BURKE LAKEFRONT AIRPORT (BKL)

Airport Layout Plan (ALP) Update Narrative Report

WORKING PAPER #1: INVENTORY & FORECASTS

May 2021

BKL®

CLEVELAND BURKE LAKEFRONT AIRPORT

Prepared By:

CHA

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1 INVENTORY OF EXISTING FACILITIES AND CONDITIONS

The City of Cleveland has retained CHA Consulting, Inc. ('CHA') to prepare an Airport Layout Plan (ALP) Update and associated Narrative Report for Burke Lakefront Airport ('BKL' or 'the Airport'). The purpose of this update is to evaluate how the Confined Disposal Facilities (CDF) impact existing and future operations at the Airport. This inventory chapter provides a description of the project and a background overview of the Airport and its existing facilities.

1.1 PROJECT DESCRIPTION

The existing CDF(s), in particular CDF 12 and portions of 9, have raised concerns with the FAA over the last two years as the Cleveland-Cuyahoga County Port Authority (Port Authority) began reusing CDF 12 for their dredge material beneficial reuse strategy. The operation of the CDFs has raised the following concerns that will be addressed through this ALP Update process:

- Property Ownership
- Non-compatible operations and land use within the Runway Protection Zone
- Access Through the Airport Operations Area (AOA) and Runway Object Free Area (ROFA)
- Impacts to the Proposed Replacement Runway 6R-24L
- Impacts on the existing Automated Surface Observation System (ASOS)

In addition to addressing the relationship and impacts the CDF(s) have on BKL, this project will also update the forecast for aviation demand. Since the last update to the aviation forecasts, BKL has exceeded 10,000 annual enplanements in 2017, 2018, and 2019. Finally, BKL currently does not have an FAA approved Exhibit 'A' Property Map, which will be completed as part of this project. Therefore, this ALP Update will complete the following:

- Complete an Exhibit 'A' Property Map pursuant to Federal Aviation Administration (FAA) Standard Operating Procedure (SOP) 3.00 for *FAA Review of Exhibit 'A' Airport Property Inventory Maps*
- Update the 2017 ALP addressing the impacts to the airfield from existing and proposed CDF operations.
- Update the aviation forecast demand.
- Complete an ALP Update Narrative Report documenting the changes from the 2017 ALP.

It should be noted that the existing base mapping and 2017 ALP will be utilized in this update. The collection of new base mapping and obstruction data pursuant to Airports Geographic Information Systems (AGIS) in accordance with FAA Advisory Circular's: 150/5300-16B,150/5300-17C, and 150/5300-18B were not part of this project.

1.1.1 Public and Stakeholder Involvement Program

Public and stakeholder involvement is an integral part of any significant airport planning study as it encourages information-sharing and collaboration among the community and airport stakeholders that hold a collective interest in the outcome of the study. For the purpose of this study, a Project Advisory Committee was formed to guide the technical development of the ALP Update and serve as a local sounding board throughout the process. The stakeholders included the airport sponsor (City of Cleveland, Department of Port Control), Cleveland-Cuyahoga County Port Authority (Port Authority), United States Army Corp of Engineers (USACE), the Mayor's Office, City Planning, and select Airport tenants. The full list of this committee is listed in Table 1-1.

Table 1-1 – Project Advisory Committee

Name	Agency
Mr. Edward Rybka	City of Cleveland, Mayor's Office
Mr. Nick Belluardo	City of Cleveland, Department of Port Control
Mr. Duncan Bauer	City of Cleveland, Department of Port Control
Mr. Robert Kennedy	City of Cleveland, Department of Port Control
Mr. Khalid Bahhur	City of Cleveland, Department of Port Control
Mr. Dennis Kramer	City of Cleveland, Department of Port Control
Mr. Nicholas LaPointe	Cleveland-Cuyahoga County Port Authority
Mr. Russel Brandenburg	U.S. Army Corp of Engineers
Mr. Tony Campofredano	City of Cleveland, BKL Staff
Mr. Joel Woods	City of Cleveland, BKL Staff
Mr. Richard DeCarlo	Ultimate Air
Mr. Paul Yagel	Signature Flight Support
Mr. Raymond Baca	BKL ATCT
Mr. Freddy Collier	City of Cleveland, Planning
Mr. Mark Molnar	Zone Aviation
Mr. Raymond Brown	Top Gun
Ms. Nancy Todd	T&G Flying
Mr. Richard Newenhisen	Aitheras Aviation Group, LLC

Source: CHA, 2021.

1.2 AIRPORT BACKGROUND

Understanding the background of an airport and the region it serves is essential in making informed decisions pertaining to airport-related improvements. This section discusses BKL, the context of its location, service area, and its role in the National Airspace System (NAS).

1.2.1 Location and Study Area

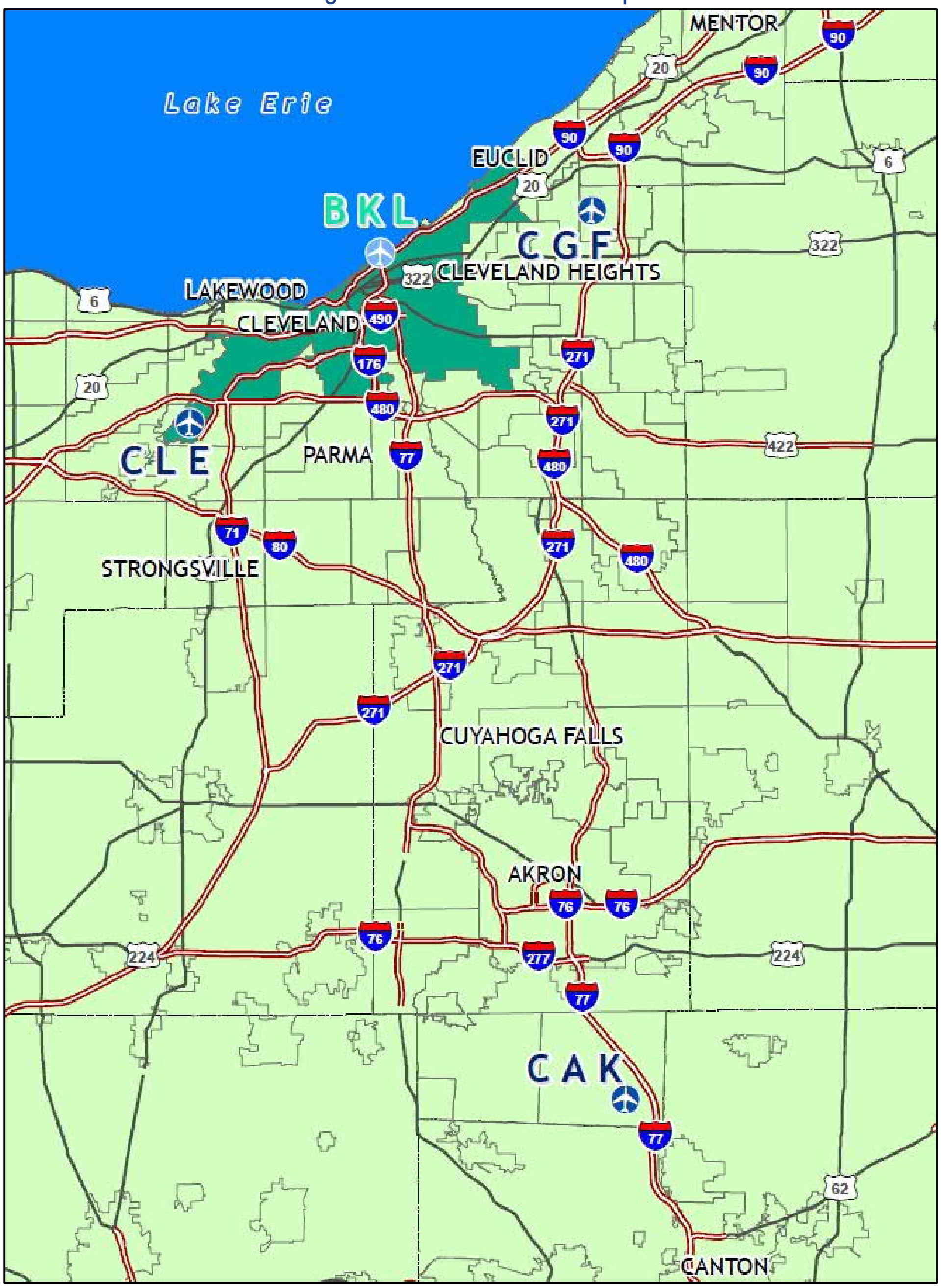
BKL is located along Interstate 90, on the shore of Lake Erie, immediately northeast of downtown Cleveland. BKL is approximately 445 acres and is located on fill under multiple submerged land leases the City of Cleveland has with the State of Ohio (i.e. State owns the lake bottom and leases any land filled on top). In addition, various CDFs are also part of airport property.

Given its proximity to these major business centers, the Airport is a key general aviation facility serving the entire Northeast Ohio region. BKL's location, regarding time and distance in nautical miles (nm), in comparison to the region's other major airports is as follows:

- Cleveland Hopkins International Airport (CLE) – 9 nm southwest of BKL; approximate 20-minute drive
- Cuyahoga County Airport (CGF) – 9 nm northeast of BKL; approximate 15-minute drive
- Akron Canton Airport (CAK) – 38 nm south of BKL; 60-minute drive.

The relative locations of BKL and these airports, as well as the surrounding region, are depicted in Figure 1-1, with the general vicinity of the Airport within Cleveland depicted in Figure 1-2.

Figure 1-1 – Location Map



Source: CHA, 2021.

Figure 1-2 – Vicinity Map

Source: CHA, 2021.

1.2.2 Airport Role

Airports included in the National Plan of Integrated Airports Systems (NPIAS) are considered significant to national air transportation and are eligible to receive grants under the FAA's Airport Improvement Program (AIP). The NPIAS further categorizes the nation's airports based on types of service provided, such as commercial or general aviation services.

In the 2021 to 2025 NPIAS Report, BKL is classified as a National General Aviation airport. Based on NPIAS criteria, National category GA airports have *10,000+ enplanements and at least 1 charter enplanement by a large certificated air carrier* and/or *5,000+ instrument operations, 11+ based jets, 20+ international flights, or 500+ interstate departures*. The classification is based on existing activity levels as shown in Table 1-2.

Table 1-2 – NPIAS Airport Classifications

Airport Classifications		Hub Type: % of Annual Passenger Boardings
Commercial Service: *Publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service*	Primary: *Have more than 10,000 passenger boardings each year*	Large Hub: *1% or more*
		Medium Hub: *At least .25%, but less than 1%*
		Small Hub: *At least .05%, but less than .25%*
		Non-hub Primary: *More than 10,000, but less than .05%*
	Nonprimary	Non-primary Commercial Service: *At least 2,500, and no more than 10,000*
Non-primary (*Except Commercial Service*)		Reliever
		General Aviation

Source: FAA 2021-2025 NPIAS Report

1.2.3 Airport Tenants

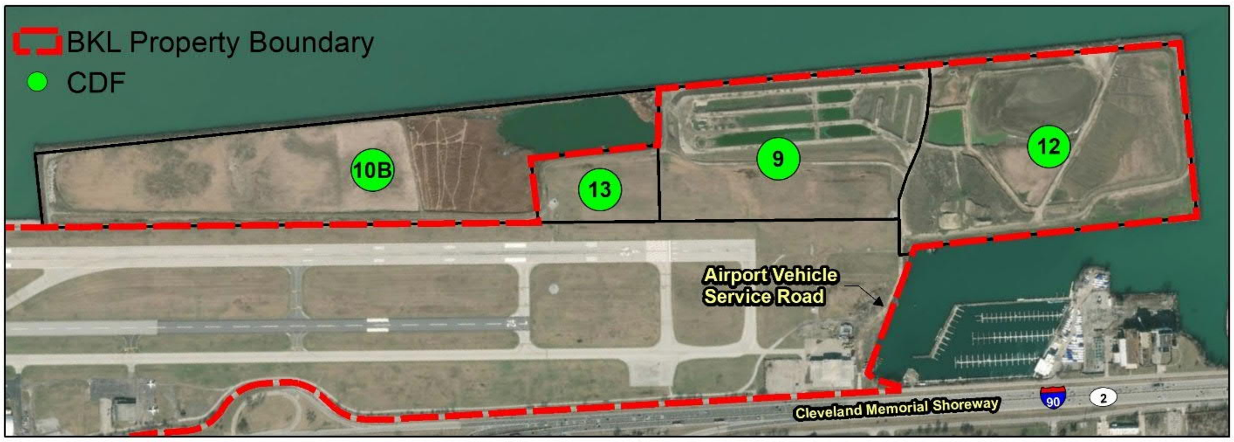
As a GA airport with National status, BKL serves a broad range of tenants and operational activity. This includes, but is not limited to, the following:

- Commercial air service: Ultimate Air Shuttle, an on-demand Part 135 operator, provides scheduled air service 5 days a week to Cincinnati-Lunken Airport (KUK)
- General aviation: Given its proximity to major business centers, event spaces, sporting venues, and other major cultural centers of downtown Cleveland, BKL serves a wide variety of both transient and based aircraft operators. These are handled through its fixed-base operator (FBO), Signature Flight Support. Signature handles fueling, hangar operation, and maintains the FBO Terminal.
- Charter flights: In addition to GA activity, charter operations are handled by Aitheras Aviation and BKL accommodates visiting professional sports teams (NBA & MLB).
- Flight training: Multiple flight schools operate and train at BKL, including Zone Aviation, Circadian Knight Corporation/Top Gun, and T&G Flying. Additionally, the PHASTAR Corporation is a non-profit organization that trains youth students in flight, through the Cleveland Metropolitan School District.
- Emergency services: Due to its proximity to several world-renowned medical centers, Cleveland Clinic Critical Transport, and PHI Air Medical provide emergency medical transport services and are based at BKL. Additionally, the Cleveland Police Department bases aviation units at the Airport.
- Non-aeronautical uses: Space in and around the terminal building is leased out for non-aeronautical development purposes, such as the International Women's Air and Space Museum and office space for private tenants.

1.2.4 Confined Disposal Facilities

Operating as both a neighbor and a tenant, the CDFs are located both on airport property and adjacent to airport property. A CDF is a technology where dredged material is placed inside perimeter dikes that are built up above the water surface level. This provides more protection to the adjacent surface water as any contaminated material is confined. The dredged material at BKL comes from the Cuyahoga River. There are currently three CDFs located on airport property and one adjacent to airport property (see Figure 1-3). The Port Authority currently operates the northern half of CDF 9 and all of CDF 12, both currently on airport property. The U.S. Army Corps of Engineers (USACE), Buffalo District operates and maintains CDF 10B, and CDF 13 is closed.

Figure 1-3– Existing Confined Disposal Facilities



Source: CHA, 2021.

CDF 9 served as storage for dredge material from 1969-1974 with a capacity of 2.0 million cubic yards while CDF 12 served in the same capacity from 1974-1979. The facility cost approximately $6.8 million and was constructed at 100 percent Federal cost. CDF 12 was designed with an approximate capacity of 2.8 million cubic yards. The Port Authority was the local sponsor for CDF 12 and the City of Cleveland was the local sponsor for CDF 9.

It was initially anticipated that by the end of 2008, all existing CDF's in Cleveland would be filled. The Port Authority, in conjunction with the USACE identified measures to obtain additional and renewable capacity by operating sediment processing facility within the bounds of CDF 9 & 12. This sediment processing facility produces manufactured topsoil by dewatering and blending dredge material which can then be removed from the CDF and used for construction elsewhere. The space created by this on-going removal of sediment is used to accommodate future dredged material storage and topsoil production. The Port Authority dredges, recycles, and transfers as much as 150,000 CY of this material offsite annually with the remaining material permanently stored in elevated retention basins on CDF 12.

According to previous Construction Safety Phasing Plans (CSPP) submitted to FAA, the removal of dredge sediment from CDF 9 & 12 occurs throughout the year and is necessary to continuously restore the CDF's capacity. The process includes transporting dredge sediment from the Cuyahoga River to the CDF, where it is dewatered and stockpiled on site. This material is then loaded out into trucks and removed from the facility.

The CDF truck traffic currently utilizes the Vehicle Service Road (VSR) on the east side of the airport accessing the Airport Operations Area (AOA) through a controlled gate and traveling north to enter the CDF. The existing VSR is outside, but adjacent to the Runway 6L-24R Runway Safety Area (RSA). Previously, approximately 200 feet of the VSR traversed the Runway Object Free Area (ROFA); however, the City implemented declared distances for 6L operations in 2020 to temporarily mitigate the non-standard condition, which is discussed in more detail in Section 1.4.2. In addition, approximately 1,520 linear feet of the airport VSR and a portion of CDF are located within the Runway 6L-24R Approach and Departure RPZs.

1.3 ALP UPDATE NARRATIVE OBJECTIVE

BKL underwent a comprehensive airport master plan update that was completed in 2017 with the final publication of the BKL Airport Master Plan (APM) Update. As a part of the AMP, an updated ALP depicting proposed future development was developed. A typical master plan outlines the future development of an airport, and includes several components: identification of existing conditions, forecasting, determining facility requirements, developing alternatives, recommending improvements, and developing capital improvement plans and funding mechanisms. It can also include a significant public involvement program. Airport master plans are typically updated by airport sponsors every 10-12 years, and because of their complexity can often take up to two years to complete.

An ALP documents the Master Plan's recommended improvements over time, and as such, is used as a planning and funding tool by the Federal Aviation Administration (FAA) to prioritize and plan for funding of airport capital improvement projects at airports over a 20-year planning horizon. Thus, any airport that uses FAA Airport Capital Improvement (AIP) funding are bound by Federal Grant Assurance 29 under the Airport and Airway Improvement Act of 1982 which requires an airport sponsor keep its ALP updated.

The ALP is often updated after a construction project that changes the geometry of the airfield, adds a new building, or the acquisition of land into airport property. Other instances that may require a modification to an existing ALP includes future development shown on the ALP that is no longer considered necessary to meet the forecasted aviation demand or no longer meets updated FAA design criteria. The future development shown on the 2017 ALP was based upon the forecasted need and existing facilities and services that were available at the Airport at that time, which included a new parallel runway outboard of the existing Runway 6L-24R. This new runway allowed the existing in-board runway to be converted into a taxiway which opened the south side of the airport for development. The on-going CDF operations as well as the 20-year plan for the CDF dredge operation impacts this proposed outboard runway. Although the City is fully committed to supporting existing and future aviation activity at the airport, the vision for the airport has shifted to also accommodate the CDF operations, as it also plays a very important role in the economy of the City and Cuyahoga County.

This ALP Update Narrative Report provides revised aviation demand forecasts and facility requirements through the next 20 years, reflecting the City's changes. It assesses requirements for the airfield (runway, taxiways, safety and object free areas, runway protection zones, and navigational aids) and landside (aprons, hangars, vehicle access roads, maintenance areas, and buildings that are within the City's control) based on existing conditions of these facilities and future demand.

The initial step in the airport planning process is to develop an inventory of the existing physical conditions and operational characteristics of the Airport and its surroundings. The information presented in this chapter is the basis for evaluating the Airport's existing and future facility requirements.

1.4 AIRSIDE FACILITIES

The Airport's airside and airfield facilities generally include the facilities located within the airport perimeter that are most closely associated with the movement and operation of aircraft, such as taxiing, takeoff, landing, and parking. Additional elements related to airfield activity and infrastructure include the runway and taxiway systems, aircraft parking aprons and hangars, and airfield pavement, markings, signage, lighting, and NAVAIDs. The existing facilities are depicted in Figure 1-4.

BKL

BURKE LAKEFRONT AIRPORT

GRAPHIC SCALE (FEET)
0 400 800

EXISTING FACILITIES	
1	TERMINAL BUILDING
2	ATCT/ADMINISTRATION OFFICES
3	ARFF/AIRPORT MAINTENANCE
4	VEHICLE STORAGE
5	FBO HANGAR/STORAGE (SIGNATURE)
6	HANGAR/STORAGE (SIGNATURE)
7	ELECTRICAL STORAGE FACILITY
8	PUMP HOUSE
9	AVIATION HIGH SCHOOL BUILDING
10	ENGINE TEST CHAMBER
11	FBO UNDERGROUND FUEL FACILITIES
12	FBO UNDERGROUND FUEL FACILITIES
13	ROTATING BEACON
14	FBO BUILDING (SIGNATURE)
15	FBO HANGAR/STORAGE (SIGNATURE)

Figure 1-4
Existing Facilities

1.4.1 Airport Design Criteria

The FAA uses a classification system, known as the Airport Reference Code (ARC), to signify the airport's highest Runway Design Code (RDC), the design standards to which the runway is to be built. RDC consists of three components: aircraft approach speed (AAC), airplane design group (ADG) relating to either the aircraft wingspan or tail height (whichever is more restrictive), and visibility minimums. ARC is determined by taking the highest RDC minus the visibility component. It affects runway and taxiway dimensions, separation standards, pavement marking standards, and other safety standards. Furthermore, it is used for planning and design only and does not limit the aircraft that may be able to operate safely at the airport. The relationship between the ARC and design standards is further described in FAA AC 150/5300-13A, *Airport Design*. The characteristics of the RDC are shown in Table 1-3.

As previously noted, the ARC is based on an aircraft's approach speed and wingspan or tail height, whichever is most restrictive. The most demanding aircraft is commonly referred to as the critical, or design, aircraft and must account for a minimum of 500 annual itinerant operations. An itinerant operation is the takeoff or landing of an aircraft going from one airport to another, at least 20-miles from each other. The ARC consists of a letter designating the aircraft approach category and a Roman numeral designating the Airplane Design Group (ADG). BKL is currently designated with an ARC C-II and the current critical aircraft is Cessna Citation XL5.

Approach categories A and B include small piston-engine aircraft and corporate jets with approach speeds of less than 121 knots, while categories C, D, and E include larger aircraft with approach speeds of 121 knots or greater (those typically associated with commercial or military use). Similarly, design groups I and II typically include small piston-engine aircraft and light to midsize corporate jets, as well as single- and twin-engine turboprop aircraft. Design groups III, IV, and V include larger corporate jets and the majority of the commercial jet fleet, as well as numerous military aircraft. Design group VI includes very large jets such as the Airbus A380 and the military C-5 transport aircraft.

Table 1-3 – Airport Reference Code

Approach Categories			
Approach Category	Airspeed (Knots)		Example Aircraft
A	<91		Beechcraft-E33 Bonanza, Cessna 152
B	91 ≤ 121		CRJ-200, ERJ-135/140/145
C	121 ≤ 141		B737-700W, MD-88
D	141 ≤ 166		A300, B757
E	166+		B-52H, B-2 Spirit
Airplane Design Group			
Design Group	Tail Height (feet)	Wingspan (feet)	Example Aircraft
I	<20	<49	Beechcraft-E33 Bonanza, Cessna 152
II	20-<30	49 ≤ 79	CRJ-700, ERJ-145
III	30-<45	79 ≤ 118	A319, CRJ-900
IV	45-<60	118 ≤ 171	Boeing 757, MD 11
V	60-<66	171 ≤ 214	A300, B757
VI	66-<80	214 ≤ 262	B-52H, B-2 Spirit

Source: FAA AC 150/5300-13A, *Airport Design*, CHA, 2021.

1.4.2 Runway System

The existing airfield configuration at BKL consists of two parallel runways, identified as Runway 6L-24R and Runway 6R-24L. Both runways are oriented in a northeast/southwest orientation. Table 1-4 presents the characteristics of each runway.

Table 1-4 – Existing Runway Specifications

Item	Runway 6L	Runway 24R	Runway 6R	Runway 24L
Runway Length (feet)	6,603		5,199	
Displaced Threshold (feet)	178	600	275	
Width (feet)	150		100	
Runway End Elevation (feet above MSL)	561.1	582.4	580.5	582.5
Pavement Type	Asphalt		Asphalt	
Pavement Load Bearing and Pavement Classification Number	Single wheel: 93.0 Double wheel: 113.0 Double tandem: 170.0 PCN: 84/F/C/X/T		Single wheel: 43.0 Double wheel: 50.0 Double tandem: 82.0 PCN: 63/F/C/X/T	
Declared Distances	LDA: 6,325' TODA: 6,503' TORA: 6,503' ASDA: 6,503'	LDA: 6,003' TODA: 6,603' TORA: 6,603' ASDA: 6,603'	LDA: 4,924' TODA: 5,199' TORA: 5,199' ASDA: 5,199'	LDA: 5,199' TODA: 5,199' TORA: 5,199' ASDA: 5,199'
Aircraft Approach Category	C-II		B-II	
Runway Markings	Precision		Basic	
Runway and Approach Lighting	HIRL, PAPI-4, REIL	-	-	HIRL, REIL
Navigational Aids	-	LOC/ILS, MALSF, GPS	-	-
Runway Design Code	C-II-VIS	C-II-4000	B-II-VIS	B-II-VIS

Sources: CHA, 2017 ALP, Airnav.

HIRL – High Intensity Runway Lights
REIL – Runway End Indicator Lights
PAPI-4 – Four Box Precision Approach Path Indicator
LOC - Localizer
ILS – Instrument Landing System
MALSF – Medium-Intensity Approach Lighting System with Sequenced Flashing Lights

BKL's primary runway, Runway 6L-24R, is adjacent to Lake Erie and CDF 10B. The runway is 150 feet wide and has a usable runway length of 6,603 feet with declared distances. The FAA defines declared distances as the distance an airport operator declares available for satisfying an aircraft's takeoff run, takeoff distance, accelerate stop-distance, and landing distance. When declared distances are used, the airport provides specific distance information for calculating maximum operating weights. These four "distances" are described below and depicted in Figure 1-5.

Accelerate-Stop Distance Available (ASDA)

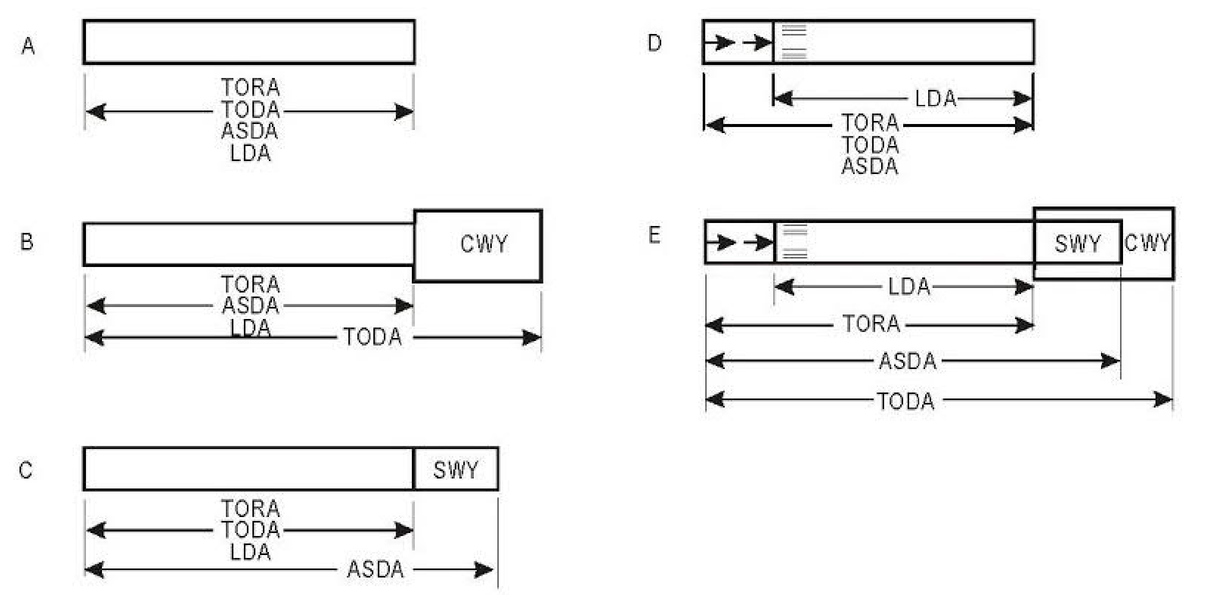
The accelerate-stop distance available (ASDA) is defined as the runway plus stopway (SWY) length declared available for the acceleration/deceleration of an aircraft aborting its takeoff. The ASDA is measured from the point at which the aircraft takeoff run begins to the point where the standard Runway Safety Area (RSA) or Runway Object Free Area (ROFA) begins, whichever is shorter.

Landing Distance Available (LDA)
The landing distance available (LDA) is defined as the runway length declared available for the ground run of an aircraft landing. The LDA cannot be longer than the runway, but with obstacles on the ground or in the approach of a given runway, the LDA can be shorter to provide standard RSA(s) and/or clear approach surfaces. The LDA is measured to the point where the standard RSA or ROFA begins at the rollout end of the runway or the runway end, whichever yields a shorter distance.

Takeoff Run Available (TORA)
The takeoff run available (TORA) is the distance to accelerate from brake release to lift-off. Typically, the TORA is measured from the start of takeoff to a point 200 feet beyond the beginning of the departure RPZ. However, if a departure RPZ is not located at least 200 feet from the departure end of a runway, the TORA will be shorter than the actual runway length. Regarding RSA compliance, the TORA is not required to have a fully compliant RSA at either end of the runway.

Takeoff Distance Available (TODA)
The takeoff distance available (TODA) is defined as the length of the TORA plus the length of a clearway, if provided. A clearway (CWY), if available, is defined as an area beginning at the end of a runway that must be under the Sponsor's control, at least 500 feet wide, cannot exceed 1,000 feet in length, and clear of any obstacle or terrain at an upward slope of 1.25 percent (or 80:1). Like the TORA, the TODA does not require a standard RSA beyond the runway end.

Figure 1-5 – Typical Declared Distances



Note.— All declared distances are illustrated for operations from left to right.

Source: FAA, 2017.

According to the 2017 ALP, the Runway 6L end is displaced 178' allowing for 6,425' for landing or LDA. However, in 2020, Runway 6L operating lengths were reduced an additional 100' (6,503' for TORA, TODA, and ASDA and 6,325' for LDA). These declared distances were implemented for a 6L operation to mitigate a portion of existing VSR located within the ROFA and the road itself being an obstruction to the departure surface (see Figure 1-6).

Figure 1-6 – Runway 6L Safety Areas

Source: CHA, 2021.

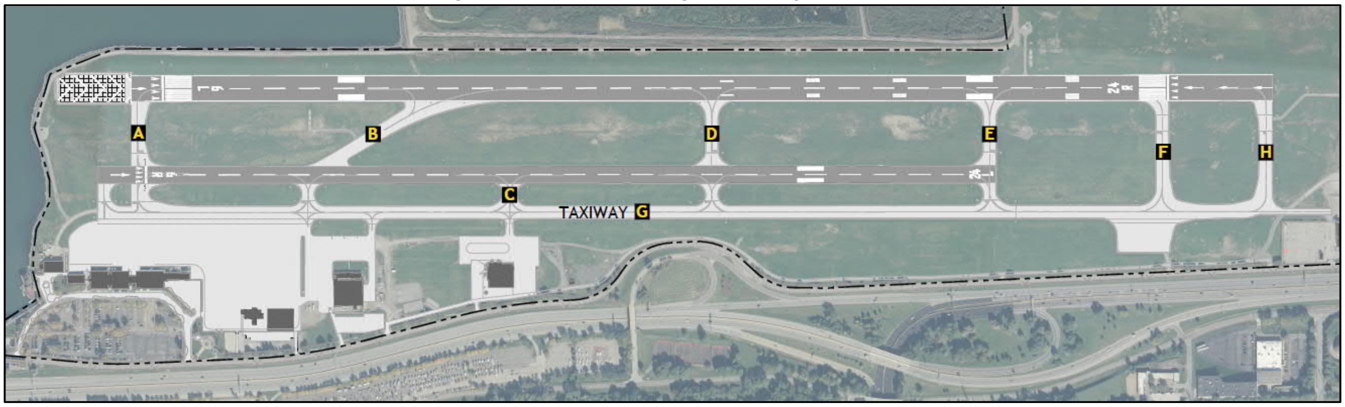
The Runway 24R threshold is currently displaced 600' providing 6,003' for landing aircraft. It is constructed of asphalt with a grooved surface. The 24R departure end includes a 422-foot Engineered Materials Arresting System (EMAS) bed. The runway's load-bearing capacity is 93,000 pounds single-wheel; 113,000 pounds double-wheel; and 170,000 pounds double-tandem. This runway has a Pavement Classification Number (PCN) of 84/F/C/X/T, which will be further discussed in a subsequent section.

Situated between the primary runway and terminal facility, Runway 6R-24L is the Airport's secondary runway and is located 500 feet centerline to centerline to Runway 6L-24R. The runway is 100 feet wide with a usable runway length of 5,199 feet, with a 275-foot displaced threshold on the 6R end. It is constructed of asphalt and has a grooved surface. The runway's load-bearing capacity is 43,000 pounds single-wheel; 50,000 pounds double-wheel; and 82,000 pounds double-tandem, and has a PCN of 63/F/C/X/T.

1.4.3 Taxiway System

An airport's taxiway system connects the runways to aircraft parking aprons, storage hangars and other facilities. At BKL, Taxiway 'G' serves as the parallel taxiway between the aprons and Runway 6R-24L. The remaining taxiways serve as connectors, with Taxiway 'B' as a high-speed runway exit. Figure 1-7 and Table 1-5 provide the characteristics and specifications of each taxiway.

Figure 1-7 – Existing Taxiways



Source: CHA, 2021.

Similarly, to ADG, taxiways are classified based on Taxiway Design Group (TDG). The TDG sets the criteria for design minimums of taxiways and their safety areas. All the taxiways have a width of 75', a Taxiway Object Free Area (TOFA) of 131', and Taxiway Safety Area (TSA) of 79'. While it will be further discussed in Chapter 3, BKL currently employs TDG-2 on all taxiways for TOFA and TSA; however, a typical TDG-2 would only be 35' wide.

Table 1-5 – Existing Taxiway Specifications

Taxiway	Width (feet)	Taxiway Safety Area (feet)	Taxiway Object Free Area (feet)	Taxiway Design Group (TDG)
A	75	79	131	TDG-2
B	75	79	131	TDG-2
C	75	79	131	TDG-2
D	75	79	131	TDG-2
E	75	79	131	TDG-2
F	75	79	131	TDG-2
G	75	79	131	TDG-2
H	75	79	131	TDG-2

Source: FAA Airport Diagram, AC 150/5300-13A, CHA 2021.

1.4.4 Aircraft Parking Aprons

Airport aprons, also referred to as ramps, provide space for short-term and long-term aircraft parking and deicing operations, as well as the loading/unloading of passengers and goods. There is an approximately 18,000 square foot (SF) apron on the north side of the main terminal and an approximately 32,000 SF apron between the terminal and Signature Flight Support facility, who serves as the FBO for BKL. These aprons are both for storage of itinerant aircraft, as well as operations for Ultimate Air Shuttle. The FBO additionally maintains an approximately 8,000 SF apron around their hangar, and an approximately 5,000 SF apron around their operations facility. These aprons are shown in Figure 1-8.

Figure 1-8 – Apron Areas

1.4.5 Airfield Markings

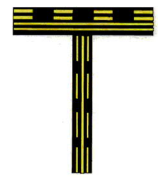
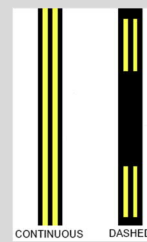
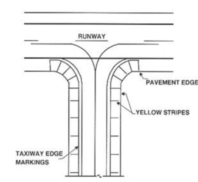
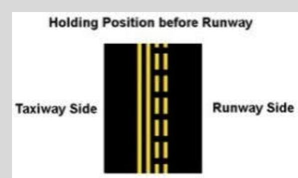
FAA AC150/5340-1M, *Standards for Airport Markings*, provides the standards for surface markings used on airfield roadways and airfield pavements, such as runways, taxiways, and aprons, assuming the surfaces are built in accordance to the standard dimensions and layouts in AC 15/5300-13, *Airport Design* (this excludes privately owned apron areas). These standards apply to all airports certificated under Title 14 CFR Part 139, which establishes certification requirements for airports serving scheduled air carrier operations. Examples of airfield markings are provided in Table 1-6 and Table 1-7.

Table 1-6 – Runway Markings

Type of Marking	Purpose of Marking
Designation	Numbers and letters are determined from approach direction; labeled according to Compass Rose
Centerline	Identifies the center of the runway; Provides alignment guidance during takeoff and landings
Threshold	Delineates the beginning of the runway that is available for landing
Aiming Point	Serve as a visual aiming point for a landing aircraft, located approximately 1,000 feet from the landing threshold
Touchdown Zone	Identify the touchdown zone for landing operations and are coded to provide distance information in 500 feet increments
Runway Edge Marking	Define the edge of the usable, full-strength surface

Source: CHA, 2021.

Table 1-7 – Taxiway Markings

Type of Marking	Purpose of Marking	Visual Representation of Marking
Normal Centerline	Provides a visual cue to permit taxiing along a designated path	
Enhanced Centerline	Intended to warn the pilot that he/she is approaching a runway holding position marking and should prepare to stop unless he/she has been cleared onto or across the runway by ATC; Usually at larger, commercial service airports	
Edge Markings	Continuous- Define the taxiway edge from the shoulder or other abutting paved surface not intended for use by aircraft; Dashed- Defines the taxiway edge from the adjoining pavement intended for use by aircraft	
Shoulder Markings	Identifies paved shoulders (areas intended to prevent blast and water erosion); not intended for use by aircraft (may not be full-strength pavement)	
Runway Holding Position	Indicate where an aircraft is supposed to stop when approaching a runway	
Taxiway/Taxiway Intersection	Indicate where an aircraft is supposed to stop when approaching intersecting taxiways	

Source: CHA, 2021.

1.4.6 Airfield Signage

According to Title 14 CFR Part 139.311, *Marking, Signs, and Lighting*, each certificate holder, such as BKL, must provide and maintain sign systems for air carrier operations on the airport that are authorized by the Administrator and consist of at least the following:

- Signs identifying taxiing routes on the movement area.
- Holding position signs.

- Instrument Landing System (ILS) critical area signs.

The holding position signs, as well as the ILS critical area signs, must be internally illuminated. FAA AC 150/5340-18G, *Standards for Airport Sign Systems*, contains all regulations pertaining to airfield signage for Part 139 airports, while specifications are contained in AC 150/5345-44K, *Specifications for Runway and Taxiway Signs*. A further description of typical airfield signage is included in Table 1-8. See AC 150/5340-18G, Glossary of sign types, for additional sign type descriptions.

Lighted signage on BKL's airfield consists of all required signage for a Part 139 certificated airport including airfield location signage, mandatory instruction signage, and runway hold position signage. Additional signage may be required to accommodate future improvements or additions to airfield pavements.

Table 1-8 – Airfield Signage

Type of Sign	Purpose of Sign	Visual Description of Sign
Mandatory Instruction Sign	Denote taxiway/runway intersections, runway/runway intersections, Instrument Landing System (ILS) critical areas, Precision Obstacle Free Zone (POFZ) boundaries, runway approach areas, CAT II/III operations area, military zones, and no entry zones	White Inscription/Red Background
Location Sign	Identify the taxiway or runway apron upon which the aircraft is located	Yellow Inscription/Black Background
Boundary Sign	Identify the boundary of the Runway Safety Area (RSA)/Object Free Zone (OFZ) or ILS critical are for a pilot exiting the runway	Black Inscription/Yellow Background
Directional Sign	Indicate directions of other taxiways leading out of an intersection	Black Inscription/Yellow Background; Always Contains an Arrow
Destination Sign	Indicate the direction to a remote location	Black Inscription/Yellow Background; Always Contains an Arrow
Runway Distance Remaining Sign	Provide distance remaining information to pilots during takeoff and landing operations	White Inscription/Black Background

Source: FAA AC 150/5340-18G.

1.4.7 Navigational Aids (NAVAIDs) and Instrument Procedures

Pilots utilize a variety of navigational aids (NAVAIDs) and instrument procedures, including standard terminal arrival routes (STARs), instrument approach procedures (IAPs) and NAVAIDs, approach lighting systems (ALS), airfield lighting, and rotating beacons. By providing point-to-point guidance information or position data, NAVAIDs assist pilots to locate airports, land aircraft, taxi aircraft, and depart safely and efficiently from airports during nearly all meteorological conditions. Table 1-9 summarizes the Airport's existing instrument approach procedures, by runway, and the NAVAIDs required.

Table 1-9 – Navigational Aids (NAVAIDs) and Approach Lighting

Runway	Runway Markings	Approach Lighting	Minimum Ceiling (AGL)/ Visibility	Instrument Approach Types
6L	Precision	PAPI, REIL	VFR	-
24R	Precision	PAPI, MALSF	¾-mile	ILS (Category I), LOC, GPS
6R	Basic	-	VFR	-
24L	Basic	REIL	VFR	-

Source: FAA Airport Master Record (Form 5010), Accessed 2021.

Precision Approach Path Indicator (PAPI) Lights
A PAPI is a system of lights located near a runway end. It provides pilots with visual glide slope guidance information during an approach to the runway. PAPIs typically have an effective visual range of at least three miles during the day and up to 20 miles at night and inform pilots if they are high, low or on the correct approach descent path for the threshold. Runway 6L-24R is equipped with a PAPI system on both ends.

Standard Terminal Arrival Routes (STARs)
Standard Terminal Arrival Routes (STARs) are preplanned IFR air traffic control arrival procedures published for pilot use. STARs serve as a critical form of communication between pilots and ATC by providing a method and criteria for descent, routing, and communications when navigating to the destination after leaving the en-route structure. The STAR and approach procedures virtually connect to each other in such a way as to create a seamless transition.

Once a flight crew has accepted a clearance for a STAR, they have communicated with the controller what route, and in some cases what altitude and airspeed, they will fly during the arrival, depending on the type of clearance. BKL's ATC has three STAR procedures: *BRWNZ THREE*, *ROKNN THREE*, and *TRYBE FOUR*.

Types of Instrument Approach Procedures (IAPs) and Instrument Approach NAVAIDs
Based on current FAA classifications, there are four types of instrument approach categories:

- Visual (V) – Approaches performed under visual flight rules only when meteorological conditions include a cloud ceiling height of 1,000 feet or greater and visibility of 3 miles or greater. Runway approaches for 6R, 6L, and 24R operate under visual conditions only.
- Non-Precision Approach (NPA) – Instrument approach procedures providing only lateral guidance with a ceiling minimum of 400 feet above the threshold. These can include VHF Omnidirectional Range (VOR), non-directional beacon (NDB), area navigation (RNAV), lateral navigation (LNAV), localizer performance (LP), and localizer (LOC) equipment. At BKL, Runway 24R has an NPA procedure.
- Approach Procedure with Vertical Guidance (APV) – Instrument approach procedures providing vertical guidance minimums of 250 feet above the threshold and visibility minimums as low as ¾ mile. These can include an ILS, LNAV/Visual Navigation Aids (VNAV), Localizer Performance with Vertical Guidance (LPV) or Area Navigation (RNAV) Required Navigation Performance (RNP). Runway 24R maintains this procedure.

- Precision Approach (PA) – Instrument approach procedures providing vertical guidance less than 250 feet above the threshold and visibility minimums lower than ¾ mile. These can include an ILS, LPV, and Global Navigation Satellite System (GNSS) Landing System (GLS). This category applies to Runway 24R only.

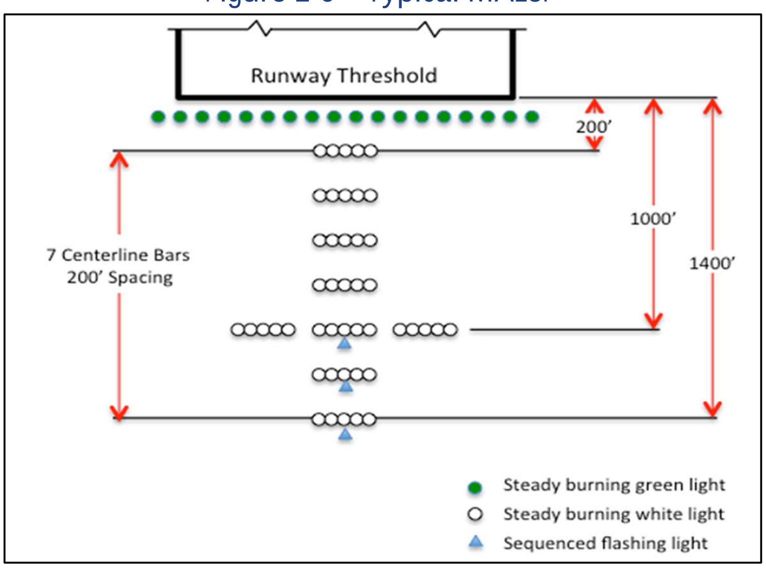
The precision approach is one component that determines the minimum ceiling and visibility for each runway (other variables may influence the minimums - obstructions to the approach, buildings, terrain, etc.). The NAVAIDs that make up the ground-based equipment required to perform the approach procedures are divided into two categories: precision and non-precision. The NAVAIDs supporting traditional ground-based precision approaches are collectively called an Instrument Landing System (ILS). According to FAA Order 6750.16E, *Siting Criteria for Instrument Landing Systems*, the ILS provides guidance to pilots of properly equipped aircraft to assist them in landing safely under conditions of reduced ceilings and lowered visibility. The Airport operates an ILS for the approach to Runway 24R.

Two components of an ILS include: a localizer (LOC) and a glide slope (GS). A localizer is normally situated 1,000 feet past the departure-end of the runway that has the approach and provides lateral positioning guidance to pilots. However, the LOC antenna beyond the Runway 24R departure end is approximately 433 feet from the end of runway. Additionally, Runway 24R utilizes Global Positioning System (GPS) based technology to enable vertically guided instrument approach procedures with approach capabilities similar to ILS approaches without the need for the traditional ground-based ILS NAVAID components.

Approach Lighting Systems (ALS)

The third component of an ILS, in addition to the localizer and glideslope, is the approach lighting system (ALS). At BKL, Runway 24R utilizes a Medium-Intensity Approach Lighting System with Sequenced Flashers (MALSF). A MALSF is a typical approach lighting system, normally 1,400 feet long, that features three sequenced flashing lights on the last three light bars. These are utilized when the approach area identification is difficult.

Figure 1-9 – Typical MALSF



Source: code7700.com.

1.4.8 Airfield Lighting

In addition to the visual aids previously described, lighting on the airfield includes the rotating beacon, runway threshold lighting, runway edge lighting, Runway End Identifier Lights (REILs), runway centerline lights, taxiway edge lighting and apron lighting. Each of the lighting systems/types are described below:

Rotating Beacon

The rotating beacon functions as the universal indicator for locating an airport at night. For a civilian airport, it has one clear and one green lens, 180 degrees apart, and is generally visible 10 miles from the airport. According to the Aeronautical Information Manual, October 2017, at Class C airports, the operation of the airport beacon during the hours of daylight often indicates that the ground visibility is less than three miles, and/or the ceiling is less than 1,000 feet. The rotating beacon at BKL is located atop the air traffic control tower, adjacent to the terminal.

Runway Edge Lighting

Runway edge lighting is white in color and is used to outline the edges of a runway during periods of darkness or restricted visibility. The runway edge lights are positioned parallel to the runway centerline at least two feet from the edge of the full-strength pavement designated for runways not used by jet aircraft and 10 feet from the edge of the full-strength pavement designated for runways used by jet aircraft. Both runways are equipped with a High-Intensity Runway Edge Lighting (HIRL) system.

Runway End Identifier Lights (REILs)

The primary function of the REIL is to provide rapid and positive identification of the end of the runway. The REIL system consists of two synchronized, unidirectional flashing white lights that are positioned on each corner of the runway landing threshold, facing the approach area, and aimed at an angle of 10 to 15 degrees. Runway 6L and Runway 24L are equipped with REILs.

1.4.9 Airfield Pavement Condition

The load-carrying capacity of the pavement for unrestricted runway operations is expressed as a Pavement Classification Number (PCN). According to AC 150/5335-5C, *Standardized Method of Reporting Airport Pavement Strength-PCN*, the International Civil Aviation Organization (ICAO) adopted the Aircraft Classification Number-Pavement Classification Number (ACN-PCN) method. The PCN is a five-part number which includes a numerical PCN value [indicating the load-carrying capacity of a pavement (between 0 and 100)], pavement type (flexible-F or rigid-R), subgrade category (high-A, medium-B, low-C, ultra-low-D), allowable tire pressure (unlimited/no pressure-W, high/pressure limited to 254 psi-X, medium/pressure limited to 181 psi-Y, and low/pressure limited to 73psi-Z), and the method used to determine the PCN (via technical study-T or evaluation based on using aircraft experience-U). The PCN for each runway at BKL is shown in Table 1-10.

Table 1-10 – Airfield Pavement Condition

Runway	PCN Classification	Numerical Value (0-100)	Pavement Type	Subgrade Strength Category	Allowable Tire Pressure	Method
6L-24R	PCN 84/F/C/X/T	84	Flexible	Low	High - limited to 254 psi	Technical Study
6R-24L	PCN 63/F/C/X/T	63	Flexible	Low	High - limited to 254 psi	Technical Study

Source: Applied Pavement Technology, 2016.
psi: pounds per square inch

1.4.10 Airspace Obstructions

The National Airspace System (NAS) is made up of a network of air navigation facilities, Air Traffic Control (ATC) facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system. The FAA created the NAS to protect persons and property on the ground, and to establish a safe and efficient airspace environment for civil, commercial, and military aviation within the United States. Airspace is broken down into two categories: regulatory and non-regulatory. Within the regulatory airspace category, there are two types of airspace, controlled and uncontrolled. Categories and types of airspace are defined based on their complexity or density of aircraft movements, or the nature of the operations conducted within the airspace, which dictates the level of safety required and the level of national and public interest.

The purpose of controlled airspace is to provide adequate separation between IFR and VFR aircraft, thus, IFR services are available, but not required, within all controlled airspace. Airspace designated as Class A, B, C, D, and E is controlled airspace.

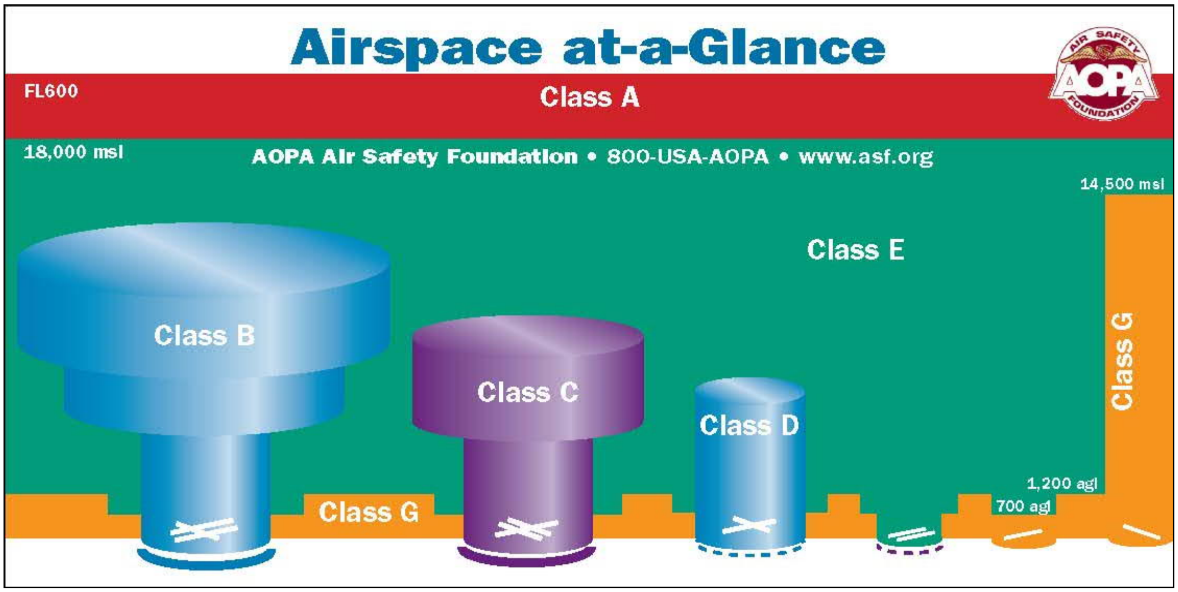
VFR aircraft operating in Class B, C, or D airspace must be in contact with ATC. This gives ATC the authority to manage IFR and VFR traffic in the proximity to airports and ensure proper separation. Controlled airspace designations do not affect IFR traffic as IFR traffic is cleared through controlled airspace by ATC.

Class G airspace is uncontrolled and IFR services may or may not be available.

Large sections of controlled and uncontrolled airspace have been designated as special use airspace. Special use airspace is further defined as prohibited, restricted, warning, military operations, and alert areas. Civil operations within special use airspace may be limited or even prohibited, depending on the area, as operations within these areas is considered hazardous to civil aircraft.

BKL is located within Class C airspace, extending from the runway surface up to 4,000 feet mean sea level (MSL) for a 5-nm radius, and from 1,200 feet MSL to 4,000 feet MSL for a 10-nm radius. A graphic of the U.S. Airspace Profile is presented in Figure 1-10.

Figure 1-10 – National Airspace System



Source: FAA Aeronautical Information Manual, CHA, 2020.

1.5 AIRPORT BUILDINGS AND INFRASTRUCTURE

Support facilities provide vital functions related to the overall operation of the Airport, and typically include facilities related to: airport fencing, airport equipment storage and maintenance, Air Traffic Control (ATC), Aircraft Rescue and Firefighting (ARFF), aircraft fueling, snow and ice control, FBO and GA facilities. In addition to these facilities, as well as the terminal facility, this section will discuss existing hangar and aircraft storage facilities.

1.5.1 Terminal Facility

The majority of activity occurs in the Airport's 57,700-SF passenger terminal facility. This includes airport administrative office space, leased office space, operations space for airport tenants such as flight schools and charter services, passenger facilities for Ultimate Air Shuttle, and the International Women's Air and Space Museum. This complex is accessed via the Airport's main entrance on North Marginal Road and includes an 800-space parking lot. The main building of the facility is two levels, with the ATCT connected to the east, and two additional single level buildings connected to the west. The main building's first floor has operational space for flight schools, airport and Department of Port Control administrative space, boarding gates, the air carrier departure lounge, air traffic control operational space, and public facilities, as well as the International Women's Air and Space Museum. The second level contains leased office space. The two buildings connected to the west house customs and border patrol, additional gates, and additional operational space for tenants. The general campus is shown in Figure 1-11.

Figure 1-11 – Terminal Area Facilities

Source: Google Earth, CHA, 2021.

1.5.2 Airport Equipment Storage and Maintenance / Aircraft Rescue and Firefighting (ARFF)

Located immediately west of the terminal is the Airport's maintenance and equipment storage facilities. This facility houses the Airport's snow removal equipment, maintenance, and utility vehicles. The Vehicle Storage building (closest to the terminal) is approximately 5,300 square feet.

ARFF vehicles are designed to provide an invaluable service to the commercial and private users of the Airport and the passengers and cargo they transport. The vehicles that airport fire departments employ serve as the medium to deliver firefighters, specialized tools and equipment, and firefighting agents to the scene of an aircraft incident. They must be designed to perform specific functions, constructed for longevity and ease of maintenance, and tailored to the airport's needs. The ARFF facility is co-located with the maintenance facility, just west of the terminal. The combined ARFF/maintenance building is approximately 7,100 square feet.

The document used to determine an airport's index is Title 14 CFR Part 139.315, *Aircraft Rescue and Firefighting: Index Determination*. BKL operates as an ARFF Index A. The requirements for ARFF vehicles to transport a specific quantity and type of firefighting agents are established by Title 14 CFR Part 139.317, *Airport Rescue and Firefighting: Equipment and Agents*. As an ARFF Index A, the Airport operates two vehicles.

1.5.3 Air Traffic Control Tower (ATCT)

The Air Traffic Control Tower (ATCT) is located immediately east of the terminal building and is staffed as a contract tower. The ATCT is approximately 50-feet tall and is in operation from Monday at 7:00 AM through Saturday at 11:00 PM, and on Sunday from 8:00 AM-12:00 AM. Runway 6R-24L is closed when the tower is not operational.

1.5.4 General Aviation (GA) Facilities

The FBO, Signature Flight Support, maintains a facility to the east of the main terminal. In addition to this facility serving the needs of both based and itinerant aircraft visiting the Airport, there are various hangar facilities for storage of based aircraft and other operations at the Airport. The various facilities are shown in Figure 1-12.

Signature Flight Support maintains their FBO Building, an approximately 18,000 SF hangar, plus parking for 49 vehicles. Further east, Signature maintains an approximately 22,000 SF hangar, underground fuel storage facility, and parking for 82 vehicles. Beyond this, Signature operates an additional facility that includes an approximately 14,000 SF hangar, underground fuel storage, and parking for 30 vehicles. At the eastern edge of the Airport (not pictured), is a large vacant building and parking lot that was the previous Aviation High School and is now used by Cleveland Police.

Figure 1-12 – General Aviation Facilities

Source: 2017 ALP, CHA.

1.5.5 Aircraft Fueling

Signature Flight Support is responsible for handling the fuel at BKL. Fuel is stored in four tanks: three 20,000-gallon tanks for Jet-A, and one 12,000-gallon tank for Avgas.

1.5.6 Airport Service Roads

Running along the southern boundary of the Airport, parallel to North Marginal Road, is the Airport's access and service road. It runs east to west, connecting the Terminal facility to the FBO facility and hangars, and onto the former Aviation High School on the east side of the property. This road is located within the Airport's perimeter security fence. Additionally, a perimeter road runs around the remainder of the Airport property, providing access to NAVAID and airfield infrastructure, as well as the Confined Disposal Facilities.

2 FORECASTS OF AVIATION ACTIVITY

2.1 INTRODUCTION

This chapter of the Master Plan Update projects aviation demand over a 20-year planning horizon for Burke Lakefront Airport (BKL). Facility sizing and capacity recommendations, both airside and landside, are directly impacted by the projected aviation activity levels presented in this chapter. The projections are derived from approved methodologies in accordance with the requirements provided in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*.

To develop the most realistic forecasts possible, an understanding of current and historical airport operations, industry trends, and economic conditions within BKL's primary catchment area (i.e., market) is necessary. These variables must be detailed and factored into individual forecast scenarios that will comprise the commercial passenger and operations forecasts.

The assumptions, methodologies, and data used to create the various projections are presented and analyzed in the sections to follow. The specific activity elements to be forecasted are limited to passenger and operational activity that directly affect the terminal and immediately adjacent land use associated with passenger and general aviation (GA) activity. As such, the evaluations presented in this chapter include:

- ✈ Enplaned Passengers
  - o 5-, 10-, and 20-year forecasts
  - o Load Factors
- ✈ Air Carrier Activity
  - o Operations
  - o Fleet Mix
- ✈ Air Cargo Activity
  - o Operations
- ✈ Cargo Volume
- ✈ General Aviation Activity (GA)
  - o Based Aircraft
  - o Operations
- ✈ Peak Activity
  - o Enplaned Passengers
  - o Operations

2.2 AIRPORT CATEGORIZATION

Based on FAA guidelines within the National Plan of Integrated Airport Systems (NPIAS), BKL is categorized as a nonprimary General Aviation airport – National. Nonprimary airports that do not have scheduled commercial passenger service are classified as either GA or Reliever airports, which are further grouped into five roles: national, regional, local, basic, and unclassified. The definition of GA and Reliever airports, and the five roles and criterion used for their determination are outlined in Table 2-1.

Table 2-1 – NPIAS Airport Classifications

Statutory Definition	Nonprimary Airport Classifications (except commercial service)	Airport Roles within National Airspace System
General Aviation: A public airport that does not have scheduled service or has scheduled service with less than 2,500 passenger boardings each year. §(47102(8)) Reliever: An airport designated by the Secretary of Transportation to relieve congestion at a commercial service airport and to provide more general aviation access to the overall community. §(47102(23))	National	Support the national airport system by providing communities access to national and international markets in multiple States and throughout the United States. National airports have very high levels of aviation activity with many jets and multi-engine propeller aircraft.
	Regional	Support regional economies by connecting communities to regional and national markets. Generally located in metropolitan areas and serve relatively large populations. Regional airports have high levels of activity with some jets and multiengine propeller aircraft. The metropolitan areas in which regional airports are located can be Metropolitan Statistical Areas with an urban core population of at least 50,000 or Micropolitan Statistical Areas with a core urban population between 10,000 and 50,000.
	Local	Supplement local communities by providing access to markets within a State or immediate region. Local airports are most often located near larger population centers, but not necessarily in metropolitan or micropolitan areas. Most of the flying at local airports is by piston aircraft in support of business and personal needs. These airports typically accommodate flight training, emergency services, and charter passenger service.
	Basic	Provide a means for general aviation flying and link the community to the national airport system. These airports support general aviation activities, such as emergency response, air ambulance service, flight training, and personal flying. Most of the flying at basic airports is self-piloted for business and personal reasons using propeller-driven aircraft. They often fulfill their role with a single runway or helipad and minimal infrastructure.
	Unclassified	Currently in the NPIAS but with limited activity.

Source: FAA, CHA, 2021.

2.3 FORECAST RATIONALE

A critical component of an Airport Master Plan is the preparation of detailed passenger and operations forecasts required for airport planning purposes. Traditional forecasting efforts, as previously stated, are based on requirements set forth in AC 150/5070-6B, *Airport Master Plans*. The process of developing the recommended activity forecasts consists of identifying aviation activity measures, reviewing previous Airport forecasts, gathering data, selecting forecast methodologies, applying forecast methods and comparing forecast results with the FAA's Terminal Area Forecast (TAF). The general requirement for FAA approval of forecasts is that the forecasts are supported by an acceptable forecasting analysis and are consistent with the FAA

TAF. For this ALP Update, a 20-year forecast horizon has been established for 2021-2041 with 2020 being the base year. However, due to impacts from COVID-10 discussed in Section 2.3.1, the 2021-2041 forecast includes an aviation activity recovery forecast from COVID-19 (Section 2.7) and the typical aviation activity forecast following BKL's recovery (Section 2.7.4).

2.3.1 Factors Affecting Forecasts

Several factors should be considered when preparing activity forecasts or when updating existing forecasts. When developing the forecasts, socioeconomic data (demographics, etc.), geographic attributes (catchment and core areas), and external factors (charter activity, fuel costs, etc.) were considered. Nearby airports and their activity were also evaluated.

COVID-19 Impacts

The first COVID-19 ("COVID" or "the pandemic") case in the United states was reported on January 20, 2020 and quickly spread across the country. In response, a public health emergency declared on January 31 and a national emergency subsequently declared March 13, which generally marks the beginning of the pandemic in the United States. To date, over 29.5 million cases and over 530,000 deaths have been reported in the United States due to COVID.[1]

According to the FAA and industry sources, the impacts of COVID on the Aerospace system have been split, in terms of types of users. Although impacted by the virus outbreak, GA users were not as impacted as commercial operators. While travel restrictions were placed on the commercial industry and routes, route restrictions were not placed on civil aviation. Business and travel restrictions have had an impact on itinerant GA travel; however, recreational flying during the pandemic has been largely stable. In addition, during 2020, GA pilots began assisting with COVID-19 relief efforts by aiding in delivery of personal protective equipment to medical facilities.

General Aviation Aircraft Shipment Reports, published by the General Aviation Manufactures Association (GAMA), indicates aircraft shipments in the United States declined from 1,771 aircraft in 2019 to 1,552 aircraft in 2020; however, the number of single-engine piston aircraft remained relatively stable with approximately a 3.0 percent increase in shipments, showing the trend of stability amongst smaller aircraft users.

Due to the impacts of COVID-19 on the aviation industry, it was important to analyze and become familiar with historical activity trends at BKL prior to 2020 to determine the level of impact to the Airport's activity and to further determine recovery efforts. Moreover, 10-year historical aviation activity trends is discussed in Section 2.5 and COVID impacts is discussed in Section 2.6.

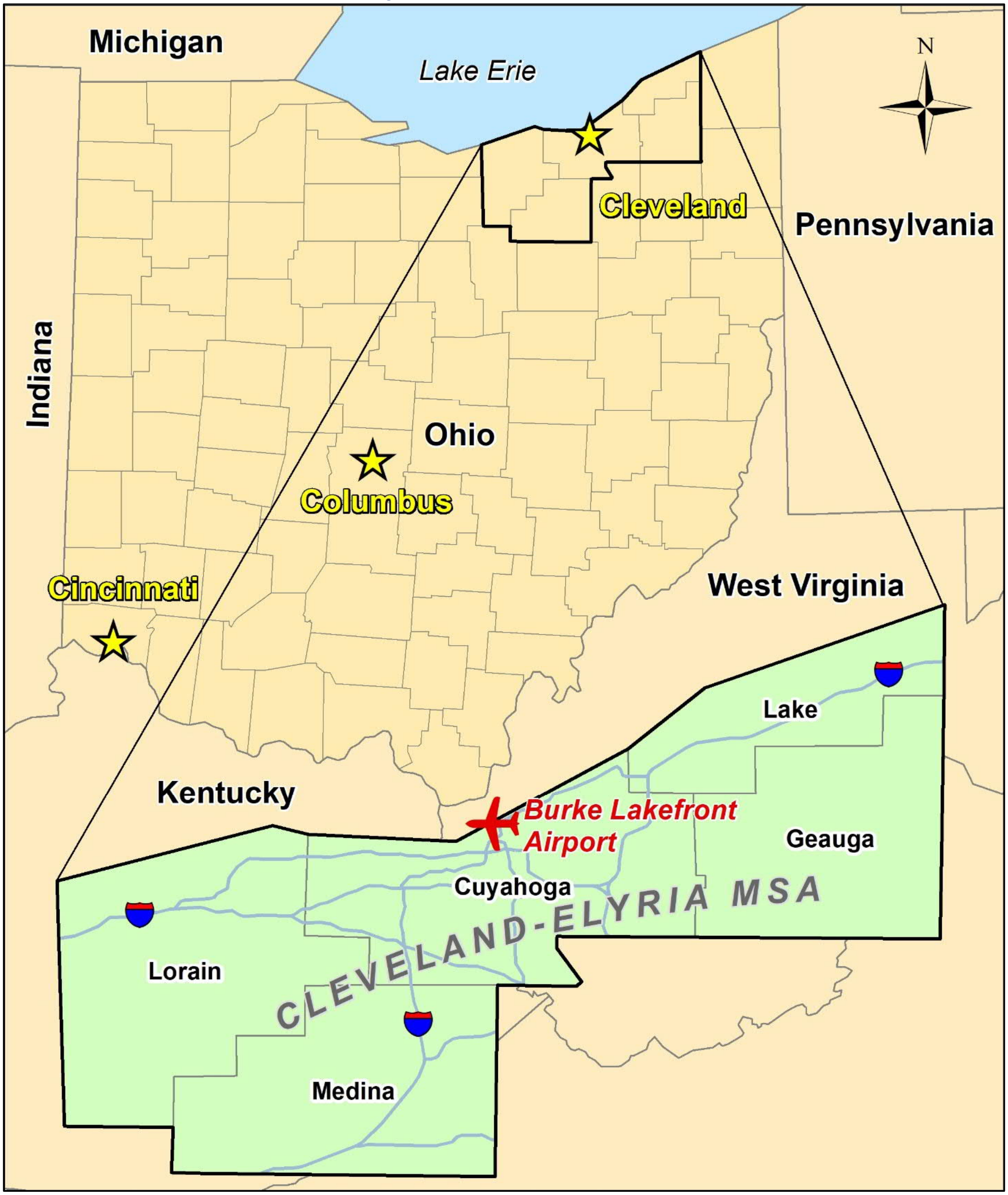
Catchment Area

An airport's catchment area, or market, is defined as the area in which an airport captures most of its airport users. To determine the catchment area, an evaluation using socioeconomic factors was conducted to identify which airports the local area population are most likely to use, based on the proximity with respect to other airports in the region, drive-time, and demographics. For the purposes of this forecast, the catchment area for BKL traffic is the Cleveland-Elyria

[1] John Hopkins University & Medicine, Coronavirus Resource Center, https://coronavirus.jhu.edu/map.html, 2021.

Metropolitan Statistical Area (MSA) consisting of Cuyahoga, Geauga, Lake, Lorain, and Medina Counties (Figure 2-1), as defined by defined by the U.S. Office of Management and Budget.

Figure 2-1 – BKL Location

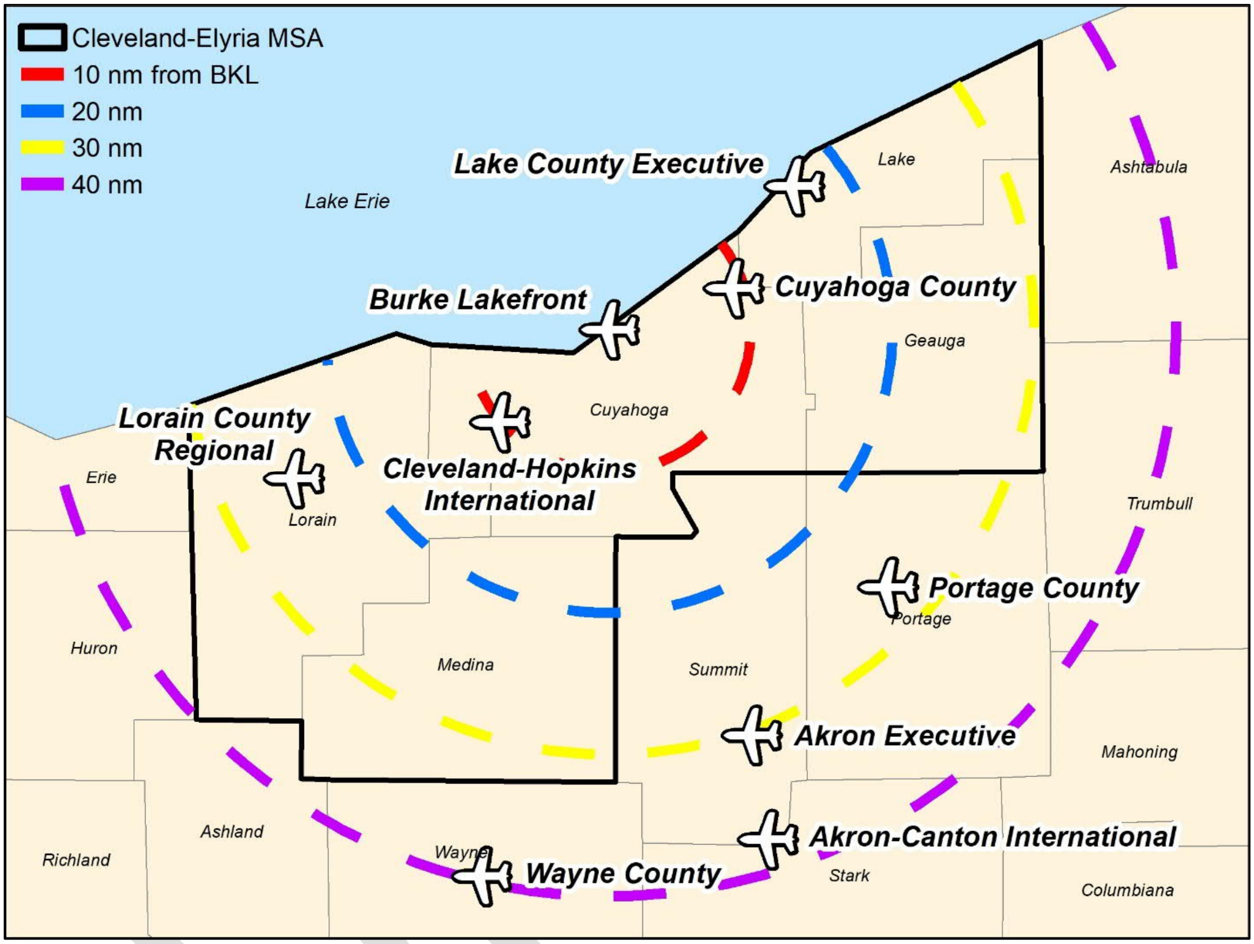


Source: CHA, 2021.

Nearby Airports

BKL is within 40 nautical miles of eight airports ranging in size from Cleveland-Hopkins International Airport (medium hub, commercial service – primary) to Portage County Airport (GA – local), as shown in Figure 2-2.

Figure 2-2 – BKL Vicinity



2.3.2 Forecast Data Sources

Information factored into both the planning and the forecasting efforts include commercial air carrier industry trends, airframe orders and retirement programs, cargo operational trends, GA operational trends, and anticipated changes in the aircraft fleet mix operating at BKL. The data and assumptions used to define baseline conditions and future activity trends were derived from the following data sources:

- Airport Management – Airport management representatives from the City of Cleveland Department of Port Control typically provide the most accurate historical data and future assumptions at the Airport. This includes passenger and operational activity, facility needs, gate requirements, fleet mix transition, and anticipated service growth.
- Airline Management – Airline representatives provide insight on planned and future airline routes and airframe changes, which are directly factored into the assumptions and methodologies of the demand projections.

- Air Traffic Control Tower – Midwest ATC controls all air traffic at BKL as the contractor operator of its Air Traffic Control Tower (ACTC). ACTC operations data is considered the most accurate and current data available.
- Airport Tenants – Airport tenants were interviewed in part of the ALP Update process to obtain existing and future operations data, which in turn are utilized to forecast aviation activity at BKL. Tenants included the Airport's FBO, flight schools, and other aeronautical operators.
- FAA Terminal Area Forecast (TAF)[2] – TAF activity estimates are derived by the FAA from national estimates of aviation activity. These estimates are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast.
- FAA Traffic Flow Management System Counts (TFMSC) – TFMSC is a system used by the FAA to provide information on traffic counts at the airport, city, state, or regional level. It includes only data for flights under Instrument Flight Rule (IFR) conditions and are automatically recorded by the FAA's enroute computers. It includes metrics such as equipment and flight type.
- FAA Air Traffic Activity Data Systems (ATADS) – ATADS is a system used by the FAA that provides the official national air system air traffic operations data available for public release.
- FAA Aerospace Forecast FY 2020-2040 – This forecast provides an overview of aviation industry trends and expected growth for the commercial passenger air carrier activity segments. National growth rates in enplanements and operations, as well as growth and mix for commercial fleets, are provided over a 20-year forecast horizon. This forecast also provides an overview of trends regarding general aviation (GA) activity and aircraft. For the purposes of this forecast, the FAA Aerospace Forecasts were used as comparisons for the basis of determining the growth of the BKL general aviation and based aircraft.
- Woods & Poole Economics, Inc. – Woods & Poole Economics, Inc. is an independent firm that specializes in developing long-term economic and demographic projections. Their database includes every State, Metropolitan Statistical Area (MSA), and county in the United States (U.S.) and contains historical data and projections from 1970 through 2050, utilizing more than 900 economic and demographic variables.
- Bureau of Transportation Statistics (Air Carriers: T-100) – The Bureau of Transportation Statistics (BTS), part of the Department of Transportation (DOT), provides statistical data relating to commercial aviation, multimodal freight activity, and transportation economics. The T-100 data contains market data reported by U.S. carriers, including the air carrier, flight origin and destination, equipment type and seat information, and number of enplaned passengers.

[2] Note, the 'FAA 2020 TAF', which was published in May 2021, represents the TAF containing all data from FY 2020.

2.3.3 Forecast Categories

Aviation demand forecasts are prepared for a variety of aviation categories. These categories are determined based on the type and level of activity expected at an airport over the planning horizon. They can also vary in relevance depending on the size and category of an airport and the basic objectives of a specific master plan. Four types of aviation activity are forecasted herein, as defined below and include: based aircraft, general aviation, commercial aviation, and military aviation.

Commercial Aviation (Air Carrier, Air Taxi and Commuter)

Air carrier operations are performed by aircraft designed to have a seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes US and foreign flagged carriers.

Air taxi and commuter operations are performed with aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.

General Aviation

General aviation (GA) includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. General aviation represents the largest percentage of civil aircraft in the U.S. and accounts for most operations handled by towered and non-towered airports. Its activities include flight training, sightseeing, recreational, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter operations.

General aviation aircraft encompass a broad range of types, from single-engine piston aircraft to large corporate jets, as well as helicopters, gliders, and amateur-built aircraft.

General aviation and military operations are further categorized as either itinerant or local operations. Local operations are those performed by aircraft that remain in the local traffic pattern or within a 20-mile radius of the tower. Local operations are commonly associated with training activity and flight instruction and include touch and go operations. Itinerant operations are arrivals or departures, other than local operations, performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius.

Military

Operations conducted by the nation's military forces. Military activity at the Airport is nominal and represents approximately only 1% of total annual operations, and therefore is considered static throughout the forecast.

Based Aircraft

Based aircraft are defined as aircraft that use a specific airport as a home base. These are the aircraft that typically rent tie-down or hangar space for extended periods of time and, are registered as based at that specific airport. It is important to note that the number of based aircraft at most GA airports is, perhaps, the most important indicator of growth, as based aircraft most directly affect the daily aircraft activity.

2.4 SOCIOECONOMIC DATA

The factors that have the greatest impact on the growth prospects of an airport are the socioeconomic characteristics, such as population, income, and employment, present within the Airport's catchment area, which in the case of BKL is the Cleveland-Elyria MSA. The economic and demographic growth patterns for this core area will have major impacts on future demand for air service at BKL.

COVID-19 Disclaimer

Although 2018 represents the last year of historical data, Woods & Poole has continued to analyze the effects of COVID-19 on the economy and the impacts on the provided projections. Per Woods & Poole's 2020 State Profile for Ohio, "COVID-19 itself does not appear to have made a quantifiable long-term economic impact that would affect forecasts." During conversations with Woods & Poole, a representative confirmed that recent activity levels are being compiled and short-term projections adjusted to reflect recent impacts due to COVID-19, with projections expected to be complete in June 2021.

To supplement the projections provided by Woods and Poole, the United States census was referenced; however, due to COVID-19, 2020 Census data is being adjusted and further analyzed, with data not being available to the states until September 2021.

2.4.1 Population

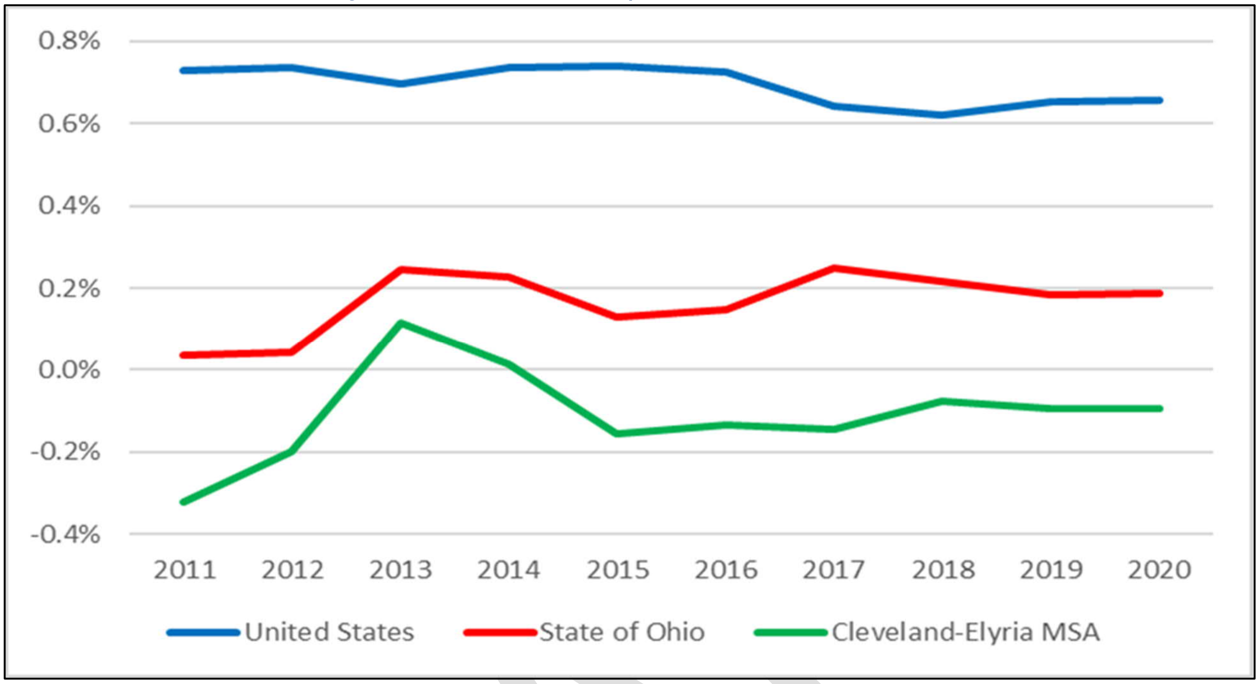
In 2020, the Cleveland-Elyria MSA had a population of approximately 2,053,171. The Average Annual Growth Rate (AAGR) compared to 2019 was -0.1%, which was less than the AAGR for both the United States (0.7%) and State of Ohio (0.2%). This discrepancy is further evident when comparing the overall population change from 2010 to 2020 as the MSA lost approximately 1.1% of its population, whereas the United States and Ohio grew by 7.2% and 2%, respectively. Figure 2-3 illustrates the population AAGR from 2010 to 2020 for the MSA, United States, and Ohio.

Population projections through 2045 retain a similar AAGR trajectory where the Unites States and Ohio continue to grow in population, though their growth rates diminish over time, ending with zero to 0.5% growth in 2045. The MSA, however, is projected to continue its population loss with loss rates increasing over time to -0.3% in 2045. Several factors are contributing to Cleveland's population decline according to the City of Cleveland Planning Commission[3], including:

- Net out-migration of residents
- Families and married couples leaving the City
- Lack of new immigrants making the City their home
- Downtown has unrealized potential

[3] City of Cleveland Planning Commission, *Population Challenges, https://planning.clevelandohio.gov/cwp/pop_chall.php.*

Figure 2-3 – Historic Population Growth Rates



Note: Depicts AAGR.
Source: Woods and Poole, CHA, 2021.

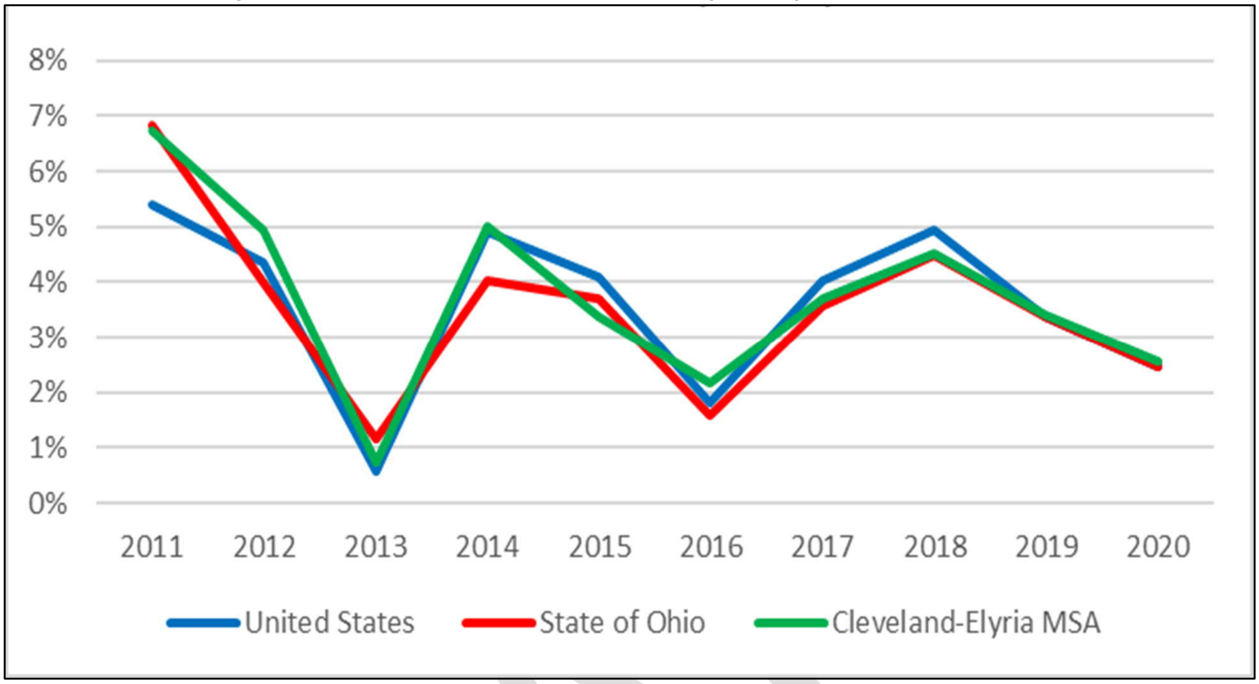
2.4.2 Personal Income per Capita

In 2020, the Cleveland-Elyria MSA had a personal income per capita of approximately $56,982. The AAGR compared to 2019 was 2.6%, which was slightly more than both the United States (2.5%) and State of Ohio (2.5%). This comparison of AAGR is similar to the overall change in personal income per capita from 2010 to 2020 as the MSA grew by approximately 43.9%, whereas the United States and Ohio grew by 42.4% and 41%, respectively. Figure 2-4 illustrates the personal income per capita AAGR from 2010 to 2020 for the MSA, United States, and Ohio. Projections of personal income per capita through 2045 predict a steady AAGR increase of 4 to 5% for the MSA, United States, and Ohio. Several factors are contributing to the stalling of Cleveland's personal income per capita according to the City of Cleveland Planning Commission[4], including:

- Inadequate supply of workers with high technology skills
- Population lacks basic literacy and math skills
- Racial and ethnic prejudice acting as barriers to employment

[4] City of Cleveland Planning Commission, *Population Challenges*, *https://planning.clevelandohio.gov/cwp/pop_chall.php.*

Figure 2-4 – Historic Personal Income per Capital Growth Rates



Note: Depicts AAGR.
Source: Woods and Poole, CHA, 2021.

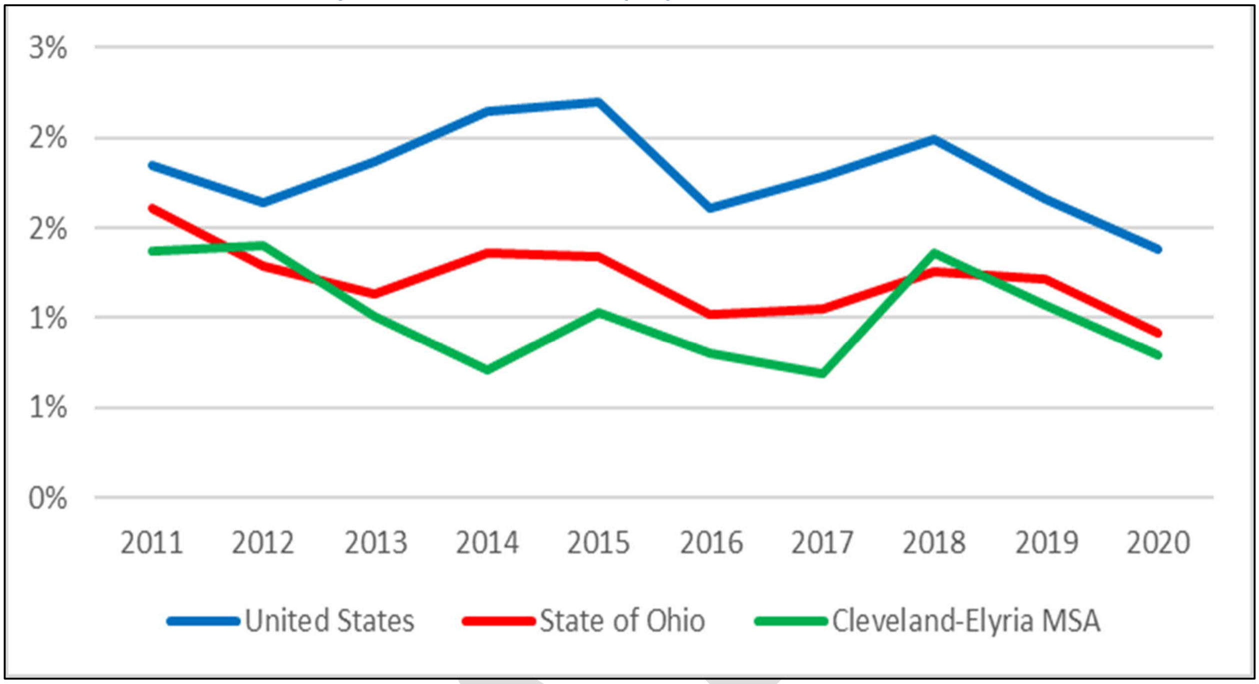
2.4.3 Employment

In 2020, the Cleveland-Elyria MSA had approximately 1,376,272 jobs. The AAGR compared to 2019 was 0.8%, which was slightly less than the State of Ohio (0.9%) but even more so than the United States (1.4%). This discrepancy in AAGR is further widened when comparing the overall change in employment from 2010 and 2020 as the MSA gained approximately 10.7% of jobs, whereas the United States and Ohio grew by 19.7% and 13%, respectively. Figure 2-5 illustrates the employment AAGR from 2010 to 2020 for the MSA, United States, and Ohio. Employment projections through 2045 retain a similar AAGR trajectory where the MSA, United States, and Ohio continue to add more jobs, though their growth rates diminish over time, ending with a 0.3 to 1% increase in 2045. Several factors are contributing to the stalling of Cleveland's economy according to the City of Cleveland Planning Commission[5], including:

- Loss of manufacturing jobs are not being replaced
- Industrial sites lack access to rail, water, or highways
- Lack of assembled sites of sufficient size for major development
- Competition from regions with lower labor and land costs
- Competition from cities perceived to have a better quality of life

[5] City of Cleveland Planning Commission, *Population Challenges, https://planning.clevelandohio.gov/cwp/pop_chall.php.*

Figure 2-5 – Historic Employment Growth Rates



Note: Depicts AAGR.
Source: Woods and Poole, CHA, 2021.

2.5 HISTORICAL AVIATION ACTIVITY

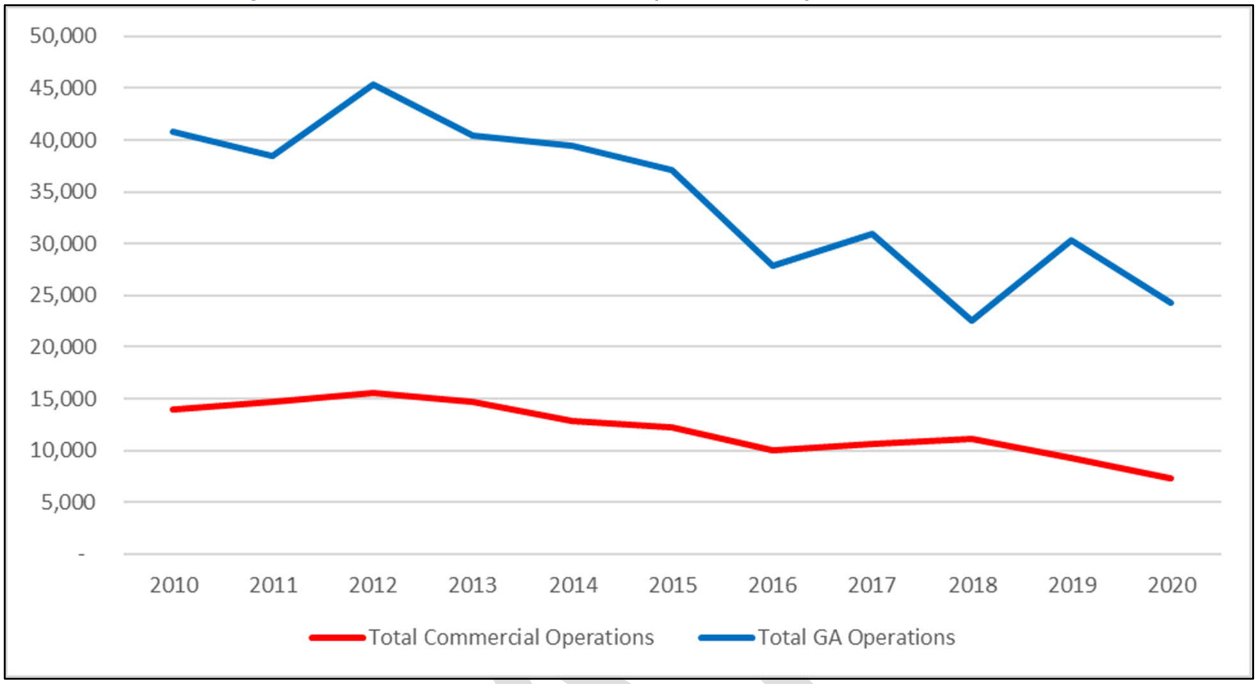
This section presents historical operations and enplanements aviation activity as provided by the FAA 2020 TAF, ATCT, BTS, and BasedAircraft.com. The historical data is presented in FAA fiscal years that run from October to September.

Based on the 2020 TAF and actual ATCT data, annual operations for commercial and GA declined by 33% and 26%, respectively, from 2010 to 2019. This decline generally slowed and stabilized between 2016 and 2019 until the pandemic started in March 2020 when both commercial and GA operations were dramatically reduced. GA impacts from the pandemic were concentrated in the first months of the pandemic and recovered quickly, while commercial impacts stretched throughout the entire year and has not recovered to date, as further detailed in Section 2.6.

Based on the 2020 TAF data, annual enplanements increased by 782% from 2010 to 2019. However, when compared to BTS data, enplanements increased by 818%. This large increase in enplanements is primarily due to the introduction of Part 135 service in November 2015 by Ultimate Air. The emergence of the pandemic forced Ultimate Air to reduce and later cease operations in 2020, which accordingly had a ripple-effect on enplanements that reduced their level to 2016 when Part 135 service was first introduced, as further detailed in Section 2.6.

TAF Operations (Adjusted)

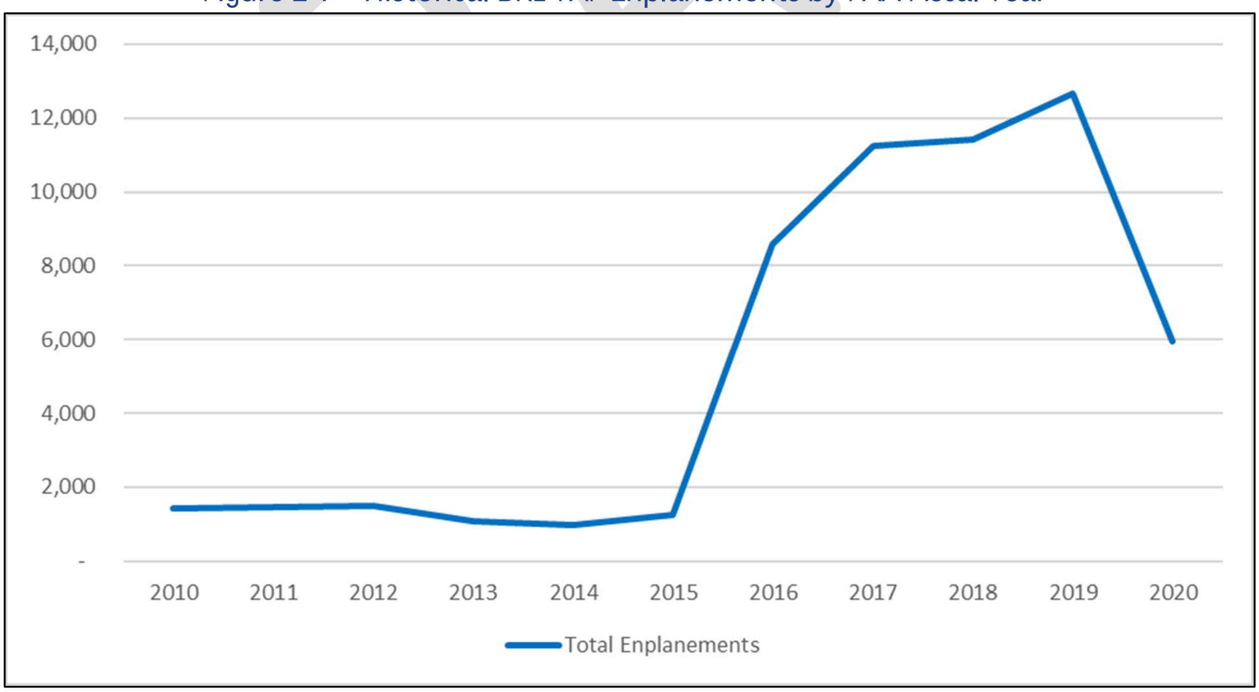
Figure 2-6 – Historical BKL TAF Operations by FAA Fiscal Year



Source: 2020 TAF, Midwest ATC, CHA, 2021.

TAF Enplanements

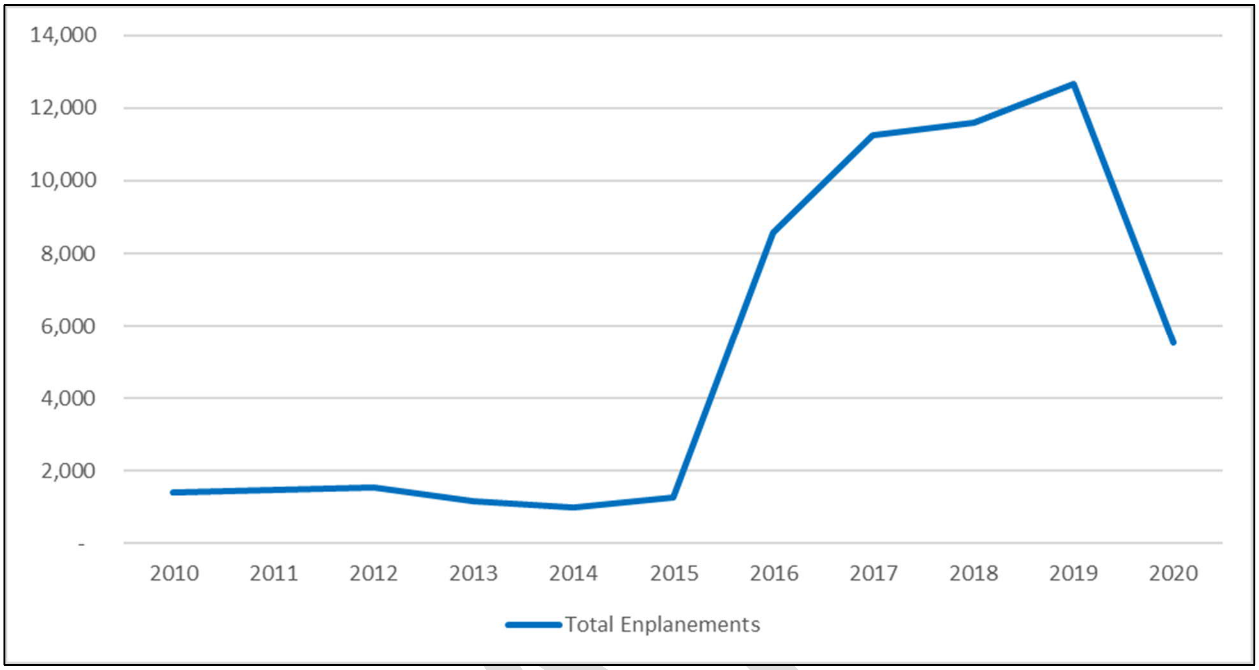
Figure 2-7 – Historical BKL TAF Enplanements by FAA Fiscal Year



Source: 2020 TAF, CHA, 2021.

BTS Enplanements

Figure 2-8 – Historical BKL BTS Enplanements by FAA Fiscal Year

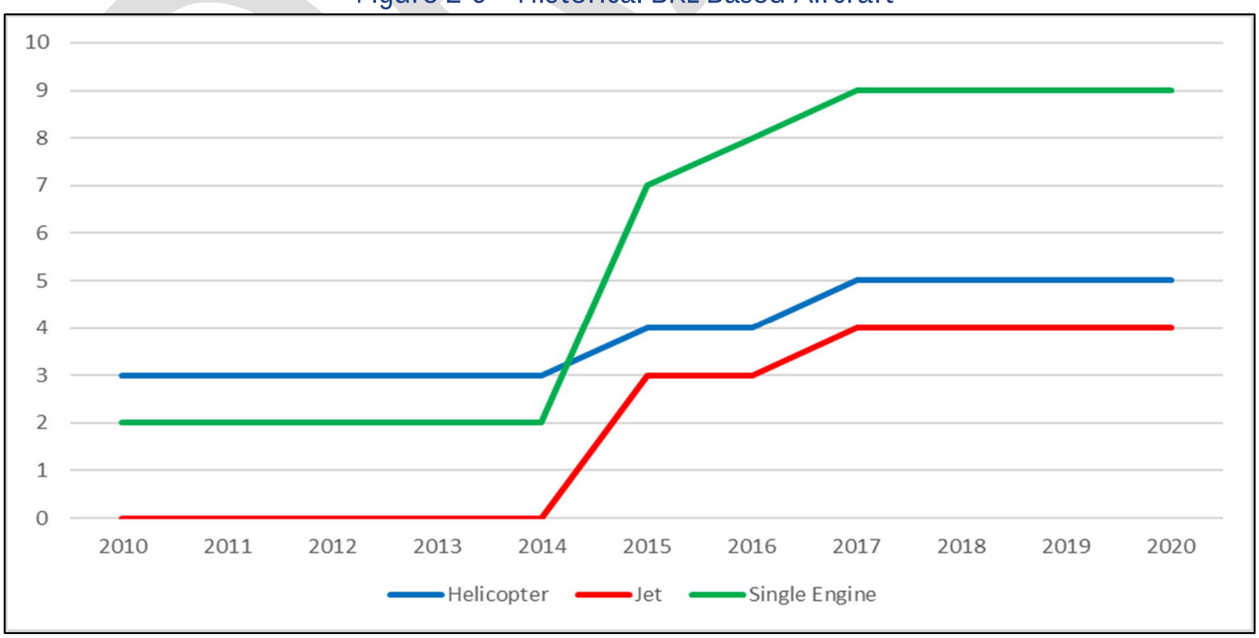


Source: BTS, CHA, 2021

Based Aircraft

The existing based aircraft count, as provided by BasedAircraft.com, serves as the based aircraft baseline for this forecast. Figure 2-3 summarizes the Airport's historical based aircraft from 2010 to 2020 and Table 2-2 summarizes the existing based aircraft fleet by aircraft type for the Airport. There are currently 9 single-engine piston aircraft, 4 jets, and 5 helicopters based at BKL.

Figure 2-9 – Historical BKL Based Aircraft



Source: BasedAircraft.com, CHA, 2021.

Table 2-2 – 2020 BKL Based Aircraft

Aircraft Category	Aircraft Count
Single-Engine Piston	9
Jet	4
Helicopter	5
Total	18

Source: BasedAircraft.com, CHA, 2021.

Based on discussions with the Airport, the existing based aircraft count provided by BasedAircraft.com is not up to date nor reflect current aviation demand. Therefore, the aircraft count provided by BasedAircraft.com will continue to serve as the based aircraft baseline, and additional based aircraft reported by BKL (Table 2-3) will be added to the forecast to reflect a true aviation demand.

Table 2-3 – 2020 BKL Based Aircraft (Adjusted)

Aircraft Category	Aircraft Count per BaseAircraft.com	Additional Aircraft Count per Airport Management	Total Based Aircraft
Single-Engine Piston	9	9	18
Jet	4	7	11
Helicopter	5	1	6
Total	18	17	35

Source: BasedAircraft.com, BKL, CHA, 2021.

2.6 COVID-19 IMPACTS ON AVIATION ACTIVITY

Typical aviation forecasts develop a baseline of aviation activity by examining the prior year to establish a historical datum at which all forecasts begin; however, due to the COVID-19 pandemic, the first step in this forecast is to examine recent historical aviation activity prior to the pandemic (e.g., 2016, 2017, 2018, 2019) and the first year of the pandemic (2020). Three primary sources were used to examine historical aviation activity: operations data provided by the Air Traffic Control Tower (ATCT), operations data provided by the FAA Traffic Flow Management System Counts (TFMSC), air carrier operations data provided by the Bureau of Transportation Statistics (BTS), and based aircraft data provided by BasedAircraft.com.

2.6.1 Recent Enplanement Trends

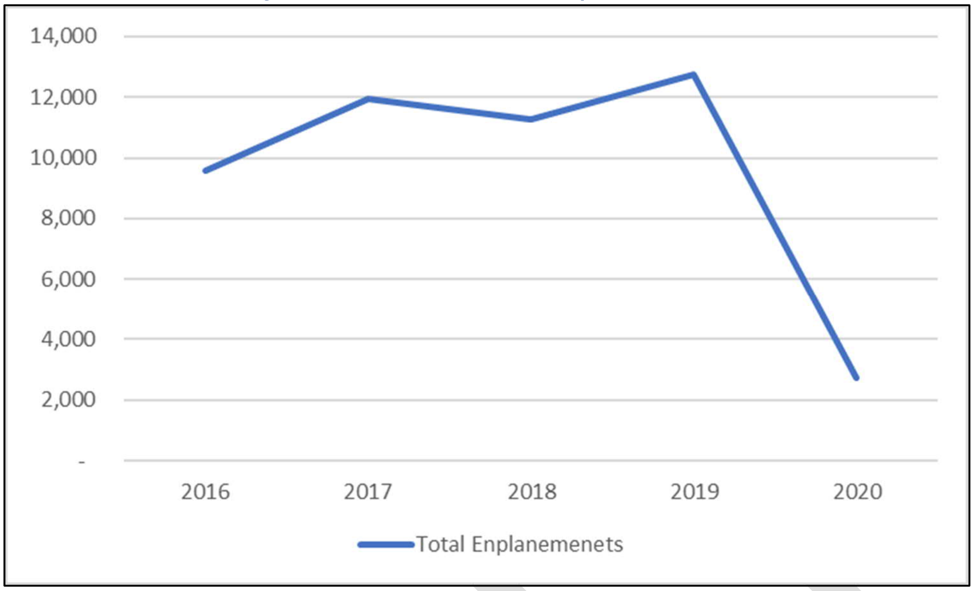
Based on BTS data, BKL had approximately 10,000 annual enplanements for the four years before the pandemic (2016-2019). As a consequence of the pandemic that began in March 2020, enplanements were reduced to 2,339 for the whole of 2020, representing a 79% loss from 2019. Table 2-4 and Figure 2-10 summarizes Airport annual enplanements from 2016 to 2020.

Table 2-4 – BKL Total Enplanements

Year	Enplanements
2016	8,242
2017	10,310
2018	10,566
2019	11,239
2020	2,339

Source: BTS, CHA, 2021.

Figure 2-10 – BKL Total Enplanements



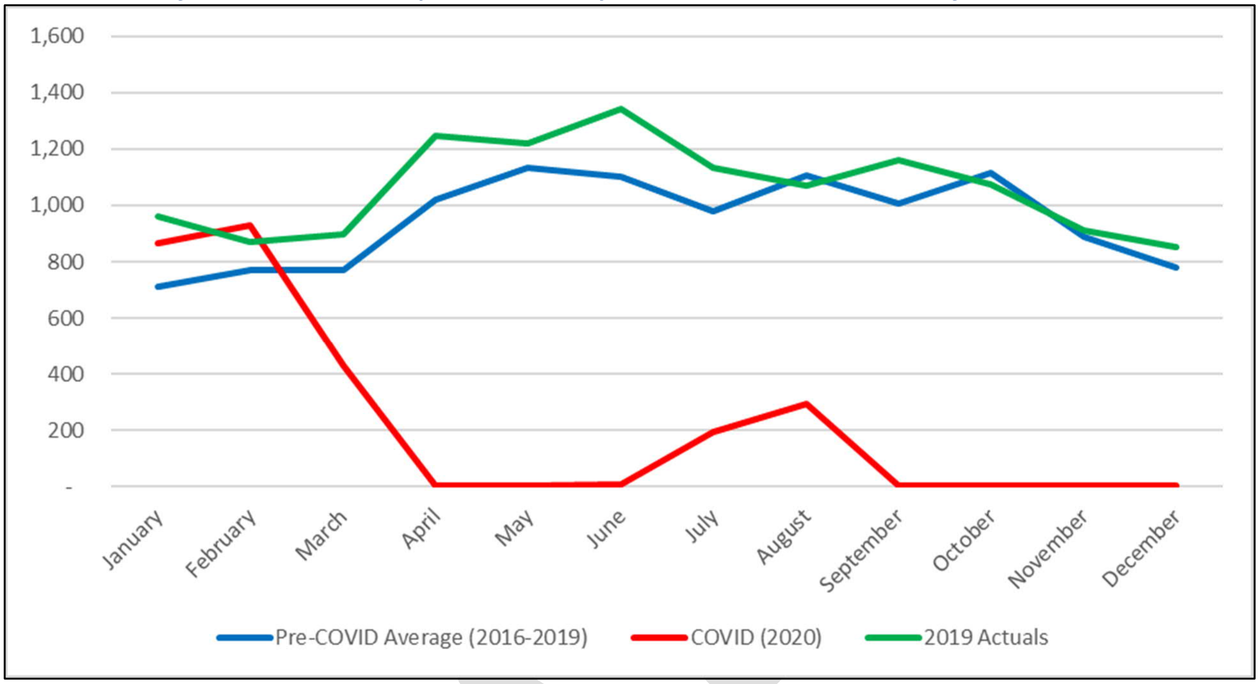
Coupled with flight restrictions due to COVID, the loss of enplanements was primarily related to the reduction and cease of operations by Ultimate Air, the sole Part 135 air charter carrier operator at the Airport. On average between 2016 and 2019, Ultimate Air accounted for 89% of all enplanements at the Airport. Ultimate Air operations and enplanements are further discussed in Section 2.6.2. Table 2-5 and Figure 2-11 summarizes Airport enplanements by monthly average before the pandemic (2016-2019) and operations by month during the pandemic (2020).

Table 2-5 – BKL Enplanements by Month Before and During Pandemic

Month	Average Total Enplanements Before Pandemic (2016-2019)	Total Enplanements During Pandemic (2020)	Difference (+/-)	Difference (%)
January	710	866	156	22%
February	771	928	157	20%
March	773	430	-343	-44%
April	1,021	0	-1,021	-100%
May	1,135	0	-1,135	-100%
June	1,102	5	-1,097	-100%
July	979	191	-788	-80%
August	1,107	291	-816	-74%
September	1,005	0	-1,005	-100%
October	1,115	0	-1,115	-100%
November	886	0	-886	0%
December	781	0	-781	-100%
Average	949	226	-723	-63%

Source: BTS, CHA, 2021.

Figure 2-11 – BKL Enplanements by Month Before and During Pandemic



Source: BTS, CHA, 2021.

2.6.2 Recent Operations Trends

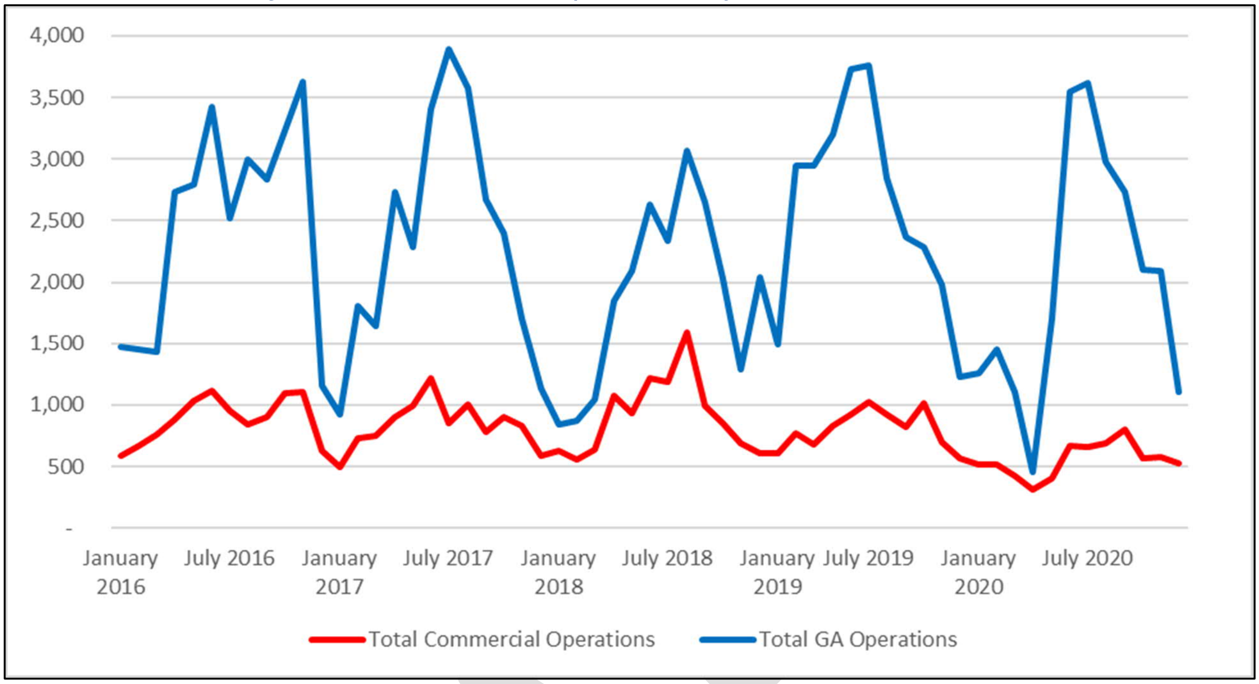
Based on ATCT data provided by Midwest ATC, BKL had approximately 38,000 annual operations for the four years before the pandemic (2016-2019). As a consequence of the pandemic that began in March 2020, operations were reduced to 31,107 for the whole of 2020, representing a 23% loss from 2019. Table 2-6 summarizes Airport operations by type from 2016 to 2020; Figure 2-12 shows total operations by commercial and GA (itinerant and local combined) from 2015 to 2020.

Table 2-6 – BKL Total Operations

Year	Commercial (Air Carrier, Taxi, and Commuter)	GA Itinerant	GA Local	Military Itinerant	Military Local	Total Operations	AAGR
2016	9,907	15,596	12,616	446	59	38,624	-22%
2017	10,050	16,418	11,744	331	62	38,605	0%
2018	10,972	13,618	9,130	395	44	34,159	-12%
2019	9,435	16,523	13,884	381	88	40,311	18%
2020	6,667	12,772	11,372	246	50	31,107	-23%

Source: Midwest ATC, CHA, 2021.

Figure 2-12 – BKL Total Operations by Commercial and GA



Source: Midwest ATC, CHA, 2021.

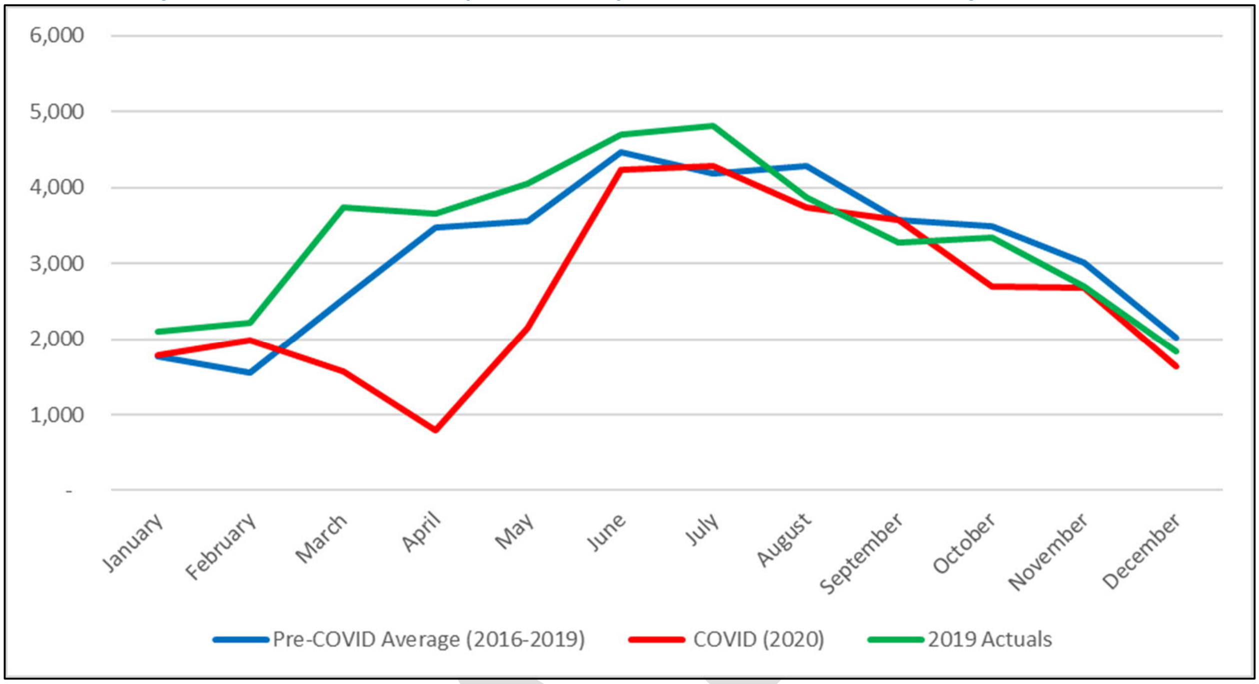
To further examine historical operations and impacts from pandemic, Table 2-7 and Figure 2-13 summarizes the Airport's operations by monthly average before the pandemic (2016-2019) and operations by month during the pandemic (2020). Once the pandemic began in March 2020, the Airport experienced a loss in operations every month compared to the monthly average in the previous four years except July, though operations in June and September were nearly on par, to accumulate to a 16% monthly average loss for 2020.

Table 2-7 – BKL Total Operations by Month Before and During Pandemic

Month	Average Total Operations Before Pandemic (2016-2019)	Total Operations During Pandemic (2020)	Difference (+/-)	Difference (%)
January	1,772	1,791	+19	+1%
February	1,555	1,979	+425	+27%
March	2,523	1,566	-957	-38%
April	3,481	798	-2,683	-77%
May	3,565	2,142	-1,423	-40%
June	4,462	4,229	-233	-5%
July	4,192	4,291	+99	+2%
August	4,288	3,735	-553	-13%
September	3,575	3,569	-6	0%
October	3,490	2,689	-801	-23%
November	3,004	2,682	-322	-11%
December	2,018	1,636	-382	-19%
Average	3,160	2,592	568	-16%

Source: Midwest ATC, CHA, 2021.

Figure 2-13 – BKL Total Operations by Month Before and During Pandemic



Source: Midwest ATC, CHA, 2021.

The impact of the pandemic reveals itself more clearly when total operations are examined by GA operations and commercial operations, as shown in Table 2-8 and Figure 2-14 for GA operations, and Table 2-9 and Figure 2-15 for commercial operations. Commercial operations dropped by a 31% monthly average during the pandemic in 2020 compared to the previous four years, whereas GA operations only dropped by a 11% monthly average. GA operations had the most significant drop at the initial height of the pandemic in April 2020 compared to commercial operations, dropping 82% and 64%, respectively. However, GA operations mostly recovered by June and were above the monthly average in June, July, and September, and nearly on par in August and November, before a large spike in the pandemic occurred in December 2020 and stunted its recovery.

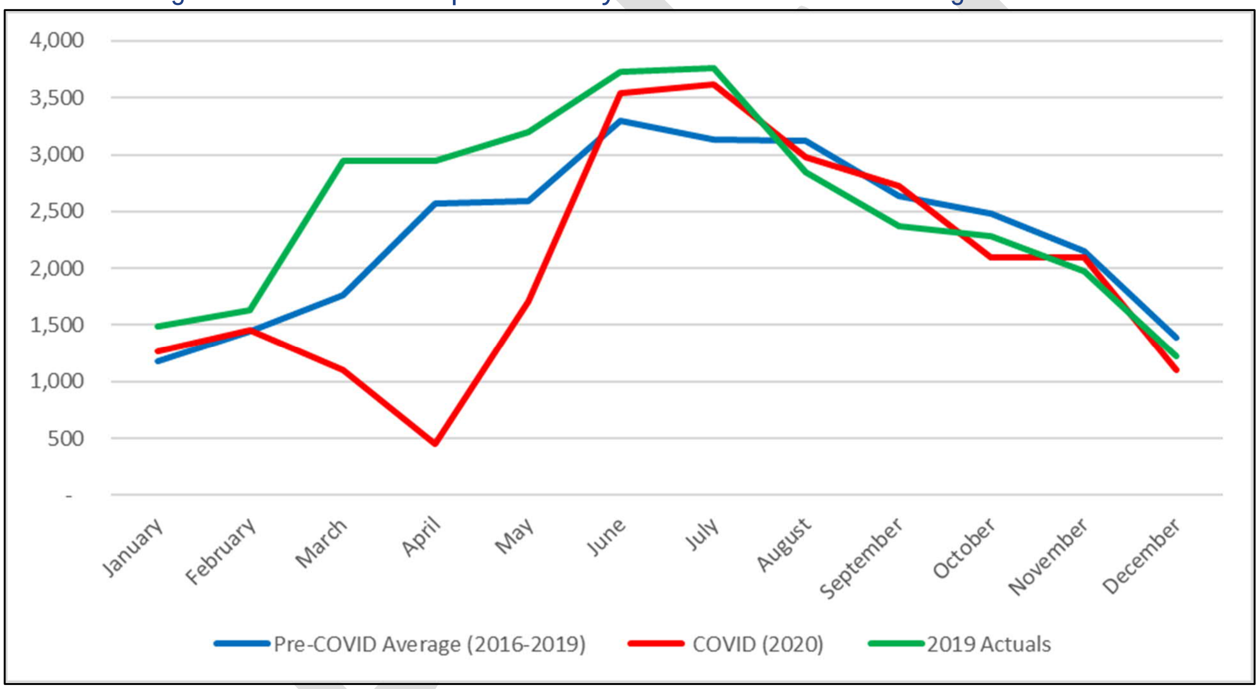
Commercial operations continued to be below the monthly average for the entirely of the pandemic in 2020 and never recovered. One of the key reasons for this steady decline was related to the reduction and cease of operations by Ultimate Air, the sole Part 135 air charter carrier operator at the Airport. Based on BTS operations data shown in Table 2-10 and Figure 2-16, Ultimate Air responded to the onset of the pandemic in March 2020 by reducing operations by 50% and then ceasing operations entirely in April, May, and June. Thereafter, Ultimate Air offered reduced operations in July and August, but then ceased operations again for the remainder of 2020 and eventually ended its lease with Airport in December 2020. Ultimate Air enplanements were equally impacted in correlation with the reduction and cease of operations, as shown in Table 2-11 and Figure 2-17.

Table 2-8 – BKL GA Operations by Month Before and During Pandemic

Month	Monthly Average Operations Before Pandemic (2016-2019)	Operations During Pandemic (2020)	Difference (+/-)	Difference (%)
January	1,179	1,263	-69	+7%
February	1,077	1,451	+55	+35%
March	1,766	1,103	-301	-38%
April	2,566	455	-570	-82%
May	2,591	1,709	-543	-34%
June	3,298	3,542	-453	+7%
July	3,129	3,615	-346	+16%
August	3,121	2,979	-399	-5%
September	2,632	2,728	-71	+4%
October	2,486	2,100	-400	-16%
November	2,150	2,097	-256	-2%
December	1,388	1,102	-74	-21%
Average	2,282	2,012	-270	-11%

Source: Midwest ATC, CHA, 2021.

Figure 2-14 – BKL GA Operations by Month Before and During Pandemic



Source: Midwest ATC, CHA, 2021.

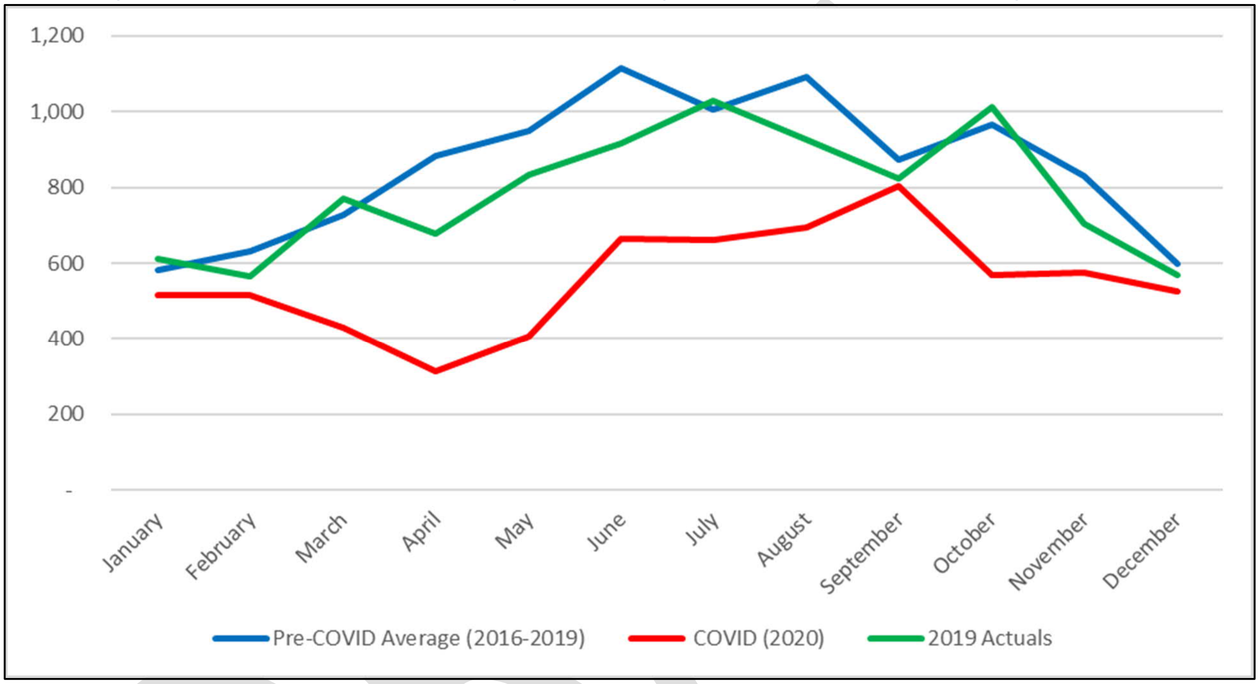
Table 2-9 – BKL Commercial Operations by Month Before and During Pandemic

Month	Monthly Average Operations Before Pandemic (2016-2019)	Operations During Pandemic (2020)	Difference (+/-)	Difference (%)
January	583	514	-69	-12%
February	462	517	+55	+12%
March	729	428	-301	-41%
April	884	314	-570	-64%
May	948	405	-543	-57%
June	1,117	664	-453	-41%
July	1,007	661	-346	-34%

Month	Monthly Average Operations Before Pandemic (2016-2019)	Operations During Pandemic (2020)	Difference (+/-)	Difference (%)
August	1,092	693	-399	-37%
September	874	803	-71	-8%
October	968	568	-400	-41%
November	830	574	-256	-31%
December	600	526	-74	-12%
Average	841	556	-285	-31%

Source: Midwest ATC, CHA, 2021.

Figure 2-15 – BKL Commercial Operations by Month Before and During Pandemic



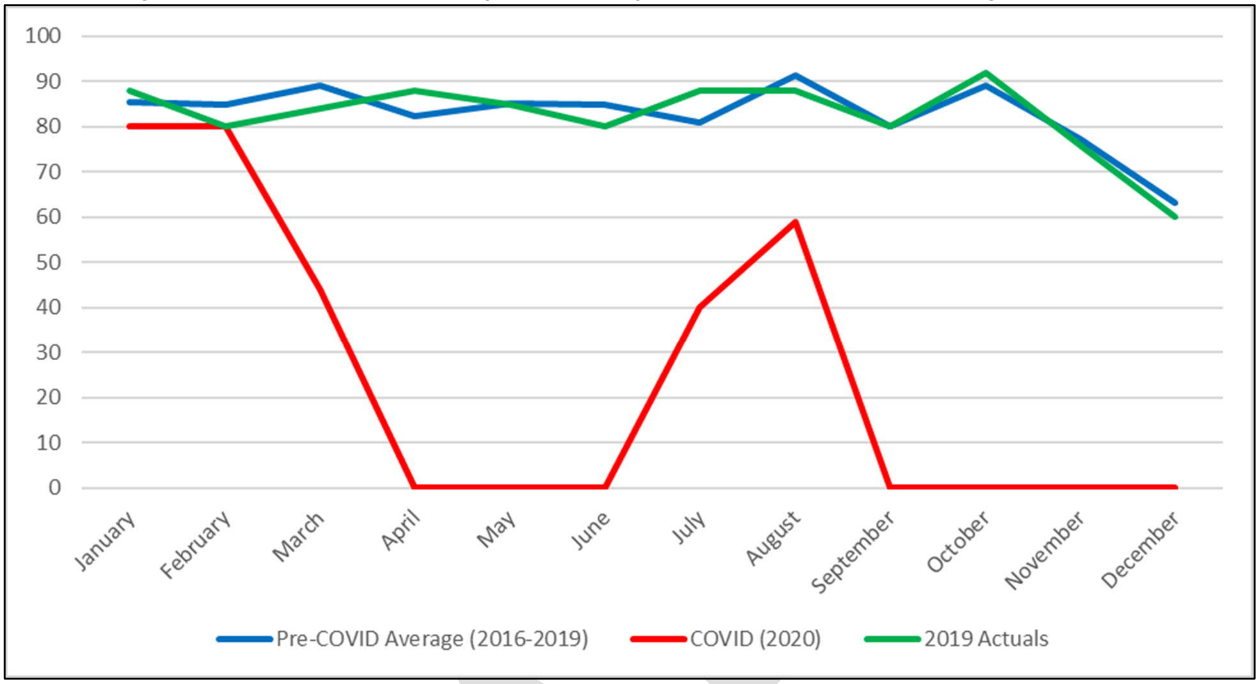
Source: Midwest ATC, CHA, 2021.

Table 2-10 – Ultimate Air Operations by Month Before and During Pandemic

Month	Monthly Average Operations Before Pandemic (2016-2019)	Operations During Pandemic (2020)	Difference (+/-)	Difference (%)
January	86	80	-6	-6%
February	85	80	-5	-6%
March	89	44	-45	-51%
April	83	0	-83	-100%
May	85	0	-85	-100%
June	85	0	-85	-100%
July	81	40	-41	-51%
August	91	59	-32	-35%
September	80	0	-80	-100%
October	89	0	-89	-100%
November	77	0	-77	-100%
December	63	0	-63	-100%
Average	76	25	-58	-71%

Source: BTS, CHA, 2021.

Figure 2-16 – Ultimate Air Operations by Month Before and During Pandemic



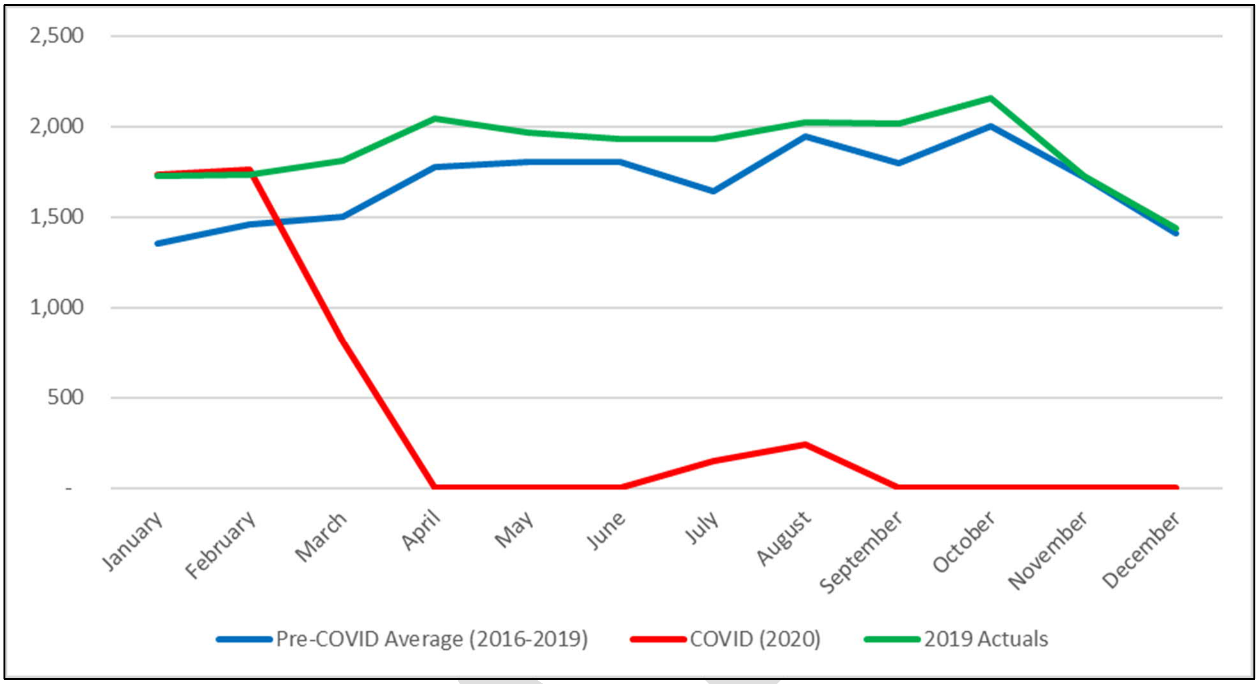
Source: BTS, CHA, 2021.

Table 2-11 – Ultimate Air Enplanements by Month Before and During Pandemic

Month	Monthly Average Operations Before Pandemic (2016-2019)	Operations During Pandemic (2020)	Difference (+/-)	Difference (%)
January	1,357	1,733	377	+28%
February	1,459	1,760	301	+21%
March	1,506	811	-695	-46%
April	1,777	0	-1,777	-100%
May	1,804	0	-1,804	-100%
June	1,806	0	-1,806	-100%
July	1,643	147	-1,496	-91%
August	1,944	238	-1,706	-88%
September	1,798	0	-1,798	-100%
October	2,000	0	-2,000	-100%
November	1,720	0	-1,720	0%
December	1,407	0	-1,407	-100%
Average	1,685	391	-1,294	-62%

Source: BTS, CHA, 2021.

Figure 2-17 – Ultimate Air Enplanements by Month Before and During Pandemic



Source: BTS, CHA, 2021.

2.7 AVIATION ACTIVITY RECOVERY FORECASTS FROM COVID-19

The process of formulating an aviation activity recovery forecast is based on several factors that are either unknown or fluidly changing during the pandemic. Therefore, this forecast provides an "optimistic" and "pessimistic" recovery forecast to provide flexibility as these factors are realized over time. These factors are broadly divided into two categories and described in Table 2-12: driving forces and critical uncertainties. It should be noted that these factors are ever-changing and include others beyond those listed.

Table 2-12 – Variables for Aviation Activity Recovery from Pandemic

Driving Forces	*Critical Uncertainties*
✈ COVID-19 vaccination efficacy, supply, distribution, and community acceptance	✈ Pace of community vaccinations and vaccine effectiveness duration
✈ Uneven economic recovery by region and airport category/use	✈ Worsening mutations and new surges of the COVID-19 virus
✈ Rate of return in business and leisure air travel and perception of safety	✈ Rapid aviation activity shifts in response to new surges
✈ Travel restrictions by local, state, and Federal governments	✈ Population shift from urban to rural or suburban areas
	✈ Destruction of vaccination shipments

Source: 2021 AAAE/ACC Airport Planning, Design, and Construction Symposium: Scenario Planning Session (3/2/2021).

Moreover, the proceeding aviation activity recovery forecasts will be based on assumptions on these variables outlined in Table 2-12, which in turn will be applied to historical operation trends. While the review of historical operations included an examination of monthly operations during the pandemic in 2020 versus the monthly average of operations from the previous four years before the pandemic (2016, 2017, 2018, 2019), the recovery forecasts examines the most current 12 months of operations available and formulates an optimistic and pessimistic forecast in which operations return to pre-pandemic levels. The optimistic and pessimistic assumptions on the variables for aviation activity recovery from the pandemic include:

- Optimistic Forecast assumes vaccinations are rapidly distributed and 100% successful that result in a diminished virus, travel restrictions are 100% lifted throughout the U.S., and passenger confidence in air travel safety is 100% restored.
- Pessimistic Forecast assumes vaccination distribution progresses at a slow pace, new mutations stall in diminishing the virus, travel restrictions are unequally lifted throughout the U.S., and passenger confidence in air travel safety grows as the same slow pace as vaccination distribution.

It should be noted that these are pure assumptions as empirical data on forecasting aviation activity recovery from the pandemic is not available. The International Civil Aviation Organization (ICAO) provides indicative scenarios regarding aviation recovery from the pandemic but stresses they "are not forecasts of what is most likely to happen. Given rapidly changing circumstances, they are merely indicative of possible paths or consequential outcomes out of many … The exact path (depth, length and shape) will depend upon various factors, inter alia, duration and magnitude of the outbreak and containment measures, availability of government assistance, consumer confidence, and economic conditions."[6] In these scenarios, ICAO estimates North American domestic enplanements in the second quarter of 2021 will be down between 66% to 69.5% compared to 2019. However, the scenarios are only applicable to domestic enplanements for all North America and are not specific to general aviation, commercial, and military operations in the U.S. only.

The International Air Transport Association (IATA) estimated in November 2020 that global enplanements would recovery to 2019 levels by 2024, but this was based on an assumption that vaccinations would not begin until the second half of 2021, which in actuality began in early 2021. It also acknowledged there is a "huge amount of uncertainty over virus behavior, vaccine effectiveness and government responses" that creates a wide range of uncertainty in this estimation.[7] Again, an estimation specific to general aviation, commercial, and military operations in the U.S. only is not available.

Further, the proceeding recovery forecasts consider historical operation trends and tenant interviews regarding their operations and apply the optimistic and pessimistic assumptions on the variables for aviation activity recovery from the pandemic in order to formulate when BKL will recovery operations to pre-pandemic levels.

2.7.1 Enplanements

In 2019, Ultimate Air accounted for 89% of all enplanements at the Airport based on BTS data; therefore, the enplanement recovery forecasts are based on Ultimate Air enplanements and

[6] ICAO, "Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis", March 4, 2021.

[7] IATA, "Outlook for Air Transport and the Airline Industry", November 24, 2020.

subsequently adds non-Ultimate Air enplanements based on their respective share of enplanements per month. Considering that Ultimate Air utilizes the 30-seat capacity Fairchild 328 Jet and/or Embraer 135, Ultimate Air's load factor was 76% in 2019 and 52% in 2020, representing a 32% reduction due to the pandemic. Based on interviews with Ultimate Air, Part 135 is anticipated to be restored in April 2021, which is a primary factor in the below recovery forecasts.

Optimistic Enplanement Recovery Forecast

The optimistic recovery forecast for enplanements is based on the premises that Ultimate Air would recover its load factor from 2019 before the pandemic within two years of restarting Part 135 service, or by March 2023. The optimistic recovery forecast assumes that the load factor would be recovered by 1.5x the AAGR of the overall load factor growth between 2017 (to compare Ultimate Air's first and second full year in operation) and 2019, which was 11%. Therefore, the load factor recovery rate is 117% each month except in the following circumstances:

- Ultimate Air did not restart Part 135 service until April 2021; therefore January, February and March 2021 had no recovery.
- January, February, and March 2020 had a higher or similar load factors compared to 2019 as the pandemic had not fully onset yet, so their load factors from 2019 was first reduced by the total 2019-2020 load factor percent reduction (32%) before applying the 117% growth rate in 2021. As Ultimate Air reduced or ceased operations in the remaining months of 2020, their load factors from 2019 was also first reduced by the total 2019-2020 load factor percent reduction (32%) before applying the 117% growth rate in 2021.

Table 2-13 summarizes the optimistic load factor recovery forecast that recovers 93% of Ultimate Air's load factor from 2019 to equal a 71% load factor. Following establishment of the optimistic load factor recovery forecast, the Ultimate Air optimistic enplanement recovery forecast was determined by applying the recovery load factor percent to its respective month prior to the pandemic, as summarized in Table 2-14; it was assumed that the 30-seat capacity Fairchild 328 Jet and/or Embraer 135 will continue to be utilized. To account for the remaining 11% of annual enplanements at the Airport, Ultimate Air enplanements are divided by its relative percent of all Airport enplanements for each month in 2019 to generate total enplanements. As summarized in Table 2-15 and Figure 2-18, the optimistic forecast recovers 99% of annual enplanements by March 2023.

Table 2-13 – Ultimate Air Optimistic Load Factor Recovery Forecast

Recovery Year	Month	Load Factor % Before Pandemic (2019)	Load Factor % During Pandemic (2020)	Load Factor % Pandemic Recovery (2021-2023)	Load Factor % Recovered (2021-2023)
2021	January	65%	72%	0%	0%
	February	73%	73%	0%	0%
	March	71%	62%	0%	0%
	April	77%	0%	62%	80%
	May	78%	0%	62%	80%
	June	81%	0%	65%	80%
	July	72%	12%	57%	80%
	August	76%	13%	61%	80%
	September	84%	0%	67%	80%
	October	78%	0%	62%	80%
	November	76%	0%	60%	80%
	December	80%	0%	64%	80%
2022	January			52%	80%
	February			58%	80%
	March			57%	57%
	April			72%	93%
	May			73%	93%
	June			75%	93%
	July			67%	93%
	August			71%	93%
	September			78%	93%
	October			72%	93%
	November			71%	93%
	December			75%	93%
2023	January			60%	93%
	February			67%	93%
	March			85%	119%
Total		76% Load Factor *Year 2019*	52% Load Factor *Year 2020*	71% Load Factor *March 2022-2023*	93% Recovery *March 2022-2023*

Source: BTS, CHA, 2021.

Table 2-14 – Ultimate Air Optimistic Enplanement Recovery Forecast

Recovery Year	Month	Ultimate Air Enplanements Before Pandemic (2019)	Ultimate Air Enplanements During Pandemic (2020)	Ultimate Air Enplanements Pandemic Recovery (2021-2023)	Pandemic Recovery %
2021	January	857	863	0	0%
	February	871	879	0	0%
	March	896	410	0	0%
	April	1,021	0	800	78%
	May	988	0	811	82%
	June	975	0	840	86%
	July	954	71	747	78%
	August	1,006	116	788	78%
	September	1,008	0	869	86%
	October	1,076	0	806	75%
	November	865	0	785	91%
	December	722	0	830	115%

Recovery Year	Month	Ultimate Air Enplanements Before Pandemic (2019)	Ultimate Air Enplanements During Pandemic (2020)	Ultimate Air Enplanements Pandemic Recovery (2021-2023)	Pandemic Recovery %
2022	January			671	78%
	February			751	86%
	March			735	82%
	April			934	92%
	May			947	96%
	June			981	101%
	July			873	92%
	August			921	92%
	September			1,015	101%
	October			942	88%
	November			917	106%
	December			969	134%
2023	January			784	92%
	February			877	101%
	March			1,102	123%
Total		11,239 *Year 2019*	2,339 *Year 2020*	11,019 *March 2022-2023*	99% Recovery *March 2022-2023*

Source: BTS, CHA, 2021.

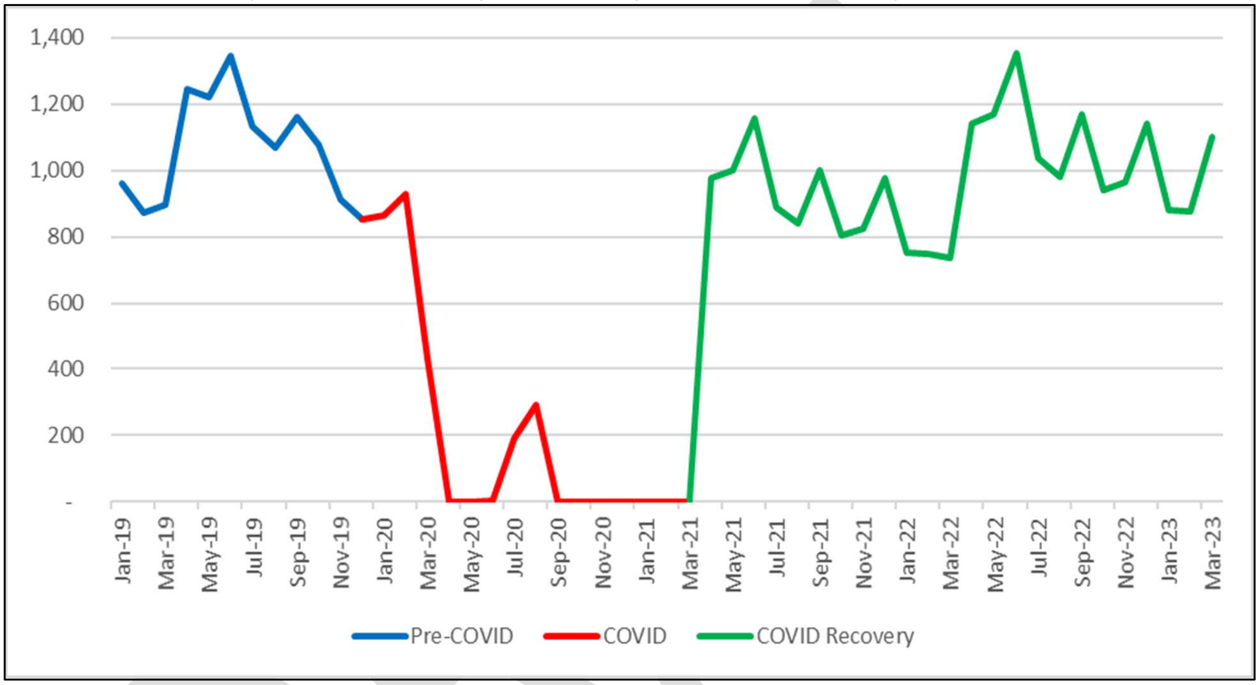
Table 2-15 – BKL Optimistic Enplanement Recovery Forecast

Recovery Year	Month	BKL Enplanements Before Pandemic (2019)	BKL Enplanements During Pandemic (2020)	BKL Enplanements Pandemic Recovery (2021-2023)	Pandemic Recovery %
2021	January	961	863	0	0%
	February	871	879	0	0%
	March	896	410	0	0%
	April	1,247	0	977	78%
	May	1,221	0	1,002	82%
	June	1344	0	1,158	86%
	July	1,135	71	889	78%
	August	1,071	116	839	78%
	September	1,160	0	1,000	86%
	October	1,076	0	806	75%
	November	911	0	826	91%
	December	851	0	978	115%
2022	January			753	78%
	February			751	86%
	March			735	82%
	April			1,141	92%
	May			1,171	96%
	June			1,353	101%
	July			1,039	92%
	August			980	92%
	September			1,168	101%
	October			942	88%
	November			965	106%
	December			1,142	134%

Recovery Year	Month	BKL Enplanements Before Pandemic (2019)	BKL Enplanements During Pandemic (2020)	BKL Enplanements Pandemic Recovery (2021-2023)	Pandemic Recovery %
2023	January			879	92%
	February			877	101%
	March			1,102	123%
Total		12,744 *Year 2019*	2,711 *Year 2020*	12,516 *March 2022-2023*	99% Recovery *March 2022-2023*

Source: BTS, CHA, 2021.

Figure 2-18 – BKL Optimistic Enplanement Recovery Forecast



Source: BTS, CHA, 2021.

Pessimistic Enplanement Recovery Forecast

The pessimistic recovery forecast for enplanements follows the same logic as the optimistic recovery except that the load factor from 2019 would not be recovered until three years of restarting Part 135 service, or by March 2024. The pessimistic recovery forecast assumes that the load factor would be recovered by the AAGR of the overall load factor growth between 2017 (to compare Ultimate Air's first and second full year in operation) and 2019, which was 11%. Therefore, the load factor recovery rate is 111% each month except in the circumstances described in the optimistic recovery forecast.

Table 2-16 presents the pessimistic load factor recovery forecast that recovers 93% of Ultimate Air's load factor from 2019 to equal a 71% load factor. Similar to the optimistic enplanement recovery forecast, once the pessimistic load factor recovery forecast was established, the Ultimate Air pessimistic enplanement recovery forecast was determined by applying the recovery load factor percent to its respective month prior to the pandemic, as summarized in Table 2-17; it was assumed that the 30-seat capacity Fairchild 328 Jet and/or Embraer 135 will continue to be utilized. Then to account for the remaining 11% of annual enplanements at the Airport, Ultimate Air enplanements are divided by its relative percent of all Airport enplanements for each month in 2019 to generate total enplanements. As summarized in Table 2-18 and Figure 2-19, the pessimistic forecast recovers 100% of annual enplanements by March 2024.

Table 2-16 – Pessimistic Load Factor Recovery Forecast

Recovery Year	Month	Load Factor % Before Pandemic (2019)	Load Factor % During Pandemic (2020)	Load Factor % Pandemic Recovery (2021-2023)	Pandemic Recovery % (2021-2023)
2021	January	65%	72%	0%	0%
	February	73%	73%	0%	0%
	March	71%	62%	0%	0%
	April	77%	0%	59%	76%
	May	78%	0%	59%	76%
	June	81%	0%	62%	76%
	July	72%	12%	55%	76%
	August	76%	13%	58%	76%
	September	84%	0%	64%	76%
	October	78%	0%	59%	76%
	November	76%	0%	57%	76%
	December	80%	0%	61%	76%
2022	January			49%	76%
	February			55%	76%
	March			54%	76%
	April			65%	84%
	May			66%	84%
	June			68%	84%
	July			61%	84%
	August			64%	84%
	September			71%	84%
	October			66%	84%
	November			64%	84%
	December			68%	84%
2023	January			55%	84%
	February			61%	84%
	March			77%	108%
	April			72%	94%
	May			73%	94%
	June			76%	94%
	July			68%	94%
	August			71%	94%
	September			79%	94%
	October			73%	94%
	November			71%	94%
	December			75%	94%
2024	January			61%	94%
	February			68%	94%
	March			85%	112%
Total		76% Load Factor *Year 2019*	52% Load Factor *Year 2020*	71% Load Factor *March 2023-2024*	93% Recovery *March 2023-2024*

Source: BTS, CHA, 2021.

Table 2-17 – Ultimate Air Pessimistic Enplanement Recovery Forecast

Recovery Year	Month	Ultimate Air Enplanements Before Pandemic (2019)	Ultimate Air Enplanements During Pandemic (2020)	Ultimate Air Enplanements Pandemic Recovery (2021-2023)	Pandemic Recovery %
2021	January	857	863	0	0%
	February	871	879	0	0%
	March	896	410	0	0%
	April	1,021	0	761	75%
	May	988	0	772	78%
	June	975	0	800	82%
	July	954	71	711	75%
	August	1,006	116	750	75%
	September	1,008	0	827	82%
	October	1,076	0	768	71%
	November	865	0	747	86%
	December	722	0	790	109%
2022	January			639	75%
	February			700	78%
	March			898	100%
	April			847	83%
	May			858	87%
	June			889	91%
	July			791	83%
	August			834	83%
	September			920	91%
	October			854	79%
	November			831	96%
	December			878	122%
2023	January			711	83%
	February			795	91%
	March			779	87%
	April			942	92%
	May			955	97%
	June			989	101%
	July			880	92%
	August			928	92%
	September			1,023	101%
	October			949	88%
	November			924	107%
	December			977	135%
2024	January			790	92%
	February			884	101%
	March			886	97%
Total		11,239 *Year 2019*	2,339 *Year 2020*	11,106 *March 2023-2024*	100% Recovery *March 2023-2024*

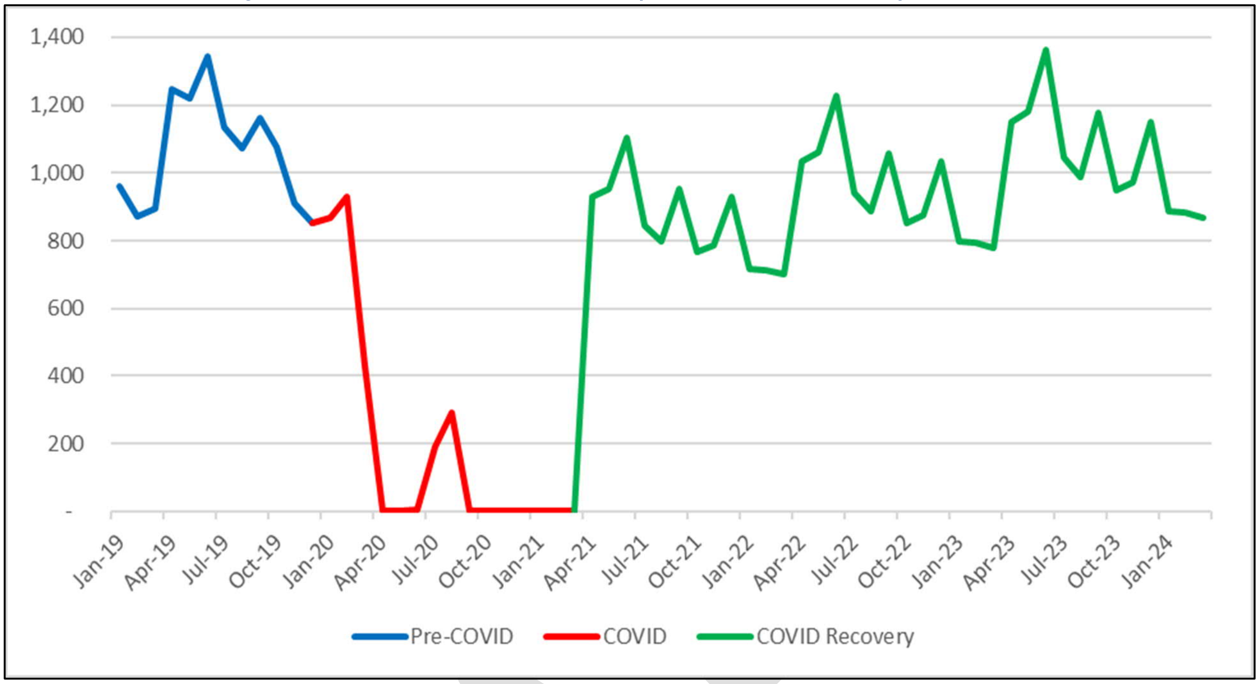
Source: BTS, CHA, 2021.

Table 2-18 – BKL Pessimistic Enplanement Recovery Forecast

Recovery Year	Month	BKL Enplanements Before Pandemic (2019)	BKL Enplanements During Pandemic (2020)	BKL Enplanements Pandemic Recovery (2021-2023)	Pandemic Recovery %
2021	January	961	863	0	0%
	February	871	879	0	0%
	March	896	410	0	0%
	April	1,247	0	930	75%
	May	1,221	0	954	78%
	June	1344	0	1,102	82%
	July	1,135	71	846	75%
	August	1,071	116	799	75%
	September	1,160	0	952	82%
	October	1,076	0	768	71%
	November	911	0	787	86%
	December	851	0	931	109%
2022	January			717	75%
	February			714	82%
	March			700	78%
	April			1,034	83%
	May			1,061	87%
	June			1,226	91%
	July			941	83%
	August			888	83%
	September			1,058	91%
	October			854	79%
	November			875	96%
	December			1,035	122%
2023	January			797	83%
	February			795	91%
	March			779	87%
	April			1,150	92%
	May			1,180	97%
	June			1,364	101%
	July			1,047	92%
	August			988	92%
	September			1,177	101%
	October			949	88%
	November			973	107%
	December			1,151	135%
2024	January			886	92%
	February			884	101%
	March			866	97%
Total		12,744 *Year 2019*	2,711 *Year 2020*	12,615 *March 2022-2023*	100% Recovery *March 2022-2023*

Source: BTS, CHA, 2021.

Figure 2-19 – BKL Pessimistic Enplanement Recovery Forecast



Source: BTS, CHA, 2021.

2.7.2 Commercial Aviation

Since more recent commercial operations data is available compared to BTS data, the commercial aviation recovery forecast examines the 12 months before and after the onset of the pandemic.

In comparing commercial operations between the 12 months before and after the onset of the pandemic, commercial was reduced by 2,808 operations or a loss of 30%. On a month to month comparison, there was a reduction of 234 operations or a loss of 29% per monthly average. Every month between March 2020 and February 2021 experienced reduced operations; the most significant reductions occurred at the onset of the pandemic in March, April, and May 2020 with losses of 44%, 54%, and 51%, respectively. October 2021 also experienced a loss of 44%. As mentioned in Section 2.6.2 regarding historical operations, losses in commercial operations were exacerbated by Ultimate Air reducing or discontinuing Part 135 service throughout the pandemic. However, based on interviews with Ultimate Air, Part 135 is anticipated to be restored in April 2021, which has been factored into the below recovery forecasts.

Optimistic Commercial Operations Recovery Forecast

The optimistic recovery forecast for commercial operations assumes that BKL would regain the majority of the previous year's losses from the pandemic within one year. Further, the optimistic recovery forecast assumes that the net percent loss for each month from the pandemic would be equally recovered as applied to its respective number of operations during the pandemic. For example, operations in June 2020 were reduced by 28% compared to June 2019 before the pandemic, therefore, operations in June 2021 would recover 128% of operations from June 2020. Moreover, as shown in Table 2-19 and Figure 2-20, the optimistic recovery forecast for commercial recovers 97% of annual operations by February 2022 due primarily by the restoration of Part 135 service by Ultimate Air in April 2021.

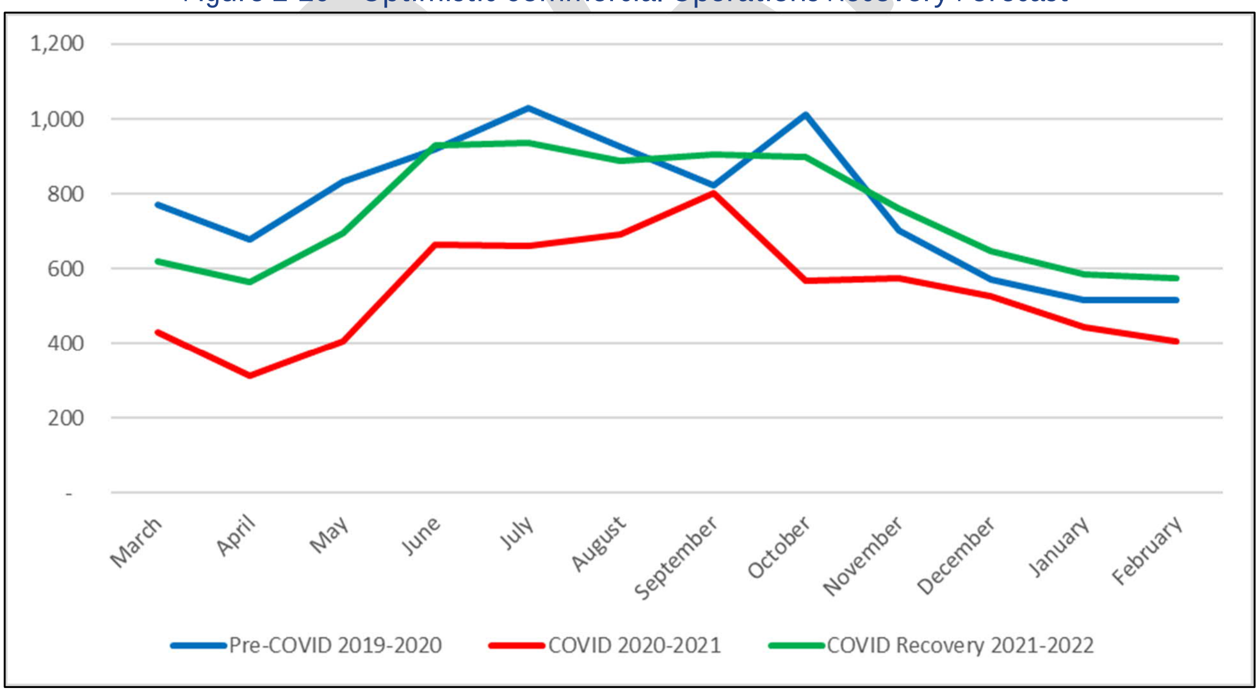
The optimistic commercial operations recovery forecast was chosen as the preferred commercial recovery forecast to be included in the recommended aviation activity forecast after COVID-19, as detailed in Section 2.7.4.

Table 2-19 – Optimistic Commercial Operations Recovery Forecast

Month	Operations Before Pandemic (2019-2020)	Operations During Pandemic (2020-2021)	Operations Pandemic Recovery (2021-2022)	Pandemic Recovery % (2020-2022)
March	769	428	618	80%
April	677	314	562	83%
May	834	405	693	83%
June	918	664	928	101%
July	1,029	661	937	91%
August	926	693	888	96%
September	824	803	903	110%
October	1,011	568	897	89%
November	703	574	759	108%
December	570	526	647	113%
January	514	443	584	114%
February	517	405	573	111%
Total	9,292 *March 2019 to February 2020*	6,484 *March 2020 to February 2021*	8,990 *March 2021 to February 2022*	97% Total Recovery

Source: Midwest ATC, CHA, 2021.

Figure 2-20 – Optimistic Commercial Operations Recovery Forecast



Source: Midwest ATC, CHA, 2021.

Pessimistic Commercial Operations Recovery Forecast

The pessimistic recovery forecast for commercial operations follows the same logic as the optimistic recovery except that the net percent loss for each month from the pandemic would not be recovered for three years until 2024. For example, operations in June 2020 were reduced by 28% compared to June 2019 before the pandemic, therefore, operations in June 2021 would recover 109.33% of operations from June 2020 (28/3 = 9.33), recover another 109.33% from the following June to June, and so on. After the first 12 months of recovery, the recovery rate would be applied to the recovery number of operations for that respective month each subsequent year. Akin to the optimistic recovery, Ultimate Air is anticipated to restore Part 135 service in April 2021. Moreover, as shown in Table 2-20 and Figure 2-21, the pessimistic recovery forecast for commercial recovers 102% of annual operations by February 2024 due primarily by the restoration of Part 135 service by Ultimate Air in April 2021.

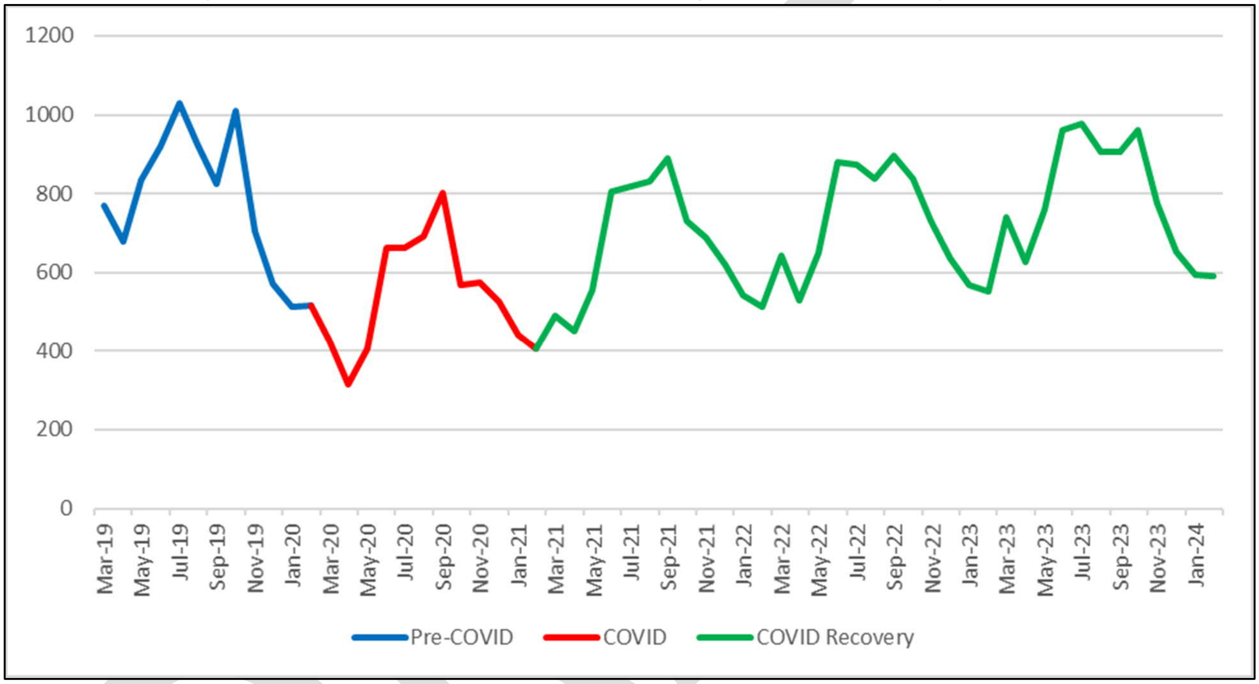
Table 2-20 – Pessimistic Commercial Operations Recovery Forecast

Recovery Year	Month	Operations Before Pandemic (2019-2020)	Operations During Pandemic (2020-2021)	Operations Pandemic Recovery (2021-2024)	Pandemic Recovery % (2021-2024)
2021	March	769	428	491	64%
	April	677	314	450	66%
	May	834	405	554	66%
	June	918	664	805	88%
	July	1,029	661	780	76%
	August	926	693	772	83%
	September	824	803	890	108%
	October	1,011	568	731	72%
	November	703	574	689	98%
	December	570	526	620	109%
2022	January	514	443	543	106%
	February	517	405	514	99%
	March			644	84%
	April			531	78%
	May			650	78%
	June			880	96%
	July			873	85%
	August			837	90%
	September			897	109%
	October			838	83%
	November			731	104%
	December			635	111%
2023	January			568	111%
	February			551	107%
	March			739	96%
	April			625	92%
	May			761	91%
	June			961	105%
	July			977	95%
	August			907	98%
	September			905	110%
	October			960	95%
	November			776	110%
	December			652	114%

Recovery Year	Month	Operations Before Pandemic (2019-2020)	Operations During Pandemic (2020-2021)	Operations Pandemic Recovery (2021-2024)	Pandemic Recovery % (2021-2024)
2024	January			595	116%
	February			591	114%
Total		9,292 *March 2019 to February 2020*	6,484 *March 2020 to February 2021*	9,449 *March 2021 to February 2024*	102% Total Recovery

Source: Midwest ATC, CHA, 2021.

Figure 2-21 – Pessimistic Commercial Operations Recovery Forecast



Source: Midwest ATC, CHA, 2021.

2.7.3 General Aviation

Since more recent GA operations data is available compared to BTS data, the GA aviation recovery forecast examines the 12 months before and after the onset of the pandemic.

In comparing GA operations between the 12 months before and after the onset of the pandemic, GA was reduced by 6,223 operations or a loss of 21%. On a month to month comparison, there was a reduction of 519 operations or a loss of 18% per monthly average. While August and September of 2020, and January of 2021, had increased GA operations in their respective months compared to before the pandemic, the remaining 9 months had reduced operations. March, April, and May 2020 experienced the greatest reductions by losing 63%, 85%, and 47% of their operations from the previous year, respectively. Moreover, as mentioned at the beginning of the section, an optimistic and pessimistic recovery forecast were developed to evaluate how BKL may regain these losses from the pandemic.

Optimistic GA Operations Recovery Forecast

The optimistic recovery forecast for GA operations assumes that BKL would regain the majority of the previous year's losses from the pandemic within one year. To accomplish this recovery, the optimistic recovery forecast assumes that the net percent loss for each month from the pandemic would be equally recovered as applied to its respective number of operations during the pandemic. For example, operations in June 2020 were reduced by 8% compared to June 2019 before the pandemic, therefore, operations in June 2021 would recover 108% of operations from June 2020. For months that experienced increased operations during the pandemic, those operations would be carried forward to the recovery year one-to-one. To compensate for the significant drop in operations during March and April 2020 at the onset of the pandemic, the recovery rates for these two months adds the largest percent net loss between the two (85% in April 2020) to their respective net percent loss. As shown in Table 2-21 and Figure 2-22, the optimistic recovery forecast for GA recovers 93% of annual operations by February 2022.

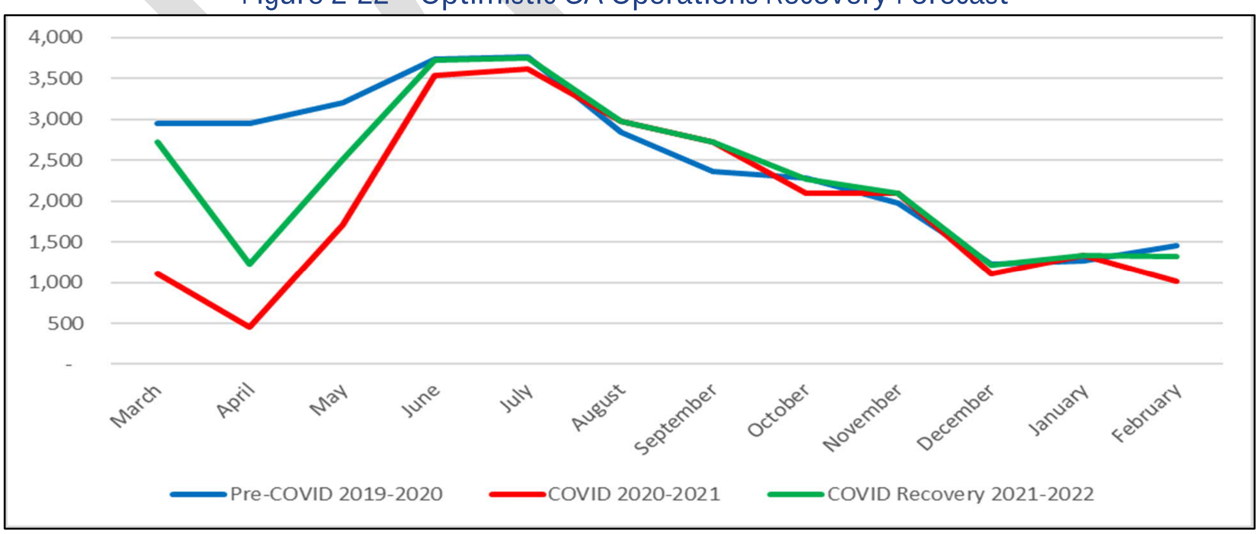
The optimistic GA operations recovery forecast was chosen as the preferred GA recovery forecast to be included in the recommended aviation activity forecast after COVID-19, as detailed in Section 2.7.4.

Table 2-21 – Optimistic GA Operations Recovery Forecast

Month	Operations Before Pandemic (2019-2020)	Operations During Pandemic (2020-2021)	Operations Pandemic Recovery (2021-2022)	Pandemic Recovery % (2020-2022)
March	2,945	1,103	2,725	93%
April	2,944	455	1,224	42%
May	3,199	1,709	2,505	78%
June	3,734	3,542	3,724	100%
July	3,762	3,615	3,756	100%
August	2,843	2,979	2,979	105%
September	2,368	2,728	2,728	115%
October	2,283	2,100	2,268	99%
November	1,978	2,097	2,097	106%
December	1,227	1,102	1,214	99%
January	1,263	1,331	1,331	105%
February	1,451	1,013	1,319	91%
Total	29,997	23,774	28,872	93% Total Recovery

Source: Midwest ATC, CHA, 2021.

Figure 2-22 – Optimistic GA Operations Recovery Forecast



Source: Midwest ATC, CHA, 2021.

Pessimistic GA Operations Recovery Forecast

The pessimistic recovery forecast for GA operations follows the same logic as the optimistic recovery except that the net percent loss for each month from the pandemic would not be recovered for three years until 2024. For example, operations in June 2020 were reduced by 8% compared to June 2019 before the pandemic, therefore, operations in June 2021 would recover 102.66% of operations from June 2020 (8/3 = 2.66), recover another 102.66% from the following June to June, and so on. For months that experienced increased operations during the pandemic, those operations would also be carried forward to the recovery year one-to-one. The significant drop in operations experienced in March and April 2020 at the onset of the pandemic would similarly be compensated like the optimistic forecast for the first recovery year only, then subsequent years would recovery their net percent loss in the same manner as other months. After the first 12 months of recovery, the recovery rate would be applied to the recovery number of operations for that respective month each subsequent year. As shown in Table 2-22 and Figure 2-23, the pessimistic recovery forecast for GA recovers 93% of annual operations by February 2024.

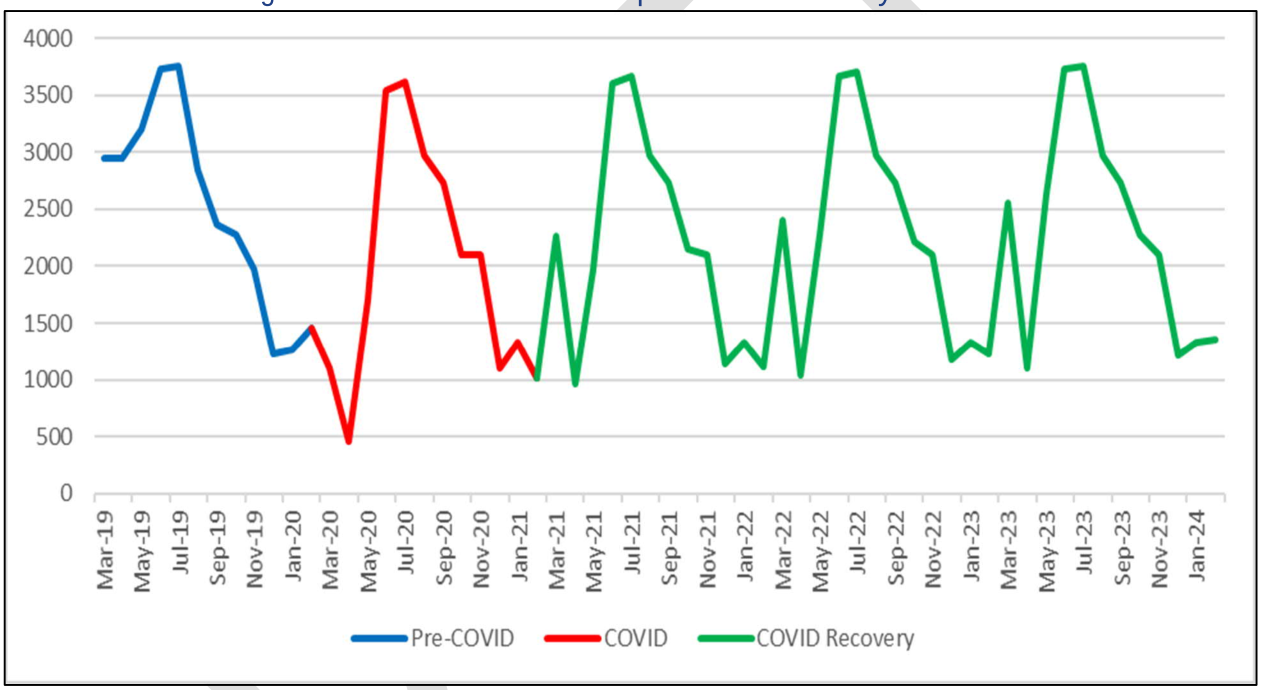
Table 2-22 – Pessimistic GA Operations Recovery Forecast

Recovery Year	Month	Operations Before Pandemic (2019-2020)	Operations During Pandemic (2020-2021)	Operations Pandemic Recovery (2021-2024)	Pandemic Recovery % (2021-2024)
2021	March	2,945	1,103	2,265	77%
	April	2,944	455	968	33%
	May	3,199	1,709	1,974	62%
	June	3,734	3,542	3,603	96%
	July	3,762	3,615	3,662	97%
	August	2,843	2,979	2,979	105%
	September	2,368	2,728	2,728	115%
	October	2,283	2,100	2,156	94%
	November	1,978	2,097	2,097	106%
	December	1,227	1,102	1,139	93%
2022	January	1,263	1,331	1,331	105%
	February	1,451	1,013	1,115	77%
	March			2,404	82%
	April			1,035	35%
	May			2,281	71%
	June			3,664	98%
	July			3,710	99%
	August			2,979	105%
	September			2,728	115%
	October			2,214	97%
	November			2,097	106%
	December			1,178	96%
2023	January			1,331	105%
	February			1,227	85%
	March			2,550	87%
	April			1,106	38%
	May			2,635	82%
	June			3,727	100%
	July			3,758	100%

Recovery Year	Month	Operations Before Pandemic (2019-2020)	Operations During Pandemic (2020-2021)	Operations Pandemic Recovery (2021-2024)	Pandemic Recovery % (2021-2024)
2023 (Cont.)	August			2,979	105%
	September			2,728	115%
	October			2,273	100%
	November			2,097	106%
	December			1,218	99%
2024	January			1,331	105%
	February			1,351	93%
Total		29,997 *March 2019 to February 2020*	23,774 *March 2020 to February 2021*	27,754 *March 2021 to February 2024*	93% Total Recovery

Source: Midwest ATC, CHA, 2021.

Figure 2-23 – Pessimistic GA Operations Recovery Forecast



Source: Midwest ATC, CHA, 2021.

2.7.4 Military Aviation

Similar to commercial and GA operations, an optimistic and pessimistic recovery forecast was developed for military operations that followed the same logic to recovery operations within one and three years, respectively. Due to the limited, but consistent, capacity of military operations at BKL, the optimistic military operations recovery forecast was chosen as the preferred recovery forecast to be included in the recommended aviation activity forecast after COVID-19. The optimistic recovery forecast projects a 83% recovery within one year to total 393 military operations between March 2021 and February 2022.

2.8 AVIATION ACTIVITY FORECASTS AFTER COVID-19

This section of the aviation activity forecast presents a projection of based aircraft and operations through the 2041 planning horizon once the Airport has recovered from the pandemic. As discussed in Section 2.7, the optimistic commercial and GA operations recovery forecast was chosen as the preferred recovery forecasts. Therefore, 2020 is the base year using ATCT operations data, 2021 is the recovery year using the optimistic recovery forecasts, and 2022 to 2041 is the post-recovery forecast.

The forecast methodologies applied to each aviation activity is described within their respective sections, but include:

- National, State, and Regional Market Share Forecasts (Static and Adjusted)
- Historic Trend (Time-Trend) Forecasts
- Regression Forecasts based on Population, Income, and Employment
- Econometric Forecasts based on Population, Income, and Employment

Per FAA guidance, activity forecasts developed for an airport should be within 10 percent of the data reported in TAF for the five-year forecast period, and within 15 percent of the 10-year forecast period. If projected activity data is greater than these percentages for each forecast period, additional justification is generally required for forecast approval from the FAA.

2.8.1 Enplanements Forecast

Air Service Forecast

The optimistic enplanement recovery forecast (Section 2.7.1) projects that Ultimate Air's enplanement load factors will return to near pre-pandemic levels in March 2023, or two years after restoring service in April 2021. As Ultimate Air accounted for 89% of all enplanements at the Airport based on BTS data in 2019, the optimistic enplanement recovery forecast subsequently adds non-Ultimate Air enplanements based on their respective share of enplanements per month in 2019.

Once Ultimate Air's load factor has been recovered, a midday turn will likely be introduced to existing service in April 2023 based on interviews with Ultimate Air. The forecast projects the load factor will begin at 50% (similar to when Ultimate Air began service at BKL) and grow at an 11% AAGR (similar to Ultimate Air's load factor growth from 2016 to 2019) until it reaches and stabilizes at 76% in 2027. At this 76% load factor, Ultimate Air may consider adding more turns to existing service.

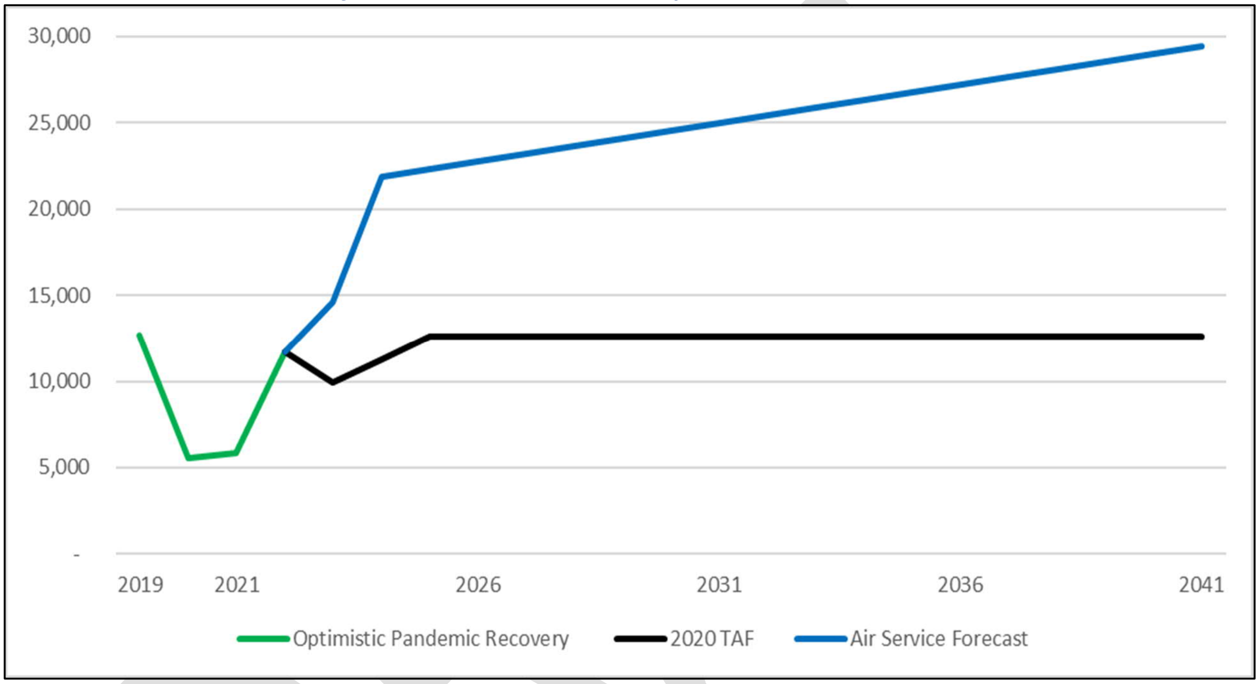
Also based on interviews with Ultimate Air, new service (morning and evening flights) will likely be introduced to a mid-west airport approximately one year after adding the midday turn to existing service, or April 2024. Similar to the midday turn, the forecast projects the load factor will begin at 50% and grow at an 11% AAGR until it reaches and stabilizes at 76% in 2028.

Table 2-23 and Figure 2-24 illustrates the projected number of enplanements at the Airport based on the optimistic recovery forecast and planned additional service. For the recommended forecast, Air Service Forecast was determined to best represent projected enplanements at the Airport.

Table 2-23 – Air Service Enplanement Forecast

Year	Air Service Forecast	Pandemic Status	Enplanement Activity
2020 (Base)	5,549	Pandemic	Part 135 Service: Reduced/Ceased
2021	5,864	Pandemic Recovery	Part 135 Service: Restored
2026 (PAL 1)	22,771	Post-Recovery	Part 135 Service: Added Midday Turn (2023) & New Service to Mid-West Airport (2024)
2031 (PAL 2)	25,001	Post-Recovery	Part 135 Service: Routine
2036 (PAL 3)	27,231	Post-Recovery	Part 135 Service: Routine
2041 (PAL 4)	29,461	Post-Recovery	Part 135 Service: Routine

Figure 2-24 – Air Service Enplanement Forecast

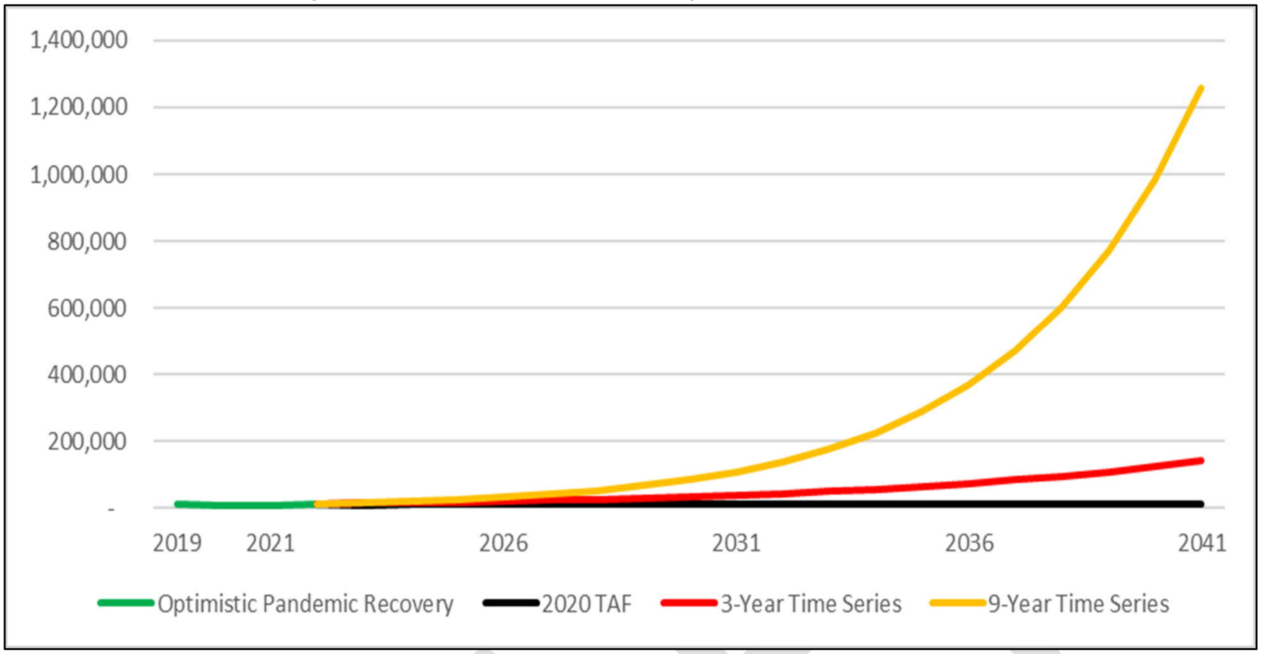


Source: BTS, 2020 TAF, CHA, 2021.

Historic Trend Forecasts

The historic trend forecast examined the AAGR of enplanements performed at BKL over three time series (3-year, 5-year, and 9-year) and applied their respective trajectory to forecast future operations. Note that the historic trend analysis does not include the 2020 base year, this to remove the anomaly of the pandemic so previous trends can be evaluated. Between 2016 and 2019 (3-year), enplanements at BKL increased by an AAGR of 13.9%. Between 2014 and 2019 (5-year), enplanements increased by an AAGR of 66.3%. Between 2010 and 2019 (9-year), enplanements increased by an AAGR of 27.89%. Figure 2-29 illustrates the projected number of enplanements at the Airport if these historic trends remained constant, starting at the projected number of enplanements within the optimistic pandemic recovery; the 5-year time series has been omitted as it projected nearly 200 million enplanements by 2041, which would be graphically difficult to interpret.

Figure 2-25 – Historic Trend Enplanements Forecast

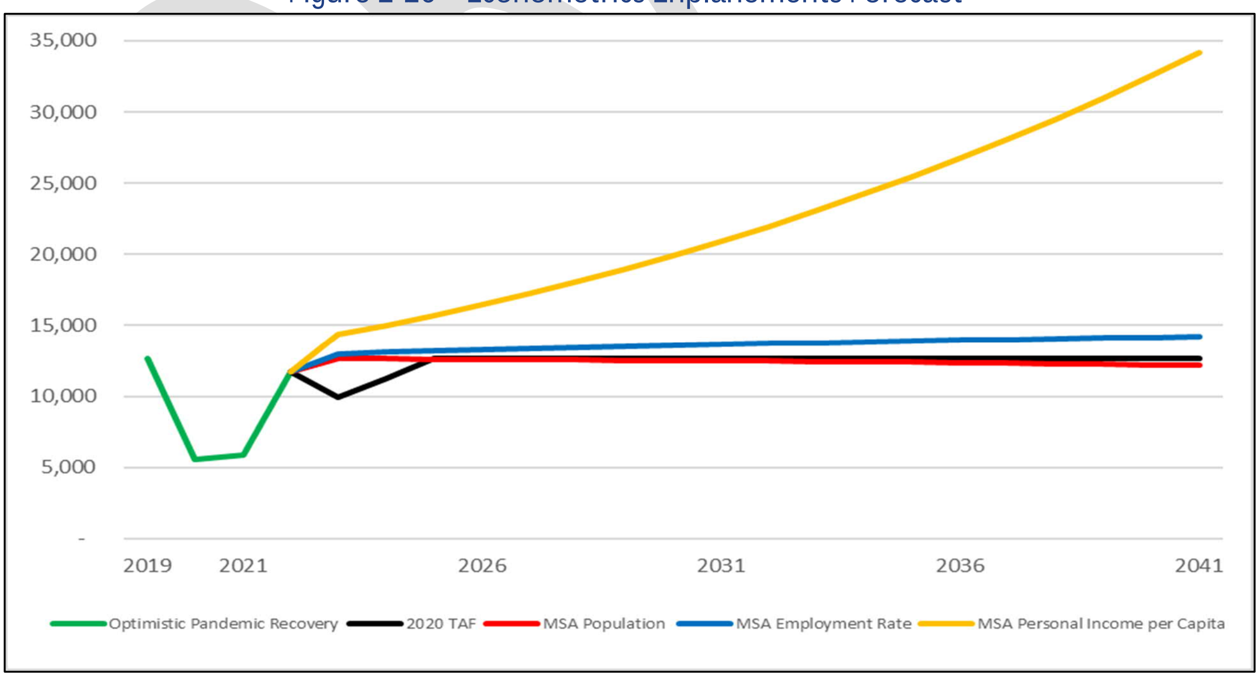


Source: BTS, 2020 TAF, CHA, 2021.

Econometrics Forecasts

An econometric-based forecast applies the annual growth rate trend of socioeconomic data points to project future operations; for the case of BKL, this includes the Cleveland-Elyria MSA population, employment rate, and personal income per capita. Figure 2-26 summarizes the results of the econometrics enplanements forecast, starting at the projected number of enplanements within the optimistic pandemic recovery forecast.

Figure 2-26 – Econometrics Enplanements Forecast



Source: Woods and Poole, 2020 TAF, BTS, CHA, 2021.

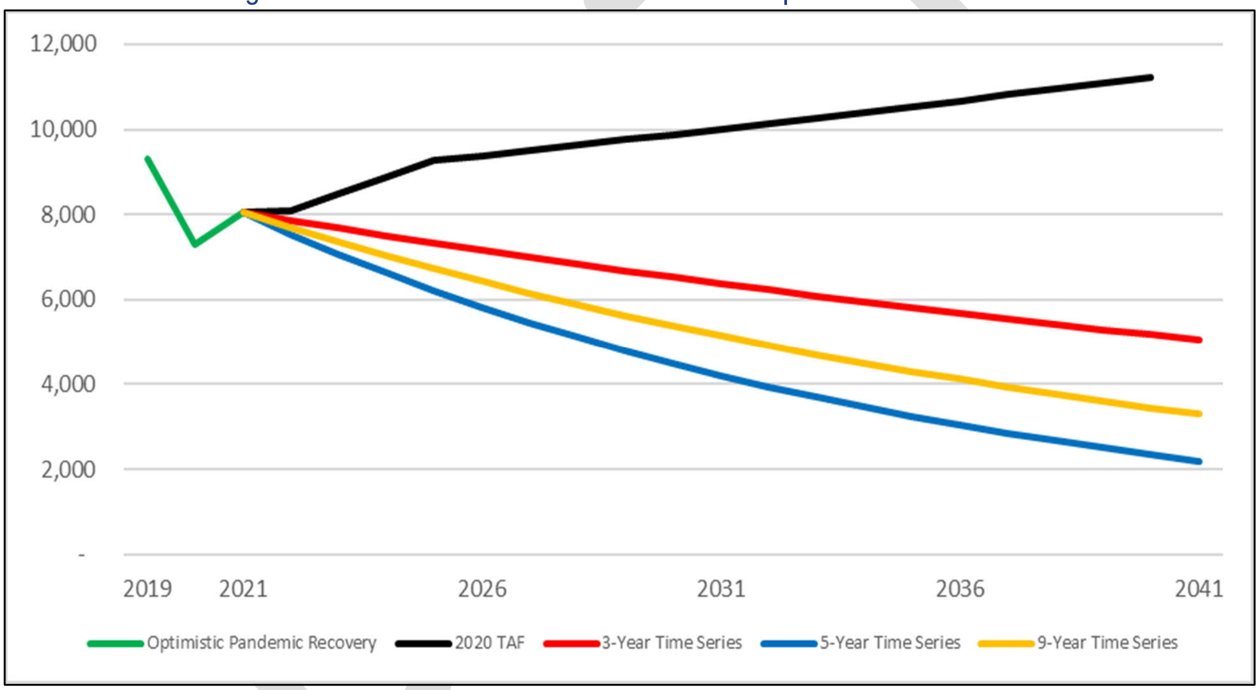
2.8.2 Operations Forecast

Commercial Aviation

Historic Trend Forecasts

The historic trend forecast examined the AAGR of commercial operations performed at BKL over three time series (3-year, 5-year, and 9-year) and applied their respective trajectory to forecast future operations. Between 2016 and 2019 (3-year), commercial operations at BKL decreased by an AAGR of 4.6%. Between 2014 and 2019 (5-year), commercial operations decreased by an AAGR of 6.4%. Between 2010 and 2019 (9-year), commercial operations decreased by an AAGR of 4.4%. Note that the historic trend analysis does not include the 2020 base year, this to remove the anomaly of the pandemic so previous trends can be evaluated. Figure 2-27 illustrates the projected number of commercial operations at the Airport if these historic trends remained constant, starting at the projected number of commercial operations within the optimistic pandemic recovery forecast.

Figure 2-27 – Historic Trend Commercial Operations Forecast



Source: 2020 TAF, Midwest ATC, CHA, 2021.

Static Market Share Forecasts

In 2019 prior the pandemic, the 9,267 commercial operations performed at BKL represented 0.04% of all commercial operations performed in the United States, 1.83% of all commercial operations performed in the State of Ohio, and 0.25% of all commercial operations performed in the FAA Great Lakes region. Due to the pandemic airport operations unevenly across all markets, the market share forecast was deemed irrelevant and not used further in this evaluation.

Adjusted Market Share Forecasts

The adjusted market share forecast is similar to the static market share forecast except that it considers additional commercial operations planned for future service. Based on the optimistic enplanement recovery forecast, Ultimate Air plans to introduce a midday turn to its existing service in April 2023 after its 75% load factor is recovered prior to the pandemic, resulting in an additional 390 operations in 2023 and 520 annual operations thereafter. Ultimate Air also plans to introduce service (morning and evening flights) to a mid-west airport approximately one year after adding the midday turn to existing service, resulting in an additional 780 operations in 2024 and 1,040 annual operations thereafter. Due to the pandemic airport operations unevenly across all markets, the market share forecast was deemed irrelevant and not used further in this evaluation.

Regression Forecasts

Four regression-based forecasts were examined for commercial services: population, personal income per capita, population to personal income per capita, and population to personal income per capita to employment. These regression forecasts use historical operation numbers and socioeconomic data points as dependent variables to identify any correlation, which is then used to project future commercial operations. From either starting point under the optimistic or pessimistic pandemic recovery forecast, the regression forecasts projected commercial operations to cease within five to ten years, which are not considered to be statistically accurate, therefore they were not used further in this evaluation. However, the outcomes of the regression forecasts are detailed below.

Regarding population, the Cleveland-Elyria MSA has experienced population loss nearly every year from 2010 to 2019; 2020 has been omitted to evaluate BKL operation trendlines prior to the pandemic. When considering this continuing trend of population decline as the single dependent variable in conjunction with commercial operations trending downward from 2010 to 2019, the regression forecast projected commercial operations to cease by 2033.

Regarding personal income per capita, although the Cleveland-Elyria MSA has experienced an increase in personal income per capita from 2010 to 2019, the regression forecast projected commercial operations to cease by 2029 when personal income per capita is considered as the single dependent variable in conjunction with commercial operations trending downward from 2010 to 2019.

When considering a declining population and an increasing personal income per capita from 2010 to 2019 as two dependent variables, in conjunction with commercial operations trending downward, the regression forecast projected commercial operations to cease by 2027.

Finally, when considering a declining population, an increasing personal income per capita, and an increasing employment from 2010 to 2019 as three dependent variables, in conjunction with commercial operations trending downward, the regression forecast projected commercial operations to cease by 2027.

Econometrics Forecasts

An econometric-based forecast applies the annual growth rate trend of socioeconomic data points to project future operations; for the case of BKL, this includes the Cleveland-Elyria MSA population, employment rate, and personal income per capita. Figure 2-28 summarizes the results of the econometrics commercial operations forecast, starting at the projected number of commercial operations within the optimistic pandemic recovery forecast.

As mentioned in the regression forecast above, the Cleveland-Elyria MSA has experienced population loss nearly every year from 2010 to 2019 (AAGR -0.1%) and is projected to continue its decline at an increasing rate to -0.3% in 2041. Therefore, when applied to project future commercial operations, operations will also decline accordingly.

As mentioned in the regression forecast above, the Cleveland-Elyria MSA has experienced an increase in personal income per capita from 2010 to 2019 (AAGR 3.8%) and is projected to continue at an increasing rate to 5% in 2041. Therefore, when applied to project future commercial operations, operations will also increase accordingly.

As mentioned in the regression forecast above, the Cleveland-Elyria MSA has experienced an increase in employment from 2010 to 2019 (AAGR 0.05%). While employment is projected to continue to increase in the future it will be at a slower rate to 0.3% in 2041. Therefore, when applied to project future commercial operations, operations will also increase accordingly.

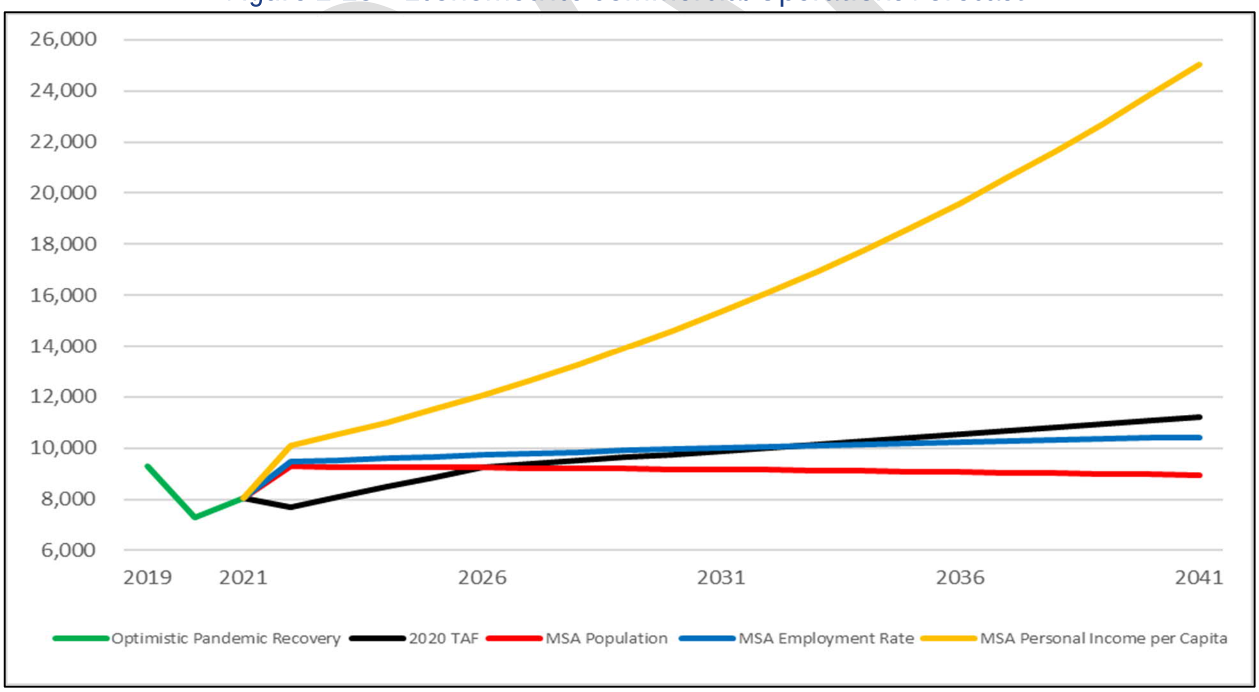
For the recommended forecast, the Econometric MSA Employment Forecast was determined to best represent projected operations at the Airport, which was further adjusted to reflect planned additional service described in Section 2.8.1.

Table 2-24 – Econometrics MSA Employment Commercial Operations Forecast (Adjusted)

-	2020 (Base)	2021	2026 (PAL 1)	2031 (PAL 2)	2036 (PAL 3)	2041 (PAL 4)
Commercial Operations	7,283	8,046	10,516	10,793	11,019	11,203

Source: Woods and Poole, 2020 TAF, Midwest ATC, CHA, 2021

Figure 2-28 – Econometrics Commercial Operations Forecast



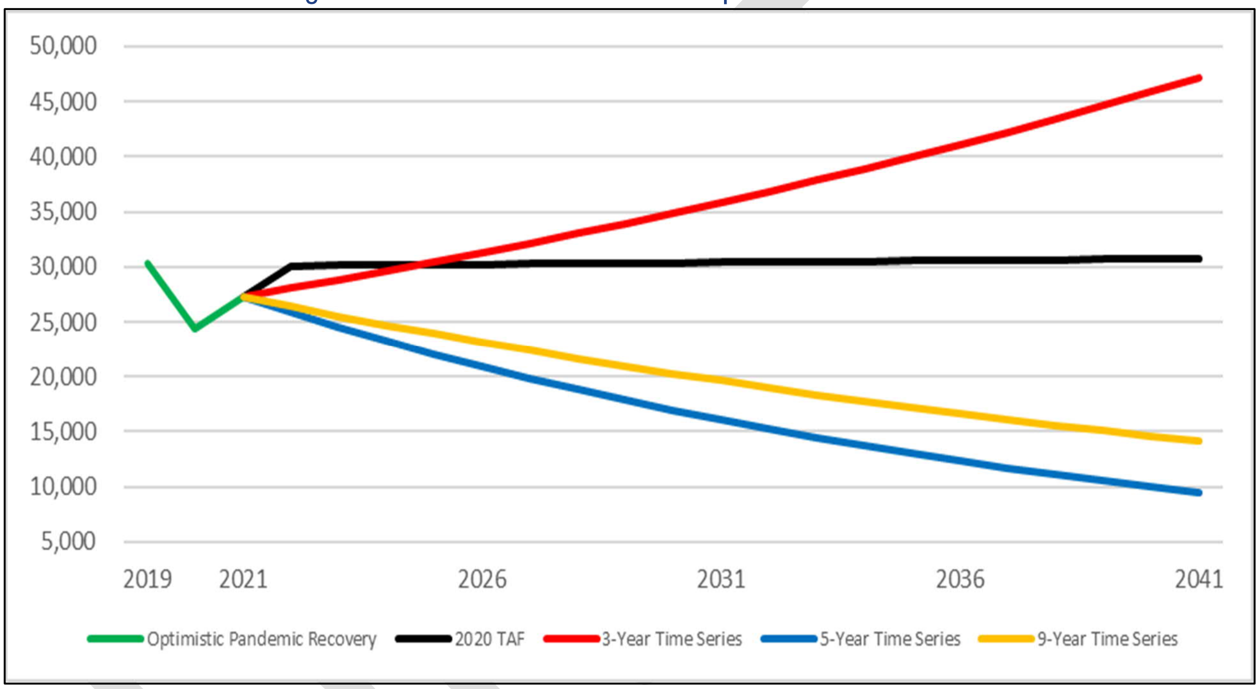
Source: Woods and Poole, 2020 TAF, Midwest ATC, CHA, 2021

General Aviation

Historic Trend Forecasts

The historic trend forecast examined the AAGR of GA operations performed at BKL over three time series (3-year, 5-year, and 9-year) and applied their respective trajectory to forecast future operations. Note that the historic trend analysis does not include the 2020 base year, this to remove the anomaly of the pandemic so previous trends can be evaluated. Between 2016 and 2019 (3-year), GA operations at BKL increased by an AAGR of 0.6%. Between 2014 and 2019 (5-year), GA operations decreased by an AAGR of 5.2%. Between 2010 and 2019 (9-year), GA operations decreased by an AAGR of 3.3%. Figure 2-29 illustrates the projected number of GA operations at the Airport if these historic trends remained constant, starting at the projected number of GA operations within the optimistic pandemic recovery forecast.

Figure 2-29 – Historic Trend GA Operations Forecast



Source: 2020 TAF, Midwest ATC, CHA, 2021.

Static Market Share Forecasts

In 2019 prior the pandemic, the 30,199 GA operations performed at BKL represented 0.03% of all GA operations performed in the United States, 1.24% of all GA operations performed in the State of Ohio, and 0.27% of all GA operations performed in the FAA Great Lakes region. Due to the pandemic airport operations unevenly across all markets, the market share forecast was deemed irrelevant and not used further in this evaluation.

Regression Forecasts

A regression-based forecast was examined for GA operations that included dependent variables on the population size within 100 miles of the Airport, the percent of that population within 25 miles of the Airport, and the number of based aircraft at the Airport[8]. However, from either starting point under the optimistic or pessimistic pandemic recovery forecast, the regression forecast projected GA operations to cease within five years, which is not considered to be

[8] FAA Model for Estimating GA Operations at Non-Towered Airports (Equation #9), https://www.faa.gov/data_research/aviation_data_statistics/general_aviation/media/GAModel3F.doc, 2001.

statistically accurate, therefore were not used further in this evaluation.

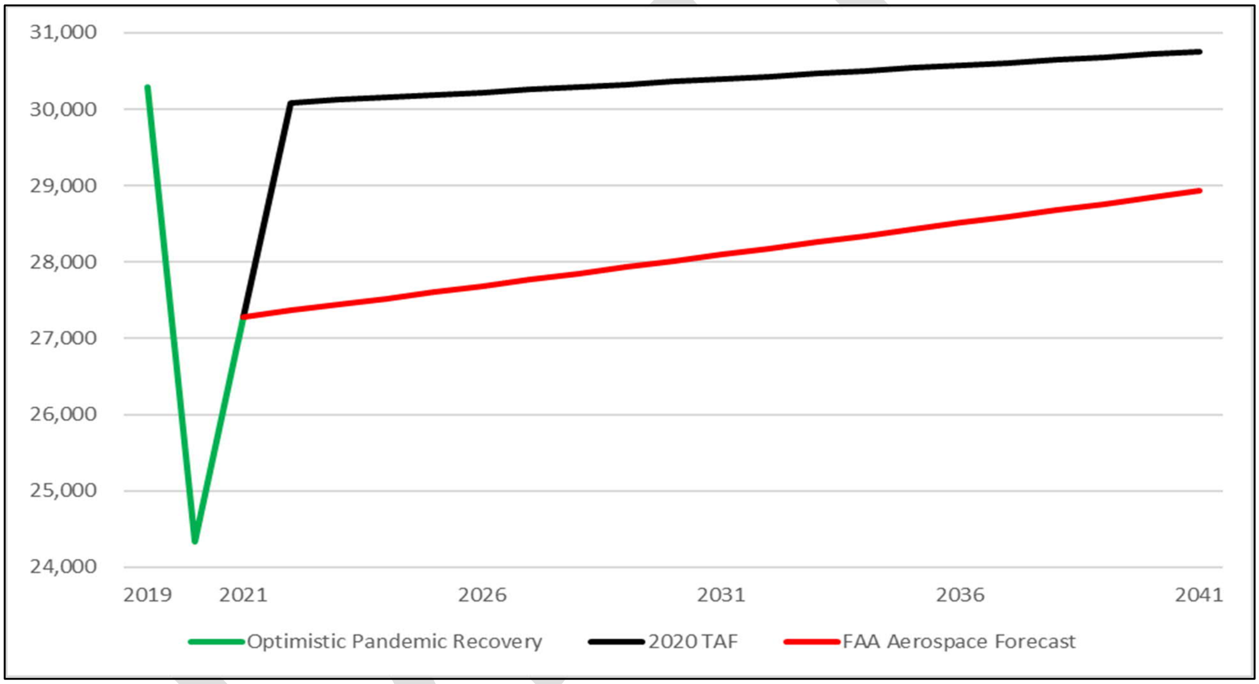
FAA Aerospace 2020-2040 Forecast

The FAA Aerospace 2020-2040 Forecast projects that GA operations (combined iterant and local) will increase by an AAGR of 0.3% from 2020 to 2040. Table 2-25 and Figure 2-30 illustrates the projected number of GA operations at the Airport if operations increased by an AAGR of 0.3%, starting at the projected number of GA operations within the optimistic pandemic recovery forecast. For the recommended forecast, the FAA Aerospace 2020-2040 Forecast was determined to best represent projected GA operations at the Airport.

Table 2-25 – FAA Aerospace 2020-2040 GA Operations Forecast

-	2020 (Base)	2021	2026 (PAL 1)	2031 (PAL 2)	2036 (PAL 3)	2041 (PAL 4)
GA Operations	24,333	27,285	27,688	28,097	28,512	28,933

Figure 2-30 – FAA Aerospace 2021-2041 GA Operations Forecast



Source: FAA Aerospace Forecast FY 2020-2040, 2020 TAF, Midwest ATC, CHA, 2021.

Military Operations

Based on the optimistic military recovery forecast, it is projected BKL will have 366 annual military operations in FAA fiscal year 2021, which will be carried forward annually at a consistent rate through 2041.

2.8.3 Based Aircraft Forecast

Historic Trend Forecasts

The historic trend forecast examined the AAGR of BA at BKL over three time series (3-year, 5-year, and 10-year) and applied their respective trajectory to forecast future BA. Between 2017 and 2020 (3-year), BKL added zero BA at an AAGR of 0%. Between 2015 and 2020 (5-year), BKL added 4 BA at an AAGR of 5.2%. Between 2010 and 2020 (10-year), BA similarly added 13 BA at an AAGR of 13.7%. As mentioned in Section 2.5, the Airport reported that the aircraft count provided by BasedAircraft.com was not up to date, therefore the historical trend forecast is considered irrelevant as it does not reflect an accurate history of based aircraft activity.

Static Market Share Forecasts

In 2020, the Airport had 18 BA, which represented 0.01% of all BA in the United States, 0.42% of all BA in the State of Ohio, and 0.07% of all BA in the FAA Great Lakes region. Due to the pandemic airport operations unevenly across all markets, the market share forecast was deemed irrelevant and not used further in this evaluation.

FAA Aerospace 2020-2040 Forecast

The FAA Aerospace 2020-2040 Forecast projects that the number of based single-engine aircraft will decrease by an AAGR of 1% from 2020 to 2040, that the number of based jet aircraft will increase by an AAGR of 1.2%, and that the number of based rotorcraft (combined piston and turbine) will increase by an AAGR of 1.5%. Table 2-26 illustrates the projected number of BA at the Airport if the current number of BA (per BasedAircraft.com) follows the trends outlined in the FAA Aerospace 2020-2040 Forecast for BA, and then are adjusted by the additional BA reported by BKL as discussed in Section 2.5. The FAA Aerospace 2020-2040 Forecast has been selected as the preferred BA forecast.

Table 2-26 – FAA Aerospace 2020-2040 Based Aircraft Forecast (Adjusted)

Aircraft Type	2020 (Base)	2021	2026 (PAL 1)	2031 (PAL 2)	2036 (PAL 3)	2041 (PAL 4)
Single-Engine	18	18	18	17	17	16
Jet	11	11	11	12	13	13
Helicopter	6	6	6	7	7	8
Total	35	35	35	36	37	37

Source: BasedAircraft.com, BKL, CHA, 2021.

2.8.4 Recommended Forecast

The following tables present a summary of the preferred aviation activity forecasts for based aircraft, enplanements, and operations (commercial, GA, and military) as detailed in the previous sections. Additionally, direct comparisons to the FAA's TAF for BKL are provided for evaluation purposes; a based aircraft comparison is omitted as the 2020 TAF reports that BKL had 22 BA in 2018 and 76 BA in 2019, which is factual incorrect and therefore its projections are not included. The recommended forecasts are the preferred projections on which future planning for the Airport will be based. Table 2-27 presents the complete summary of the preferred forecast for based aircraft, enplanements, and operations by type.Source: Woods and Poole, FAA Aerospace Forecast FY 2020-2040, Midwest ATC, BasedAircraft.com, BTS, BKL, CHA, 2021.

Table 2-28 details the recommended forecast of enplanements and total airport operations (all activity types) in comparison to the FAA 2020 TAF forecast. At the end of the planning period, the recommended forecast predicts a level of enplanements 133 percent above the 2020 TAF and total Airport operations 0.05 percent below the 2020 TAF. As noted earlier, per FAA requirements, forecasts should be within 10 percent of the TAF in the first 5 years and 15 percent in 10 years, as set forth by the FAA in AC 150/5070-6B, Airport Master Plans, for approval of Master Plan forecasts.

Table 2-27 – Recommended Forecast Summary

Year	Based Aircraft	Enplanements	Operations			
			Commercial	GA	Military	Total
2020 (Base)	35	5,549	7,283	24,333	363	31,979
2021	35	5,864	8,046	27,285	366	35,698
2026 (PAL 1)	35	22,771	10,516	27,688	366	38,571
2031 (PAL 2)	36	25,001	10,793	28,097	366	39,256
2036 (PAL 3)	37	27,231	11,019	28,512	366	39,897
2041 (PAL 4)	37	29,461	11,203	28,933	366	40,503

Source: Woods and Poole, FAA Aerospace Forecast FY 2020-2040, Midwest ATC, BasedAircraft.com, BTS, BKL, CHA, 2021.

Table 2-28 – Recommended Forecast vs. FAA 2020 TAF

Year	Enplanements			Operations		
	FAA 2020 TAF	Recommended	% Difference	FAA 2020 TAF	Recommended	% Difference
2020 (Base)	5,974	5,549	-7%	31,979	31,979	0%
2021	7,303	5,864	-20%	34,794	35,698	0.03%
2026 (PAL 1)	12,621	22,771	80%	39,953	38,571	-0.03%
2031 (PAL 2)	12,621	25,001	98%	40,749	39,256	-0.04%
2036 (PAL 3)	12,621	27,231	116%	41,591	39,897	-0.04%
2041 (PAL 4)	12,621	29,461	113%	42,475	40,503	-0.05%

Source: 2020 TAF, Woods and Poole, FAA Aerospace Forecast FY 2020-2040, Midwest ATC, BasedAircraft.com, BTS, BKL, CHA, 2021.

2.9 PEAK AVIATION OPERATIONS FORECAST

Airports experience peaks in total operations that drive demand for various areas of airport infrastructure. To properly plan, size, and design passenger terminal facilities, an understanding of peak month-average day (PMAD) and peak hour is necessary. The peak month, PMAD, and peak month-peak hour forecasts are key elements in defining the future facility requirements needed to accommodate above average levels of utilization (i.e., peak activity).

The peak month is the calendar month of the year when the highest level of total operations typically occurs. Peak month-average day is simply the total operations divided by the number of days in the peak month. Terminal facilities are generally designed to accommodate enplanements on the average day during the peak month, rather than the absolute peak level of activity. Table 2-29 summarizes the Airport's peak month and PMAD of total annual operations from 2010 to 2020, which identifies July as the peak month in 2019 and 2020. Subsequently,

Table 2-30 summarizes the average number of operations per hour in July 2019 and 2020, which identifies the noon hour and 1pm hour to be the peak hour, respectively.

Table 2-29 – Historical Peak Month Operations

Year	Annual Operations	Peak Month	Peak Month Operations	Peak Month Percent of Annual Operations	Peak Month Average Daily (PMAD)
2010	53,987	July	5,980	11.1%	193
2011	54,288	July	7,497	13.8%	242
2012	61,179	August	7,070	11.6%	228
2013	54,596	August	6,089	11.2%	196

Year	Annual Operations	Peak Month	Peak Month Operations	Peak Month Percent of Annual Operations	Peak Month Average Daily (PMAD)
2014	51,738	July	7,128	13.8%	230
2015	49,278	July	7,007	14.2%	226
2016	41,071	November	4,770	11.6%	159
2017	38,571	July	4,793	12.4%	155
2018	34,497	August	4,755	13.8%	153
2019	40,185	July	4,820	12.0%	155
2020	30,794	July	4,291	13.9%	138

Source: TFMSC, CHA, 2021.

Table 2-30 – Historical Peak Month-Peak Hour Average Operations

Hour Timeframe	July 2019		July 2020	
	Average Daily Operations	Percent of Average Daily Operations	Average Daily Operations	Percent of Average Daily Operations
12am	9	5.8%	9	6.5%
1am	3	1.9%	5	3.6%
2am	4	2.6%	3	2.2%
3am	2	1.3%	9	6.5%
4am	2	1.3%	3	2.2%
5am	4	2.6%	4	2.9%
6am	5	3.2%	8	5.8%
7am	9	5.8%	12	8.7%
8am	12	7.7%	9	6.5%
9am	14	9.0%	9	6.5%
10am	13	8.4%	12	8.7%
11am	13	8.4%	13	9.4%
12pm	16	10.3%	16	11.6%
1pm	14	9.0%	19	13.7%
2pm	11	7.1%	14	10.1%
3pm	14	9.0%	16	11.6%
4pm	12	7.7%	18	13.0%
5pm	11	7.1%	10	7.2%
6pm	12	7.7%	10	7.2%
7pm	9	5.8%	13	9.4%
8pm	8	5.1%	8	5.8%
9pm	5	3.2%	15	10.8%
10pm	5	3.2%	4	2.9%
11pm	7	4.5%	1	0.7%

Source: TFMSC, CHA, 2021.

To determine the peak aviation operation forecast summarized in Table 2-31, the percent of annual operations in the peak month of July in 2020 (13.9%) is carried forward through the 20-year planning horizon, as well as percent of average daily operations during the peak hour in the peak month (13.7%).

Table 2-31 – Peak Aviation Operations Forecast

Year	Annual Operations	Peak Month Percent	Peak Month Operations	PMAD	Peak Hour Percent	Peak Hour Operations
2019	40,185	12.0%	4,436	155	10.3%	16
2020 (Base)	31,979	13.9%	4,456	144	13.7%	20
2021	35,698	13.9%	4,974	160	13.7%	22
2026 (PAL 1)	38,571	13.9%	5,375	173	13.7%	24
2031 (PAL 2)	39,256	13.9%	5,470	176	13.7%	24
2036 (PAL 3)	39,897	13.9%	5,559	179	13.7%	25
2041 (PAL 4)	40,503	13.9%	5,644	182	13.7%	25

Source: TFMSC, Woods and Poole, FAA Aerospace Forecast FY 2020-2040, Midwest ATC CHA, 2021.

2.10 CRITICAL AIRCRAFT

The basis of facility planning and design of federally obligated airports are based on the specifications and dimensional requirements of the critical aircraft, making the critical aircraft an important component of the airport planning process. Per FAA AC 150/5000-17, Critical Aircraft and Regular Use Determination, the critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics that make regular use of the airport.

Regular use is defined as an aircraft or grouping of aircraft with more than 500 annual operations, including both itinerant and local operations, but excluding touch-and-go operations. In some instances, it is necessary to group aircraft with similar characteristics, rather than requiring a single aircraft type to exceed the regular use threshold alone. In these cases, aircraft with similar wingspan's and/or approach speeds may be grouped to determine the most demanding Aircraft Approach Category (AAC), Aircraft Design Group (ADG), and/or Taxiway Design Group (TDG). Table 2-32 and Table 2-33 presents the characteristics and applicability of these classification systems to the FAA airport design standards for individual airport components, respectively.

Table 2-32 – AAC and ADG Characteristics

AAC Category	Approach Speed	
A	Approach speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
ADG Group	**Tail Height (and/or)**	**Wingspan**
I	< 20′	< 49′
II	20′ - < 30′	49′ - < 79′
III	30′ - < 45′	79′ - < 118′
IV	45′ - < 60′	118′ - < 171′
V	60′ - < 66′	171′ - < 214′
VI	66′ - < 80′	214′ - < 262′

Source: FAA AC 150-5300-13A, CHA, 2021.

Table 2-33 – Applicability of Aircraft Classifications

Aircraft Classification	Related Design Components
AAC	Runway Safety Area (RSA), Runway Object Free Area (ROFA), Runway Protection Zone (RPZ), runway width, runway-to-taxiway separation, runway-to-fixed object
ADG	Runway, Taxiway, and apron Object Free Areas (OFAs), parking configuration, taxiway-to-taxiway separation, runway-to-taxiway separation
TDG	Taxiway width, radius, fillet design, apron area, parking layout.

Source: FAA AC 150-5300-13A, CHA, 2021.

The FAA classifies airports and runways by Airport Reference Codes (ARC) based on their existing and planned operational capabilities. ARC is an airport designation that represents the AAC category and ADG group of the aircraft that the airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

2.10.1 Exiting Critical Aircraft

The BKL 2017 Airport Layout Plan (ALP) identified the critical aircraft as the Cessna Citation XL (C-II) and Learjet 35/36 (D-I) for airfield and pavement design, with the ultimate ARC being C-II. To determine the current critical aircraft for the 2021 ALP Update, FAA's Traffic Flow Management System (TFMSC) operational data for 2019 and 2020 were evaluated to identify BKL's trends by AAC category and ADG grouping (Table 2-34) and for the design aircraft family fleet mix with ADG C or D (Table 2-35); Appendix A provides the entire BKL fleet mix. Moreover, based on fleet mix of similar characteristics with more than 500 regular use annual operations, the current ARC has increased from C-II to D-II for the 2021 ALP Update.

Table 2-34 – BKL Operations by AAC Category and ADG Group

Total		2019 Ops.	2020 Ops.
		12,280	7,468
Subtotal by AAC	A	2,086	1,208
	B	7,376	4,616
	C	2,032	1,188
	D	772	456
	N/A	14	0
Subtotal by ADG	I	4,282	2,888
	II	7,480	4,300
	III	438	258
	IV	76	22
	V	0	0
	VI	4	0

Source: TFMSC, CHA, 2021.

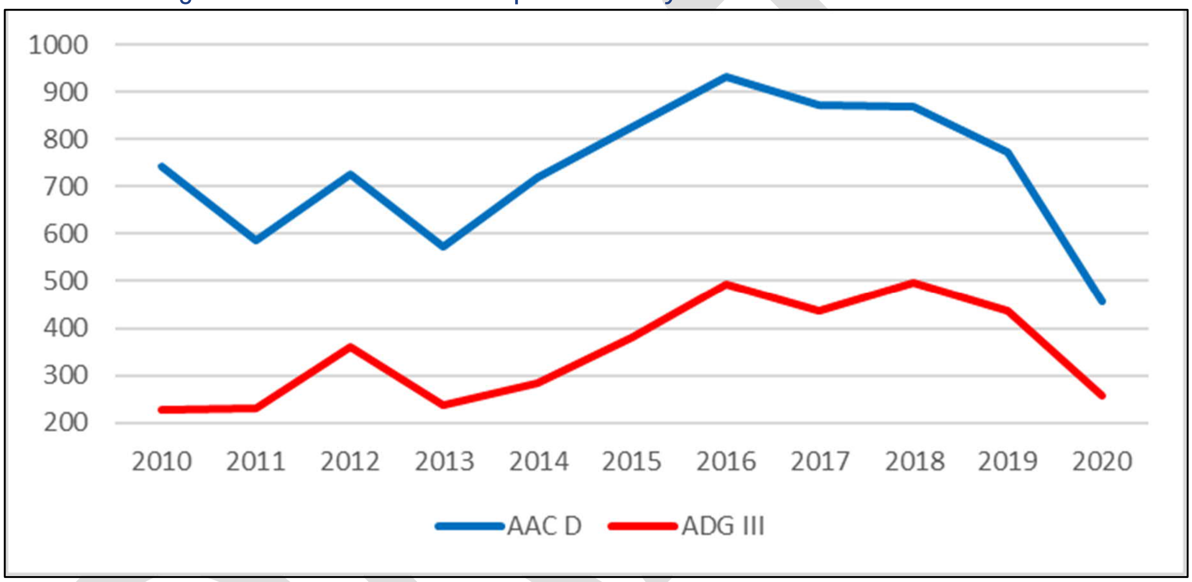
Table 2-35 – Design Aircraft Family Fleet Mix Operations by ACC C and D Aircraft

Aircraft	AAC + ADG	2019 Operations	2020 Operations
GLF5 - Gulfstream V/G500	D-III	148	78
GLF6 - Gulfstream	D-III	70	64
B739 - Boeing 737-900	D-III	4	16
B738 - Boeing 737-800	D-III	20	4
P8 - Boeing P-8 Poseidon	D-III	4	0
GLF4 - Gulfstream IV/G400	D-II	218	110
LJ35 - Bombardier Learjet 35/36	D-I	296	180
F18S - F18 Hornet	D-I	8	2
F22 - Boeing Raptor F22	D-I	0	2
F18H - F/A 18 Hornet	D-I	2	0
T38 - Northrop T-38 Talon	D-I	2	0
C5 - Lockheed C-5	C-VI	4	0
B752 - Boeing 757-200	C-IV	36	12
C130 - Lockheed 130 Hercules	C-IV	24	6
C30J - C-130J Hercules; Lockheed	C-IV	8	4
K35R - Boeing KC-135 Stratotanker	C-IV	4	0
GLEX - Bombardier BD-700 Global Express	C-III	58	26
GL5T - Bombardier BD-700 Global 5000	C-III	20	10
A320 - Airbus A320 All Series	C-III	12	8
MD81 - Boeing (Douglas) MD 81	C-III	12	4
B737 - Boeing 737-700	C-III	2	4
B735 - Boeing 737-500	C-III	0	4
A319 - Airbus A319	C-III	8	0
A321 - Airbus A321 All Series	C-III	4	0
DC91 - Boeing (Douglas) DC 9-10	C-III	2	0
CL30/CL35 - Bombardier Challenger 300	C-II	406	222
CL60 - Bombardier Challenger 600/601/604	C-II	138	76
E135 - Embraer ERJ 135/140/Legacy	C-II	108	50
G280 - Gulfstream G280	C-II	92	34
GALX - IAI 1126 Galaxy/Gulfstream G200	C-II	60	28
LJ75 - Learjet 75	C-II	64	24
ASTR - IAI Astra 1125	C-II	10	24
LJ70 - Learjet 70	C-II	10	12
G150 - Gulfstream G150	C-II	36	10
GLF3 - Gulfstream III/G300	C-II	8	6
E35L - Embraer 135 LR	C-II	24	4
CRJ2 - Bombardier CRJ-200	C-II	6	2
E145 - Embraer ERJ-145	C-II	0	2
CRJ7 - Bombardier CRJ-700	C-II	4	0
H25B - BAe HS 125/700-800/Hawker 800	C-I	368	220
LJ60 - Bombardier Learjet 60	C-I	156	138
LJ45 - Bombardier Learjet 45	C-I	242	132
LJ31 - Bombardier Learjet 31/A/B	C-I	58	98
LJ40 - Learjet 40; Gates Learjet	C-I	10	18
LJ55 - Bombardier Learjet 55	C-I	22	8
WW24 - IAI 1124 Westwind	C-I	4	2
HAWK - BAe Systems Hawk	C-I	12	0

Source: TFMSC, CHA, 2021.

The number of AAC D annual operations has been above the 500 regular use threshold since at least 2010 until it fell below the threshold in 2020 due to impacts from the pandemic, as shown in Figure 2-31. While the forecast of aviation activity is still under development until the 2020 Terminal Area Forecast (TAF) is released by FAA, it is anticipated that AAC D operations will incrementally increase above the 500 regular use threshold as BKL recovers from the pandemic resembling years 2010 through 2019 within the next one to three years. Based on the existing fleet mix of operations at the Airport, the existing AAC designation is identified as D. The number of ADG II annual operations has been several thousand above the 500-threshold since 2010; therefore, the existing ADG designation is identified as ADG II. Moreover, based on existing fleet mix of similar characteristics with more than 500 regular use annual operations, the existing ARC will increase from C-II to D-II.

Figure 2-31 – BKL Annual Operations by AAC D and ADG III Aircraft



Source: TFMSC, CHA, 2021.

2.10.2 Future Critical Aircraft

The number of AAC D annual operations fell below the 500 regular use threshold in 2020 for the first time since 2010 due to impacts from the pandemic. As previously stated, it is anticipated that AAC D operations will increase above the 500 operational threshold in the short-term forecast period; therefore, the future ACC designation is anticipated to remain D in the future.

The data indicates the number of ADG III annual operations trended upward for a period of four years (2013-2016) and remained just below the 500 operational threshold with its peak of 496 in 2018 before declining due to impacts of the pandemic (Section 2.6). Although the existing annual operations do not justify an ADG III, given the consistency of annual ADG III operations before the pandemic, it is reasonable to assume that over the 20-year planning period the future ADG will increase to III.

APPENDIX A

Table A-1– BKL Fleet Mix

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
C560 - Cessna Citation V/Ultra/Encore	1,124	820	B	II	0	107	52.17	15.00	19.90	17.58
C680 - Cessna Citation Sovereign	446	358	B	II	1B	108	63.33	20.33	27.58	10.00
J328 - Fairchild Dornier 328 Jet	932	330	B	II	0	N/A	N/A	N/A	N/A	N/A
C525 - Cessna CitationJet/CJ1	306	330	B	I	1A	108	46.92	13.77	15.33	13.00
E55P - Embraer Phenom 300	378	310	B	II	0	116	52.17	16.75	16.75	10.00
BE20 - Beech 200 Super King	480	264	B	II	2	98	54.50	15.00	15.00	17.17
C550 - Cessna Citation II/Bravo	242	260	B	II	0	112	52.17	15.00	18.50	13.33
C56X - Cessna Excel/XLS	526	254	B	II	0	107	55.71	17.21	21.92	14.92
H25B - BAe HS 125/700-800/Hawker 800	368	220	C	I	0	137	54.33	18.08	N/A	N/A
F2TH - Dassault Falcon 2000	440	196	B	II	1B	111	63.42	23.17	25.00	16.58
BE40 - Raytheon/Beech Beechjet 400/T-1	200	184	B	I	0	121	43.50	13.92	13.92	9.33
PC12 - Pilatus PC-12	314	182	A	II	0	87	53.33	14.00	11.42	14.83
LJ35 - Bombardier Learjet 35/36	296	180	D	I	0	143	39.50	12.25	25.00	11.00
SR22/S22T - Cirrus SR 22/SR-22 Turbo	318	194	A	I	0	78	38.33	8.92	N/A	N/A
LJ60 - Bombardier Learjet 60	156	138	C	I	0	125	43.75	14.67	25.00	11.00
CL30/CL35 - Bombardier Challenger 300	406	222	C	II	1B	117	63.83	20.33	27.75	12.64
C172 - Cessna Skyhawk 172/Cutlass	156	134	A	I	0	62	36.08	8.92	5.42	N/A
LJ45 - Bombardier Learjet 45	242	132	C	I	0	123	47.83	14.08	25.00	11.00
C68A - Cessna Citation Latitude	248	116	B	II	1B	N/A	72.33	20.92	27.00	10.00
GLF4 - Gulfstream IV/G400	218	110	D	II	2	150	77.83	24.42	38.10	15.67

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
LJ31 - Bombardier Learjet 31/A/B	58	98	C	I	0	125	43.83	12.25	N/A	N/A
C650 - Cessna III/VI/VII	58	96	B	II	0	126	53.50	17.25	21.33	9.33
P28A - Piper Cherokee	108	88	A	I	0	65	30.00	7.29	6.21	10.53
FA50 - Dassault Falcon/Mystère 50	244	86	B	II	1B	113	61.88	22.90	N/A	N/A
B350 - Beech Super King Air 350	216	86	B	II	2	107	57.92	14.33	16.25	17.17
C25B - Cessna Citation CJ3	158	82	B	II	2	108	53.33	15.17	20.00	16.00
C25A - Cessna Citation CJ2	100	82	B	I	1A	114	49.83	14.00	17.83	15.92
GLF5 - Gulfstream V/G500	148	78	D	III	2	150	86.33	25.50	45.00	15.88
CL60 - Bombardier Challenger 600/601/604	138	76	C	II	0	125	64.33	20.67	26.21	12.97
PA32 - Piper Cherokee Six	102	72	A	I	0	78	32.67	7.75	7.96	11.13
BE10 - Beech King Air 100 A/B	78	68	B	I	0	111	45.92	15.42	13.90	13.70
GLF6 - Gulfstream	70	64	D	III	2	145	99.58	25.67	45.00	16.00
BE36 - Beech Bonanza 36	88	62	A	I	1A	77	33.50	8.58	< 10	9.63
BE9L - Beech King Air 90	88	62	B	I	0	108	54.50	14.83	12.30	16.30
C750 - Cessna Citation X	90	52	B	II	0	112	63.58	19.25	28.67	10.58
E135 - Embraer ERJ 135/140/Legacy	108	50	C	II	2	124	65.75	22.17	40.75	15.72
C500 - Cessna 500/Citation I	42	42	B	I	0	107	47.08	14.40	17.83	15.92
C340 - Cessna 340	32	42	B	I	0	94	38.11	12.58	N/A	N/A
F900 - Dassault Falcon 900	104	40	B	II	1B	111	63.42	24.79	26.00	16.58
C310 - Cessna 310	40	40	A	I	0	82	36.92	10.58	N/A	N/A
FA7X - Dassault Falcon F7X	70	36	B	III	0	104	86.00	25.67	N/A	N/A
C25C - Cessna Citation CJ4	44	36	B	II	1B	111	50.83	15.42	21.17	12.33
TBM9 - Socata TBM	32	36	A	I	0	85	42.10	14.29	9.56	12.71
G280 - Gulfstream G280	92	34	C	II	1B	125	63.00	21.33	30.08	12.60
C208 - Cessna 208 Caravan	40	34	B	II	0	79	52.08	14.92	11.67	11.67

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
HDJT - HONDA HA-420 HondaJet	40	34	B	I	0	N/A	N/A	N/A	N/A	N/A
PA46 - Piper Malibu	58	30	A	I	0	75	43.00	11.29	8.00	12.29
C414 - Cessna Chancellor 414	36	30	B	I	0	95	44.17	11.50	N/A	N/A
BE58 - Beech 58	76	28	B	I	1A	95	37.83	9.75	8.00	9.58
GALX - IAI 1126 Galaxy/Gulfstream G200	60	28	C	II	1B	146	58.08	21.42	24.25	12.03
SR20 - Cirrus SR-20	52	28	A	I	0	74	38.33	8.92	N/A	N/A
PA31 - Piper Navajo PA-31	42	28	A	I	0	79	40.67	13.00	N/A	N/A
C182 - Cessna Skylane 182	118	26	A	I	0	64	36.00	9.33	5.58	9.00
GLEX - Bombardier BD-700 Global Express	58	26	C	III	0	111	104.33	26.67	44.23	16.00
TBM7 - Socata TBM-7	70	24	A	I	0	79	41.60	14.27	9.54	12.69
LJ75 - Learjet 75	64	24	C	II	0	125	50.92	14.00	25.00	11.00
P46T - Piper Malibu Meridian	60	24	A	I	0	78	43.00	11.33	8.00	12.29
TBM8 - Socata TBM-850	40	24	A	I	0	85	41.60	14.30	N/A	N/A
E545 - Embraer EMB-545 Legacy 450	34	24	B	II	0	135	66.42	21.08	N/A	N/A
ASTR - IAI Astra 1125	10	24	C	II	1B	125	52.67	18.17	25.00	12.00
P180 - Piaggio P-180 Avanti	8	24	B	I	0	117	46.04	13.08	19.00	19.00
PA27 - Piper Aztec	8	22	A	I	0	N/A	N/A	N/A	N/A	N/A
BE35 - Beech Bonanza 35	36	20	A	I	1A	72	33.50	7.58	< 10	9.63
M20P - Mooney M-20C Ranger	56	18	A	I	0	65	35.00	8.33	6.58	9.17
AEST - Piper Aero Star	50	18	B	I	0	96	34.17	12.13	11.67	10.21
C501 - Cessna I/SP	16	18	B	I	0	107	47.08	14.40	17.83	15.92
LJ40 - Learjet 40; Gates Learjet	10	18	C	I	0	123	47.78	14.13	25.00	11.00
P28R - Cherokee Arrow/Turbo	54	16	A	I	0	78	30.00	7.29	7.85	10.98
BE30 - Raytheon 300 Super King Air	52	16	B	II	2	107	57.92	14.33	16.25	17.17
C421 - Cessna Golden Eagle 421	28	16	B	I	0	96	44.17	11.50	N/A	N/A
P32R - Piper 32	14	16	A	I	0	78	36.17	8.50	7.96	11.13
B739 - Boeing 737-900	4	16	D	III	3	141	112.58	41.42	61.58	22.96

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
C210 - Cessna 210 Centurion	34	14	A	I	0	75	36.75	9.67	N/A	N/A
FA20 - Dassault Falcon/Mystère 20	28	14	B	II	0	107	53.50	17.58	N/A	N/A
BE33 - Beech Bonanza 33	18	14	A	I	1A	69	33.50	8.25	< 10	9.58
C25M - Cessna Citation M2	18	14	B	I	1A	100	47.25	13.92	15.33	13.00
C206 - Cessna 206 Stationair	8	14	B	I	0	70	36.00	9.29	5.77	8.09
PAY2 - Piper Cheyenne 2	40	12	B	I	0	98	42.69	12.75	N/A	N/A
B752 - Boeing 757-200	36	12	C	IV	4	137	124.83	45.08	72.00	28.00
C441 - Cessna Conquest	20	12	B	II	0	98	49.33	13.17	N/A	N/A
LJ70 - Learjet 70	10	12	C	II	0	125	50.92	14.00	25.00	11.00
PRM1 - Raytheon Premier 1/390 Premier 1	64	10	B	I	0	120	44.50	15.33	17.58	9.17
G150 - Gulfstream G150	36	10	C	II	1B	130	55.58	19.08	24.08	11.08
DA40 - Diamond Star DA40	32	10	A	I	0	87	38.17	6.50	N/A	N/A
M20T - Turbo Mooney M20K	20	10	A	I	0	77	36.08	8.33	6.58	9.17
GL5T - Bombardier BD-700 Global 5000	20	10	C	III	0	108	94.00	25.50	48.42	16.00
LJ55 - Bombardier Learjet 55	22	8	C	I	0	125	43.83	14.67	25.00	11.00
HA4T - Hawker 4000	20	8	B	II	0	121	43.50	13.92	19.25	11.33
PA34 - Piper PA-34 Seneca	14	8	A	I	0	N/A	N/A	N/A	N/A	N/A
A320 - Airbus A320 All Series	12	8	C	III	3	136	111.88	39.63	50.20	29.36
PAY1 - Piper Cheyenne 1	10	8	B	I	0	92	42.69	12.75	N/A	N/A
PA24 - Piper PA-24	4	8	A	I	0	75	36.00	7.47	6.55	10.17
SBR1 - North American Rockwell Sabre 40/60	0	8	B	I	0	N/A	N/A	N/A	N/A	N/A
BE55 - Beech Baron 55	36	6	A	I	1A	88	37.83	9.58	7.00	9.58
C130 - Lockheed 130 Hercules	24	6	C	IV	0	129	132.58	39.30	N/A	N/A
P28B - Piper Turbo Dakota	22	6	A	I	0	62	35.00	7.17	6.50	10.53

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
SW4 - Swearingen Merlin 4/4A Metro2	22	6	B	II	0	N/A	N/A	N/A	N/A	N/A
BE9T - Beech F90 King Air	8	6	B	II	0	108	54.50	14.83	12.30	16.30
GLF3 - Gulfstream III/G300	8	6	C	II	2	150	77.83	24.42	38.10	15.67
DA42 - Diamond Twin Star	6	6	A	I	0	88	44.50	8.17	N/A	N/A
E550 - Embraer Legacy 500	24	4	A	I	0	135	66.42	21.17	N/A	N/A
C510 - Cessna Citation Mustang	24	4	B	I	1A	105	43.17	13.42	14.33	11.83
E35L - Embraer 135 LR	24	4	C	II	2	124	65.75	22.17	40.75	15.72
B738 - Boeing 737-800	20	4	D	III	3	142	112.58	41.42	56.42	22.96
MD81 - Boeing (Douglas) MD 81	12	4	C	III	4	134	107.85	30.17	72.43	20.40
PA30 - Piper PA-30	10	4	A	I	0	N/A	N/A	N/A	N/A	N/A
EA50 - Eclipse 500	8	4	A	I	0	90	37.25	11.00	N/A	N/A
C30J - C-130J Hercules ; Lockheed	8	4	C	IV	0	N/A	N/A	N/A	N/A	N/A
EVOT - Lancair Evolution Turbine	6	4	A	I	0	N/A	N/A	N/A	N/A	N/A
P210 - Riley Super P210	6	4	A	I	0	75	36.75	9.67	N/A	N/A
DH8B - Bombardier DHC8-200	4	4	B	III	3	92	85.00	24.58	26.08	28.12
C177 - Cessna 177 Cardinal	2	4	A	I	0	52	35.50	8.58	N/A	N/A
B737 - Boeing 737-700	2	4	C	III	3	130	117.42	41.58	46.58	22.92
C150 - Cessna 150	0	4	A	I	0	55	33.17	8.50	N/A	N/A
PAY3 - Piper PA-42-720 Cheyenne 3	0	4	B	I	1A	113	47.67	14.75	10.60	18.75
B735 - Boeing 737-500	0	4	C	III	3	128	94.75	36.33	41.58	20.92
MU2 - Mitsubishi Marquise/Solitaire	16	2	A	I	0	100	39.17	13.67	N/A	N/A
E50P - Embraer Phenom 100	16	2	B	I	0	100	40.33	14.25	16.83	10.00
COL4 - Lancair LC-41 Columbia 400	8	2	A	I	0	78	36.08	9.00	N/A	N/A
F18S - F18 Hornet	8	2	D	I	0	N/A	N/A	N/A	N/A	N/A
PA44 - Piper Seminole	6	2	A	I	0	66	38.60	8.50	8.40	10.50
AC90 - Gulfstream Commander	6	2	B	I	0	N/A	N/A	N/A	N/A	N/A
FA10 - Dassault Falcon/Mystère 10	6	2	B	I	0	107	42.92	15.13	N/A	N/A

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
MU30 - Mitsubishi MU300/ Diamond I	6	2	B	I	0	100	43.50	13.92	19.25	9.33
CRJ2 - Bombardier CRJ-200	6	2	C	II	1B	140	68.67	20.75	37.42	13.25
AC11 - North American Commander 112	4	2	A	I	0	N/A	N/A	N/A	N/A	N/A
KODI - Quest Kodiak	4	2	A	I	0	N/A	N/A	N/A	N/A	N/A
PA28 - Piper Cherokee	4	2	A	I	0	65	30.00	7.29	6.21	10.53
WW24 - IAI 1124 Westwind	4	2	C	I	1B	129	44.79	15.79	23.00	12.00
T210 - Cessna T210M	2	2	A	I	0	75	36.75	9.67	N/A	N/A
E120 - Embraer Brasilia EMB 120	2	2	B	II	3	113	64.92	21.43	22.90	23.48
BE60 - Beech 60 Duke	0	2	B	I	1A	98	39.25	12.33	N/A	N/A
BE90 - Beech King Air 90	0	2	B	II	0	108	54.50	14.83	12.30	16.30
D328 - Dornier 328 Series	0	2	B	II	0	N/A	N/A	N/A	N/A	N/A
E110 - Embraer EMB110	0	2	B	II	2	92	50.25	16.17	17.00	17.00
E145 - Embraer ERJ-145	0	2	C	II	2	124	65.75	22.17	40.75	15.72
F22 - Boeing Raptor F22	0	2	D	I	0	N/A	N/A	N/A	N/A	N/A
TEX2 - Raytheon Texan 2	16	0	B	I	0	N/A	N/A	N/A	N/A	N/A
A10 - Fairchild A10	12	0	0	I	0	N/A	N/A	N/A	N/A	N/A
AC50 - Aero Commander 500	12	0	B	II	0	77	51.71	14.50	13.98	12.92
H25C - BAe/Raytheon HS 125-1000/Hawker 1000	12	0	B	I	0	108	47.00	17.25	22.73	12.00
HAWK - BAe Systems Hawk	12	0	C	I	0	N/A	N/A	N/A	N/A	N/A
C82R - Cessna Skylane RG	10	0	A	I	0	64	36.00	9.33	5.58	9.00
DHC6 - DeHavilland Twin Otter	10	0	A	II	0	75	65.00	19.33	14.88	14.88
A319 - Airbus A319	8	0	C	III	3	126	111.88	39.73	44.90	29.36
AA5 - American AA-5 Traveler	4	0	A	I	0	68	31.42	8.00	N/A	N/A
PA23 - Piper PA-23	4	0	A	I	0	N/A	N/A	N/A	N/A	N/A
C17 - Boeing Globemaster 3	4	0	B	IV	0	N/A	N/A	N/A	N/A	N/A

Aircraft	2019 Ops.	2020 Ops.	AAC	ADG	TDG	AAC	ADG		TDG	
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
A321 - Airbus A321 All Series	4	0	C	III	3	140	111.88	39.70	44.95	29.43
C5 - Lockheed C-5	4	0	C	VI	0	135	222.70	65.10	N/A	N/A
CRJ7 - Bombardier CRJ-700	4	0	C	II	2	135	76.27	24.83	49.25	16.39
K35R - Boeing KC-135 Stratotanker	4	0	C	IV	4	N/A	N/A	N/A	N/A	N/A
P8 - Boeing P-8 Poseidon	4	0	D	III	3	N/A	N/A	N/A	N/A	N/A
V22 - Bell V-22 Osprey	2	0	0	I	0	N/A	N/A	N/A	N/A	N/A
BE23 - Beech 23 Sundowner	2	0	A	I	0	N/A	N/A	N/A	N/A	N/A
BE76 - Beech 76 Duchess	2	0	A	I	0	76	38.00	9.50	N/A	N/A
C240 - Cessna TTx Model T240	2	0	A	I	0	78	36.00	9.00	N/A	N/A
AC95 - Gulfstream Jetprop Commander 1000	2	0	B	II	0	N/A	N/A	N/A	N/A	N/A
C551 - Cessna Citation II/SP	2	0	B	II	0	112	52.17	15.00	18.50	13.33
DC91 - Boeing (Douglas) DC 9-10	2	0	C	III	0	132	N/A	N/A	N/A	N/A
F18H - F/A 18 Hornet	2	0	D	I	0	N/A	N/A	N/A	N/A	N/A
T38 - Northrop T-38 Talon	2	0	D	I	0	N/A	N/A	N/A	N/A	N/A

Source: TFMSC, CHA, 2021.