5 FORECAST OF AVIATION ACTIVITY

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CHAPTER FIVE

FORECAST

The forecast is a critical component of the airport master planning process. It is used to help understand and anticipate the aviation activity that is expected to occur at the airport during the 20-year planning period of 2022–2042. It also provides the basis for guiding airport development needed to meet future demand.

5.1. Introduction

An effective forecast should be realistic, based on current data, and developed using appropriate methods. Developing a forecast for an airport master plan involves considering a variety of factors that can vary in complexity—such as the size and location of the airport, the type of aircraft using the airport, and activity levels. However, every forecast is developed using the same series of basic steps. As outlined in FAA Advisory Circular (**AC**) 150/5070-6B, *Airport Master Plans*, these steps include identifying existing aviation activity; reviewing historical activity levels and previous forecasts; examining industry trends and regional socioeconomic data; selecting the appropriate forecast method; and then applying the methodology and evaluating the results.

The forecast developed for this airport master plan includes projections for a short-term planning horizon of five years, a medium-term planning horizon of ten years, and a long-term planning horizon of 20 years. Each of these projections uses 2022 as the base year when applying the selected forecasting methodology.

5.2. Existing Aviation Activity and Forecast Summary

It is important to first identify existing aviation activity to make sure the forecast includes all relevant activities likely to affect airport facilities. This typically includes aircraft operations (i.e., takeoffs and landings), enplanements (i.e., revenue paying passengers boarding commercial flights), and the critical aircraft. For commercial service airports with significant general aviation (GA) activity, like CDC, it also includes the number and type of aircraft based at the airport.

5.2.1. Aircraft Operations

Every landing, takeoff, or touch-and-go procedure conducted at an airport is counted as one operation. They are separated into three main categories—commercial service, general aviation, and military operations. These operations are then classified as either itinerant or local. In general, local operations are flights that originate and terminate at the same airport while itinerant operations are flights that originate and terminate at different airports. Each type of operation is forecasted separately in order to account for the different national or local trends and socioeconomic factors that are expected to affect each category.

a. Commercial Service

It is important to note that commercial operations are not handled the same way in every forecast. For example, air carrier, commuter, and air taxi operations are all considered to be commercial service in the FAA's Terminal Area Forecast (TAF). However, for this forecast, only air carrier and commuter flights are considered to be commercial service operations because they are both scheduled while air taxi operations are considered to be general aviation because they are not scheduled. Commercial service operations are expected to remain at an estimated 1,248 flights per year throughout the entire 20-year planning period.

b. General Aviation

General aviation includes all operations that are not scheduled commercial service or military operations. This typically includes privately owned aircraft used for business or personal travel, flight training, recreation, aerial firefighting, and medical transport or other types of emergency services. At CDC, a significant portion of the GA operations are conducted as part of the Southern Utah University (SUU) training program, and—to a lesser extent—air cargo and aerial firefighting operations.

Itinerant GA operations are expected to increase from 12,418 for 2022 to 25,351 for 2042 with a compound annual growth rate (CAGR) of 3.63%. Local GA operations, excluding SUU, are expected to increase from 8,279 for 2022 to 16,901 for 2042 with a CAGR of 3.63%. Overall, GA operations—excluding SUU—are expected to increase from 20,697 for 2022 to 42,252 for 2042 with a CAGR of 3.63%.

Southern Utah University

The university's flight school offers both fixed wing and rotor pilot training at CDC. While these operations are counted as GA operations, they were forecasted separately in order to avoid skewing the forecast for total GA operations. Local GA operations for SUU are expected to increase from 98,499 in 2022 to 109,588 in 2042 with a CAGR of 0.53%.

Air Cargo

An individual forecast was not developed for air cargo operations because they are counted as GA operations. However, the air cargo fleet mix was analyzed in order to anticipate any potential changes to the fleet used for cargo operations. FedEx and Alpine Air Express are the two dedicated cargo operators at CDC. FedEx uses its fleet of Cessna Caravan 208 aircraft for the majority of the smaller markets the company serves, including CDC, and Alpine Air Express operates a fleet of Beech 99 and Beech 1900 aircraft. There are no indications that the air cargo fleet used at CDC will change during the 20-year planning period.[1]

It is important to note that cargo volumes at CDC have significantly increased this past decade. Since 2012, cargo volumes have increased at a CAGR of 5.7%. This trend is expected to continue due to the nationwide increase in e-commerce activity as well as the positive economic outlook for the region.

Aerial Firefighting

While the airport is home to the Color Country Interagency Fire Center (CCIFC), an individual forecast was not developed specifically for aerial firefighting operations because these are also counted as GA operations. Additionally, future activity levels are difficult to predict because these aircraft are only activated to support firefighting missions and can vary significantly from year to year depending on the severity of the fire season.

c. Military

Unless there is specific knowledge of an upcoming change, military operations are typically forecast to continue at current levels because the Department of Defense provides limited details regarding future activity levels. As a result, itinerant military operations are projected to remain at 550 annual operations, and local military operations are projected to remain at 0 for the 20-year planning period. While the Utah Army National Guard is currently in the process of establishing a long-term presence at CDC, the forecast for military operations was not adjusted based on this information because it is unknown how it will affect future activity levels.

5.2.2. Passenger Enplanements

The passenger enplanements forecast is particularly important because it will help determine future requirements for airport facilities necessary for accommodating passengers such as the size of the terminal building and parking facilities. A variety of factors and trends must be taken into consideration in order to develop an effective forecast for passenger enplanements. This includes regional socioeconomic conditions as well as the airline and aviation industry trends expected to affect the airport. Overall, passenger enplanements are expected to increase from 11,452 for 2022 to 29,473 for 2042 with a CAGR of 4.84%.

5.2.3. Based Aircraft

A based aircraft is any operational and airworthy aircraft that is based at the airport for the majority of the year.[2] The type, size, and number of aircraft based at an airport are important factors to consider when analyzing airport capacity, facility requirements, and planning future development. This is because the forecast of based aircraft can indicate the need for new hangar space as well as new or expanded services. Overall, based aircraft are expected to increase from 100 for 2022 to 136 for 2042 with a CAGR of 1.55%.

5.2.4. Critical Aircraft

The critical aircraft is the most demanding type of aircraft, or group of aircraft with similar characteristics, that regularly use the airport. (Regular use is defined as a minimum of 500 annual operations; excluding touch-and-go operations).[3] The critical aircraft is often referred to as the design aircraft because is used to determine the correct design standards for many areas of the airport.

a. Existing Critical Aircraft

The existing critical aircraft is the Avro RJ87. This aircraft, which has an aircraft approach category (AAC) of C and aircraft design group (ADG) of III, is representative of several aircraft with similar characteristics that regularly use the airport. This includes the McDonnell Douglas MD-87 used for aerial firefighting operations as well as the Airbus A320 used by SUU athletics. As a result, the primary runway and taxiway system will be required to meet AAC C and ADG III design specifications.

b. Future Critical Aircraft

Based on the projected fleet mix and the commercial service operations forecast, the future critical aircraft will ultimately be the Embraer E-175 as airlines continue to transition to more fuel-efficient aircraft. The Embraer also has an AAC of C and ADG of III.

c. Forecast Summary

Table 5.1 summarizes the forecast of aircraft operations, passenger enplanements, and based aircraft that has been developed for this airport master plan. However, it is important to understand that actual activity may differ from these forecasts because aviation activity can be affected by a wide range of unforeseen developments at the local, regional, and national levels. A copy of the FAA approval of this airport master plan forecast is included as Appendix B, FAA Forecast Approval.

Table 5.1: Forecast Summary

	Base Year	Forecast Years			Compound Annual Growth Rate		
	2022	2027	2032	2042	5-Year	10-Year	20-Year
Operations							
Commercial Service	**1,250**	**1,248**	**1,248**	**1,248**	**-0.03%**	**-0.02%**	**-0.01%**
Air Taxi	1,182	1,419	1,725	2,413	3.72%	3.85%	3.63%
Itinerant GA	11,236	13,486	16,396	22,938	3.72%	3.85%	3.63%
Total Itinerant GA	**12,418**	**14,905**	**18,121**	**25,351**	**3.72%**	**3.85%**	**3.63%**
SUU	98,499	100,893	103,529	109,588	0.48%	0.50%	0.53%
Local GA (ex. SUU)	8,279	9,936	12,081	16,901	3.72%	3.85%	3.63%
Total Local GA	**106,778**	**110,829**	**115,610**	**126,489**	**0.75%**	**0.80%**	**0.85%**
Total GA Operations	**119,196**	**125,734**	**133,731**	**151,840**	**1.07%**	**1.16%**	**1.22%**
Itinerant Military	550	550	550	550	0.00%	0.00%	0.00%
Local Military	0	0	0	0	0.00%	0.00%	0.00%
Total Military	**550**	**550**	**550**	**550**	**0.00%**	**0.00%**	**0.00%**
Total Operations	**120,996**	**127,532**	**135,529**	**153,639**	**1.06%**	**1.14%**	**1.20%**
Passengers							
Total Enplanements	**11,452**	**14,388**	**18,232**	**29,473**	**4.67%**	**4.76%**	**4.84%**
Based Aircraft							
Total Based Aircraft	**100**	**108**	**117**	**136**	**1.55%**	**1.58%**	**1.55%**

Source: DOT, T-100; FAA, TAF; Ardurra

5.3. Historical Aviation Activity

It is important to assemble the airport's historical aviation activity and identify past trends before preparing the forecast. Understanding the airport's usage patterns and historical demand for aviation services is used to help analyze the accuracy of previous forecasts and evaluate the current forecast. Table 5.2 summarizes historical activity levels for aircraft operations, passenger enplanements, and based aircraft for 2012–2021.

Table 5.2: Historical Aviation Activity, 2012–2021

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Operations										
Commercial Service	**1,688**	**1,368**	**1,306**	**1,254**	**1,250**	**1,256**	**1,244**	**1,521**	**828**	**1,254**
Itinerant GA	11,977	20,713	20,775	8,242	8,631	12,393	12,466	11,237	23,982	23,723
Local GA	16,150	26,102	26,102	47,450	69,550	59,154	63,214	60,214	94,191	94,856
Total GA	**28,127**	**46,815**	**46,877**	**55,692**	**78,181**	**71,547**	**75,680**	**71,451**	**118,173**	**118,579**
Itinerant Military	250	250	250	250	450	300	300	420	550	550
Local Military	0	0	0	0	0	0	0	0	0	0
Total Military	**250**	**250**	**250**	**250**	**450**	**300**	**300**	**420**	**550**	**550**
Total Operations	**30,065**	**48,433**	**48,433**	**57,196**	**79,881**	**73,103**	**77,224**	**73,392**	**119,551**	**120,383**
Passengers										
Total Enplanements	**14,630**	**14,089**	**13,131**	**13,330**	**13,601**	**14,422**	**14,727**	**23,135**	**5,883**	**11,999**
Based Aircraft										
Total Based Aircraft	**67**	**70**	**70**	**91**	**84**	**91**	**75**	**78**	**102**	**102**

CAGR	Operations	Passengers	Based Aircraft
2012-2022	14.94%	-2.42%	4.09%

Source: DOT, T-100; FAA, TAF.

5.3.1. Aircraft Operations

As shown in Table 5.2, total aircraft operations have increased steadily since 2012. Overall, aircraft operations at CDC have increased at a CAGR of 14.94% for 2012–2022. The following summarizes historical activity levels for commercial service, GA, and military aircraft operations at CDC.

a. Commercial Service Operations

Commercial service operations have fluctuated from a high of 1,688 for 2012 to a low of 828 for 2020 and have decreased at a CAGR of -2.96% for 2012–2022.

b. General Aviation Operations

General aviation operations make up the majority of the operations flown at CDC, and they have increased steadily since 2012. For 2012 to 2022, itinerant GA operations increased at a CAGR of 0.36% and local GA operations at a CAGR of 20.79%. Overall, GA operations have increased at a CAGR of 15.54%.

c. Military Operations

Itinerant military operations increased at a CAGR of 8.20% for 2012–2022, and local military operations have remained at zero. It is typical to see these types of variances in military operations as the Department of Defense alters its operational requirements.

5.3.2. Passenger Enplanements

While commercial service operations have returned to pre-COVID levels due to the EAS contract, passenger enplanements at CDC have not fully returned to pre-pandemic levels. Passenger activity levels have fluctuated between a high of 23,135 for 2019 to a low of 5,883 for 2020. Overall, passenger enplanements have decreased at a CAGR of -2.42% for 2012–2022.

5.3.3. Based Aircraft

The number of based aircraft at the airport has increased at a CAGR of 4.09% for 2012–2022.

5.4. Review of Previous Forecasts

When preparing a forecast of aviation demand, it is important to examine other forecasts prepared for the airport. In this case, it includes reviewing the forecast prepared for the previous airport master plan, the Terminal Area Forecast (**TAF**) prepared by the FAA, and the forecast prepared for the *2020 Utah Aviation Development Strategy*. These forecasts should be examined in terms of the assumptions made at the time as well as the actual projections. Analyzing the accuracy of previous forecasts can help identify past trends and changes in the aviation industry that have affected the airport's usage patterns.

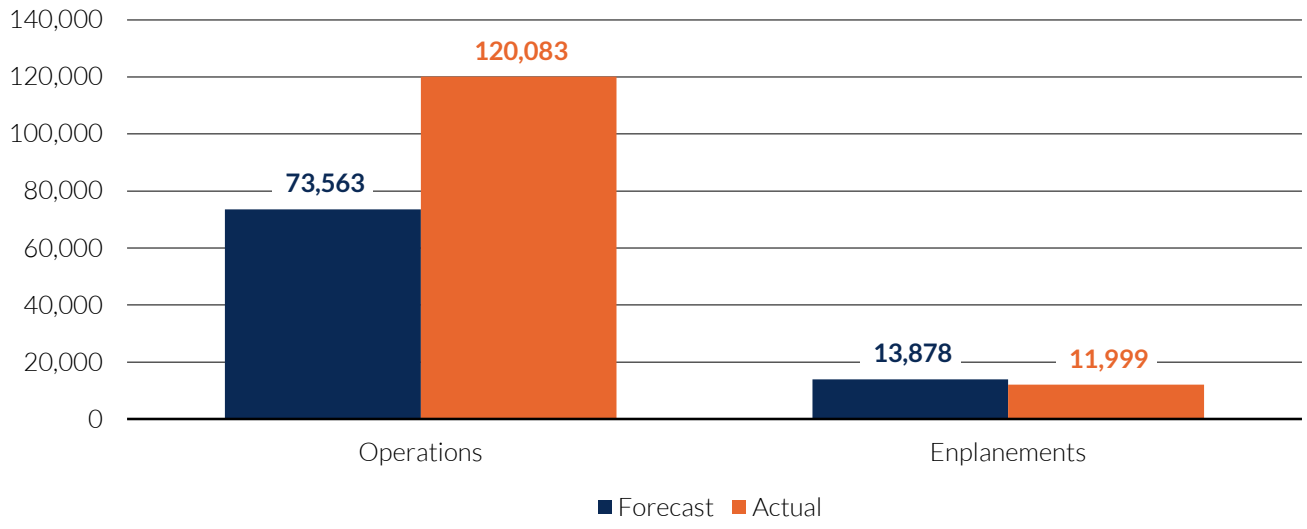
5.4.1. 2017 Airport Master Plan Forecast

The previous airport master plan for Cedar City Regional Airport was completed December 2017. The 2017 Airport Master Plan forecast, which used 2015 as the base year, expected there to be approximately 13,878 enplanements for 2021. Additionally, this forecast showed 1,248 commercial service operations, 72,267 general aviation operations, and 48 military operations for a total of 73,563 operations forecasted for 2021.

According to the U.S. Department of Transportation Air Carrier Statistics database (**T-100**), there were 11,999 enplanements and 1,254 commercial service operations, and, according to the TAF, there were 118,579 general aviation operations, and 250 military operations for a total reported 11,999 enplanements and 120,083 operations for 2021.

Overall, the previous airport master plan forecast expected total aircraft operations and enplanements to both increase at a CAGR of 0.75% for 2015–2021. Figure 5.1 shows the total operations and enplanement activity levels forecast for 2021 alongside historical activity levels for 2021.

Figure 5.1: Review of 2017 Airport Master Plan Forecast



Source: GDA Engineers, 2017 Airport Master Plan; FAA, TAF; DOT, T-100

5.4.2. Terminal Area Forecast

The Terminal Area Forecast (**TAF**) is the FAA's official forecast of aviation activity for all U.S. airports included in the National Plan of Integrated Airport Systems (**NPIAS**). This forecast is published annually, and the current edition is *Terminal Area Forecast, Fiscal Years 2021–2045*. It includes historical and forecast data for aircraft operations as well as passenger enplanements and based aircraft. This forecast is developed based on local and national economic conditions as well as other conditions affecting the aviation industry.[4]

The FAA's TAF for Cedar City Regional Airport provides an important point of comparison when evaluating the forecast developed for this airport master plan and is discussed throughout this chapter. Unlike the previous master plan, it is assumed the current TAF is counting flight school operations accurately. Additionally, it is assumed the majority of SkyWest operations are being counted as commuter operations because it typically uses aircraft with 60 or fewer seats for service at CDC. As shown in Table 5.3, both commercial and military operations are expected to remain at current levels, and GA operations are forecast to increase at a CAGR of 0.71% for 2022–2042. Passenger enplanements are expected to remain at current activity levels, and only a slight increase is forecast for based aircraft.

Table 5.3: Terminal Area Forecast, 2022–2042

	Base Year	Forecast Years			Compound Annual Growth Rate		
	2022	2027	2032	2042	5-Year	10-Year	20-Year
Operations							
Commercial Service	**1,304**	**1,304**	**1,304**	**1,304**	**0.00%**	**0.00%**	**0.00%**
Itinerant GA	23,840	24,695	25,588	27,498	0.71%	0.71%	0.72%
Local GA	95,521	98,934	102,458	109,920	0.70%	0.70%	0.70%
Total GA	**118,523**	**122,761**	**127,148**	**136,460**	**0.71%**	**0.70%**	**0.71%**
Itinerant Military	550	550	550	550	0.00%	0.00%	0.00%
Local Military	0	0	0	0	0.00%	0.00%	0.00%
Total Military	**550**	**550**	**550**	**550**	**0.00%**	**0.00%**	**0.00%**
Total Operations	**121,215**	**125,483**	**129,900**	**139,272**	**0.69%**	**0.69%**	**0.70%**
Passengers							
Total Enplanements	**10,600**	**10,600**	**10,600**	**10,600**	**0.00%**	**0.00%**	**0.00%**
Based Aircraft							
Total Based Aircraft	**102**	**104**	**104**	**104**	**0.39%**	**0.19%**	**0.10%**

Source: FAA, *Terminal Area Forecast, Fiscal Years 2021–2045*

5.4.3. 2020 Utah Aviation Development Strategy Forecast

As previously discussed in Section 3.5.2. Utah Aviation Development Strategy, the Utah Department of Transportation (UDOT) Division of Aeronautics prepares a statewide forecast as part of its statewide aviation development strategy. The current edition, *2020 Utah Aviation Development Strategy*, was published June 2021 and uses 2018 as the base year with a ten-year planning horizon ending in 2028. This forecast essentially mirrors the TAF for each of the Utah NPIAS airports.[5]

As shown in Table 5.4, this forecast combines air carrier, commuter, and air taxi operations into one category and counts them all as commercial service operations. This makes activity levels for commercial service operations appear to be much higher than reported in either the TAF or this forecast. Additionally, it does not include a forecast for military operations. Like the TAF, commercial service operations are expected to remain at current activity levels, and GA operations are forecast to increase at a CAGR of 0.70% for 2018–2028. Passenger enplanements are expected to remain at current activity levels, and only a slight increase is forecast for based aircraft.

Table 5.4: Utah Aviation Development Strategy Forecast, 2018–2028

	Base Year	Forecast Years		Compound Annual Growth Rate	
	2018	2023	2028	5-Year	10-Year
Operations					
Total Commercial Service	3,772	3,772	3,772	0.00%	0.00%
Total General Aviation	69,824	72,325	74,886	0.71%	0.70%
Passengers					
Total Enplanements	15,626	15,626	15,626	0.00%	0.00%
Based Aircraft					
Total Based Aircraft	75	77	78	0.53%	0.39%

Source: Jviation, *2020 Utah Aviation Development Strategy*

5.5. Factors Affecting Aviation Activity

This section identifies the national, statewide, and local forecasts, trends, and other factors expected to affect aviation activity. It also identifies the geographic area served by the airport and the regional characteristics that influence aviation demand.

5.5.1. FAA Aerospace Forecast, Fiscal Years 2022–2042

Local aviation trends generally follow national trends. Therefore, it is necessary to analyze the industry from a broad perspective and then apply local socioeconomic factors to refine the forecast. The FAA publishes an annual update of the agency's national aviation forecast. While this forecast is prepared to meet the budget and planning needs of the FAA, it is also widely used by state and local authorities, the aviation industry, and the general public. It is developed using statistical models to explain and incorporate emerging trends for each segment of the aviation industry including commercial airlines, cargo operations, GA, unmanned aircraft systems, and commercial space travel. The following discussion is summarized from the current edition, *FAA Aerospace Forecast, Fiscal Years 2022–2042*.

The U.S. airline industry, which has a long history of volatility, has experienced steady and significant growth since the end of the Great Recession in 2009. The recession required the airlines to refine their business models and minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. The results of these efforts were impressive, and 2019 marked the eleventh consecutive year of profitability for the industry. However, this was brought to a rapid end in 2020 by the COVID-19 pandemic. While passenger airline activity and profitability tumbled almost overnight, cargo activity was boosted by consumer spending. By the middle of 2021, conditions and the outlook had brightened considerably due to the introduction of vaccines. Recovery has been extremely uneven across markets and population segments, driven by COVID-19 case counts, vaccinations, governmental restrictions, and the degree of pent-up demand. While domestic leisure traffic has led the recovery, domestic business travel is expected to gain momentum in 2022. Additionally, many of the business modifications necessitated by the downturn will shape the industry long after the recovery is complete. In particular, airlines will be smaller having retired aircraft and encouraged voluntary employee separations while fleets will continue to become younger and more fuel-efficient as airlines retire the oldest and the least efficient aircraft.

This year's forecast is driven, at least in the near term, by the pace of recovery from impacts to the U.S. and global economies as well as the aviation industry as a result of the COVID-19 pandemic. Additionally, the domestic forecast is based on economic assumptions from IHS Markit's ten-year and 30-year U. S. Macro Baseline forecasts. According to these forecasts, real gross domestic product (GDP) for the U. S. is forecast to grow at 2.3% for 2022–2042.[6]

a. FAA Aerospace Forecast for Commercial Service

The FAA Aerospace Forecast expects calls for both commercial service operations and passenger enplanements to return to pre-COVID levels by 2023. However, the commercial air carrier industry is expected to be focused on recovering from the devastating consequences of the COVID-19 pandemic for several years. The following points are also of particular interest:

- **Commercial Operations:** Air carrier operations are expected to increase at an average rate of 3.4% per year for 2022–2042 while air taxi and commuter operations are expected to increase at an average rate of 0.1%. Large and medium hubs are expected to see much faster increases than small and non-hub airports.

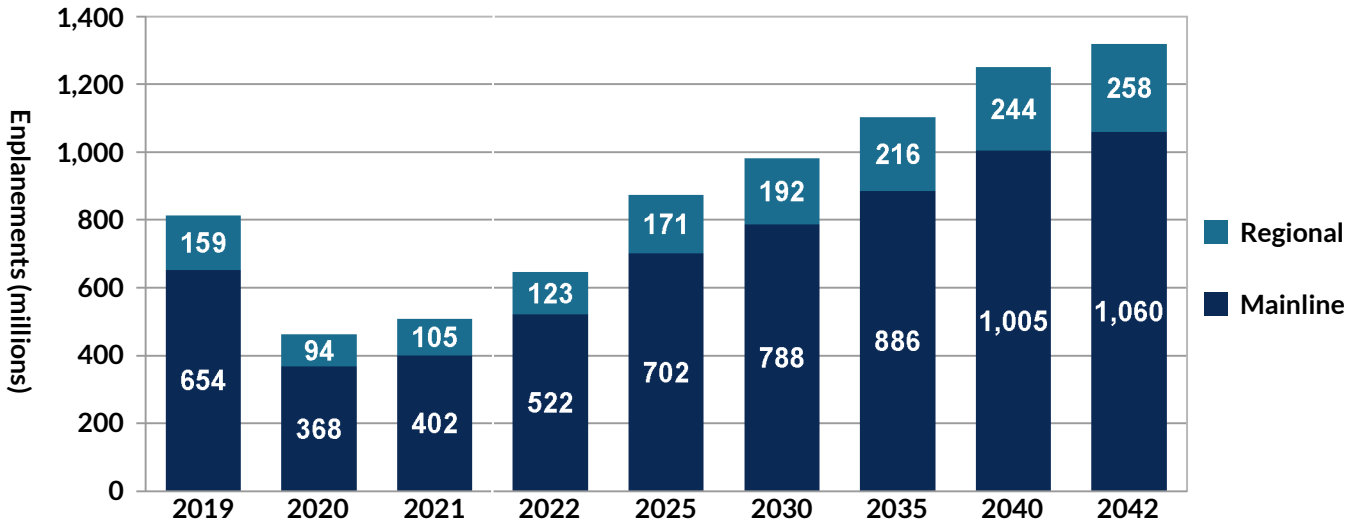
- **Regional Fleet:** The regional carrier fleet is expected to increase at an annual rate of 0.4% for 2022–2042. This includes a 1.0% increase for jet aircraft and a 3.1% decrease for non-jet aircraft as the carriers remove 50-seat aircraft and small turboprop and piston aircraft while adding 70–90-seat jets.

- **Seat Capacity:** Seat capacity is expected to increase an average of 3.7% annually for 2022–2042.

- **Load Factors:** Load factors are expected to increase from 83.2% for 2022 to 85.1% for 2042. Load factors are expected to return to pre-COVID levels by 2025.

- **Enplanements:** Passenger growth is expected to average 4.7% per year for the next 20 years (Figure 5.2). However, this average includes double-digit growth for 2022 and 2023 as activity levels continue to recover followed by an average growth rate of 2.6% through the end of the planning period.[7]

Figure 5.2: FAA Aerospace Forecast for Passenger Enplanements, 2022–2042



Source: FAA Aerospace Forecast, 2021-2041

b. FAA Aerospace Forecast for General Aviation

The FAA Aerospace Forecast includes projections for fleet mix and hours flown for GA aircraft. This includes fixed wing piston, fixed wing turbine, rotorcraft, and light sport aircraft (LSA) as well as experimental and other types of aircraft. The agency uses estimates of fleet size and activity levels based on the results of its annual General Aviation and Part 135 Activity Survey as baseline figures. It also includes forecasts of new aircraft deliveries using data from the General Aviation Manufacturers Association (GAMA), together with assumptions for retirement rates, to generate growth rates for fleet size by aircraft category. The forecast is then further refined based on discussions with industry experts. It is important to note that these forecasts are for active aircraft, not total aircraft, with active aircraft defined as one that has been flown at least one hour per year.

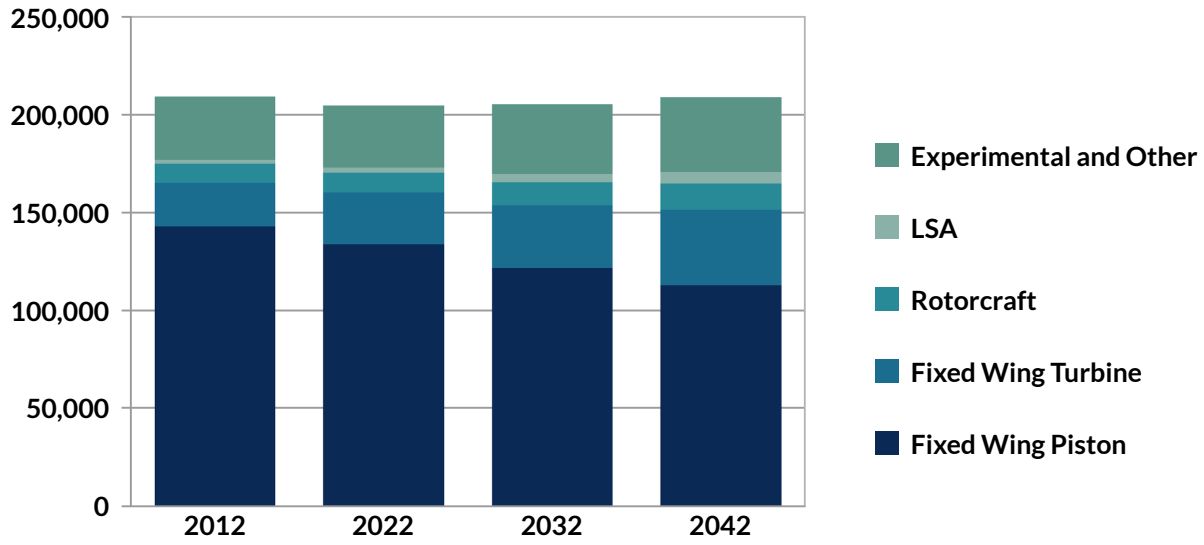
Overall, the forecast for the GA sector is promising. This is largely because it was not as affected by the COVID-19 pandemic as the airlines. Growth at the higher end of the market is expected to continue to offset retirements of mostly piston-powered aircraft which is at the traditional low end of the market. GA operations accounted for 57% of total U.S. operations for 2021. This share has been increasing since the pandemic and is up from 51% for 2019. General aviation operations are forecast to increase an average of 0.6% per year for 2022–2042.[8]

FAA Aerospace Forecast for General Aviation Fleet Mix

The results of the FAA's most recent General Aviation and Part 135 Activity Survey show an estimated 204,140 active aircraft for 2020. This was a decline of 3.2% from 2019 as decreases of fixed wing piston aircraft, rotorcraft, and light sport aircraft (**LSA**) as well as experimental and other types of aircraft outpaced increases of fixed wing turbine aircraft. Overall, deliveries of general aviation aircraft for 2021 were 7.4% higher than deliveries for 2020. However, this was 5.7% lower than deliveries for 2019.

As shown in Figure 5.3, fixed wing piston aircraft are forecast to decrease 0.8%, fixed wing turbine aircraft are forecast to increase 1.9%, rotorcraft are forecast to increase 1.5%, light sport aircraft are forecast to increase 3.4%, experimental aircraft are forecast to increase 1.0%, and other types of aircraft are forecast to increase 0.7% per year. Overall, the general aviation fleet is expected to increase at an average of 0.1% per year for 2022–2042.[9]

Figure 5.3: FAA Aerospace Forecast for General Aviation Fleet Mix, 2022–2042



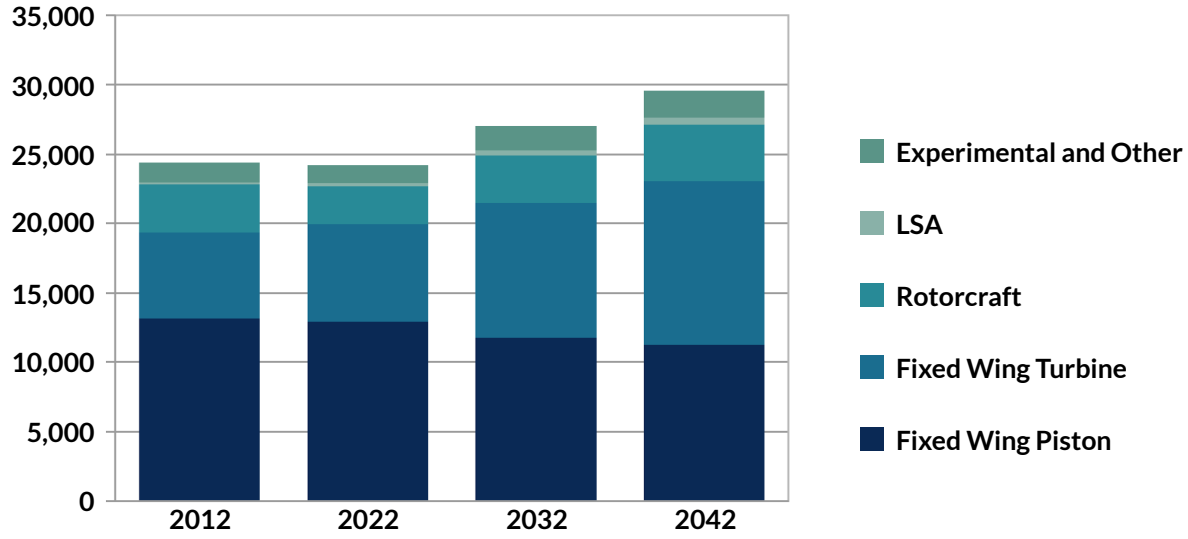
Source: FAA Aerospace Forecast, 2021-2041

FAA Aerospace Forecast for General Aviation Hours Flown

Although only a marginal increase is expected for the total general aviation fleet, the number of general aviation hours flown is forecast to increase an average of 1.0% per year for 2022–2042 with total hours flown increasing from 22.5 million hours for 2020 to 29.6 million hours for 2042. This increase is partly due to an anticipated increase in hours flown for newer aircraft. However, the majority of this increase is expected to result from a significant increase in hours flown for jet aircraft due to the increasing size of the business jet fleet.

As shown in Figure 5.4, hours flown for fixed wing piston aircraft are forecast to decrease 0.7%, fixed wing turbine aircraft are forecast to increase 2.6%, rotorcraft are forecast to increase 2.1%, light sport aircraft are forecast to increase 3.8%, experimental aircraft are forecast to increase 1.9%, and other types of aircraft are forecast to increase 1.3% per year. Overall, total general aviation hours flown are expected to increase at an average of 1.0% per year for 2022–2042.[10]

Figure 5.4: FAA Aerospace Forecast for General Aviation Hours Flown, 2022–2042



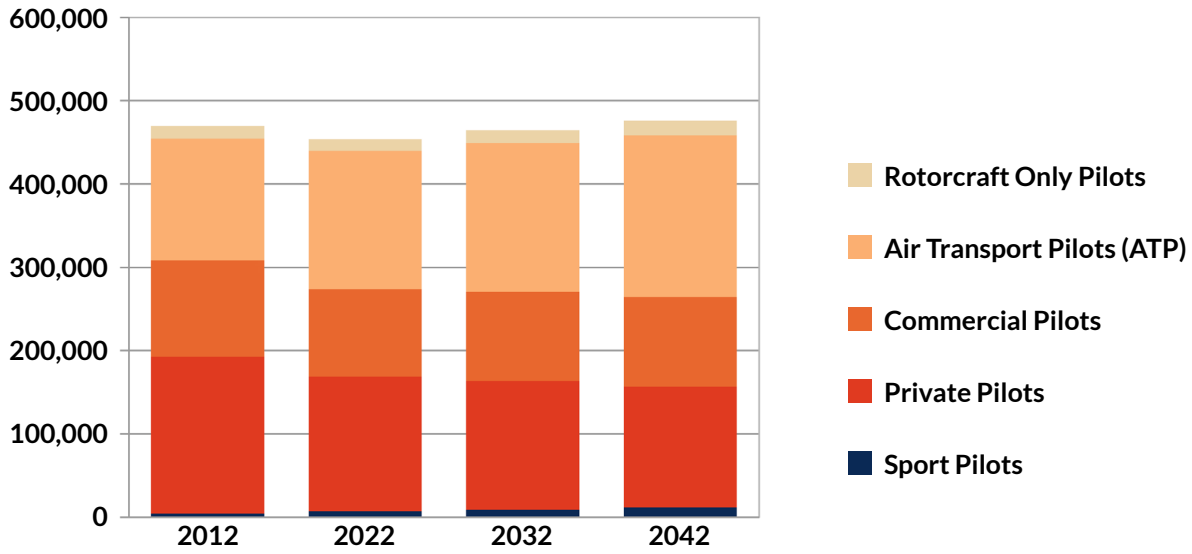
Source: FAA Aerospace Forecast, 2021-2041

National Forecast for Active Pilots by Certificate Type

According to the FAA Aerospace Forecast, there were 720,605 active pilots certificated by the FAA at the end of 2021. This includes 250,197 student pilots, 306,474 general aviation pilots, and 163,934 air transport pilots (**ATP**).

As shown in Figure 5.5, the FAA has forecasted a decrease of 6.7% for recreational pilots and a 0.5% decrease for private pilots for 2022–2042. It also projects a 2.7% increase for sport pilots, a 0.1% increase for commercial pilots, a 0.8% increase for air transport pilot certifications, a 1.3% increase for rotorcraft pilots, and a 0.8% increase for glider pilots. Overall, the number of active general aviation pilots is projected to decrease at an average rate of -0.03% per year for 2021–2042.[11]

Figure 5.5: FAA Aerospace Forecast for Active Pilots by Certificate Type, 2022–2042



Source: FAA Aerospace Forecast, 2021-2041

5.5.2. National Aviation Industry Trends

It is important to take national trends relating to commercial service, general aviation, and air cargo into consideration when developing local aviation forecasts. However, the COVID-19 pandemic has disrupted many of the previous industry trends and new trends began to emerge as a result of the pandemic. For example, low-cost carriers benefited from the strength of the leisure travel segment, cuts in business travel impacted legacy carriers, and all airlines benefited from low fuel prices.

While demand for commercial air travel at CDC will be somewhat influenced by the following industry trends, it will be primarily affected by the status of the contract SkyWest Airlines has to provide commercial service at CDC as part of the Essential Air Service (EAS) program as well as local demand and regional socioeconomic conditions.[12]

a. Fleet Simplification and Modernization

Fleet simplification allows airlines to benefit from higher pilot productivity, lower training costs, reduced maintenance expenses, and increased fuel efficiency. For decades, the regional carriers have been shifting to larger, more fuel-efficient jets with higher seat capacities. This trend in replacing smaller regional jets with more fuel-efficient jets with 70–90 seats is expected to continue, and, by 2030, only a handful of 50-seat regional jets are expected to remain in the fleet.

Mainline carriers (i.e., airlines that fly aircraft with 90 or more seats) have also been increasing the number of seats per aircraft. However, unlike the regionals, this is a newer trend that has been accelerating. As of 2021, the number of seats per aircraft increased nearly 13% for mainline carriers this past decade. Additionally, network carriers—Alaska Airlines, American Airlines, Delta Air Lines, and United Air Lines—are expected to move forward with plans to significantly reduce the number of small regional jets in their fleets.[13]

Fleet Simplification and Modernization's Affect on Cedar City Regional Airport

SkyWest Airlines operates flights on behalf of Delta Air Lines, as Delta Connection, and currently provides nonstop service from Cedar City Regional Airport (CDC) to Salt Lake City International Airport (SLC). The airline currently uses its fleet of 50-seat Bombardier CRJ-200 aircraft for this route. In recent years, the company has been decreasing its fleet of Bombardier CRJ-200 aircraft in favor of the 76-seat Embraer E-175 aircraft. Between January 2019 and December 2022, SkyWest decreased its fleet of Bombardier CRJ-200 aircraft by 26% while also increasing its fleet of Embraer E-175 aircraft by 62%. The company also plans to invest more than $800 million in new Embraer E-175 aircraft in the coming years.[14] This trend will likely result in the airline shifting to using the Embraer E-175 aircraft when providing service to CDC in the coming years which will then result in increased capacity.

b. Pilot Shortage

The commercial airline industry has experienced a pilot shortage this past decade. This shortage was made worse for regional carriers as airlines began to recover from the pandemic with mainline carriers recruiting from the ranks of the regionals. While there is a surge of pilots currently in training, pilot shortages for regional carriers are likely to persist through 2023 due to the time required for training and recruitment.[15]

c. COVID-19 Pandemic

The COVID-19 pandemic caused a national and global health crisis that resulted in the issuance of stay-at-home orders and other restrictions that resulted in a severe shock to the economy and was especially tough for the airline industry. Unlike previous crises affecting the aviation industry, including 9/11 and the Great Recession, both aviation demand and supply were deeply impacted by the pandemic. The airline industry was still experiencing reduced demand at the end of 2022—more than a year after vaccines first became available. While domestic leisure travel has led the recovery, domestic business travel continues to lag behind 2019 levels. As of 2021, passenger enplanements were still 37% lower than pre-pandemic levels.[16] At CDC, flights have since returned to normal levels due to the area's status as an EAS community. However, enplanements have not yet returned to pre-pandemic levels.

5.5.3. Local Factors With Potential to Affect Aviation Activity

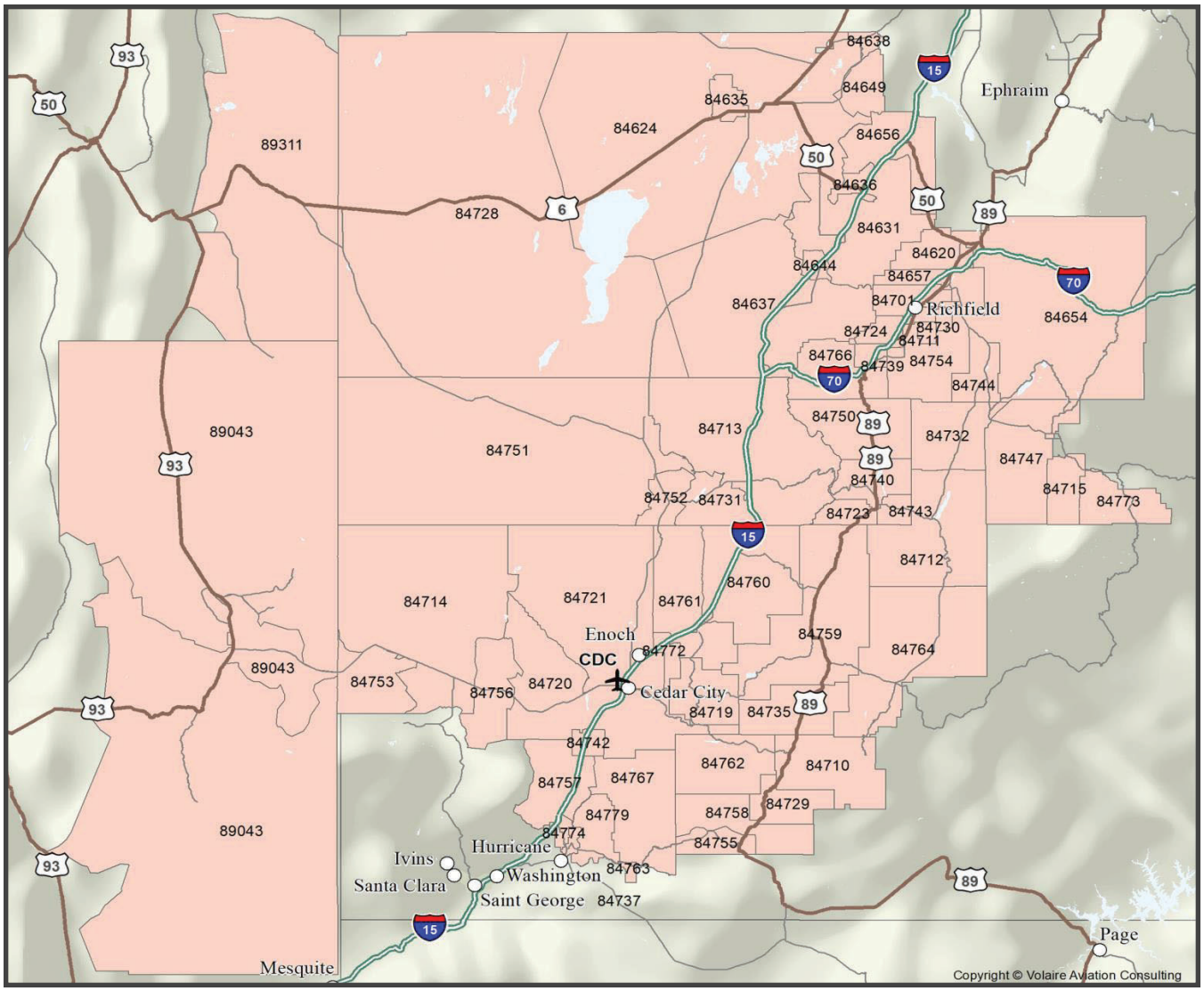
A forecast should also examine local trends and regional socioeconomic conditions, such as local population and income growth, ticket prices, competition, and airport convenience, as these can significantly affect local aviation activity.

a. Catchment Area

An airport catchment area is the geographic area from which the airport can reasonably expect to draw commercial service passengers. It is defined by several factors such as geographical access and proximity to competing airports. According to the 2019 Leakage and Retention Study conducted for CDC, the airport's catchment area covers 33 zip codes in southwestern Utah and four zip codes in Nevada (Figure 5.6). The population of this area was estimated to be 75,406 for 2019 with approximately 60.8% of the population (45,818) located within the Cedar City Metropolitan Statistical Area (MSA) (i.e., Iron County).

Based on the number of tickets sold within the catchment area for the fourth quarter of 2019, the total market size was estimated to be 398,656 origin and destination (O & D) passengers with approximately 61% traveling to or from Cedar City. The number of tickets purchased during the one-year period of the study translates to demand of 546.1 passengers per day each way (PDEW) within CDC's catchment area.[17]

Figure 5.6: Catchment Area Map, 2019



Source: Volaire Aviation Consulting, 2019 Leakage and Retention Study.

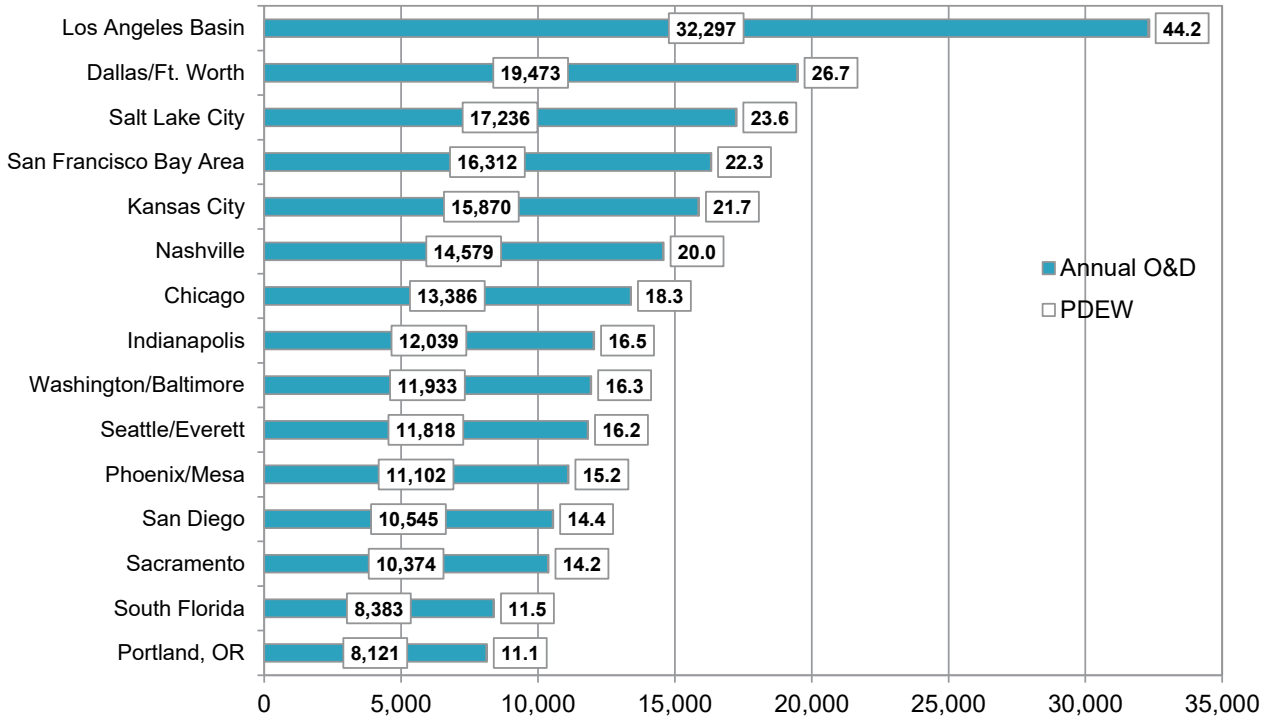
b. Scheduled Nonstop Service As of January 2023

SkyWest Airlines currently provides regularly scheduled service on behalf of Delta Air Lines (as Delta Connection) for CDC with an average of 12 weekly flights to Salt Lake City International Airport (SLC).

c. Top Origin and Destination Markets for Cedar City Regional Airport

As shown in Figure 5.7, the top five O & D markets for passengers traveling to or from CDC's catchment area are the Los Angeles Basin, Dallas/Ft. Worth, Salt Lake City, the San Francisco Bay Area, and Kansas City.

Figure 5.7: Largest Origin and Destination Markets, 2019



Source: Volaire Aviation Consulting, 2019 Leakage and Retention Study.

d. Competing Airports

According to the 2019 Leakage and Retention Study, approximately 71.4% of the passengers who flew domestically to or from the Cedar City catchment area during the fourth quarter of 2019 used Harry Reid International Airport (LAS) rather than CDC. The study also found that approximately 9.9% used SLC, and 6.5% used St. George Regional Airport (SGU).[18] Table 5.5 lists the average cost of a one-way fare for the 50 largest domestic O&D markets for each airport along with the average driving time from CDC.

Table 5.5: Domestic Passenger Retention Rate, 2019

Rank	Airport Code	Airport Name	Drive Time	Share of Passengers	Fare
1	LAS	Harry Reid International	2 Hours 45 Minutes	71.4%	$136
2	CDC	Cedar City Regional	—	12.2%	$181
3	SLC	Salt Lake City International	3 Hours 45 Minutes	9.9%	$178
4	SGU	St. George Regional	1 Hour	6.5%	$168

Source: Volaire Aviation Consulting, *2019 Leakage and Retention Study*.

It is apparent that the majority of passengers traveling to or from the Cedar City catchment area are choosing to drive to LAS due to the wide variety in carrier choice, availability of more desirable flight schedules—most of which are nonstop—to CDC's largest origin or destination (O&D) markets and at lower fares. For the fourth quarter of 2019, LAS was serviced by more than ten airlines which offered 155 nonstop routes at an average fare of $438 to international locations and $136 to domestic locations for an overall average cost of $165 for a one-way ticket.

These travel patterns are difficult but not impossible to change. According to airport management, recent adjustments to the schedule have made flight times more convenient for passengers traveling from CDC to SLC which has proven effective in retaining some local passengers. However, with so few flights available, many passengers find connecting flights to be poorly timed which makes connecting in SLC an inconvenient and unattractive option. This has likely caused many potential passengers to choose to drive to a competing airport rather than use CDC. This indicates there is a significant demand for air travel that is not being met with the limited services provided from CDC. The local community recognizes the airport's importance to the region, and airport management is working to attract additional air service to Cedar City Regional Airport.

e. Potential for New Commercial Service

Many low-cost and ultra low-cost carriers have benefited from the strength of the leisure travel segment which has largely returned to pre-pandemic levels.[19] This trend has the potential to interest these carriers in introducing new service at CDC as these types of carriers tend to thrive in smaller markets with relatively low demand indicators due to the price sensitivity of leisure travelers. This would potentially result in the introduction of seasonal nonstop service to new destinations. However, due to the wide variety in carrier fleets as well as potential routes and schedules, the forecast will not reflect this potential as an alternative scenario.

f. Socioeconomic Trends

There is typically a strong connection between socioeconomic trends and aviation demand. Local socioeconomic conditions—particularly population, employment, and income—can have either an upward or downward influence on local aviation activity levels. This is particularly true for GA activity which is largely determined by local population and income levels. Since 2015, the Kem C. Gardner Policy Institute has produced long-term population growth projections for the state of Utah and its counties. However, these projections were not used to help develop the 2025 Airport Master Plan forecast because they did not include projections for every socioeconomic aspect reviewed. The projections prepared by Woods and Poole Economics, Inc., an independent firm specializing in long-term economic and demographic projections, were used instead due to the consistency provided by using a single source of socioeconomic projections. Table 5.6 summarizes the population, employment, and per capita income growth projected for the MSA.

Table 5.6: Socioeconomic Forecast, 2022–2042

	Base Year	Forecast Years			Compound Annual Growth Rate		
	2022	2027	2032	2042	5-Year	10-Year	20-Year
Population							
	61,464	66,415	71,764	83,790	1.56%	1.56%	1.56%
Employment							
	30,842	33,988	37,371	44,734	1.96%	1.94%	1.88%
Per Capita Income							
	$36,571	$45,954	$58,709	$95,619	4.67%	4.85%	4.92%

Source: Woods and Poole Economics, Inc.

5.6. Forecast Methodologies

There are several acceptable methods for forecasting aviation activity. Selecting the most appropriate method is typically a matter of professional judgment and experience based on the analyst's industry knowledge and assessment of local conditions. Quite often, the most reliable approach for generating a reasonable estimate involves using multiple methods. As stated in FAA AC 150/5070-6B, *Airport Master Plans*, the most common techniques are regression analysis, trend analysis, market share analysis, and smoothing.

5.6.1. Regression Analysis

Regression analysis is a statistical technique used to identify trends in data by measuring the relationship between dependent (e.g., aviation demand) and independent variables (e.g., population and income). This method is most effective when using relatively simple sets of data, a strong statistical correlation is evident, and reliable data is available for the independent variables.

5.6.2. Trend Analysis

Trend analysis uses historical patterns to project future activity. This approach is useful when local conditions are unusual enough to differentiate the study airport from other airports in the region.

5.6.3. Market Share Analysis

This technique assumes a top-down relationship between national, regional, and local forecasts. It involves conducting a historical review of the airport activity and identifying its percentage, or share, of a larger regional, state, or national aviation market. The historical market share is then used to project the future market share based on forecasts developed for the larger geographical area. This type of forecast is useful when the activity has a constant share of a larger market.

5.6.4. Smoothing

Smoothing is a statistical technique used to make predictions based on applying recent trends and conditions to historical data. It is most effective for generating short-term forecasts.

5.6.5. Forecasting Methodology and Approach Used

For airports like CDC that support a wide variety of aviation needs, preparing a forecast of aviation demand can be complex because each type of aviation activity is typically influenced by different local and national trends. It is best to divide the forecast into separate elements in order to use the forecasting method that will best reflect the specific factors expected to affect each element of the forecast. The assumptions and methodologies used to develop each element of the forecast for CDC are discussed in the relevant section.

Forecasts should include a sensitivity analysis to measure potential variations in activity levels should the factors influencing aviation activity change during the 20-year planning period. One method of accommodating uncertainty in a forecast is to include a series of forecast scenarios to examine how potential changes in industry trends or socioeconomic conditions could affect the forecast. By including a range of potential outcomes, airport planners are better able to accommodate changes in aviation activity levels in response to new or changing conditions during the 20-year planning period.

5.7. Sources of Data

The following sources of operations and aircraft data were used, in addition to the TAF, in developing the forecast for this airport master plan.

5.7.1. Traffic Flow Management System Counts

The FAA's Traffic Flow Management System Counts (**TFMSC**) database includes data generated when pilots file flight plans as well as other flights detected, usually via RADAR, within the National Airspace System (**NAS**). This database includes the specific types and models of aircraft that operate under instrument flight rules (**IFR**) and are therefore required to file a flight plan. In general, this includes all commercial operations along with the majority of GA operations conducted by jet aircraft as well as both medium and large propeller aircraft. It typically only captures a small portion of GA activity conducted by small piston aircraft because they typically operate under visual flight rules (**VFR**) and are therefore not required to file a flight plan.[20] Despite this limitation, TFMSC data is helpful in identifying general trends in airport activity. TFMSC data for CDC was used to help establish a historical record of the types and classes of aircraft using the airport for the past decade.

5.7.2. Virtower

Airports like CDC that are without an airport traffic control tower (**ATCT**) are typically unable to track total airport operations. However, the airport sponsor recently invested in Virtower which is an airport operations tracking system that allows the airport to identify and track aviation activities. This includes tracking takeoffs, landings, touch-and-go procedures, and helicopter operations as well as identifying the helipad or runway end used for each operation.[21]

This system uses sensors to detect and record information being transmitted by an aircraft's automatic dependent surveillance-broadcast (**ADS-B**). While the accuracy of this data was verified by comparing it to the aircraft photos captured by the motion-activated cameras, it is only able to track aircraft equipped with an ADS-B transmitter which is not required at CDC. It was assumed that 100% of the commercial service, air taxi, and jet operations are ADS-B equipped because it is a requirement when operating in most controlled airspace. Therefore, a 10% modifier was applied to the Virtower data for GA operations in order to adjust for any operations by unequipped aircraft.

5.7.3. Motion Activated Cameras

Three motion-activated cameras were used to record aircraft operations at CDC for three months in order to verify both TFMSC and Virtower records. These cameras were placed at the intersection of Runway 2 and Taxiway Connector A4, at the intersection of Runway 20 and Taxiway Connector A1, and at the helipad. Photos from two days per week were compared to the Virtower data from the same days which showed that the Virtower system captured 100% of the aircraft operations shown in these photos.

5.7.4. U.S. Department of Transportation Air Carrier Statistics Database

The Air Carrier Statistics database, also known as the T-100, contains domestic and international airline market data as reported by U.S. air carriers on a monthly basis. It reports carrier, origin, destination, and service class data for enplaned passengers as well as freight and mail data for domestic markets. It also includes aircraft type, available capacity, scheduled departures, departures performed, and load factors for domestic non-stop flights. This database is frequently used by the aviation industry, the press, and the legislature to produce reports and analyses on air travel patterns and carrier market shares as well as passenger, freight, and mail cargo flow.[22] The T-100 data for CDC was used to help establish a historical record of the commercial operations and passenger activity levels for the past decade.

5.8. Aircraft Operations

This section presents the forecast for aircraft operations. The projections for commercial service, general aviation, and military operations are each presented separately along with the assumptions and methodologies used to develop each forecast.

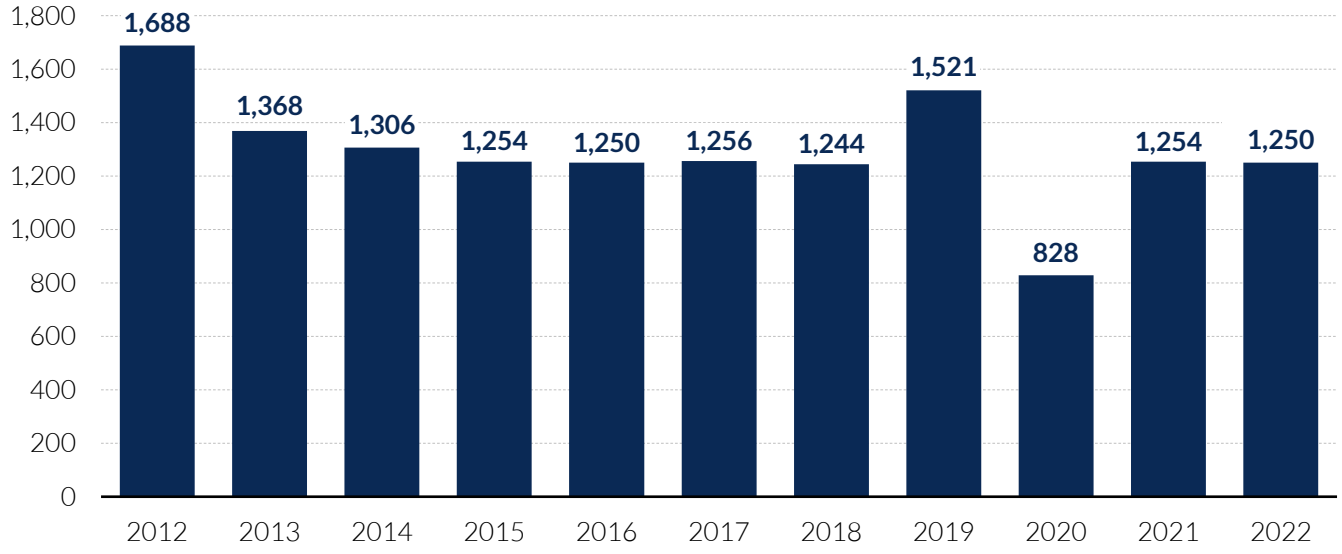
5.8.1. Commercial Service Operations

As previously discussed, commercial service operations are not handled the same way in every forecast. For this forecast, only regularly scheduled passenger flights (i.e., SkyWest Airlines flights) are counted as commercial service operations. The forecast for commercial service operations, along with the passenger enplanements forecast, will help determine future requirements for airport facilities—especially those necessary for accommodating passengers. In general, commercial service operations can be affected by a variety of national and local factors, airline and aviation industry trends, and regional socioeconomic conditions. However, at CDC, the status of the EAS contract will likely have the greatest effect on these operations for the 20-year planning period. As previously discussed, SkyWest Airlines currently has a revolving two-year contract to provide commercial service at CDC as part of the EAS program. The current contract, which covers 2022–2024, is for a minimum of 12 round-trip flights per week to Salt Lake City International Airport (SLC) using an aircraft that seats 30–50 passengers.

a. Historical Commercial Service Operations

Figure 5.8 shows historical commercial service operations for 2012–2022 as reported by the U.S. Department of Transportation T-100 database. While commercial service operations have remained relatively consistent this past decade, there was a notable increase in 2019 due to the temporary closure of St. George Regional Airport (SGU) and a significant decrease in 2020 due to the COVID-19 pandemic. Overall, commercial service operations have decreased at a CAGR of -2.96% for 2012–2022.

Figure 5.8: Air Carrier Operations, 2012–2022



Source: U.S. Department of Transportation, T-100.

b. Commercial Service Operations Forecast

The forecast for commercial service operations is based on the assumption that the existing EAS contract for 12 weekly round-trip flights will remain in effect throughout the 20-year planning period. As shown in Table 5.7, commercial operations are expected to remain at 1,248 for 2022–2024.

Table 5.7: Commercial Service Operations Forecast

Year	TAF	Commercial Operations
2022	1,304	1,250
2027	1,304	1,248
2032	1,304	1,248
2042	1,304	1,248
CAGR	**TAF**	**Commercial Operations**
2022–2042	0.00%	-0.01%

Source: FAA, TAF; Ardurra.

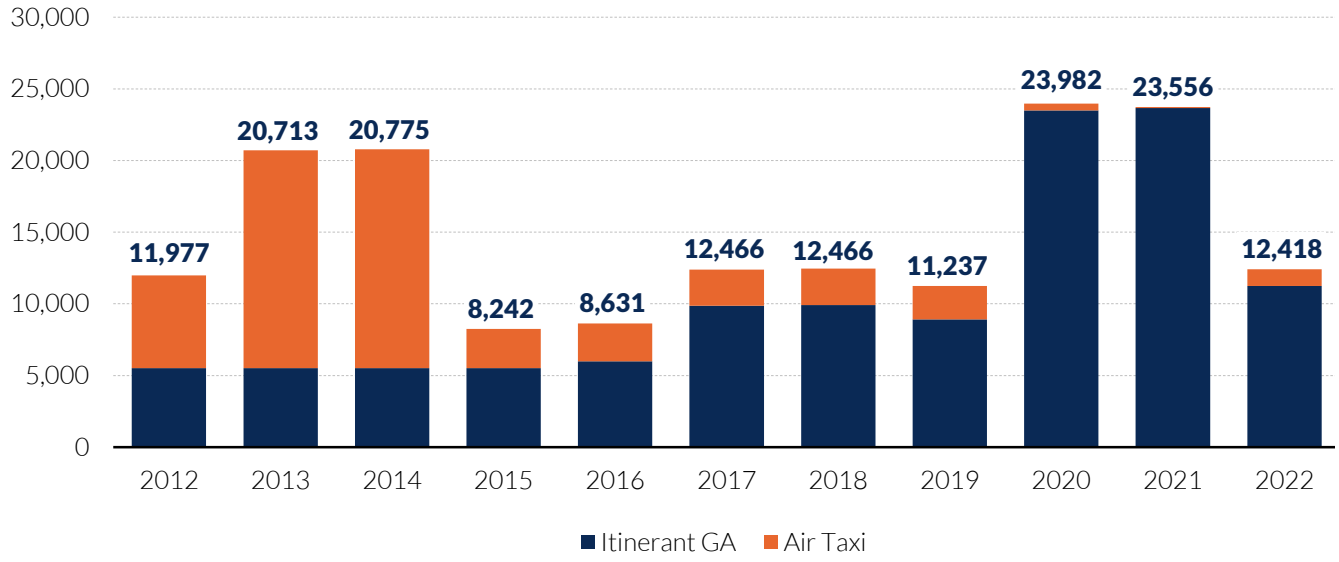
5.8.2. General Aviation Operations

General aviation includes all operations that are not scheduled commercial service or military operations. At CDC, this includes air taxi operations (i.e., charter flights), dedicated air cargo operations, aerial firefighting and other emergency services, pilot training (i.e., SUU operations), and recreational flights. The forecast for general aviation operations, along with the based aircraft forecast, will aid in planning and developing the areas of the airport that cater to GA customers.

a. Historical Itinerant General Aviation Operations

Itinerant operations are all operations that originate or terminate at different airports. Figure 5.9 shows historical rates of itinerant GA operations and air taxi operations for 2012–2022 as reported by the TAF. It is assumed that there are errors in the way the TAF is reporting air taxi operations which is one of the primary reasons it is incorporated as a separate element in the GA forecast. Overall, itinerant GA operations have increased at a CAGR of 0.36% for 2012–2022.

Figure 5.9: Itinerant General Aviation Operations, 2012–2022



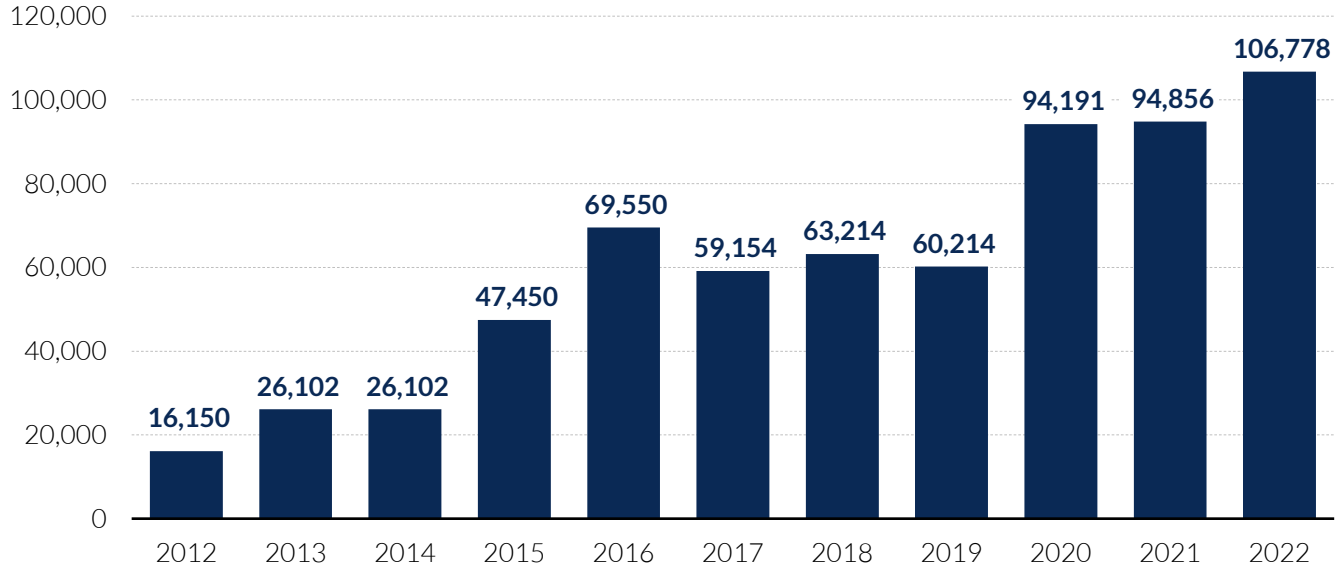
Source: FAA, TAF.

b. Historical Local General Aviation Operations

The FAA defines local GA operations as those operating in the local traffic pattern, within the airport line of sight, are known to be departing for or arriving from the local practice area, or that execute simulated instrument approaches or low passes at the airport. Figure 5.10 shows historical rates of local GA operations as reported by the TAF. Overall, local GA operations have increased at a CAGR of 20.79% for 2012–2022.

This large increase is assumed to be partially due to how the TAF has historically reported SUU operations. As noted in the 2017 Airport Master Plan, the TAF was not accurately reflecting the flight school operations prior to 2016. In more recent years, the TAF has more accurately reflected these operations, and is assumed future years will be more precise with the addition of the Virtower technology.

Figure 5.10: Local General Aviation Operations, 2012–2022



Source: FAA, TAF.

c. General Aviation Operations Forecast

A regression analysis was used to measure the statistical relationship between the population of the Cedar City MSA and GA operations. This type of analysis identifies the correlation coefficient (i.e. R value) between a dependent variable (i.e. aviation activity) and an independent variable (i.e., population). For an aviation activity forecast, an acceptable R value should be greater than 70%. The regression analysis determined an R value of 93% which indicates a strong statistical correlation with good predictive reliability. This method was used to forecast both itinerant GA operations, including air taxi operations, and local GA operations. However, a different method was used to forecast SUU operations in order to prevent these operations from inflating the overall general aviation forecast.

Virtower and TFMSC data were examined to determine baseline amounts for both itinerant and local GA operations for 2022. This analysis showed that GA operations were approximately 60% itinerant and 40% local operations. It also showed that air taxi operations accounted for approximately 9.5% of itinerant GA operations. It was assumed that these percentages will remain relatively consistent throughout the entire 20-year planning period. Therefore, this ratio was applied to the forecast for overall GA operations to determine the individual forecast for itinerant GA operations, including air taxi operations, and the forecast for local GA operations. As shown in Table 5.8, air taxi operations, itinerant GA operations, and local GA operations are expected to increase at a CAGR of 3.63% for 2022–2024 based on the expected growth in population for the Cedar City MSA.

Table 5.8: General Aviation Operations Forecast

Itinerant General Aviation Operations Forecast			
Year	**Air Taxi Operations**	**Itinerant GA Operations**	**Total Itinerant GA Operations**
2022	1,182	11,236	12,418
2027	1,419	13,486	14,905
2032	1,725	16,396	18,121
2042	2,413	22,938	25,351
CAGR	**Air Taxi Operations**	**Itinerant GA Operations**	**Total GA Operations**
2022–2042	3.63%	3.63%	3.63%

Local General Aviation Operations Forecast			
Year	**Local GA Operations**	**SUU Operations**	**Total Local GA Operations**
2022	8,279	98,499	106,778
2027	9,936	100,893	110,829
2032	12,081	103,529	115,610
2042	16,901	109,588	126,489
CAGR	**Local GA Operations**	**SUU Operations**	**Total Local GA Operations**
2022–2042	3.63%	0.53%	0.85%

Source: FAA, TFMSC; CDC, Virtower; Woods and Poole Economics, Inc., Population Forecast; Ardurra.

d. Southern Utah University Operations Forecast

According to the airport's Virtower data, SUU operations accounted for approximately 92% of all local GA operations with a total of 98,499 SUU operations for 2022. Approximately 51% of these were helicopter operations and 49% were fixed wing operations. According to program representatives, these numbers are consistent with the program's averages for the last four years. Growth of these operations is expected to be somewhat limited due to airspace, airport, and SUU fleet constraints. However, some constraints can be overcome to allow for a potential increase in SUU operations.

The forecast for SUU operations was developed based on the FAA's Aerospace Forecast for active pilots by certificate type. As shown in Table 5.9, the forecast for SUU operations shows helicopter operations increasing at a CAGR of 1.30%, and fixed wing operations decreasing at a CAGR of -0.4% for the 20-year planning period. Overall, SUU operations are expected to increase at a CAGR of 0.53% for 2022–2024.

As shown in Table 5.8, the forecast for SUU operations was combined with the local GA operations forecast to determine the forecast for total local GA operations.

Table 5.9: Southern Utah University Operations Forecast

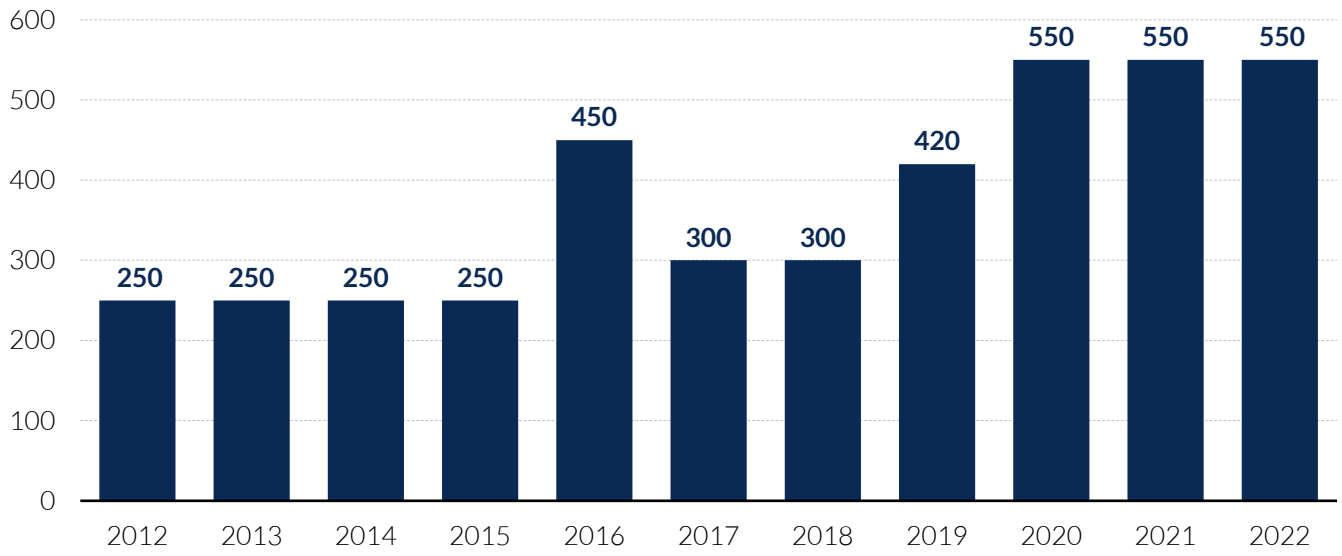
Year	Helicopter Operations	Fixed Wing Operations	Total SUU Operations
2022	50,234	48,265	98,499
2027	53,586	47,307	100,893
2032	57,161	46,368	103,529
2042	65,041	44,547	109,588
CAGR	**Helicopter Operations**	**Fixed Wing Operations**	**Total SUU Operations**
2022–2042	1.30%	-0.40%	0.53%

Source: FAA, Aerospace Forecast, TFMSC; CDC, 2020 Virtower Data; Ardurra.

5.8.3. Military Operations

According to the TAF, itinerant military operations have increased from 250 annual operations for 2012 to 550 annual operations for 2022 while local military operations have remained at zero (Figure 5.11). Overall, military operations have increased at a CAGR of 8.2% for 2012–2022.

Figure 5.11: Historical Military Operations, 2012–2022



Source: FAA, TAF.

a. Itinerant Military Operations Forecast

Military operations tend to fluctuate as the Department of Defense changes its operational requirements, and future activity levels can change without notice due to the national security nature of military missions. As a result, military operations are typically forecast at existing levels unless there is specific knowledge of an upcoming change that would affect future activity levels at the airport.

While the Utah Army National Guard is currently in the process of establishing a long-term presence at CDC, these plans have not been finalized at this time. Once plans are finalized, this would likely result in the local military fleet of UH-60 Black Hawks and AH-64 Apache helicopters beginning to conduct local military operations in 2023. However, the number of aircraft and potential activity levels are unknown. Due to this uncertainty, a reasonable forecast could not be determined. Additionally, these operations are unlikely to significantly affect the overall forecast. Therefore, the TAF is the selected forecast for itinerant military operations (Table 5.10).

Table 5.10: Itinerant Military Operations Forecast

Year	TAF Forecast	Itinerant Military Forecast
2022	550	550
2027	550	550
2032	550	550
2042	550	550
CAGR	**TAF**	**Itinerant Military Forecast**
2022–2042	0%	0%
Difference From TAF	**TAF**	**Itinerant Military Forecast**
	0%	0%

Source: FAA, TAF.

b. Local Military Operations Forecast

The TAF is also the selected forecast for local military operations. According to the TAF, local military operations are forecast to remain at zero operations for the 20-year planning period.

5.9. Passenger Enplanements

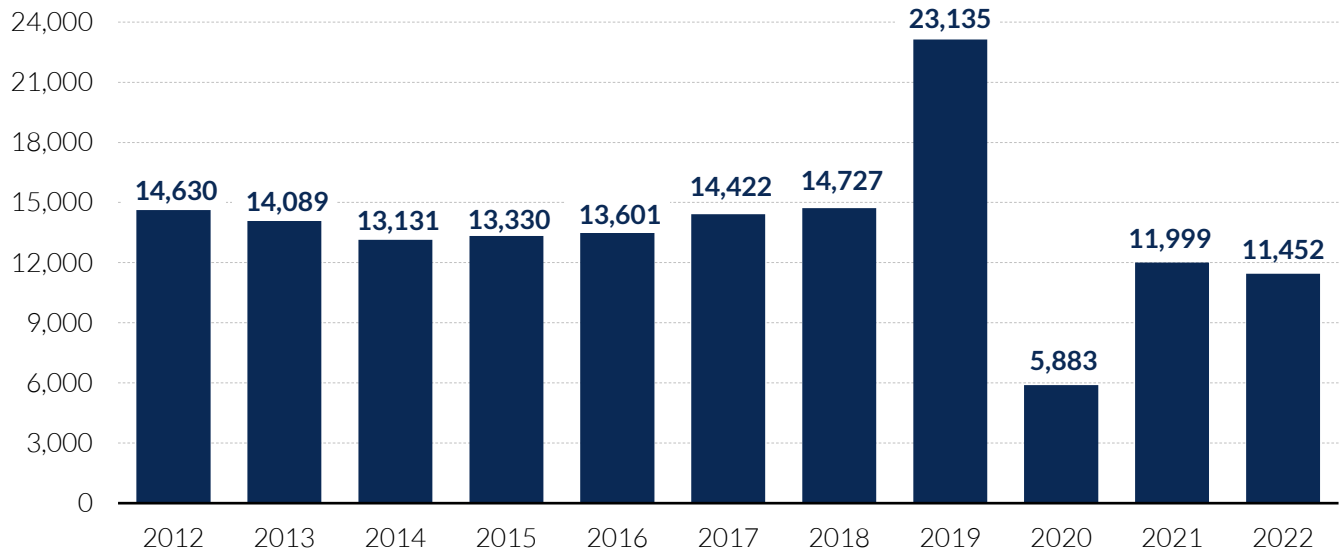
An enplanement is the term used to describe a revenue paying passenger boarding a commercial flight. The forecast for passenger enplanements, along with the forecast for commercial service operations, will help determine future requirements for airport facilities necessary for accommodating passengers. A variety of factors and trends must be taken into consideration in order to develop an effective forecast for passenger enplanements such as regional socioeconomic conditions as well as the airline and aviation industry trends that will affect the airport. This also includes analyzing the passenger load factor (i.e., percentage of seats sold). An airline's load factor is an indicator in determining the success of a particular route and is an important element in route planning. However, according to the terms of the EAS contract, passenger load factor does not necessarily determine commercial service operations as long as there is an average of ten enplanements per flight.

5.9.1. Historical Passenger Enplanements

Figure 5.12 shows historical passenger enplanements for 2012–2022 as reported by the U.S. Department of Transportation T-100 database. This data shows enplanements remained relatively steady until 2019 when they peaked at 23,135 due to the temporary closure of St. George Regional Airport (SGU). This was followed by a steep decline as a result of the COVID-19 pandemic. While this shows passenger enplanements have decreased at a CAGR of -2.42% for 2012–2022, it is important to know that this data does not reflect a declining trend in enplanements at CDC because the entire industry has yet to fully recover from the impacts of the COVID pandemic.

A more accurate measure of the enplanement trend for CDC is to adjust the 2019 numbers to correct for the increase resulting from the temporary closure of SGU in order to determine the pre-pandemic growth rate. Without the additional operations, it is assumed that there would have been 15,431 organic enplanements at CDC for 2019. This shows passenger enplanements have increased at a CAGR of 0.76% for 2012–2019.

Figure 5.12: Historical Passenger Enplanements, 2012–2022



Source: USDOT, T-100

5.9.2. Passenger Enplanements Forecast

A series of scenarios were prepared for the forecast of enplaned passengers.

- **Scenario #1:** A forecast based on CDC's historical market share of state enplanements. According to the *2020 Utah Aviation Development Strategy*, CDC's average market share of state enplanements—excluding SLC—was determined to be 6.36% for 2010-2017. This percentage was used to forecast enplanements for CDC based on the enplanements forecast included in *2020 Utah Aviation Development Strategy*. This forecast shows enplanements increasing at a CAGR of 1.49% for 2022–2024.
- **Scenario #2:** A forecast based on the rate of population growth projected for the Cedar City MSA. As shown in Table 5.6: Socioeconomic Forecast, 2022–2042, the population is projected to grow at a rate of 1.56% for 2022–2042.
- **Scenario #3:** A forecast based on the increase projected for per capita income within the Cedar City MSA. This forecast shows enplanements increasing at a CAGR of 4.84% for 2022–2024.

As shown in Table 5.11, the preferred forecast for passenger enplanements is Scenario #2 which provides a realistic outlook based on the population growth expected for the region as it more closely reflects how local conditions are likely to affect demand for air service.

Table 5.11: Passenger Enplanements Forecast

Year	Market Share	Population	Per Capita Income
2022	11,452	11,452	11,452
2027	12,331	12,374	14,388
2032	13,277	13,369	18,232
2042	15,394	15,608	29,473
CAGR	**Market Share**	**Population**	**Per Capita Income**
2022–2042	1.49%	1.56%	4.84%

Source: U.S. Department of Transportation, T-100; Woods and Poole Economics, Inc., Population Forecast; Ardurra.

5.9.3. Passenger Load Factor Forecast

While the passenger load factor is not directly used to help determine future facility requirements, it can be useful as a pre-indicator of growth—especially in regards to airlines offering additional flights or new service. The load factor forecast was calculated based on the commercial operations and enplanements forecasts and includes an increase in departing seats to reflect the potential increase that would happen if SkyWest transitions its fleet in line with current industry trends. Should this happen, it was assumed SkyWest would begin to transition to the 76-seat Embraer E-175 aircraft at CDC after approximately ten years. As shown in Table 5.12, load factors are expected to meet the minimum requirements for the EAS contract.

Table 5.12: Passenger Load Factor Forecast

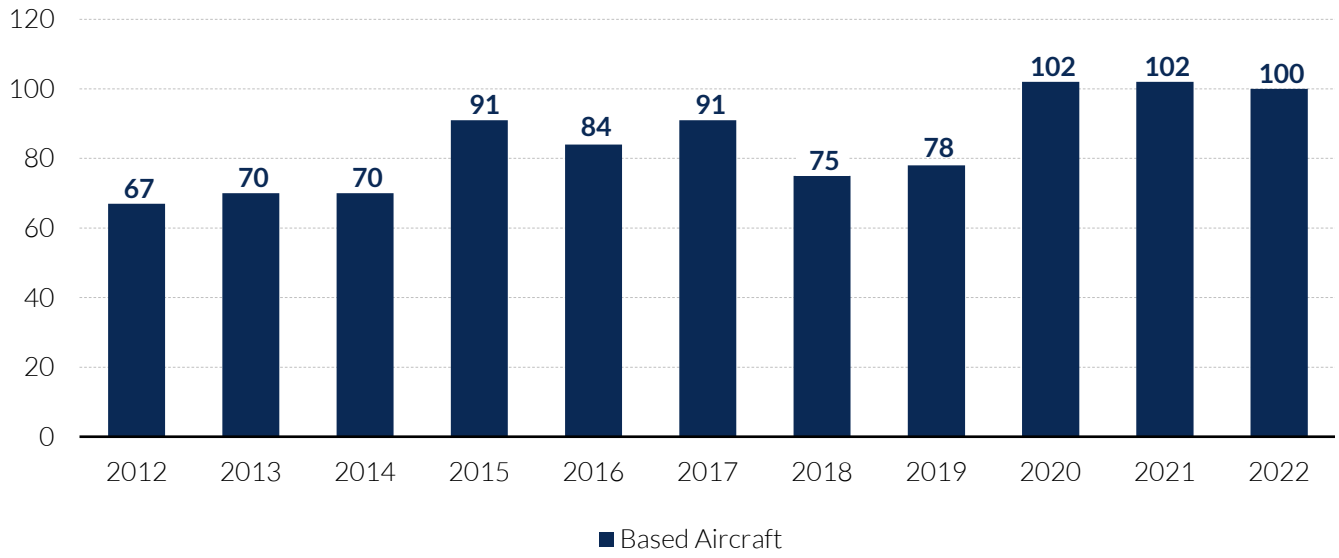
Year	Enplanements	Departing Flights	Departing Seats	Load Factor
2022	11,452	625	31,250	27%
2027	12,374	624	31,200	28%
2032	13,369	624	43,680	31%
2042	15,608	624	43,680	36%

Source: U.S. Department of Transportation, T-100; Woods and Poole Economics, Inc., Population Forecast; Ardurra.

5.10. Based Aircraft

The FAA defines based aircraft as any operational and airworthy aircraft that is based at the airport for the majority of the year. The forecast for based aircraft is essential for long-term planning and development of GA infrastructure such as aircraft hangars and tiedowns. According to the TAF, the number of based aircraft have increased at a CAGR of 4.09% for 2012–2022 (Figure 5.13).

Figure 5.13: Historical Based Aircraft, 2012–2022

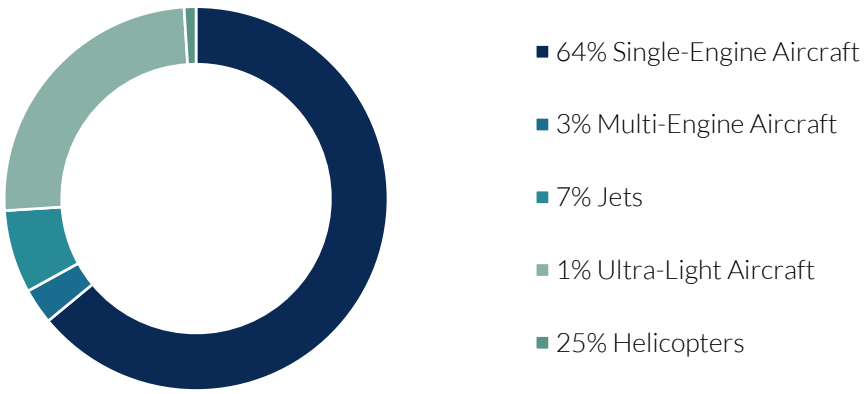


Source: FAA, TAF.

5.10.1. Based Aircraft Inventory

The airport provides the FAA with an annual inventory of based aircraft that lists the number of each type of aircraft. This information is used by the FAA when completing the airport master record (FAA Form 5010-1) for CDC. According to the TAF, a total of 102 aircraft were based at the airport for 2022. However, according to the airport master record for CDC, only 100 aircraft were actually based at the airport for 2022. As a result, the information from the airport master record will be used as the baseline for this forecast. As shown in Figure 5.14, approximately 64 of these aircraft were single-engine, three were multi-engine, seven were jets, one was an ultralight, and 25 were helicopters.

Figure 5.14: Inventory of Based Aircraft by Type, 2022



Source: FAA, Airport Master Record.

5.10.2. Based Aircraft Forecast

The following scenarios were prepared in order to determine the most suitable forecast for based aircraft:

- **Scenario #1:** The TAF forecast which shows a projected increase of 0.10% for 2022–2042.
- **Scenario #2:** A forecast based on the 1.56% increase in population projected for 2022–2042.
- **Scenario #3:** A forecast based on the 1.88% increase in employment projected for 2022–2042.

As shown in Table 5.13, the scenario based on population growth with a CAGR of 1.55% was determined to be the preferred forecast. As the moderate option, this growth rate should allow the airport to take a conservative approach to future development while still meeting future demand.

Table 5.13: Based Aircraft Forecast

Year	TAF Forecast	Population	Employment
2022	102	100	100
2027	104	108	110
2032	104	117	121
2042	104	136	145
CAGR	**TAF**	**Population**	**Employment**
2022–2042	0.10%	1.55%	1.88%
Difference From TAF	**TAF**	**Population**	**Employment**
	0%	30.77%	39.42

Source: FAA, TAF.

5.10.3. Based Aircraft Forecast by Aircraft Type

The fleet mix for based aircraft is expected to remain approximately the same throughout the 20-year planning period. Therefore, as shown in Table 5.14, the forecast for based aircraft by aircraft type was determined by applying the current percentages for each type of aircraft currently based at the airport (Figure 5.14) to the forecast for based aircraft (Table 5.13).

Table 5.14: Based Aircraft Forecast by Aircraft Type

Year	Single-Engine	Multi-Engine	Jet	Ultra-Light	Helicopters	Total
	64%	3%	7%	1%	25%	
2022	64	3	7	1	25	100
2027	69	3	8	1	27	108
2032	75	4	8	1	29	117
2042	87	4	10	1	34	136

Source: Ardurra.

5.11. Fleet Mix

The fleet mix forecast is particularly important because it is used to help identify the critical aircraft which is an essential step in identifying the correct FAA design criteria for the airport. The FAA has developed a coding system that allows airport planners and engineers to identify airport design criteria based on the operational and physical characteristics of the types of aircraft that typically operate at the airport. The aircraft approach category (AAC) is designated by a letter and is based on the speed of an aircraft as it approaches a runway when landing. It is generally used to help determine dimensional standards for runway safety areas. The airplane design group (ADG) is designated by a Roman numeral and is based on an aircraft's wingspan or tail height; depending on which is most restrictive. ADG is typically used to establish dimensional standards needed for taxiway clearance.[23]

5.11.1. Commercial Service Fleet Mix Forecast

SkyWest Airlines is expected to transition from using its fleet of 50-seat Bombardier CRJ-200 aircraft in favor of the 76-seat Embraer E-175 aircraft at CDC by 2032.

5.11.2. General Aviation Fleet Mix Forecast

As previously discussed in Section 5.7. Sources of Data, the FAA's TFMSC database and the airport's Virtower system records were used to determine the percentage of each type of aircraft currently using the airport. As shown in Table 5.15, the fleet mix forecast was determined by applying the current percentages to the GA operations forecast.

a. General Aviation Fleet Mix Forecast Assumptions

An assumption was made that the percentages for each category would remain relatively consistent throughout the 20-year planning period because there are no indicators to suggest a significant change.

Table 5.15: General Aviation Fleet Mix Forecast

AAC & ADG	Percentage	Base Year	Forecast Years		
		2022	2027	2032	2042
A-I	94.73%	65,328	70,364	76,665	90,894
A-II	1.18%	815	878	956	1,134
B-I	1.38%	950	1,023	1,115	1,322
B-II	1.97%	1,356	1,461	1,591	1,887
B-III	0.01%	9	10	11	13
C-I	0.03%	18	19	21	25
C-II	0.12%	80	86	94	111
C-III	0.54%	371	400	435	516
D-I	0.01%	4	4	5	6
D-II	0.03%	18	19	21	25
D-III	0.02%	13	14	15	18
Total Fixed Wing	**100%**	**68,962**	**74,278**	**80,930**	**90,950**
Helicopter		**50,234**	**51,456**	**52,801**	**55,890**
Total GA		**119,196**	**125,734**	**133,731**	**151,840**

Source: FAA, TFMSC; Cedar City Regional Airport, 2020 Virtower Data; Ardurra.

5.12. Critical Aircraft

The critical aircraft is the most demanding type of aircraft, or group of aircraft with similar characteristics, that makes a minimum of 500 annual operations at the airport; excluding touch-and-go operations. The critical aircraft is often referred to as the design aircraft because it is used to determine design standards for many areas of the airport. In general, once an aircraft reaches 350 operations with a forecasted upward trend, the FAA supports planning for that aircraft design.

5.12.1. Existing Critical Aircraft

The critical aircraft was identified using a grouping of aircraft with similar characteristics. This practice groups aircraft with comparable operational performance (AAC), combined with the physical dimensions (ADG) to determine the most demanding aircraft design regularly using the airport. It was determined that the most demanding AAC is C, with a total of 469 general aviation operations, and 1,250 commercial service operations, for a total of 1,719 operations by this category in 2022. It was determined that the most demanding ADG is III, with 393 operations in 2022, increasing to 500 by 2032, expedited by the assumed transition of SkyWest to the EMB-175, for an identified critical aircraft being C-III. The Avro RJ87 is the category C-III aircraft that has been selected as the representative critical aircraft (Figure 5.15). Of the 1,512 operations made by C-III aircraft for 2022, approximately 206 were by an Avro RJ87 aircraft. Additionally, the Avro RJ87 is used for aerial firefighting missions and is based at the airport from May through July. Table 5.16 summarizes the specifications for the existing commercial service critical aircraft.

Figure 5.15: Existing Critical Aircraft, Avro RJ87

Source: FAA, Airport Master Record.

Table 5.16: Avro RJ87 Specifications

Characteristic	Specification
Aircraft Approach Category (AAC)	C
Airport Design Group (ADG)	III
Taxiway Design Group (TDG)	2A
Approach Speed	126 knots
Wingspan	86.50 feet
Length	93.10 feet
Tail Height	28.60 feet
Cockpit to Main Gear (CMG)	36.50 feet
Outer to Outer Main Gear Width (MGW)	15.50 feet
Maximum Takeoff Weight	93,000 pounds

Source: FAA, Aircraft Characteristics Database.

5.12.2. Future Critical Aircraft

Airport sponsors must consider how ongoing industry trends are likely to affect the fleet mix when identifying a critical aircraft.[24] For example, the current airline industry trend of retiring 50-seat regional jets and replacing them with more efficient aircraft is expected to affect the commercial service fleet at CDC. Based on the projected fleet mix and the commercial service operations forecast, the Embraer E-175 is the category C-III aircraft that has been selected as the representative future critical aircraft (Figure 5.16). Should SkyWest transition its fleet in line with current industry trends, the airport would see an increase in E-175 operations during the next decade and this aircraft could potentially be used for the majority of commercial service operations at CDC by 2032. Table 5.17 summarizes the specifications for the future critical aircraft.

Figure 5.16: Future Critical Aircraft, Embraer E-175

Source: Delta.

Table 5.17: Embraer E-175 Specifications

Characteristic	Specification
Aircraft Approach Category (AAC)	C
Airport Design Group (ADG)	III
Taxiway Design Group (TDG)	3
Approach Speed	124 knots
Wingspan	85.33 feet
Length	103.92 feet
Tail Height	32.33 feet
Cockpit to Main Gear (CMG)	41.33 feet
Outer to Outer Main Gear Width (MGW)	20.50 feet
Maximum Takeoff Weight	82,673 pounds

Source: FAA, Aircraft Characteristics Database.

5.13. Aircraft Rescue and Firefighting Index

The airport's Aircraft Rescue and Firefighting (ARFF) index should be reviewed as part of the forecasting process to determine if the index will change during the planning period. An airport's ARFF index is determined based on the length of the longest passenger aircraft serving the airport. If this aircraft makes, on average, five or more daily departures from the airport, this aircraft is used to determine the ARFF index for the airport. If the aircraft makes less than five average daily departures, the next lower index group will be the airport's ARFF index. Index A is the minimum designated ARFF index for a commercial service airport.

Passenger aircraft are grouped into the following five categories used to determine the ARFF index:

- Index A includes aircraft less than 90 feet in length.
- Index B includes aircraft at least 90 feet but less than 126 feet in length.
- Index C includes aircraft at least 126 feet but less than 159 feet in length.
- Index D includes aircraft at least 159 feet but less than 200 feet in length.
- Index E includes aircraft at least 200 feet in length.

The longest passenger aircraft currently serving the airport is a Bombardier CRJ-200. At a length of 87.83 feet, this aircraft is categorized as ARFF Index A. The future commercial service critical aircraft is expected to be an Embraer E-175. At a length of 103.92 feet, this aircraft is categorized as ARFF Index B. However, commercial service departures are not forecast to reach an average of five or more departures per day during the planning period. As a result, the airport's ARFF index is expected to remain Index A throughout the entire 20-year planning period.

5.14. Forecast Evaluation

The FAA requires the forecast for primary, nonhub, commercial service airports like CDC to be within 10% of the TAF for the five-year forecast and within 15% for the ten-year forecast. If a forecast is not within this range, additional justification and coordination with the FAA must occur for approval. Table 5.18 shows the master plan forecast alongside the TAF forecast for CDC.

Table 5.18: Forecast Evaluation

	Base Year	Forecast Years		
	2022	2027	2032	2042
Operations				
Commercial Service	2,432	2,667	2,973	3,661
GA Operations	118,014	124,315	132,006	149,427
Military	550	550	550	550
Total Master Plan Operations	**120,996**	**127,532**	**135,529**	**153,639**
Total TAF Operations Forecast	**121,215**	**125,483**	**129,900**	**139,272**
Difference	**0%**	**2%**	**4%**	**9%**
Enplanements				
Master Plan Forecast	11,452	12,374	13,369	15,608
TAF Forecast	10,600	10,600	10,600	10,600
Difference	**7%**	**14%**	**26%**	**47%**
Based Aircraft				
Master Plan Forecast	100	108	117	136
TAF Forecast	102	104	104	104
Difference	**-2%**	**4%**	**11%**	**24%**

Source: FAA, TAF; Ardurra.

The 2025 Airport Master Plan forecast is well within the required limits for both GA and military operations as well as based aircraft. However, the master plan forecast for commercial service operations and enplanements is not within the required limits. This is partially due to the TAF not accurately reflecting the commercial service operations and enplanements activity levels reported by the U.S. Department of Transportation in the Air Carrier Statistics database (T-100). This difference is shown in Table 5.19.

Table 5.19: Terminal Area Forecast and Air Carrier Statistics Comparison

Year	TAF	T-100	Difference
2012	10,600	14,630	-38%
2013	10,600	14,089	-33%
2014	10,600	13,131	-24%
2015	10,600	13,330	-26%
2016	10,600	13,601	-28%
2017	10,600	14,422	-36%
2018	10,600	14,727	-39%
2019	10,600	23,135	-118%
2020	10,600	5,883	45%
2021	10,600	11,999	-13%
2022	10,600	11,452	-8%

Source: DOT, T-100; FAA, TAF; Ardurra.

Additionally, the FAA revised how it defined air carrier operations for the TAF beginning in 2015 which then affected how the TAF reported these operations for CDC. The revised definition meant that commercial service operations using aircraft with less than 60 seats were included in the counts for air taxi and commuter operations. Like enplanements, the TAF shows no growth for commercial operations, which is unrealistic with the current economic climate—especially when growth is expected for every other aviation element. Because of this, the large difference between the TAF and 2025 Airport Master Plan forecast is acceptable and justified through the forecast analysis.

While the forecasts prepared for this airport master plan are considered reasonable for planning purposes, it is important to understand that unforeseen factors and future events, such as economic recessions, could affect the degree to which these forecasts are realized. While this forecast provides the basis for guiding airport development, implementation of any projects should be timed based on current demand.

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