profile

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# ACRONYMS

3DP	Three-Dimensional Printing
AASHTO	American Association of State Highway and Transportation Officials
ASM	Available Seat Miles
BIP	Business Investment Program
BTS	Bureau of Transportation Statistics
CAGR	Compound Annual Growth Rate
CCOG	Centralina Council of Governments
CLT	Charlotte Douglas International Airport
CVG	Cincinnati/Northern Kentucky International Airport
DDTW	Double Dual Tandem
DOT	Department of Transportation
FAA	Federal Aviation Administration
FAF	Freight Analysis Framework
FASTLANE	Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies Grant Program
FHWA	Federal Highway Administration
FTZ	Foreign Trade Zone
GSO	Piedmont Triad International Airport
GTP	North Carolina Global TransPark
IND	Indianapolis International Airport
ISO	Kinston Regional Jetport
JDIG	Job Development Investment Grant
MEM	Memphis International Airport
NS	Norfolk Southern Railway
OneNC	One North Carolina Fund
PMFN	National Primary Multimodal Freight Network
R&D	Research and Development
RDU	Raleigh-Durham International Airport
RTK	Revenue Ton-Kilometers
SCTG	Standard Classification of Transported Goods
SDF	Louisville International Airport
TSA	Transportation Security Administration
ULI	Urban Land Institute
UPS	United Parcel Service
USPS	United States Parcel Service
WACF	Boeing World Air Cargo Forecast



# 1.0 OVERVIEW

The purpose of the Air Cargo Profile, as part of the North Carolina Statewide Freight Plan, is to catalog existing statewide air cargo infrastructure, operations, carriers, markets and shippers. This information will be used to describe the existing and future conditions and provide a needs assessment and analysis of existing and future trends for air cargo in North Carolina.

Although the North Carolina Multimodal Freight Plan was not designed to foresee the level of change due to a global pandemic, the planning process introduced in the Plan is even more relevant and important as a result of COVID-19. The unpredictable disruption associated with the pandemic and other drivers of change are altering the way people value mobility and make transportation choices, forcing transportation agencies to adapt operations, management and investment in the transportation system.

## 1.1 Methods and Data Overview

Information and data for this element of the study has been gathered from multiple sources, including:

- **Bureau of Transportation Statistics (BTS) TranStats Database:** T-100 market data provides annual air cargo statistics for all North Carolina airports with reported activity. The data contains domestic and international market data reported by U.S. and foreign air carriers, along with market data by carrier and origin/destination for enplaned freight and mail. Information about freight and mail tonnage, origin-destination geographies and carriers for North Carolina airports came from this data source.
- **Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF) version 5** contains aggregated annual volume summaries by origin-destination geography (using FAF zones), mode and commodity and provided this information on a historical and forecast basis using a combination of actual data and modeled behavior. FAF5 has a base year of 2017, with annual estimates for 2020, 2022 and 2023, as well as 5-year increment forecasts from 2025 through 2050. FAF5 provided information on commodities and cargo value for North Carolina Airports.
  - » The **low growth scenarios** were estimated in the 2017 Statewide Multimodal Freight Plan using a low growth scenario, compound annual growth rate (CAGR) from the RDU Vision 2040 Airport Master Plan for growth scenarios in 2045. This plan uses FAF5 low growth estimates for 2050 low growth scenarios due to using FAF5 data for the base year of 2017. The numbers generated in this plan were compared to the numbers generated in the previous plan and were deemed to be in line with each other.
  - » The **high growth scenarios** were estimated in the 2017 Statewide Multimodal Freight Plan using a high growth scenario, compound annual growth rate (CAGR) from the 2015 Boeing World Air Cargo Forecast (WACF) for 2045. This plan uses FAF5 high growth estimates for 2050 high growth scenarios due to using

FAF5 data for the base year of 2017. The numbers generated in this plan were compared to the numbers generated in the previous plan and were deemed to be in line with each other.

The Air Cargo Profile sourced tonnage estimates for the base year (2019) from the BTS T-100 data and used FAF5 commodity distribution for 2017 to allocate BTS figures to Standard Classification of Transported Goods (SCTG) codes.

This profile also estimates future activity and demand at North Carolina airports for a “low growth scenario” and a “high growth scenario” for air cargo activity statewide, as well as at each of the three primary air cargo airports: Charlotte Douglas International (CLT), Raleigh-Durham International (RDU) and Piedmont Triad International (GSO). To calculate the low growth scenario and the high growth scenario, this analysis used data generated with FAF5 data.

## 1.2 Section Organization

The remainder of the report is divided into four additional sections.

- Section 2 will detail the inventory/supply of air cargo activity in North Carolina, which includes air cargo facilities, capacity, service and service providers.
- Section 3 will detail the network use and performance, which focuses on the activity/demand element of air cargo activity. This section will identify the industries served by air cargo and how these connect to the state’s economy, the markets served and connections to global marketplaces, as well as bottlenecks and deficiencies.
- Section 4 describes long-term trends for the state, including future activity, performance and demand. This section will also discuss statewide trends affecting the air cargo industry and the implications of growth.
- Section 5 will feature an assessment identifying the needs and issues associated with airport access, airport infrastructure and adjacent industrial development. Additionally, Appendix A features a description of the SCTG commodity codes, which will be used to discuss commodity flow throughout this report.

## 2.0 INVENTORY - SUPPLY

This section provides an inventory of the supply of air cargo activity in North Carolina by listing all airport facilities, highlighting the facilities with air cargo activity and detailing the facility infrastructure and capacity. The three primary airports with reported air cargo activity are Charlotte Douglas International (CLT), Piedmont Triad International (GSO) and Raleigh-Durham International (RDU), in addition to the North Carolina Global TransPark facility. This section will also discuss the services and service providers at North Carolina's airports.

### 2.1 Airport Facilities

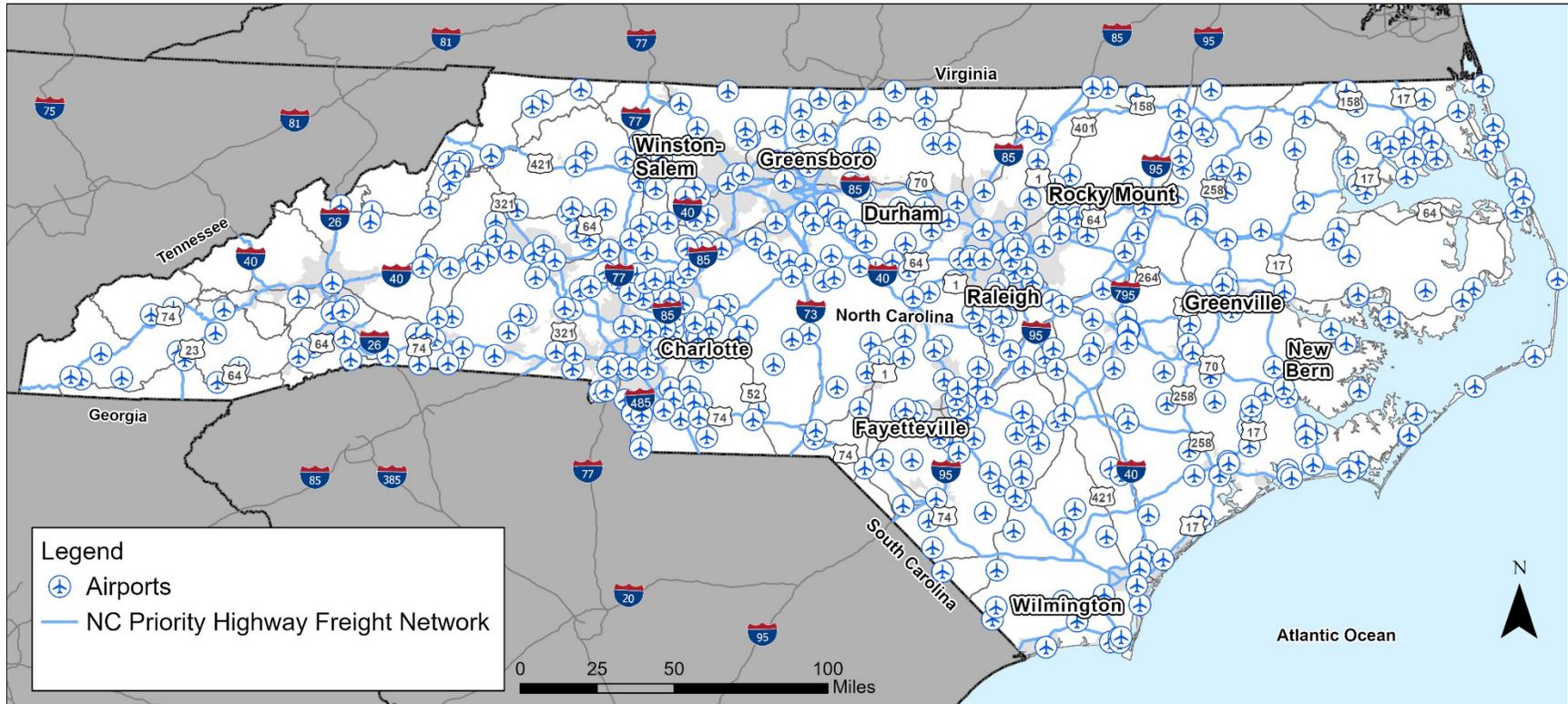
North Carolina has 72 publicly owned airports and nearly 300 privately-owned airports, as shown in Figure 2.1<sup>1</sup>. Of these airports, 10 have regularly scheduled airline service and four provide international service.<sup>2</sup> North Carolina is served by 17 airports with reported cargo activity in 2019, as reported by the Bureau of Transportation Statistics (BTS), including both dedicated all-cargo operations, as well as commercial passenger belly cargo. Figure 2.2 depicts a map of the 17 airports with reported air cargo activity throughout the state. Three airports in North Carolina, RDU, CLT and GSO, are designated as part of the comprehensive North Carolina Multimodal Freight Network. Thus, these three facilities, as well as other modes, could be eligible for federal funding under the Infrastructure Investment and Jobs Act (IIJA) grant program or North Carolina's portion of the National Freight Program that can be spent on non-highway modes.

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<sup>1</sup> "North Carolina, The State of Aviation". North Carolina Department of Transportation. Accessed April 2022. Available at: <https://www.ncdot.gov/divisions/aviation/Documents/state-of-aviation.pdf>

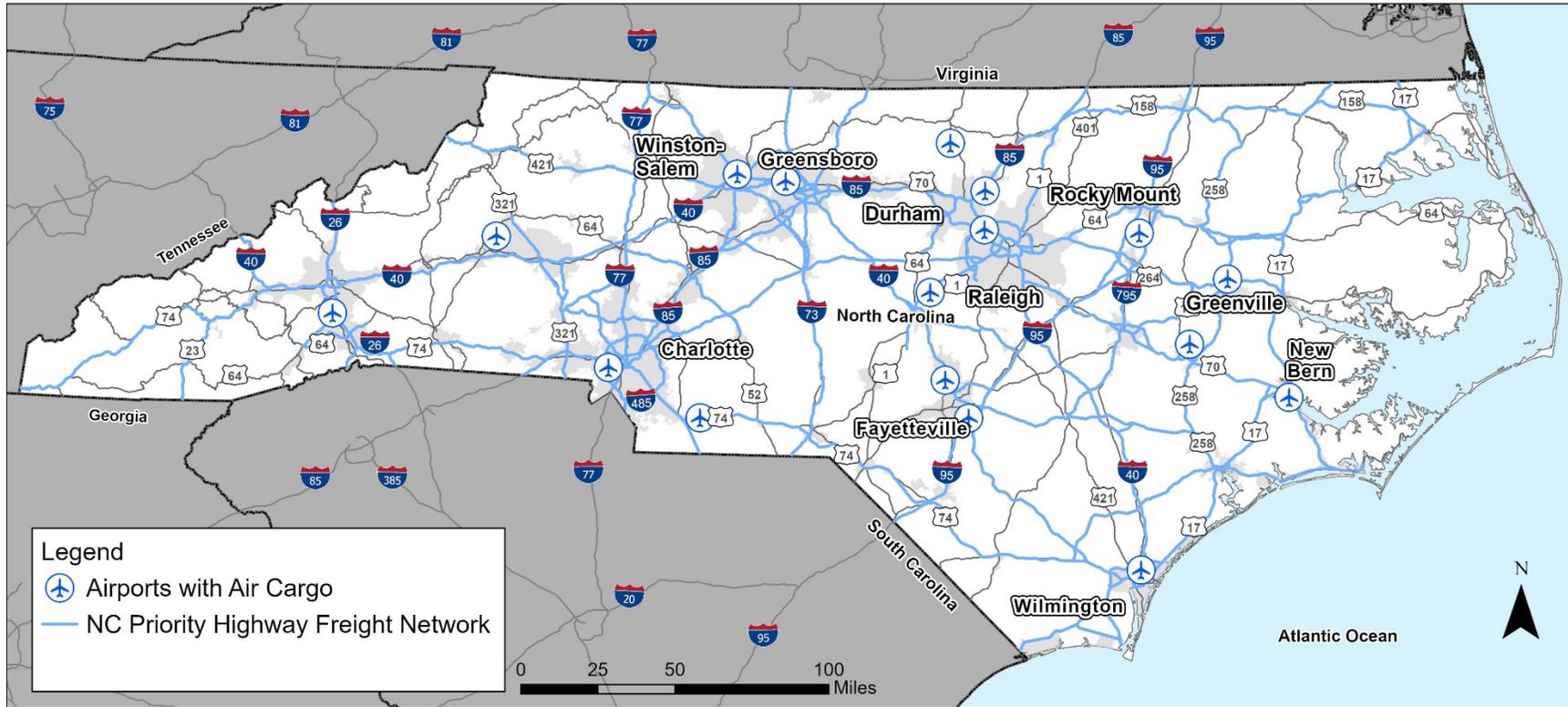
<sup>2</sup> "North Carolina, 2019-20 Airport Guide". North Carolina Department of Transportation. Accessed April 2022. Available from: <https://www.ncdot.gov/divisions/aviation/Documents/nc-airport-guide.pdf>

**FIGURE 2.1 AIRPORTS IN NORTH CAROLINA, ALL FUNCTIONS, 2019**



Source: North Carolina DOT; U.S. Department of Transportation ArcGIS Online.

FIGURE 2.2 AIRPORTS WITH AIR CARGO ACTIVITY IN NORTH CAROLINA, 2019



Source: North Carolina DOT; National Transportation Atlas Database.

## 2.2 Freight Significant Facilities

This section features descriptions of the three primary airport facilities for air cargo activity. Three airports comprise 99% of air cargo activity in North Carolina: Charlotte Douglas International Airport (CLT), Piedmont Triad International Airport (GSO) and Raleigh-Durham International Airport (RDU). This section also details North Carolina's Global TransPark facility.

### Charlotte Douglas International (CLT)

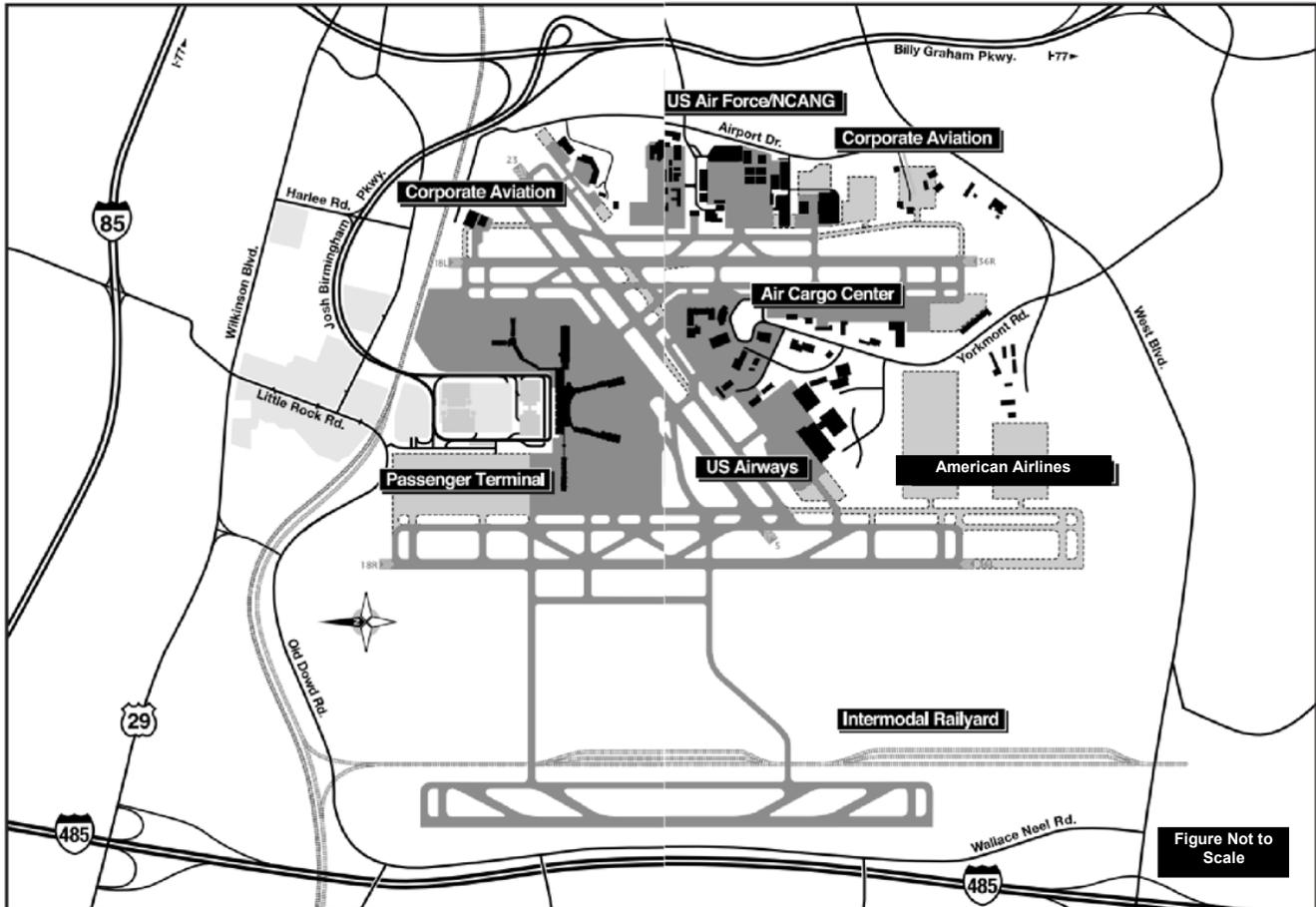
CLT, located in Charlotte, is currently ranked 6<sup>th</sup> nationwide and 6<sup>th</sup> globally (moving up one spot from being 7<sup>th</sup> globally in 2017) in the number of passengers and the volume of cargo enplaning and deplaning at the airport. The airport averages 1,600 operations daily and serves more than 50 million passengers each year, offering nonstop service to nearly 178 destinations, including 30 international destinations. CLT is served by eight domestic carriers, 15 regional carriers and three foreign flag carriers.<sup>3</sup> Air cargo is processed at CLT's Air Cargo Center. The Air Cargo Center, which is adjacent to CLT's four runways, has 570,000 square feet of available space and 2.2 million square feet of aircraft ramp space<sup>4</sup>, as shown in Figure 2.3.

#### FIGURE 2.3 CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT CARGO CENTER FACILITIES

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<sup>3</sup> Aviation Department". City of Charlotte. Accessed April 2022. Available at: <https://charlottenc.gov/aviation/Pages/default.aspx>

<sup>4</sup> "Quick Caller". Charlotte Douglas International Airport. Accessed April 2022.



Source: Charlotte Douglas International Airport, Quick Caller, 2020

As of 2020, the Air Cargo Center is used by more than 60 freight forwarders, customs brokers and international service providers, over 15 cargo airlines (including cargo lift by commercial carriers) and more than 300 trucking companies<sup>5</sup>. These numbers of freight forwarders, cargo airlines and trucking companies match those in the previous plan. CLT is also adjacent to a Foreign Trade Zone (FTZ). There is also an on-site intermodal rail/truck facility. The Air Cargo Center at CLT can link freight between air, rail, water and truck modes, and it processed nearly 116,600 tons of air cargo in 2017.

Rail connection is provided by Norfolk Southern Railway (NS). Figure 2.4 presents the rail connections near CLT. NS operates an intermodal container facility on the southwest side of CLT, which can process up to 250,000 lifts annually (up from 200,000 lifts annually in the previous plan) and has compatibility with aviation operations<sup>6</sup>. To access the Port of Morehead City for maritime freight shipments, NS track runs from Charlotte through Greensboro

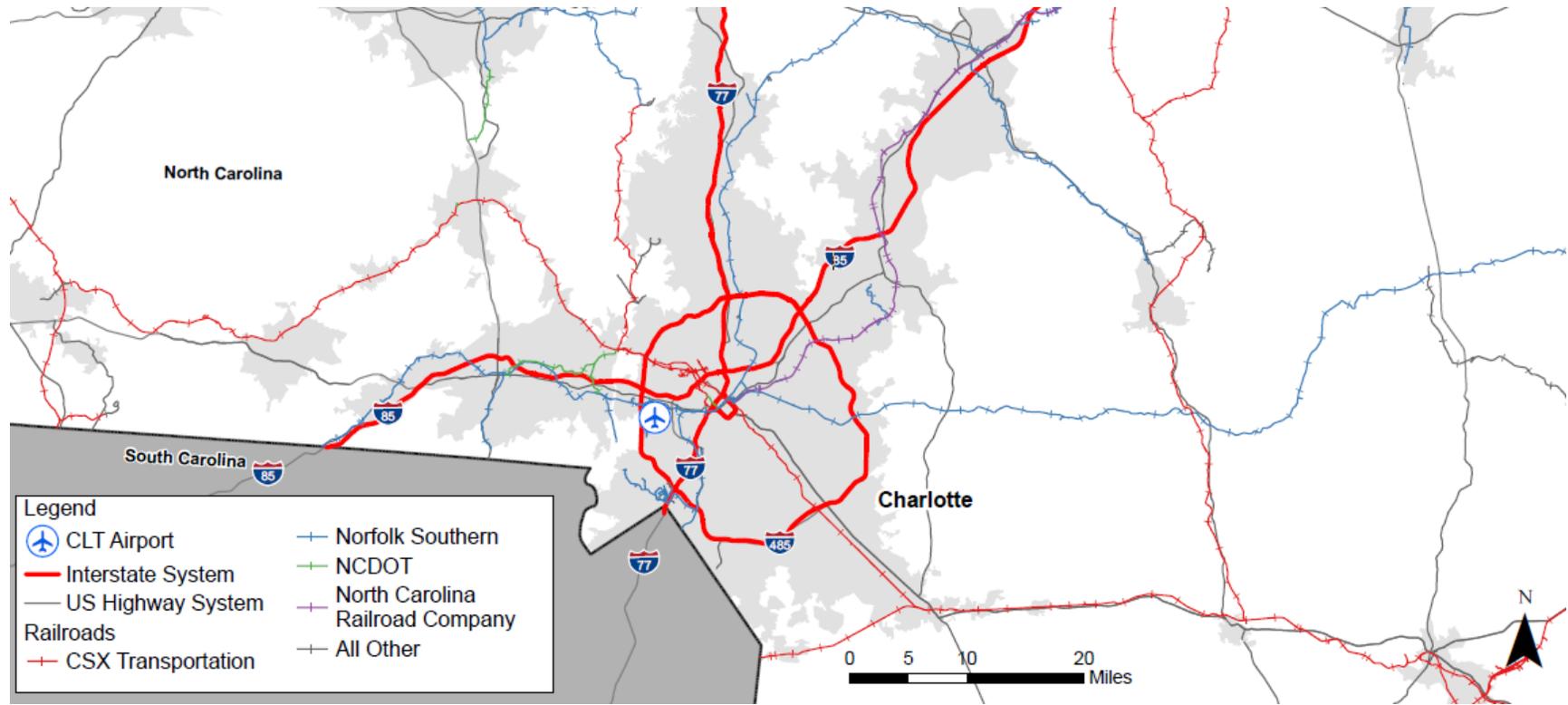
<sup>5</sup> "Quick Caller". Charlotte Douglas International Airport. Accessed April 2022.

<sup>6</sup> "Charlotte Intermodal Facility". STV Incorporated 2022. Accessed April 2022. Available at: <https://www.stvinc.com/project/charlotte-intermodal-facility#:~:text=The%20new%20facility%20has%20the,a%20%249.5%20billion%20economic%20benefit.>

and Raleigh to the coast. NS also operates both east-west and north-south in North Carolina, serving Charlotte. It has an intermodal terminal and bulk transfer terminal , east of CLT, but does not connect directly<sup>7</sup>.

In addition to the present facilities, CLT's Air Cargo Center has the capacity to handle more than 150,000 square feet of building space facilities. There are custom-built facilities including nearly 15,000 square feet of office space, nearly 28,000 square feet of cargo warehouse and a 21-foot minimum height warehouse clearance, all of which are located on-site and adjacent to ramps.

FIGURE 2.4 ACCESS TO CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT



Source: NCDOT; Bureau of Transportation Statistics<sup>8</sup>

<sup>8</sup> "Quick Caller". Charlotte Douglas International Airport. Accessed April 2022.

## Piedmont Triad International (GSO)

Piedmont Triad International Airport (GSO) is located 10 miles west of downtown Greensboro. It services the Piedmont Triad Region, which is a manufacturing, trade and financial center including the areas of Greensboro, High Point and Winston-Salem. GSO's core service area includes 12 North Carolina counties and six southern Virginia counties, a total population of 1.7 million people.<sup>9</sup> Piedmont Triad has five domestic freight forwarders and handles more than 340 million pounds of cargo a year.

GSO is a multimodal cargo facility, providing connections to major trucking lines operating terminals near the airport. Figure 2.5 shows the rail and highway access in and around the airport. Air cargo companies providing all-cargo services include FedEx, UPS, DHL Express, Airborne Express, AmeriJet International, Atlas Air, Kalitta and Mountain Air Cargo. In addition, a NS track runs along the south of GSO, along W. Market Street, but does not connect directly with the airport. However, there are plans to build a rail spur for a multimodal facility at GSO in the future. In addition, all other airlines provide belly cargo services based on space available, including American Airlines, Delta Airlines and United Airlines. There are four apron areas at GSO dedicated to air cargo services, totaling nearly 227,000 square feet of air cargo apron space with 400,000 square feet of warehouse space. GSO hosts the FedEx Express' Mid-Atlantic Air Hub, which is a 1 million square foot facility able to sort up to 24,000 packages per hour for freight destined for various east coast locations.<sup>10</sup> Mountain Air Cargo is FedEx's express cargo carrier. DHL Express leases nearly 15,000 square feet of space at GSO and 21Air, LLC operates a fleet of B767F aircrafts. UPS operates both express overnight cargo and ground cargo out of the airport in two separate facilities.<sup>11</sup>

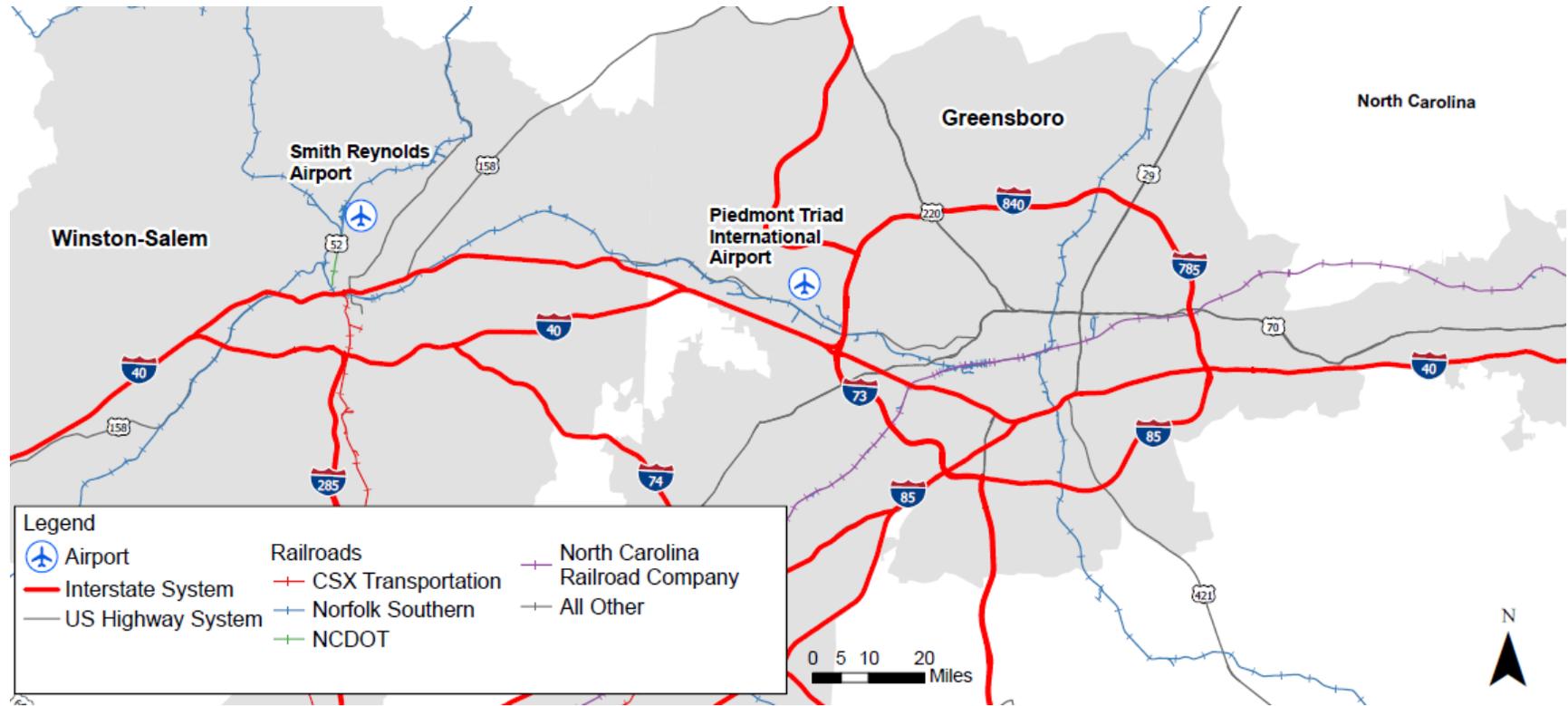
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<sup>9</sup> "About the Region". Piedmont Triad Regional Council. April 2022. Available at: <https://www.ptrc.org/about/about-the-region>

<sup>10</sup> Piedmont Triad International Airport. Greensboro North Carolina Economic Development Association. May 2013. Accessed April 2022. Available at: <http://www.greensboropartnership.com/sites/default/files/pdf/econdev/AirportText.pdf>

<sup>11</sup> Airport Master Plan Update and Strategic Long-Range Visioning Plan. Piedmont Triad International Airport Authority. September 2010. Accessed April 2022. Available at: <http://flyfrompti.com/wp-content/uploads/2014/08/Airport-Master-Plan-Update.pdf>

FIGURE 2.5 ACCESS TO PIEDMONT TRIAD INTERNATIONAL AIRPORT



Source: North Carolina DOT; National Transportation Atlas database

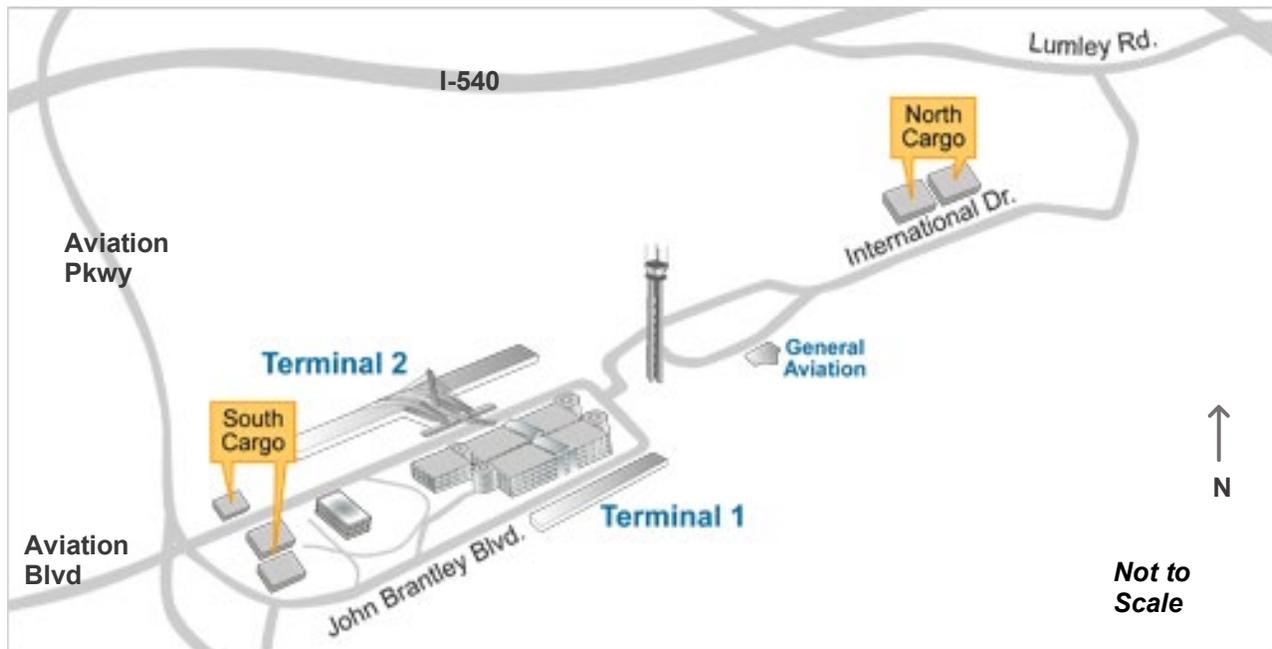


## Raleigh-Durham International (RDU)

Raleigh-Durham International Airport (RDU) is situated between the cities of Raleigh and Durham, located a few miles east of I-40/I-540 interchange near the town of Morrisville in Wake County. Thirteen air carriers (up from 9 air carriers in 2017) operate at RDU, including Southwest, American Airlines, Delta, Frontier, Jet Blue, and United Airlines<sup>12</sup>. Its primary service area includes Raleigh, Durham and the surrounding Research Triangle Region of North Carolina. The Research Triangle is known as a hub for education/ research facilities and technology companies, and is anchored by North Carolina State University, Duke University and the University of Chapel Hill.

Together, the North Cargo and South Cargo areas of RDU's campus have over 469,000 square feet of cargo space. Figure 2.7 provides an illustration of the airport's layout. The North Cargo area is located along International Drive near Cemetery Road. The North Cargo facilities house RDU's two all-cargo carriers, FedEx and UPS. The South Cargo facilities, reserved for cargo shipped via commercial airlines, are located near Aviation Parkway.

**FIGURE 2.7 RALEIGH-DURHAM INTERNATIONAL AIRPORT CARGO FACILITIES**

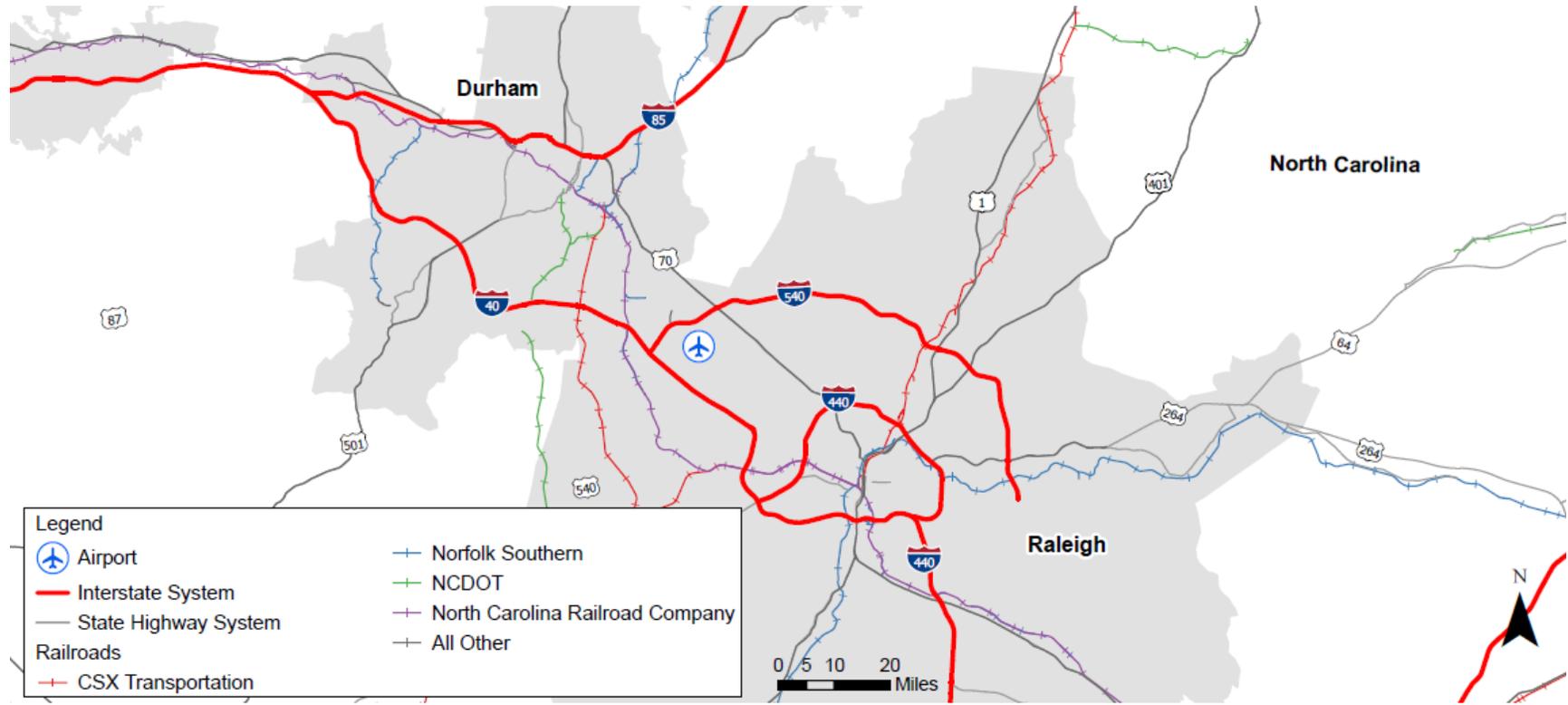


Source: Raleigh Durham International Airport. <https://www.rdu.com/fbo-and-cargo/>

Although there is no direct rail connection to either CSX or NS at RDU, both rail lines pass through Raleigh and near to RDU. Figure 2.8 presents a map of the rail and highway access to RDU.

<sup>12</sup> "Airlines Serving RDU". Raleigh-Durham International Airport. Accessed on June 9, 2022. Available from <https://www.rdu.com/airline-information/rdu-airlines/>

**FIGURE 2.8 ACCESS TO RALEIGH-DURHAM INTERNATIONAL AIRPORT**



Source: NCDOT; National Transportation Atlas database

## North Carolina Global TransPark (GTP)

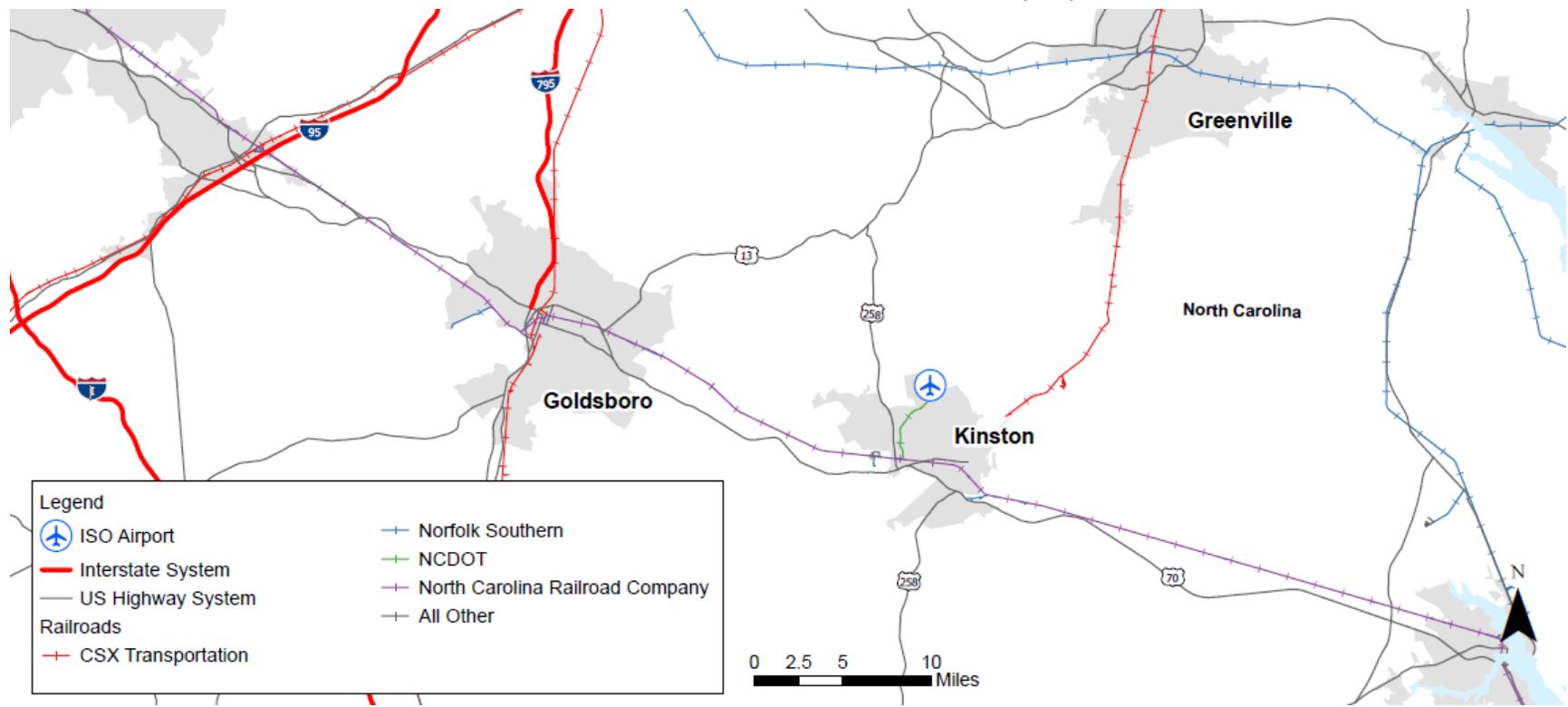
The North Carolina Global TransPark (GTP), located in Kinston in Lenoir County, is a 2,500-acre industrial site with highway, airport and rail access. Kinston Regional Jetport (ISO) is located onsite, which features the longest commercial runway in North Carolina at 11,500 feet and can handle the largest cargo aircraft, unlike RDU and CLT which have shorter runways. Additionally, ISO, which was renovated in 2010, handles commercial, military and general aviation flights, has more than 404,000 square feet of apron space, a TSA security station onsite and runway strength of 806,000 pounds double dual tandem (DDTW).<sup>13</sup>

GTP is located near U.S. Highway 70, a major trucking route in North Carolina. It is also within proximity to deep-water ports in Morehead City, Wilmington, Norfolk and Charleston and features a 5.8-mile rail spur which provides direct access to the Port of Morehead City. Additionally, GTP is 50 miles away from I-95 and 46 miles from I-40, both of which are major interstate truck routes. Figure 2.9 presents a map of the rail and highway access to GTP and ISO.

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<sup>13</sup> "Kinston Regional Airport". North Carolina Global TransPark. Accessed October 13, 2016. Available from: <http://www.ncgtp.com/features/kinston-regional-jetport.html>

**FIGURE 2.9 ACCESS TO KINSTON REGIONAL JETPORT AND GLOBAL TRANSPARK (ISO)**



Source: North Carolina DOT; National Transportation Atlas database

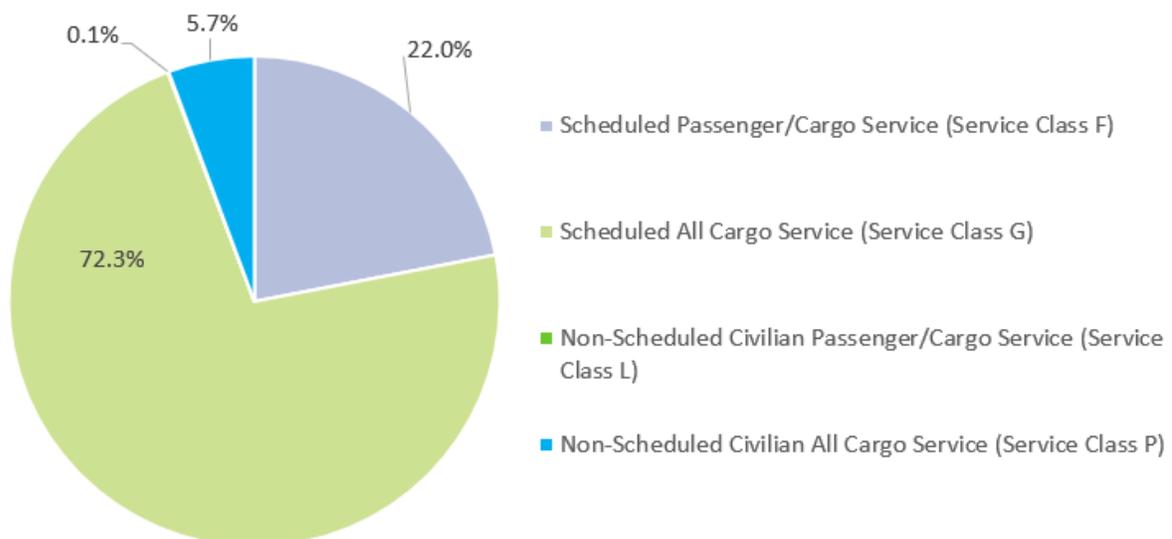
## 2.3 Air Cargo Service Providers

According to the Bureau of Transportation Statistics (BTS), there are four types of air cargo services available to and from North Carolina:

- Service Class F: Scheduled passenger/cargo service (includes freight/ mail belly cargo)
- Service Class G: Scheduled all cargo service (no passengers, including FedEx/UPS)
- Service Class L: Non-scheduled civilian passenger/cargo service (includes freight/mail belly cargo)
- Service Class P: Non-scheduled civilian all cargo service (no passengers)

Scheduled all cargo service was by far the most common in 2019, comprising 72.3% of all tonnage. Scheduled passenger/cargo service (i.e. belly cargo) occurred 22.0% of the time, with the non-scheduled services comprising of 5.7% of all activity. Non-scheduled service is defined as revenue flights, such as chartered flights, that are not operated on a regularly scheduled service. Service classes L and P do not include military service activity. These percentages of air cargo activity are similar to the percentages in the previous plan with Service Class P slightly increasing from 2% to 5.7%. Figure 2.10 shows the percentages of air cargo service types in North Carolina.

**FIGURE 2.10 AIR CARGO SERVICE TYPES, NORTH CAROLINA AIRPORTS, 2019**



Source: *BTS TranStats Database, 2019*

Two primary carriers – FedEx and United Parcel Service (UPS) – transported air cargo, which includes both freight and mail, as shown in Table 2.1 and Figure 2.11. FedEx carried over 133,000 tons of air freight in 2019, which comprised 53% of all cargo. UPS carried nearly 46,000 tons of both freight and mail, which accounted for 18% of the total. Other domestic and international passenger carriers, including American Airlines, Delta Air Lines and

Southwest Airlines, transported a small amount of belly cargo. ABX Air<sup>14</sup>, which carried six percent of all air cargo in North Carolina, is a cargo airline that provides aircraft, crew, maintenance and insurance freight services. Kalitta Air LLC<sup>15</sup> operates a large fleet of all-cargo aircraft from its base in Ypsilanti, MI.

**TABLE 2.1 TOP AIR CARGO CARRIERS AT NORTH CAROLINA AIRPORTS, 2019**

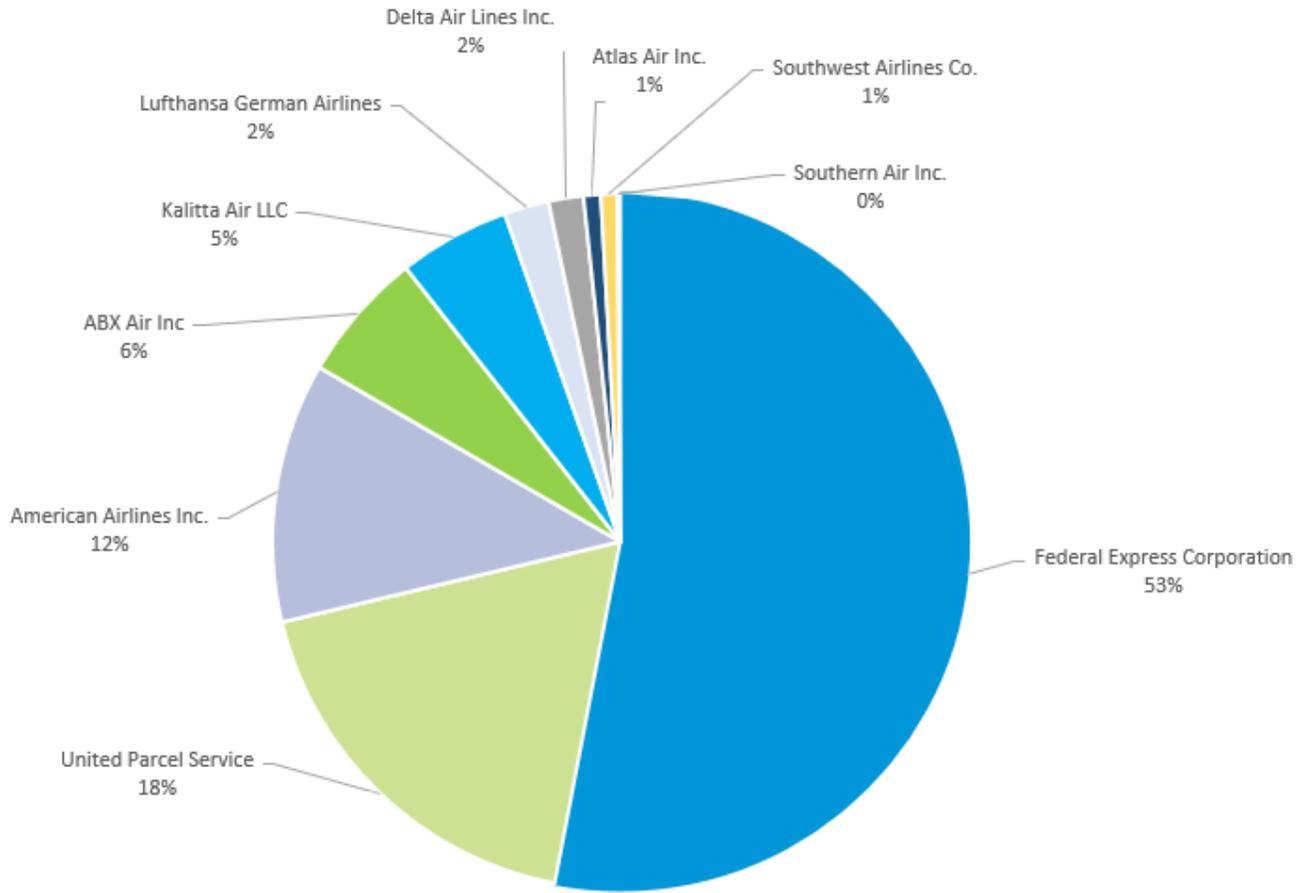
Carrier Name	Freight Tons	Mail Tons	Total Tons	% Of Total Tons
Federal Express Corporation	133,663	-	133,663	53%
United Parcel Service (UPS)	45,982	63	46,045	18%
American Airlines Inc.	23,359	7,081	30,440	12%
ABX Air Inc	15,317	-	15,317	6%
Kalitta Air LLC	13,065	-	13,065	5%
Lufthansa German Airlines	5,235	-	5,235	2%
Delta Air Lines Inc.	2,467	1,621	4,088	2%
Atlas Air Inc.	2,009	-	2,009	1%
Southwest Airlines Co.	1,955	-	1,955	1%
Southern Air Inc.	291	-	291	< 1%
<b>Total</b>	<b>244,125</b>	<b>9,477</b>	<b>253,602</b>	<b>100%</b>

Source: BTS TranStats Database, 2019

<sup>14</sup> ABX Air. Accessed March 2022. Available at: <https://www.abxair.com/>

<sup>15</sup> Kalitta Air LLC. N.D. Accessed March 2022. Available at: <http://www.kalittaair.com/>

**FIGURE 2.11 TOP AIR CARGO CARRIERS AT NORTH CAROLINA AIRPORTS, IN TONS (THOUSANDS), 2019**



Source: *BTS TranStats Database, 2019*

## 3.0 NETWORK USAGE AND PERFORMANCE

This section details the demand for air cargo in North Carolina, statewide and at each of the three hubs for air cargo. It will include air cargo trade partners, tonnage, value and top commodities.

### 3.1 Air Cargo Activity and Demand

#### Statewide Demand

In 2017, North Carolina airports handled nearly 286,000 tons of air cargo worth \$24.7 billion. Compared to other modes, air cargo is a relatively small amount of the State's overall freight activity: 624 million tons worth \$794 billion traveled by truck, 38 million tons worth \$11.6 billion traveled by rail and 292,000 tons worth \$75 million traveled by water. However, air cargo has a substantially higher value per ton compared to the rest of the modes, more than \$91,300 per ton compared to \$1,300 per ton (highway), \$300 per ton (rail) and \$250 per ton (water).

There were 17 airports with reported freight and mail activity in 2019. North Carolina traded air cargo with over 200 airports in the U.S. and across the world, including 43 international airports in 2019. Table 3.1 presents the top air cargo trading partners from 2019, which include four international cities and 14 U.S. cities. Memphis International Airport (MEM) is, by far, North Carolina's top air trade partner, with over 76,000 tons transferred in 2019, 30% of all air cargo in the state. MEM was also North Carolina's top trade partner in the 2017 Statewide Multimodal Freight Plan. The two other significant cities for air cargo trade include Louisville, KY (Louisville International Airport) and Cincinnati/Northern Kentucky International Airport. Together, these top three airports comprise 52% of all air cargo to and from North Carolina. In the previous plan, the top three trade partners handled 69% of all air cargo tonnage. UPS has hubs in Memphis, Louisville and Cincinnati, while FedEx has sorting facilities in Memphis (global hub) and Indianapolis (national hub).

**TABLE 3.1 TOP NORTH CAROLINA AIR CARGO TRADE PARTNERS, 2019**

Airport Code	Airport	City	Total Tons (Thousands)	%
13244	Memphis International	Memphis, TN	76,471	30%
14730	Louisville International-Standiford Field	Louisville, KY	32,357	13%
11193	Cincinnati/Northern Kentucky International	Cincinnati, OH	22,121	9%
12339	Indianapolis International	Indianapolis, IN	18,744	7%
14100	Philadelphia International	Philadelphia, PA	13,746	5%
12972	London Heathrow	London, United Kingdom	8,260	3%
13518	Munich Airport	Munich, Germany	7,234	3%
10397	Hartsfield-Jackson Atlanta International	Atlanta, GA	7,133	3%
13891	Ontario International	Ontario, CA	5,494	2%
11760	Frankfurt Main	Frankfurt, Germany	3,862	2%

Airport Code	Airport	City	Total Tons (Thousands)	%
11618	Newark Liberty International	Newark, NJ	3,318	1%
10693	Nashville International	Nashville, TN	3,233	1%
10920	Paris Charles de Gaulle	Paris, France	2,885	1%
13487	Minneapolis-St Paul International	Minneapolis, MN	2,632	1%
14574	Roanoke Blacksburg Regional Woodrum Field	Roanoke, VA	2,492	1%
11298	Dallas/Fort Worth International	Dallas/Fort Worth, TX	2,115	1%
12324	Wilmington Air Park	Wilmington, OH	1,888	1%
11697	Fort Lauderdale-Hollywood International	Fort Lauderdale, FL	1,844	1%

Source: BTS TranStats Database, 2019

The top three airports for air cargo activity in North Carolina are Charlotte Douglas International (CLT), Piedmont Triad International (GSO) and Raleigh-Durham International (RDU). Table 3.2 presents the total air cargo activity reported at each airport in 2019, which includes both freight and mail. Activity at CLT, GSO and RDU makes up 99% of all air cargo activity in the state. These top three airports also carried 99% of North Carolina's air cargo in the 2017 Statewide Multimodal Freight Plan.

**TABLE 3.2 TOTAL AIR CARGO ACTIVITY IN NORTH CAROLINA, 2019**

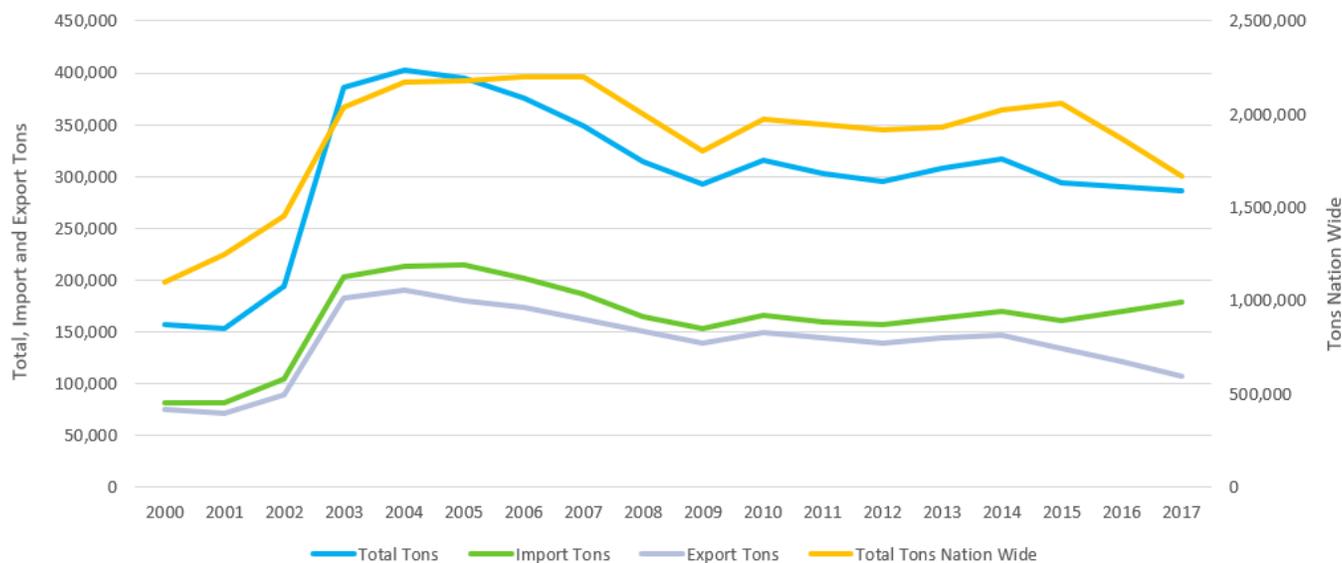
Airport Code	Airport Name	Total Tons	% Of Total
11057	Charlotte Douglas International	85,967	44%
11995	Piedmont Triad International	65,957	34%
14492	Raleigh-Durham International	41,804	21%
11617	Coastal Carolina Regional	620	< 1%
12323	Wilmington International	600	< 1%
11992	Seymour Johnson AFB	119	< 1%
13619	Gastonia Municipal	90	< 1%
13246	Dare County Regional	36	< 1%
14197	Pope AAF	26	< 1%
12149	Hickory Regional	8	< 1%
10431	Asheville Regional	7	< 1%
15163	Person County	4	< 1%
11641	Fayetteville Regional/Grannis Field	< 1	< 1%
14092	Pitt Greenville	< 1	< 1%

Airport Code	Airport Name	Total Tons	% Of Total
13795	Albert J. Ellis	< 1	< 1%
	<b>All Airports</b>	<b>195,240</b>	<b>100%</b>

Source: BTS TranStats Database, 2019

Since 2000, air cargo activity throughout North Carolina has fluctuated significantly. Figure 3.1 presents a chart with imported, exported and total air cargo tonnages in North Carolina from 2000 to 2017. The 2017 tonnage value is from FAF5 with the 2016 data point having been interpolated from the 2015 and 2017 data. The state experienced a substantial jump in total tonnage between 2002 and 2003, peaking in 2004 at over 400,000 total tons of air cargo. Since 2004, the weight of air cargo shipments has declined and hovered around 300,000 tons. However, total tonnage has hit two low points: following the global recession in 2009 (292,000 total tons) and during a year of rapidly declining fuel prices in 2015 (293,000 total tons). There was a slight increase of imported air cargo in 2017 (169,000 tons) and a slight decrease of exported air cargo the same year (120,000 tons). This resulted in a decrease of total air cargo tons from 2015 (293,000 total tons) to 2017 (286,000 total tons). Overall, imported air cargo exceeds exported air cargo by weight. Nationwide air cargo activity between 2000 and 2017 takes a similar shape, as shown in Figure 3.1.

**FIGURE 3.1 NORTH CAROLINA AIR CARGO ACTIVITY COMPATED TO NATION WIDE AIR CARGO ACTIVITY, 2000-2017**



Source: BTS TranStats Database, 2000-2017; FAF5

Generally, air freight modes tend to receive the highest proportion of high-value, low-weight commodities due to the high cost of air transport when compared with surface modes. In 2019, the top transported commodity by air at North Carolina airports was machinery, totaling nearly 55,000 tons (19% of total tonnage) worth over \$5.2 billion, as shown in Table 3.3 and Table 3.4. Similarly, electronics was the second most transported commodity by air a, totaling over 37,000 tons (13%) worth nearly \$4.9 billion. Textiles/leather was another important commodity by value, worth over \$4.3 billion (12%) in 2017. Table A-1. features a description the SCTG commodity codes, which will be used to discuss commodity flow throughout this report.

In the previous 2017 Statewide Multimodal Freight Plan, electronics made up 21% of the total tonnage of commodities transported in 2015. Electronics decreased from 21% (2015) to 13% (2017) of tons of electronics transferred via air cargo.

**TABLE 3.3 TOP 10 COMMODITIES BY TONNAGE AT NORTH CAROLINA AIRPORTS, 2017**

SCTG Code	Commodity	Total Tons	% Of Total
34	Machinery	54,960	19%
35	Electronics	37,550	13%
30	Textiles/leather	33,232	12%
21	Pharmaceuticals	17,325	6%
24	Plastics/rubber	15,936	6%
38	Precision instruments	15,248	5%
33	Articles-base metal	14,322	5%
36	Motorized vehicles	14,049	5%
23	Chemical products	11,822	4%
20	Basic chemicals	9,507	3%

Source: FAF5 data

**TABLE 3.4 TOP 10 COMMODITIES BY VALUE AT NORTH CAROLINA AIRPORTS, 2017**

SCTG Code	Commodity	Total Value (\$M)	% Of Total
21	Pharmaceuticals	5,268	21%
35	Electronics	4,963	20%
34	Machinery	4,335	18%
38	Precision instruments	1,884	8%
24	Plastics/rubber	1,124	5%
37	Transport equipment	987	4%
20	Basic chemicals	907	4%
23	Chemical products	756	3%
30	Textiles/leather	711	3%
40	Misc. manufacturing products	640	3%

Source: FAF5 data

## Charlotte Douglas International (CLT)

Out of all North Carolina airports, Charlotte Douglas International Airport (CLT) handles the most air cargo, nearly 117,000 tons in 2017. This has decreased around 10,000 tons since 2015. Figure 3.2 presents air cargo activity at CLT from 2000 to 2017. The 2017 tonnage value is from FAF5 with the 2016 data point having been extrapolated from the 2015 and 2017 data. It experienced a peak in total tonnage in 2005 (nearly 189,000 tons), but has since declined, reaching a low point in 2009 (118,000 pounds). There was a slight increase of imported air cargo in 2017 (80,000 tons) and a slight decrease of exported air cargo the same year (36,500 tons). This resulted in a decrease of total air cargo tons from 2015 (128,000 total tons) to 2017 (116,000 total tons). Overall, although imported air cargo has been consistently higher than exported air cargo tonnage, the gap has remained small.

**FIGURE 3.2 CHARLOTTE DOUGLAS INTERNATIONAL AIR CARGO ACTIVITY, 2000-2017**



Source: BTS TranStats Database, 2000-2015; FAF5, 2017

CLT exchanged air cargo with 228 airports, both domestic and international, in 2019. However, only a handful of airports handled most of the cargo to and from CLT, as shown in Table 3.5. These top airports include Memphis International Airport (MEM), Louisville International Airport (SDF) and Cincinnati/Northern Kentucky International (CVG) which comprised 45% of all cargo. FedEx has its global hub in Memphis and its national hub in Indianapolis, and UPS has hubs in Memphis and Louisville. CLT exchanged approximately 23% of all air cargo with international airports, including Munich, London, Frankfurt, Paris, Madrid and Rome. In 2015, CLT exchanged 20% of all air cargo with international airports. Out the state’s air cargo airports, CLT provides the most service to international markets.

**TABLE 3.5 CHARLOTTE DOUGLAS INTERNATIONAL TOP AIR CARGO TRADE PARTNERS, 2019**

Airport Code	Airport	City	Total Tons	% Of Total
13244	Memphis International	Memphis, TN	27,226	26%
14730	Louisville International-Standiford Field	Louisville, KY	10,679	10%
11193	Cincinnati/Northern Kentucky International	Cincinnati, OH	9,506	9%
12339	Indianapolis International	Indianapolis, IN	8,753	8%
13518	Munich Airport	Munich, Germany	7,234	7%
14100	Philadelphia International	Philadelphia, PA	5,419	5%
12972	London Heathrow	London, United Kingdom	5,044	5%
13891	Ontario International	Ontario, CA	4,296	4%

Airport Code	Airport	City	Total Tons	% Of Total
11760	Frankfurt Main	Frankfurt, Germany	3,862	4%
12324	Wilmington Air Park	Wilmington, OH	1,888	2%
10920	Paris Charles de Gaulle	Paris, France	1,389	1%
13198	Kansas City International	Kansas City, MO	1,339	1%
13156	Adolfo Suarez Madrid Barajas	Madrid, Spain	1,192	1%
11651	Fiumicino	Rome, Italy	1,081	1%
14512	Chicago/Rockford International	Rockford, IL	862	1%

Source: BTS TranStats Database, 2019

In 2017, the top transported commodity by air at CLT was machinery, totaling over 24,700 tons (21% of total tonnage) worth \$1.6 billion, as shown in Table 3.6. Electronics were another top commodity, totaling nearly 13,500 tons worth \$1.5 billion. Notably, the top three commodities by value – machinery, electronics and pharmaceuticals – comprised 56% of the total value of air freight at CLT.

**TABLE 3.6 TOP 10 COMMODITIES AT CHARLOTTE DOUGLAS INTERNATIONAL, 2017**

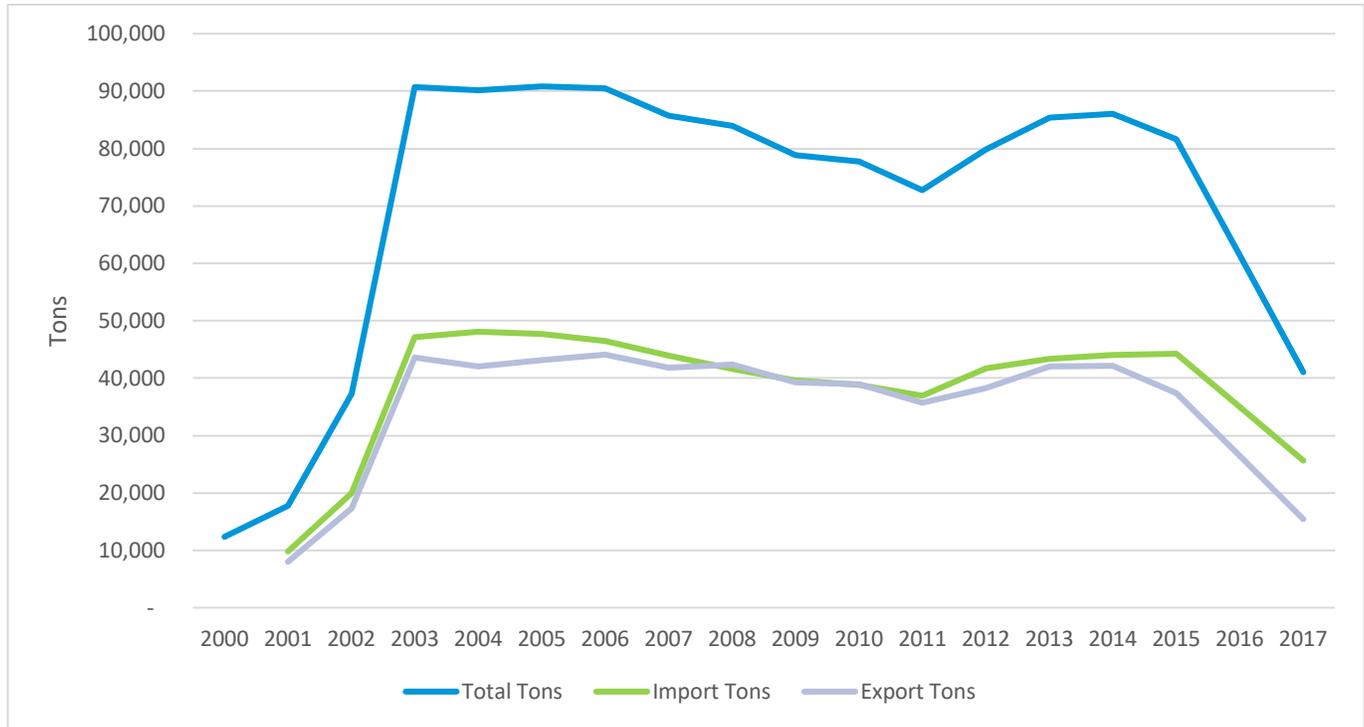
SCTG Code	Commodity	Total Tons	% Of Total by Weight	Total Value (\$M)	% Of Total by Value
34	Machinery	24,754	21%	1564	21%
35	Electronics	13,484	12%	1487	20%
30	Textiles/leather	13,206	11%	257	3%
36	Motorized vehicles	9,873	8%	583	8%
24	Plastics/rubber	7,031	6%	175	2%
33	Articles-base metal	9,972	9%	332	4%
21	Pharmaceuticals	4,173	4%	1105	15%
38	Precision instruments	11,733	10%	495	7%
20	Basic chemicals	3,935	3%	129	2%
23	Chemical products	1,697	1%	127	2%

Source: FAF5

## Piedmont Triad International (GSO)

GSO had the third-highest air cargo volumes by weight in 2017, nearly 41,000 total tons. Figure 3.3 presents air cargo activity at GSO from 2000 to 2017. The 2017 tonnage value is from FAF5 with the 2016 data point having been extrapolated from the 2015 and 2017 data. Between 2003 and 2006, total tonnage was over 90,000 tons, after which it steadily declined until 2011 (nearly 73,000 total tons) and increased thereafter. Imported air cargo volumes have generally been higher than exported cargo, although the difference was negligible between 2008 and 2011, when volumes were nearly equal. The difference between imported and exported cargo has notably widened and decreased from 2015 to 2017.

**FIGURE 3.3** PIEDMONT TRIAD INTERNATIONAL AIR CARGO ACTIVITY, 2000-2017



Source: BTS TranStats Database, 2000-2015; FAF5, 2017

In 2015, GSO was the airport with the second-highest air cargo volumes by weight in North Carolina. It was surpassed by Raleigh-Durham International Airport in 2017. GSO exchanged air cargo with 40 airports in 2019. Four airports handled 45% of all cargo trade with GSO: Memphis International Airport (MEM), Louisville International-Standiford Field (SDF), Indianapolis International Airport (IND) and Philadelphia International Airport (PHL). Again, FedEx has its global hub in Memphis and its national hub in Indianapolis, and UPS has hubs in Memphis, Louisville and Cincinnati.

**TABLE 3.7** PIEDMONT TRIAD INTERNATIONAL (GSO) TOP AIR CARGO TRADE PARTNERS, 2019

Airport Code	Airport Name	City	Total Tons	% Of Total
13244	Memphis International	Memphis, TN	22,185	34%
14730	Louisville International-Standiford Field	Louisville, KY	13,248	20%
12339	Indianapolis International	Indianapolis, IN	7,155	11%
14100	Philadelphia International	Philadelphia, PA	6,007	9%
12972	London Heathrow	London, United Kingdom	3,216	5%
10920	Paris Charles de Gaulle	Paris, France	1,497	2%
13891	Ontario International	Ontario, CA	1,198	2%
14771	San Francisco International	San Francisco, CA	1,035	2%

Airport Code	Airport Name	City	Total Tons	% Of Total
14576	Greater Rochester International	Rochester, NY	914	1%
12889	McCarran International	Las Vegas, NV	877	1%

Source: BTS TranStats Database, 2019.

Table 3.8 presents the top air commodities at GSO in 2017. Consistent with the statewide figures, machinery and electronics were the top commodities by weight at over 9,400 tons and 5,400 tons, respectively. Electronics and machinery were also the top two commodities at Piedmont Triad International in 2015. When including textiles/leather, these top three commodities made up 48% of total air freight value transported at GSO.

**TABLE 3.8 TOP 10 COMMODITIES AT PIEDMONT TRIAD INTERNATIONAL, 2017**

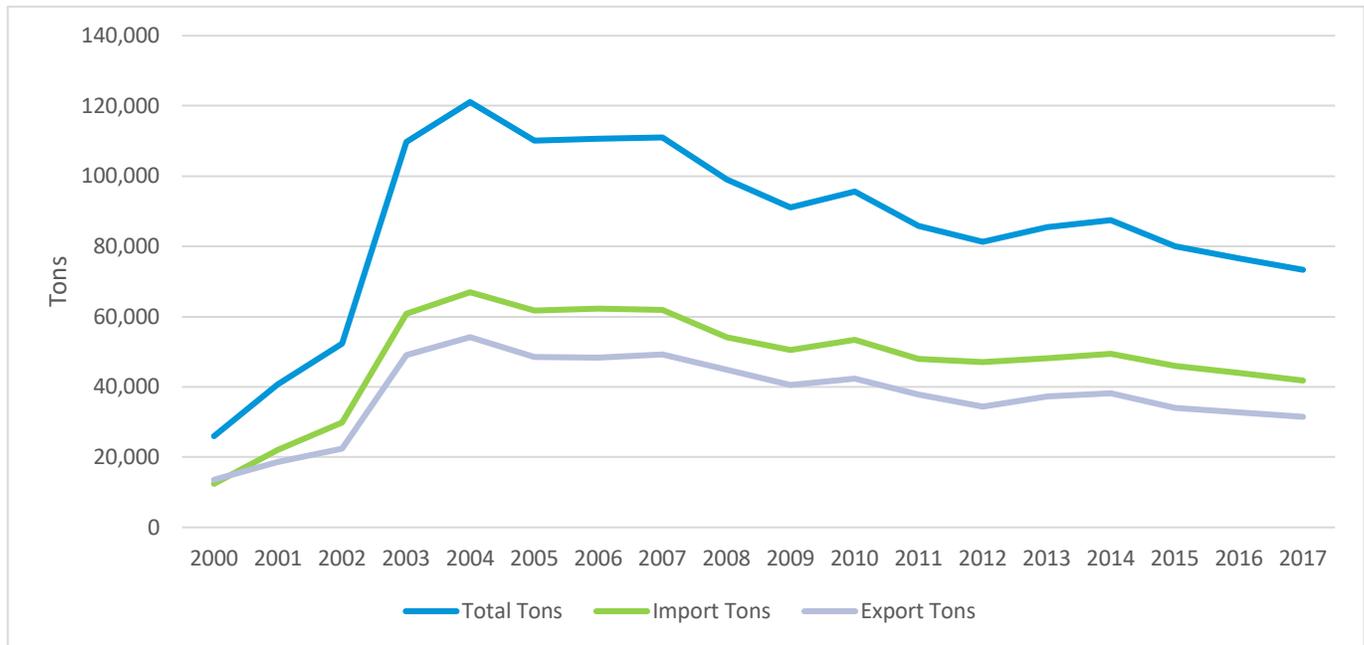
SCTG Code	Commodity	Total Tons	% Of Total Tons	Total Value (\$M)	% Of Total Value
34	Machinery	9,397	23%	687	18%
35	Electronics	5,356	13%	765	20%
30	Textiles/leather	4,934	12%	101	3%
38	Precision instruments	3,012	7%	518	14%
21	Pharmaceuticals	2,291	6%	760	20%
24	Plastics/rubber	2,147	5%	125	3%
33	Articles-base metal	1,800	4%	101	3%
23	Chemical products	1,629	4%	107	3%
20	Basic chemicals	1,116	3%	90	2%
39	Furniture	1,030	3%	34	1%

Source: FAF5

## Raleigh-Durham International (RDU)

Raleigh-Durham International Airport (RDU) primarily serves the Triangle region in North Carolina and had the second-highest cargo volumes in 2017, just over 73,000 total tons. Figure 3.4 presents air cargo activity at RDU from 2000 to 2017. The 2017 tonnage value is from FAF5 with the 2016 data point having been extrapolated from the 2015 and 2017 data. After peaking in 2004 at over 121,000 total tons, air cargo activity has declined steadily and imported tons have remained higher than exported tons. From 2015 to 2017, both imported and exported tons slightly decreased. Additionally, since 2000, imported air cargo has been consistently and notably higher than exported cargo.

**FIGURE 3.4 RALEIGH-DURHAM INTERNATIONAL AIR CARGO ACTIVITY, 2000-2017**



Source: BTS TranStats Database, 2000-2015; FAF5, 2017

RDU air cargo traveled between 77 airports in 2019, as shown in Table 3.9. Three airports handled 65% of all cargo: Memphis International Airport (MEM), Louisville International Airport (SDF) and Indianapolis International Airport (IND).

**TABLE 3.9 RALEIGH-DURHAM INTERNATIONAL TOP AIR CARGO TRADE PARTNERS, 2019**

Airport Code	Airport Name	City	Total Tons	% Of Total
13244	Memphis International	Memphis, TN	22,185	34%
14730	Louisville International-Standiford Field	Louisville, KY	13,248	20%
12339	Indianapolis International	Indianapolis, IN	7,155	11%
14100	Philadelphia International	Philadelphia, PA	6,007	9%
12972	London Heathrow	London, United Kingdom	3,216	5%
10920	Paris Charles de Gaulle	Paris, France	1,497	2%
13891	Ontario International	Ontario, CA	1,198	2%
14771	San Francisco International	San Francisco, CA	1,035	2%
14576	Greater Rochester International	Rochester, NY	914	1%
12889	McCarran International	Las Vegas, NV	877	1%

Source: BTS TranStats Database, 2019.

The top commodities at RDU were consistent with other top airports in the state, as shown in Table 3.10. Machinery and electronics were the top two commodities by weight, comprising 17% and 15% of total tonnage, respectively. When including pharmaceuticals, these three commodities comprised 60% of total air freight value transported at RDU.

**TABLE 3.10 TOP 10 COMMODITIES AT RALEIGH-DURHAM INTERNATIONAL, 2017**

SCTG Code	Commodity	Total Tons	% Of Total Tons	Total Value (\$M)	% Of Total Value
34	Machinery	12,538	17%	1,285	15%
35	Electronics	10,715	15%	1,676	19%
30	Textiles/leather	8,288	11%	206	2%
21	Pharmaceuticals	5,813	8%	2,323	26%
23	Chemical prods.	4,097	6%	382	4%
24	Plastics/rubber	3,951	5%	702	8%
38	Precision instruments	3,384	5%	474	5%
37	Transport equipment	2,850	4%	158	2%
40	Misc. manufacturing products	2,845	4%	203	2%
20	Basic chemicals	2,519	3%	543	6%

Source: FAF5

## North Carolina Air Cargo

The remainder of North Carolina outside of the metropolitan areas of Charlotte, Raleigh and Greensboro transported nearly 55,000 tons of commodities valued at \$4.7 million via air cargo. The top commodities by tonnage and value lined up with the commodities transported at CLT, RDU and GSO.

## 4.0 FUTURE PERFORMANCE AND LONG-TERM TRENDS

The U.S. airline industry has changed significantly since the 1990s. After terror attacks on the World Trade Center on September 11, 2001, the airline industry consolidated and restructured from 12 major U.S. airlines in 2005 to four major U.S. airlines in 2019: Delta, American, Southwest and United.<sup>16</sup> These four airlines, along with Alaska/Virgin and JetBlue, accounted for 85% of the United States airline industry traffic and capacity. Additionally, the U.S. economy entered a period of downturn after the 2008 recession.<sup>17</sup> The airline mergers, coupled with a difficult economic climate and competition from emerging low-cost airlines, has resulted in reduced profitability for air cargo. Many airlines have increased the number of small size regional jets in their fleet to save on operating costs, which reduces the availability of belly cargo services.<sup>18</sup> In addition, there are several other market factors that

<sup>16</sup> "FAA Aerospace Forecast: 2019-2039". Federal Aviation Administration. Available from: <https://www.faa.gov/newsroom/federal-aviation-administration-faa-aerospace-forecast-fiscal-years-fy-2019-2039#:~:text=Regional%20Carriers,reaching%20224.1%20million%20in%202039.>

<sup>17</sup> "FAA Aerospace Forecast: 2019-2039".

<sup>18</sup> "Airport Master Plan Update and Strategic Long-Range Visioning Plan". Piedmont Triad Airport Authority. September 2010. Accessed April 2022. Available from: <http://flyfrompti.com/wp-content/uploads/2014/08/Airport-Master-Plan-Update.pdf>

have reduced the dependency of shippers on air cargo. Air cargo carriers are experiencing price competition from other freight modes such as trucks and container ships. Additionally, demand for express service from all-cargo carriers such as FedEx and UPS have exploded in recent years as consumers increasingly purchase their goods online. This accelerated growth of increased air cargo services has occurred on top of an already large market share of moving goods via air.<sup>19</sup> Air cargo has also experienced a series of disruptive events: emergence of integrators (DHL, FedEx and UPS), dedicated controlled air lift for major freight forwarders, controlled lift for e-commerce platforms and major ocean carriers.

This section presents two forecasts: low and high growth scenarios. The low growth scenario was developed using 2050 low growth estimates generated by FAF5. The high growth scenario was developed using 2050 high growth estimate generated by FAF5. The numbers generated in this plan were compared to the numbers generated in the previous plan and were deemed to be in line with each other. This section will provide detail on both results for North Carolina and for the three primary airports in the state.

## 4.1 Future Activity and Demand Statewide

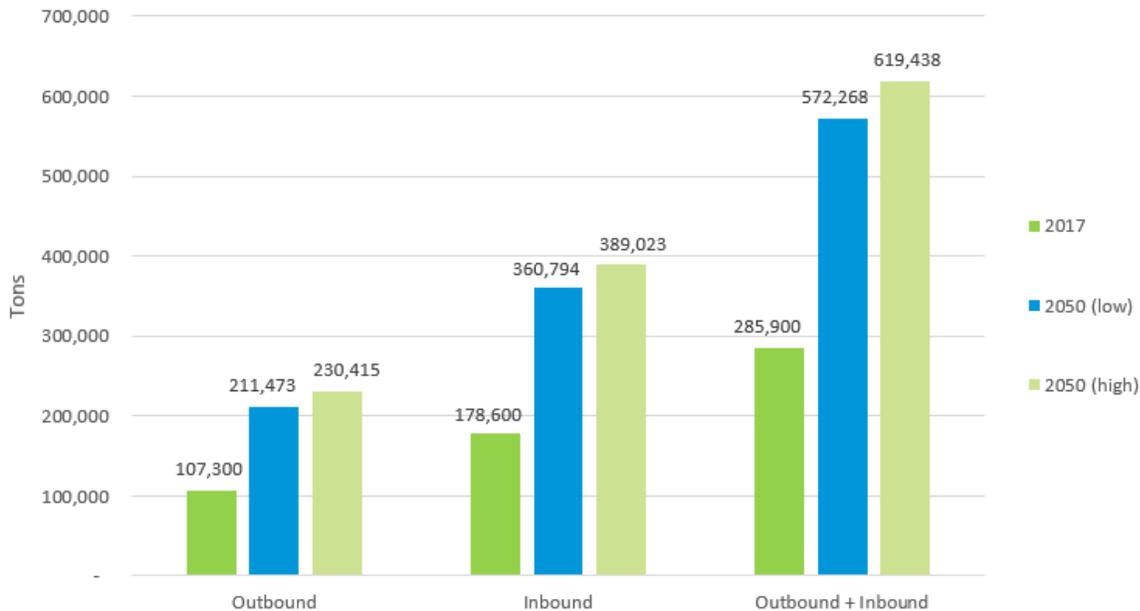
By 2050, total air cargo tonnage in North Carolina is expected to increase overall, as was the same expectation in the previous 2017 plan for 2045 data. In the low growth scenario, tonnage is expected to grow moderately by 100%, from approximately 285,900 tons in 2017 to over 572,000 tons in 2050. This is an annual growth of 3.03% over the 30-year period, which is up from the 2017 plan's 30-year period annual growth prediction of 0.9% from 2015 to 2045. In the high growth scenario, tonnage is expected to more than double to more than 619,000 tons in 2050. This is an overall growth of 117%, with an annual growth rate of 3.55%. By comparison, the FAA projects U.S. air cargo activity (measured in revenue ton miles) to almost double between 2019 and 2039 for domestic and international combined, a total growth of 91.4% at an annual rate of 2.76%.<sup>20</sup> Considering the air cargo market trends, the low growth scenario is more realistic in predicting future demand in North Carolina and the next sections will summarize both scenarios while highlighting key statistics from the low growth scenario analysis. Figure 4.1 illustrates the difference between the high and low growth scenarios.

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<sup>19</sup> "FAA Aerospace Forecast: 2019-2039".

<sup>20</sup> "FAA Aerospace Forecast: 2019-2039".

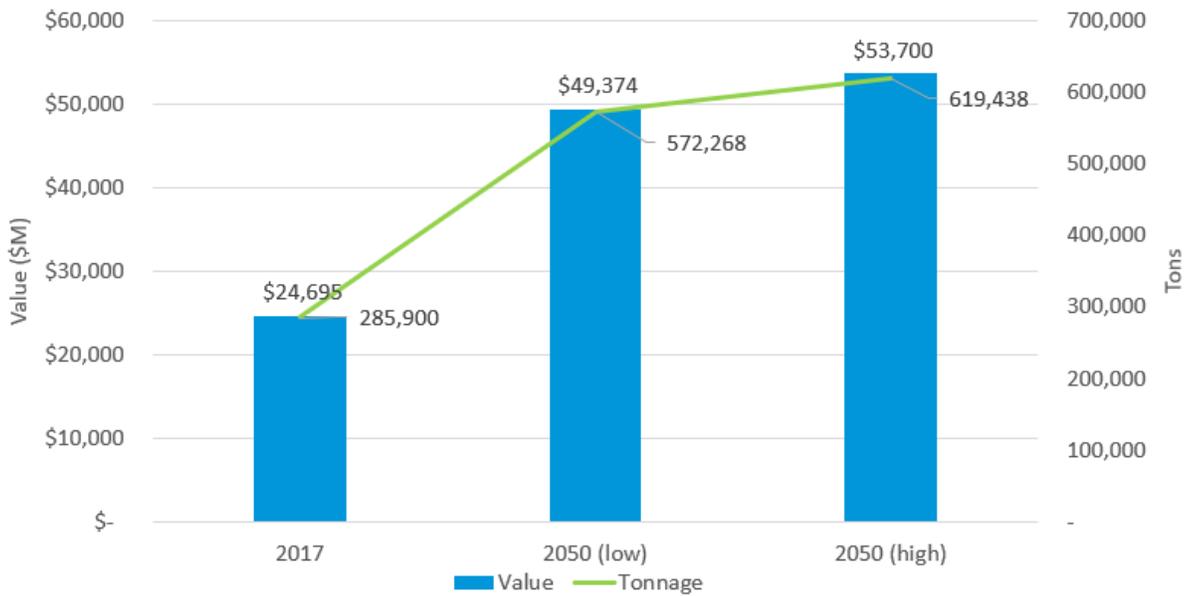
**FIGURE 4.1 PROJECTED AIR CARGO TONNAGE IN NORTH CAROLINA, BY DIRECTION AND GROWTH SCENARIO, 2017**



Source: FAF5

The value of air cargo in North Carolina is also expected to increase substantially according to the low growth scenario, from \$24.7 billion in 2017 to \$49.4 billion in 2050, an increase of approximately 100%. This is up from the 2017 plan's predicted growth of \$23 billion in 2015 to \$41.6 billion in 2045, an increase of 81%. Additionally, the high growth scenario forecasts growth of 133%, to over \$53.7 billion. Overall, air cargo value is growing at roughly the same pace, showing that the high value goods will continue to be transported via air. Figure 4.2 shows total tonnage as compared to total value from 2017 to 2050. The value per ton is projected to increase from approximately \$86,400 per ton in 2017 to approximately \$86,500 per ton in the growth scenarios.

**FIGURE 4.2 PROJECTED TOTAL AIR CARGO TONS AND VALUE IN NORTH CAROLINA, 2017 AND 2050**



Source: FAF5

Top air freight commodities are expected to shift slightly from those projected in the previous 2017 Statewide Multimodal Freight Plan which used the years 2015 to 2045 in the low growth scenario, though all are expected to increase in tonnage and value. Electronics and machinery are projected to remain the top two commodities, slightly decreasing in total share from 41% to 35%. Motorized vehicles are expected to enter the top 10, totaling nearly 27,000 tons. Finally, pharmaceuticals are expected to remain an important commodity when measured by value, with a projected worth of \$10.35 billion. Table 4.1 presents the top 10 commodities by tonnage and Table 4.2 presents the top commodities by value. In the Tonnage Rank Change column, a box marked NA shows that this is a new commodity that was not in the previous 2017 Statewide Multimodal Freight Plan, so comparisons cannot be made to the 2017 plan.

**TABLE 4.1 PROJECTED TOP 10 AIR CARGO COMMODITIES BY TONNAGE AT NORTH CAROLINA AIRPORTS, LOW GROWTH SCENARIO, 2050**

SCTG Code	Commodity	Tonnage Rank Change	Total Tons (thousands)	% Of Total
34	Machinery	1	113,316	20%
35	Electronics	-1	79,375	14%
30	Textiles/leather	1	73,385	13%
21	Pharmaceuticals	1	34,644	6%
38	Precision instruments	-2	33,462	6%
24	Plastics/rubber	1	27,973	5%
36	Motorized vehicles	NA	26,934	5%
37	Transport equipment	0	26,483	5%
33	Articles-base metal	1	21,651	4%
23	Chemical products	-4	20,358	4%

Source: FAF5

**TABLE 4.2 PROJECTED TOP 10 AIR CARGO COMMODITIES BY VALUE AT NORTH CAROLINA AIRPORTS, LOW GROWTH SCENARIO, 2050**

SCTG Code	Commodity	Tonnage Rank Change	Total Value (\$M)	% Of Total
35	Electronics	-	\$10,689	22%
21	Pharmaceuticals	-	\$10,354	21%
34	Machinery	-	\$8,649	18%
38	Precision instruments	-	\$4,246	9%
37	Transport equipment	-3	\$2,651	5%
36	Motorized vehicles	NA	\$1,767	4%
30	Textiles/leather	3	\$1,581	3%
24	Plastics/rubber	-2	\$1,677	3%
23	Chemical products	-4	\$1,369	3%
40	Misc. manufacturing products	-1	\$1,328	3%

Source: FAF5

North Carolina's top projected air cargo trading partners by FAF zone for the 2050 low growth scenario are in Table 4.3 below. The top airports that comprise most of the data per FAF zone are expected to be similar from 2017 to the 2050 low growth scenario. These top three FAF zones are expected to carry 32% of total tons.

**TABLE 4.3 PROJECTED TOP 10 NORTH CAROLINA AIR CARGO FAF ZONE TRADE PARTNERS, LOW GROWTH SCENARIO, 2050**

FAF Zone	Major City in FAF Zone	Total Tons (thousands)	% Of Total
Atlanta GA	Atlanta, GA	82.36	14%
New York NY-NJ-CT-PA (NY Part)	New York City, NY	63.37	11%
Memphis TN-MS-AR (TN Part)	Memphis, TN	37.73	7%
Louisville KY-IN (KY Part)	Louisville, KY	31.68	6%
Charlotte NC-SC (NC Part)	Charlotte, NC	31.07	5%
Miami FL	Miami, FL	30.19	5%
Chicago IL-IN-WI (IL Part)	Chicago, IL	28.85	5%
Raleigh-Durham NC	Raleigh, NC	27.34	5%
Rest of NC	-	26.31	5%
Rest of SC	-	18.15	3%

Source: FAF5

## 4.2 Future Activity and Demand at Top Airports

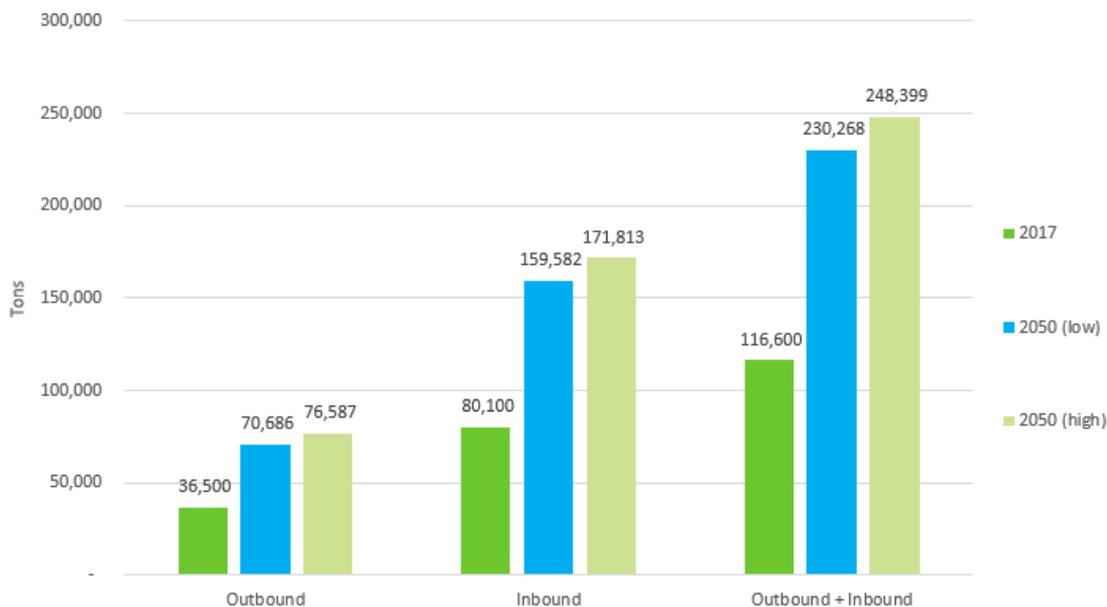
This section presents the forecasts developed for Charlotte Douglas International, Piedmont Triad International and Raleigh-Durham International airports.

### Charlotte Douglas International (CLT)

CLT, the top airport for air cargo activity, is expected to experience an increase in air cargo tonnage by 2050 in the low growth scenario, from nearly 116,000 tons to over 230,000 tons. This is a total growth of 98%, with an annual rate of 2.97%. In the high growth scenario, tonnage is expected to increase its overall tonnage by 114% to over 248,000 tons, with an annual growth rate of 3.45%. These numbers align with the previous plan’s data. Figure 4.3 illustrates the growth for the two forecast scenarios.

The value of air cargo at CLT is also expected to increase substantially according to the low growth scenario, from \$7.41 billion in 2017 to \$14.9 billion in 2050, an increase of 101% over the next 30 years. Additionally, the high growth scenario forecasts growth of 116% to \$16 billion in 2050.

**FIGURE 4.3 PROJECTED AIR CARGO TONNAGE AT CHARLOTTE DOUGLAS INTERNATIONAL, BY DIRECTION AND GROWTH SCENARIO, 2017 AND 2050**



Source: FAF5

By 2050, machinery and electronics will remain top commodities by weight, with projected tonnages of over 51,000 and 28,000, respectively. Together, they are expected to comprise 42% of total value (\$6.3 billion). This is like the previous plan where machinery and electronics comprised 44% of the total projected value for 2045. In addition, textiles/leather (27,900 tons), motorized vehicle parts (14,400 tons) and precision instruments (12,200 tons) are expected to be top air cargo commodities by weight shipped at CLT over the next 30 years. This can be seen in Table 4.4. In the ‘Tonnage Rank Change’ column of the table, a box marked ‘NA’ shows that this is a new commodity that was not in the previous 2017 Statewide Multimodal Freight Plan so comparisons cannot be made .

**TABLE 4.4 PROJECTED TOP 10 COMMODITIES AT CHARLOTTE DOUGLAS INTERNATIONAL, LOW GROWTH SCENARIO, 2050**

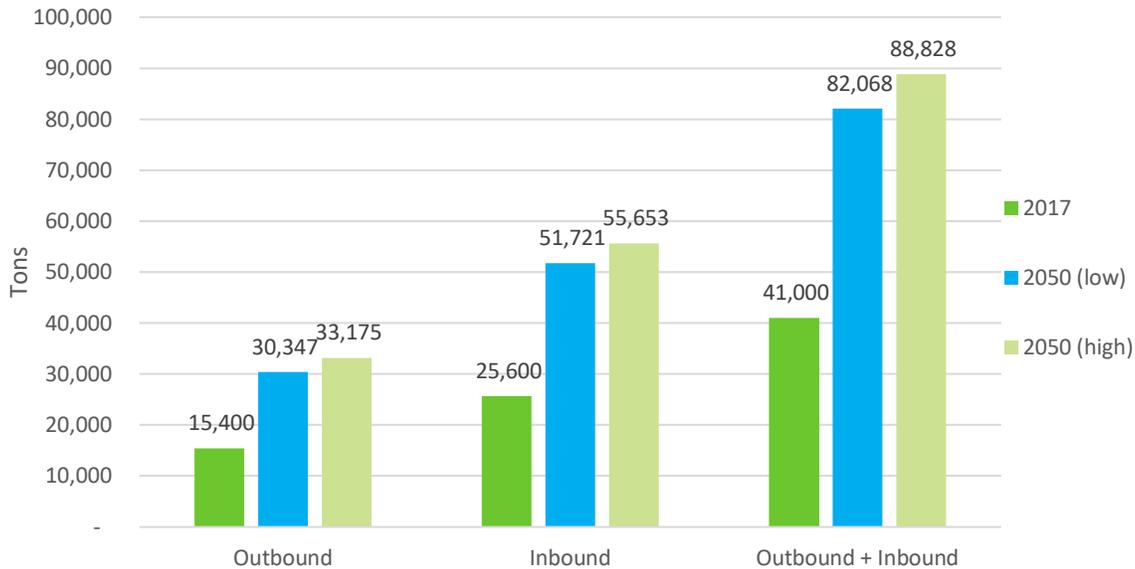
SCTG Code	Commodity	Tonnage Rank Change	Total Tons	% Of Total	Total Value (\$M)	% Of Total
34	Machinery	1	51,479	22%	\$3,095	21%
35	Electronics	-1	28,744	12%	\$3,172	21%
30	Textiles/leather	0	27,927	12%	\$566	4%
36	Motorized vehicles	5	14,403	6%	\$1,137	8%
38	Precision instruments	-1	12,212	5%	\$1,099	7%
24	Plastics/rubber	0	12,039	5%	\$311	2%
21	Pharmaceuticals	-2	11,580	5%	\$2,072	14%
33	Articles-base metal	2	10,409	5%	\$519	3%
37	Transport equipment	-1	10,306	4%	\$1,047	7%
39	Furniture	NA	5,836	3%	\$218	1%

Source: FAF5

### Piedmont Triad International (GSO)

In the low growth scenario, air cargo is expected to increase at GSO from 41,000 tons in 2017 to nearly 82,000 tons in 2050 (100%). In the high growth scenario, tonnage is expected to grow by 117% to 88,800 tons. Figure 4.4 illustrates the difference between the high and low growth scenarios. The value of air cargo at GSO is expected to increase by 101% (up from 94% in the previous plan), according to the low growth scenario, from nearly \$3.75 billion in 2017 to \$7.53 billion in 2050. Additionally, the high growth scenario forecasts growth by 118% to \$8.16 billion in 2050.

**FIGURE 4.4 PROJECTED AIR CARGO TONNAGE AT PIEDMONT TRIAD INTERNATIONAL, BY DIRECTION AND GROWTH SCENARIO, 2017 AND 2050**



Source: FAF5

The projected top 10 commodities at GSO are presented in Table 4.5 below. By 2050, machinery and textiles/leather are projected to comprise 23% and 14% of total tonnage, respectively. Electronics and pharmaceuticals are projected to be the top two commodities transported by value with 22% and 20% of the total value, respectively. This has changed since the previous plan where electronics and machinery were the top two projected commodities by value in 2045. In addition, machinery and precision instruments are projected to be the third and fourth top commodities transported by value (increasing value from the previous plan), consisting of 18% (\$1.65 billion) and 16% (\$1.17 billion) of the 2050 total respectively. This is seen in Table 4.5. In the Tonnage Rank Change column in the table, a box marked NA shows that this is a new commodity that was not in the previous 2017 Statewide Multimodal Freight Plan so comparisons cannot be made.

**TABLE 4.5 PROJECTED TOP 10 COMMODITIES AT PIEDMONT TRIAD INTERNATIONAL, LOW GROWTH SCENARIO, 2050**

SCTG Code	Commodity	Tonnage Rank Change	Total Tons	% Of Total	Total Value (\$M)	% Of Total
34	Machinery	1	19,138	23%	\$1,331	18%
30	Textiles/leather	2	11,248	14%	\$233	3%
35	Electronics	-2	11,221	14%	\$1,650	22%
38	Precision instruments	-1	6,380	8%	\$1,174	16%
21	Pharmaceuticals	1	4,371	5%	\$1,477	20%
24	Plastics/rubber	2	3,840	5%	\$205	3%
33	Articles-base metal	NA	2,709	3%	\$149	2%

SCTG Code	Commodity	Tonnage Rank Change	Total Tons	% Of Total	Total Value (\$M)	% Of Total
23	Chemical products	-3	2,659	3%	\$188	3%
37	Transport equipment	-2	2,637	3%	\$256	3%
36	Motorized vehicles	NA	2,492	3%	\$188	2%

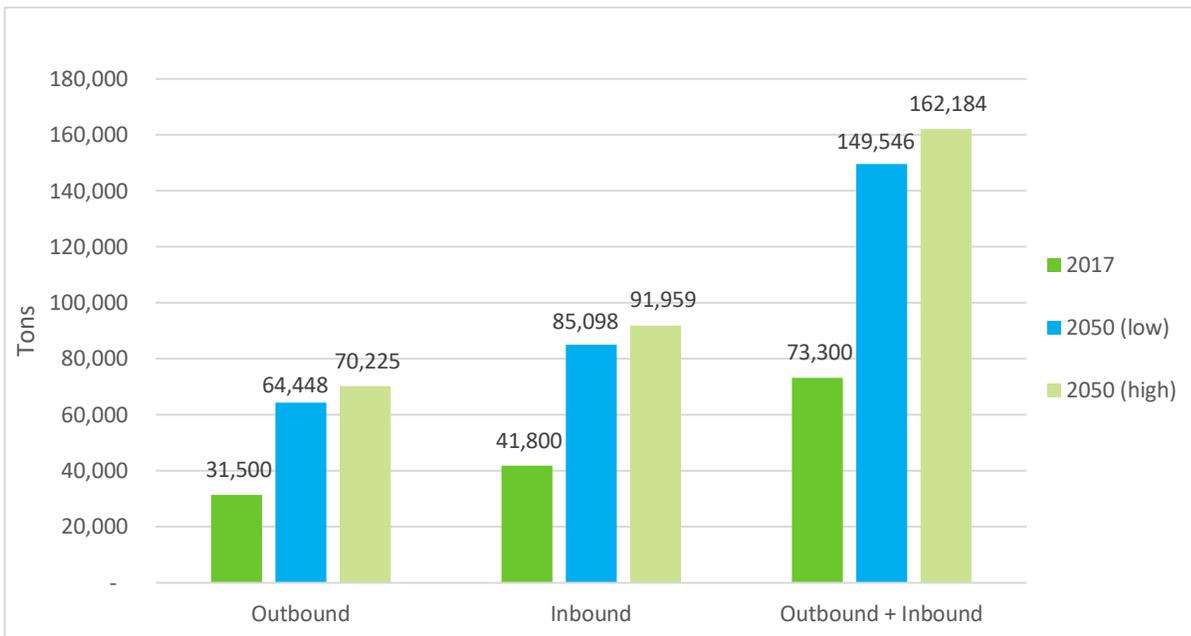
Source: FAF5

### Raleigh-Durham International (RDU)

RDU is expected to increase its air cargo tonnage 70,000 tons in 2017 to nearly 92,000 tons in 2050 according to the low growth scenario, a moderate growth of 31%. In the high growth scenario, air cargo tons are expected to grow by 121% to 162,000 tons in 2050, an annual growth of 3.7%. Figure 4.5 illustrates the difference between the high and low growth scenarios.

The value of air cargo at RDU is expected to increase substantially. According to the low growth scenario, air cargo should grow from \$8.77 billion in 2017 to \$17.5 billion in 2050, an increase of almost 100% over the next 30 years compared to the growth rate projected in the previous plan of 94% increase from 2015 to 2045. The high growth scenario forecasts growth by 120% to \$19.3 billion in 2050.

**FIGURE 4.5 PROJECTED AIR CARGO TONNAGE AT RALEIGH-DURHAM INTERNATIONAL, BY DIRECTION AND GROWTH SCENARIO, 2017 AND 2050**



Source: FAF5

Machinery and electronics will remain top commodities by tonnage by 2050, as shown in Table 4.6. Together, they are expected to make up for 32% of total tonnage and 35% of total value. Textiles/ leather is also expected to be a

top commodity by tonnage with approximately 22.4 million tons contributing 12% of tons of goods transported via air. Pharmaceuticals are projected to comprise the greatest percentage of commodity by value at 27% at nearly \$4.8 billion. In the Tonnage Rank Change column in the table, a box marked NA shows that this is a new commodity that was not in the previous 2017 Statewide Multimodal Freight Plan so comparisons cannot be made.

**TABLE 4.6 PROJECTED TOP 10 COMMODITIES AT RALEIGH-DURHAM INTERNATIONAL, LOW GROWTH SCENARIO, 2050**

SCTG Code	Commodity	Tonnage Rank Change	Total Tons	% Of Total	Total Value (\$M)	% Of Total
34	Machinery	1	26,087	17%	\$2,664	15%
35	Electronics	-1	22,397	15%	\$3,660	20%
30	Textiles/leather	2	18,039	12%	\$441	3%
21	Pharmaceuticals	0	11,642	8%	\$4,727	27%
37	Transport equipment	3	8,794	6%	\$806	5%
23	Chemical products	0	7,674	5%	\$717	4%
38	Precision instruments	-4	7,212	5%	\$1,088	6%
24	Plastics/rubber	-1	6,729	4%	\$952	5%
40	Misc. manufacturing products	NA	6,642	4%	\$463	3%
33	Articles-base metal	0	4,831	3%	\$332	2%

Source: FAF5

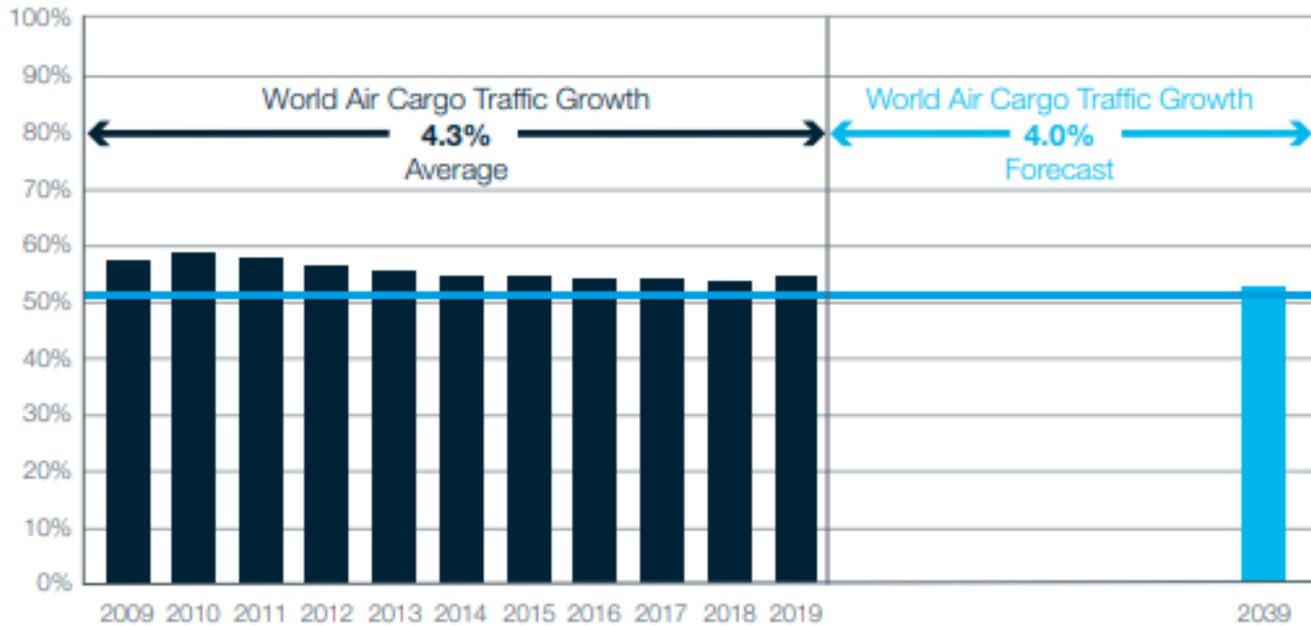
### 4.3 Trends and Implications of Growth

By 2050, North Carolina air cargo tonnage is projected to grow from 286,000 tons valued at \$24.7 billion in 2017 (an increase from \$23 billion in 2015) to over 572,300 tons worth \$49.37 billion, according to the low growth scenario. Overall, air cargo value and tonnage are expected to grow at nearly the same pace, suggesting that the trend from the previous Statewide Multimodal Freight Plan of primarily lighter and more expensive goods being shipped via air will continue. The top commodities transported by air in North Carolina in 2050 are expected to be high-value goods such as electronics, machinery, pharmaceuticals, textiles/leather and precision instruments. Electronics and pharmaceuticals are expected to remain top commodities in terms of value, with projected values of nearly \$10.7 billion and \$10.4 billion by 2050, respectively.

These top commodities are consistent with national and international air cargo trends while the growth rate of air cargo is expected to slightly decrease globally. In the Boeing World Air Cargo Forecast (WACF), annual growth of

air cargo from 2000-2019 was 4.3% and the predicted air cargo growth from 2019 to 2039 is predicted to decrease to 4.0% in 2039<sup>21</sup> (Figure 4.6).

**FIGURE 4.6 AIR CARGO TRAFFIC GROWTH PROJECTIONS**



Source: Boeing World Air Cargo Forecast (WACF), 2020-2039

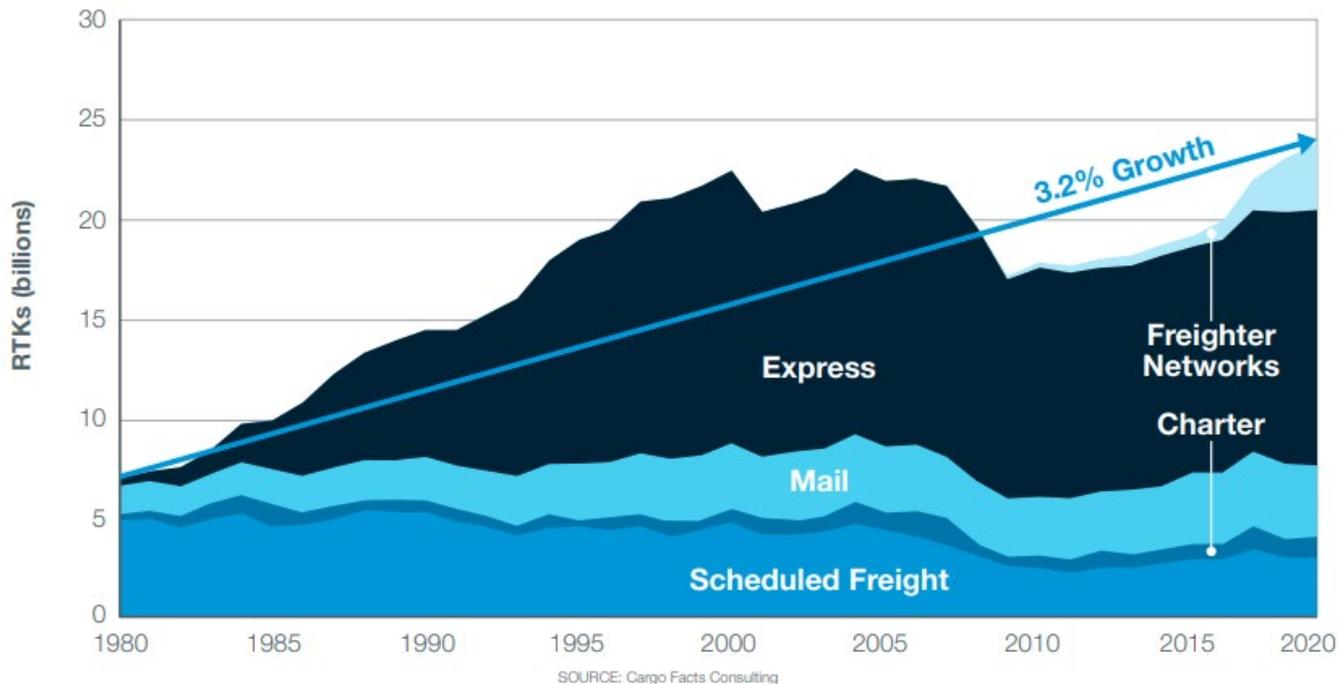
Nationwide, there are four trends that continue to shape the air cargo industry: diversification of supply chains (modal competition), globalization, market liberation and new air-eligible commodities<sup>22</sup>. As noted in earlier sections, the airline industry dramatically consolidated after September 11, 2001, but it was the global economic recession of 2008 that resulted in major decreases in air cargo activity.

As consumers increasingly purchase their goods online, expedited carriers have had to balance speed of delivery with transportation cost competitiveness to deliver these goods on time. Figure 4.6 presents the breakdown in domestic U.S. air cargo service from 1980 to 2020, with express carrier service comprising the largest share of revenue ton-kilometers (RTK) since the mid-90s. The demand for expedited services has led to additional market demand for FedEx/UPS, who have, in turn, improved their trucking/ground logistics supply chains and increased their use of air cargo, though any increases in air cargo have been mitigated by the advances in ground logistics. In North Carolina, FedEx and UPS have consistently been the top air cargo carriers and domestic belly cargo has remained relatively flat over the last decade. Ecommerce has put intense pressure on carriers to transport packages as fast and efficiently as possible. Additionally, a broader distribution market has been established across the U.S. More cities can provide freight services through expanded warehousing and distribution facilities, as opposed to relying on major freight hubs.

<sup>21</sup> Boeing World Air Cargo Forecast, 2020-2039. Accessed May 2022. Available from: <https://www.boeing.com/commercial/market/cargo-forecast/>

<sup>22</sup> Boeing World Air Cargo Forecast, 2020-2039. Accessed May 2022. Available from: <https://www.boeing.com/commercial/market/cargo-forecast/>

**FIGURE 4.7 U.S. AIR CARGO SERVICE, IN REVENUE TON-KILOMETERS, 1980-2020**



Source: Boeing World Air Cargo Forecast, 2020-2039

There are several ways to mitigate the effects of global trends and address air cargo needs in North Carolina, which will be detailed in the following section. Improvements could include infrastructure upgrades, master planning and facility expansion to increase air cargo activity at CLT, GSO, RDU and even potentially Kinston Regional Jetport (ISO). As the value of goods shipped by air and demand for overnight or on-time services continues to grow, access to air shipping via North Carolina airports will be a vital piece to support economic growth. Although capacity exists at airports, it will be important to expand access to reach more parts of the state and provide service for highly time-sensitive commodities produced in North Carolina. Additional multimodal connectivity via rail spurs and increased highway capacity to CLT, GSO and RDU will provide more access to airports. Since most goods transported via air are moved via air due to the lessened travel time to receive an item at its destination, increased multimodal connectivity will further aid the movement of goods in the state. The easier trucks and trains can access the airports, the more the airport’s full air cargo capacity can be reached. These products are well suited for air cargo transport and could take advantage of increased air cargo access to grow its manufacturing and distribution base within North Carolina and across the U.S.

## 5.0 NEEDS ASSESSMENT

North Carolina air cargo needs can be categorized into three areas: airport access, mobility and efficiency; airport facilities; and industrial development. Air cargo access is critical to economic vitality, particularly for manufacturers and consumers of high value commodities. Consumer markets tied to ecommerce have increased the demand for express package services, which have been traditionally fulfilled by all-cargo services. However, because advances in ground logistics have made trucks a viable option for express service and mid-range road feeder services, North Carolina airports must ensure seamless access to air cargo facilities via the roadway network to stay competitive

with other freight modes. Increased mobility to and from airports will help with the efficient movement of air freight on the priority freight network in North Carolina. Additionally, there are opportunities for North Carolina's airports to improve facility infrastructure on-site. This includes aiding airports in understanding future demand of air cargo needs and constructing buildings to store air cargo or for tenants to lease on the airport's property. Finally, focusing industrial development around airports can help increase the value of air cargo services.

North Carolina can position itself to strengthen air cargo activity throughout the state by making investments in places that support economic vitality and growth. This should occur in areas where companies using air cargo services are located, particularly for companies involved in electronics, pharmaceuticals, machinery and other high-value, low-weight commodities. If existing air cargo facilities are not adequate in these areas, there is an opportunity to expand air cargo access. These investments should be made for all the modes – including truck, rail and maritime – that collectively support air cargo activity in North Carolina. A planning-level economic assessment that combines insight from air cargo stakeholders with freight flow data will help highlight key corridors and areas for investment. The following sections will discuss projects related to each of the three investment areas to support air cargo activity in North Carolina.

## 5.1 Airport Access, Mobility and Efficiency Needs

Airport multi-modal access is an important component of the needs assessment for North Carolina air cargo activity. The continued growth of freight corridors and roadways will provide new growth opportunities for the future. The proposed highway to convert to an interstate near Piedmont Triad International Airport will greatly aid in the movement of goods to and from the airport. The completion of I-73 and I-74 in North Carolina would create a new component within the north-south interstate system and connect the state to other parts of the country, thereby creating another freight corridor. Additional multi-modal connectivity via rail spurs will provide another way to move air freight to and from the airports. For example, GSO has the capacity to add a rail spur to the west of the airport, allowing for increased multi-modal connectivity.

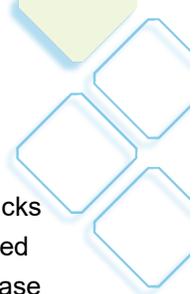
Continuing to add additional capacity to critical freight corridors in the state and around CLT, GSO and RDU will aid in providing new air cargo opportunities and improving efficiency for the movement of goods to and from the airport. Partnering with CLT, GSO and RDU and the future demand of air cargo in the state will also allow the airports to assess future air cargo storage capacity needs on their grounds. All three major airports have set aside land for future air cargo expansion.

## 5.2 Airport Facility Needs

In addition to airport access, there is also a need for improvements to some of North Carolina's airport facilities. GSO's most recent master plan<sup>23</sup> called for future land acquisition and airport development, as shown in Figure 5.1. There are 10 specified areas for future development, in addition to land acquisition in the northwest (204 acres), southwest (34 acres) and southeast (5 acres). Future development plans related to air cargo include a terminal support area for belly cargo and ground service equipment, which could accommodate more cargo buildings,

<sup>23</sup> Airport Master Plan Update and Strategic Long-Range Visioning Plan. Piedmont Triad International Airport Authority. September 2010. Accessed April 2022. Available at: <https://flyfrompti.com/wp-content/uploads/2014/08/Airport-Master-Plan-Update.pdf>

aircraft apron parking positions and truck courts, which are areas next to loading docks to provide space for trucks to maneuver. CLT is focused on supporting the second largest American Airlines hub worldwide, which is located on their grounds. This infrastructure will directly support air cargo activity at GSO and CLT, and may help increase its competitiveness as a regional air cargo facility.







There is potential room for air cargo expansion can at CLT. There is available land to build additional air cargo facilities, but the airport needs to understand the demand and have interest from potential tenants to proceed with building the additional air cargo warehouses.

### 5.3 Industrial Development Needs

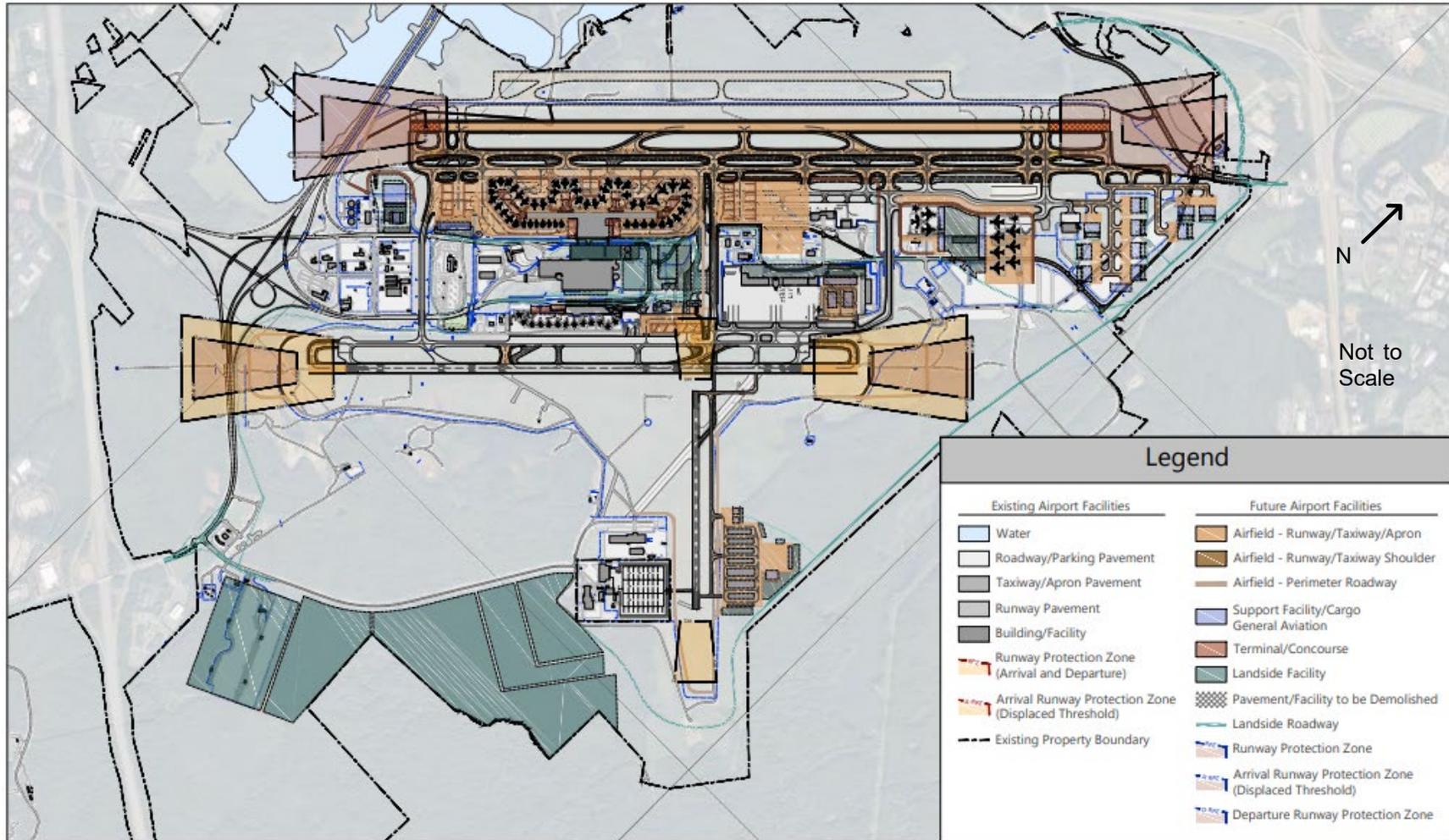
The last element of the air cargo needs assessment focuses on industrial development around key airports. There are opportunities to increase industrial development around CLT, RDU and GSO to support air cargo activity. At GSO, Boom Aerospace will be constructing supersonic planes for airlines. This operation will require efficient air cargo operations at the airport.<sup>24</sup> Additionally, the master plan for GSO calls for an extended northwest aviation-related development area west of Bryan Boulevard/Future I-73, which could be developed to support commercial/industrial activities that do not require direct access to the airfield. At RDU, there are parcels of land surrounding the facility that are ideal for retail, office, recreation and industrial space, as identified in RDU's Vision 2040 Master Plan and shown in Figure 5.2.

Lastly, GTP was originally built around a multi-modal transportation concept, including Kinston Regional Jetport (capable of handling international flights), undeveloped acreage surrounding the site, proximity to military bases and the potential for highway, rail and deep-water port access. However, it has not become the multi-modal manufacturing and distribution hub originally envisioned; rather, GTP is an industrial park with multi-modal attributes. Before its current location was selected, the feasibility study projected significant job creation associated with a global air cargo industrial complex. However, GTP is 50 miles away from I-95 and 46 miles to I-40, making it difficult for trucks to quickly access the site from an interstate highway. As a result, it has fallen short of projections, despite renovations to the air hub in 2010. However, better interstate access to GTP is in the works, as U.S. 70 is being upgraded to an interstate. In addition to better interstate access, increasing development around the facility could also help increase its relevance as an air cargo hub.

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<sup>24</sup> "Governor Cooper Announces Boom Will Manufacture". NC Governor Roy Cooper. Accessed May 2022. Available at: <https://governor.nc.gov/news/press-releases/2022/01/26/governor-cooper-announces-boom-will-manufacture-supersonic-aircraft-north-carolina-creating-more>

FIGURE 5.2 POTENTIAL LAND USE CONCEPTS AT RALEIGH-DURHAM INTERNATIONAL AIRPORT



Source: RDU Vision 2040 Master Plan

# Appendix A. Standard Classification of Transported Goods (SCTG) Commodity Classification

**TABLE A.1 SCTG COMMUNITY CODE DESCRIPTIONS**

2-Digit Code	Commodity	Description
1	Live animals/fish	Includes live animals, poultry, fish and other live animals
2	Cereal grains	Includes field crops such as wheat, corn, rye, oats and other seeds
3	Other agricultural products	Comprised of vegetables, fruits (fresh and dried), nuts, flowers, oil seeds and other agricultural products
4	Animal feed	Forage products, residues and waste from food industries used in animal feeding, other products of animal origin not elsewhere classified
5	Meat/seafood	Fresh or frozen meat, fish and poultry products
6	Milled grain products	Comprised of processed field crops into flours and meals, in addition to bakery and baked products such as pasta, dough, baked snack products, rice preparations and other processed bakery products
7	Other foodstuffs	Includes dairy products, processed or prepared vegetables, fruit and nuts, coffee/tea, oils, sugars and confectionary products, edible oils and non-alcoholic beverages
8	Alcoholic beverages	Beer, wine, spirits and denatured ethyl alcohol (not for human consumption)
9	Tobacco products	Cigarettes and other manufactured tobacco products
10	Building stone	Calcareous monumental or building stone
11	Natural sands	Sands and quartz sands used for construction, building and other uses
12	Gravel	Gravel and crushed stone
13	Non-metallic minerals	Includes various types of salts, including table salt, clays, sulfur, asbestos and other non-metallic minerals
14	Metallic ores	Includes iron, copper, nickel, aluminum, lead, zinc and other ores
15	Coal	Non-agglomerated and agglomerated coal
16	Crude petroleum	Crude petroleum oil and oils obtained from bituminous minerals
17	Gasoline	Includes gasoline and gasoline blends, aviation turbine fuel, kerosene, ethanol and ethanol blends
18	Fuel oils	Fuel oils including diesel, Bunker C, and biodiesel
19	Coal and petroleum products	Includes lubricating oils and greases, and gaseous hydrocarbons such as liquefied natural gas (LNG), propane, butane and others
20	Basic chemicals	Includes a variety of inorganic chemicals (i.e., sodium hydroxide and hydrogen chloride) and organic chemicals (i.e., phenols and organic dyes)

2-Digit Code	Commodity	Description
21	Pharmaceuticals	Any pharmaceutical products
22	Fertilizers	And fertilizer products, such as manufactured fertilizer products, slag or other materials
23	Chemical products	Includes paints and varnishes, inks, essential oils, glues and other chemical products
24	Plastics/rubber	Articles of plastic and rubber, including tubes, pipes, packaging goods, foam and other products
25	Logs	All logs for pulping, lumber, fuel wood and other untreated wood products
26	Wood products	Contains lumber and other manufactured wood parts
27	Newsprint/paper	Wood pulp, newsprint, toilet/facial tissue and other rolled paper and paperboard in large rolls or sheets
28	Paper articles	Household paper products, wallpaper, envelopes and other paper or paperboard articles
29	Printed products	Books, newspapers, journals and other printed products
30	Textiles/leather	Textile fibers and clothing, carpets and articles of leather
31	Non-metallic mineral products	Features products made from ceramic, glass, concrete and other plaster products
32	Base metals	Contains metal products such as iron, steel, copper and aluminum, among others
33	Articles-base metal	Pipes, tubes, fittings, structures and structural parts, hand tools and other articles of base metal
34	Machinery	Features several types of engines, energy generators, pumps, climate control machinery, household heavy appliances and other types of tools and manufacturing machinery
35	Electronics	Electric motors, appliances, entertainment products, computers and other electronic components and parts
36	Motorized vehicles	Examples include personal vehicles, vehicles for the transport of goods, tractors, motorcycles, bicycles and motor vehicle parts such as chassis, wheels and other parts
37	Transport equipment	Includes railway equipment, aircraft and spacecraft, ships, boats and floating structures
38	Precision instruments	This includes several specialized apparatuses such as optical elements, photocopying machines, surveying or geophysical equipment or medical devices
39	Furniture	All types of furniture, mattresses and supports, lamps, and illuminated signs
40	Misc. manufactured products	Includes a variety of manufactured goods, including toys, musical instruments, artwork and other manufactured products
41	Waste/scrap	Includes both metallic waste and scrap and non-metallic waste and scrap
43	Mixed freight	Virtually all kinds of freight that can be moved in a trailer or container and is not reported as a specific commodity. The primary commodities handled in this manner consist of consumer goods, including packaged foods, electronics, office supplies and durable goods, along with a broad range of intermediate components for manufacturing, such as auto parts.
99	Unknown	Unknown or not available

