ST. LOUIS LAMBERT INTERNATIONAL AIRPORT®

AIRPORT MASTER PLAN

CHAPTER 8 – AIRPORT LAYOUT PLAN NARRATIVE REPORT

FEBRUARY 2023 – FINAL DRAFT

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8. AIRPORT LAYOUT PLAN NARRATIVE REPORT

8.1 PLANNING EFFORTS AND EXISTING CONDITIONS HIGHLIGHTS

8.1.1 OVERVIEW

An Airport Layout Plan (ALP) is intended to support and document the aeronautical needs of an airport and provide a detailed view of its vision and developments in the long-term. As an airport changes, an ALP must be updated to reflect the changes and needs that correspond with these changes. The ALP Update (ALPU) process is reviewed and approved by the Federal Aviation Administration (FAA).

According to the FAA's Office of Airports (ARP) Standard Operating Procedure (SOP) 2.00 *Standard Procedure for FAA Review and Approval of Airport Layout Plans,* "Once an ALP arrives at the FAA, it should include (1) any required narrative report, and (2) a completed review checklist with indication that it has already been reviewed by the preparer of the drawings and the Airport Sponsor". This document serves as a summary version of the full ALP Narrative Report for St. Louis Lambert International Airport (STL or Airport). The SOP 2.00 checklist is provided in **Appendix 8A**.

St. Louis Lambert International Airport completed its last master plan in 2012 and its ALPU in 2013. Since the 2013 ALP "conditional" approval, STL has experienced significant changes in its infrastructure and overall growth. As such, the Airport has contracted with several consultants, in conjunction with major stakeholders, to update the Master Plan (MP) in order to meet aeronautical demand and facility requirements. This includes a supporting ALP and Narrative Report. One of the greatest challenges addressed in the 2023 Master Plan is the evaluation of the existing airfield geometry and standards compliance.

This document was prepared in 2021 using data gathered in 2019 and serves as an ALP Narrative report for the 2023 STL MP, and includes the following:

- Approved Forecast
- ALP Narrative Report Facility Requirements
- ALP Narrative Report Alternatives
- ALP Design Information

8.1.2 RUNWAY AND TAXIWAY CURRENT CONDITIONS

STL is classified as an FAA designated Primary, Medium Hub airport. The airport's airfield includes three parallel runways (12R-30L, 12L-30R, 11-29) and one crosswind runway (6-24). **Table 8.1-1** displays the current runway conditions at STL. **Table 8.1-2** displays a summary of runway usage in 2019, the last calendar year not affected by the pandemic.

Table 8.1-1: Existing Runway Conditions

RUNWAY	RDC	RUNWAY LENGTH	RUNWAY WIDTH	SURFACE	RUNWAY MARKINGS	LIGHTING SYSTEMS
12R-30L	D-IV	11,020' 12R (467' DT) 30L (197' DT)	200' *	Grooved concrete	Precision	PAPI, MALSR, TDZ
12L-30R	D-IV	9,013'	150'	Grooved concrete	Precision	PAPI, ALSF-2, TDZ
11-29	D-IV	9,000'	150'	Grooved Concrete	Precision	PAPI, ALSF-2, TDZ
6-24	D-IV	7,603'	150'	Grooved Concrete	Precision	PAPI, MALSR, MALS

RDC: Runway Design Code
DT: Displaced Threshold
TDZ: Touchdown Zone Lights
MALSR: Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
PAPI: Precision Approach Path Indicator
ALSF-2: High Intensity Approach Lighting System with Sequenced Flashing Lights
MALS: Medium Intensity Approach Lighting System
*2022/23 Runway 12R-30L reconstruction project will reduce width to 150 feet
Source: CMT

Table 8.1-2: Runway Usage (Based on Aircraft Operations)

	AIRPORT – WIDE USE	TAKEOFFS	LANDINGS
12R	24%	19%	5%
30L	27%	21%	6%
12R-30L	**52%**	**40%**	**11%**
12L	11%	3%	8%
30R	17%	1%	16%
12L-30R	**28%**	**4%**	**24%**
11	9%	<1%	9%
29	11%	6%	5%
11-29	**19%**	**6%**	**14%**
6	<1%	<1%	<1%
24	1%	<1%	1%
6-24	**1%**	**<1%**	**1%**
Total	100%	50%	50%

Sources: St. Louis Airport Authority, L3Harris Data for STL, January 1, 2019, through December 31, 2019; CMT, April 2020 analysis
Note: 2019 was the last calendar year not affected by the pandemic

TAXIWAY CONDITIONS

The taxiway system at STL allows for the safe and efficient movement of aircraft between the runways, passenger terminal areas, general aviation (GA) areas, air cargo aprons, and other aircraft parking/service areas. Three of the four runways have a full-length parallel taxiway:

- Runway 12L-30R - Taxiway E
- Runway 12R-30L - Taxiway D
- Runway 11-29 - Taxiway A

All taxiways are at least 75 feet wide, with the exception of Taxiway K1, which is outside the movement area and is designated a taxilane. Taxiway F4 is 60 feet wide and Taxiway V2 is 50 feet wide. All taxiways meet Taxiway Design Group (TDG) 5 standards, except for Taxiway V2, which meets TDG 3 standards.

The following section will present the key takeaways from the approved forecast.

8.2 FORECAST HIGHLIGHTS

This section presents highlights from the approved forecast of aviation activity at STL. This forecast summary includes commercial activity (passenger and air cargo traffic) and noncommercial activity (general aviation and military operations). The complete Forecast Report is part of the full ALP Narrative Report. The Forecast Report also includes consideration of the COVID-19 Global Pandemic and Economic Recession and discusses various recovery scenarios.

8.2.1 EXISTING AVIATION DEMAND

Approximately 194,000 aircraft operations were conducted at the Airport in 2019, as shown in **Table 8.2-1**. Approximately 73 percent of those operations were conducted by air carrier aircraft, and approximately 26 percent were conducted by GA aircraft, which includes air taxis. Military operations accounted for 1 percent of operations in 2019. **Table 8.2-2** shows the number of based aircraft at STL in 2019.

Table 8.2-1: STL Operations

	AIR CARRIER	AIR TAXI	GENERAL AVIATION	MILITARY	TOTAL
Number of Aircraft Operations	141,242	43,868	7,046	1,783	193,939
Percentage	72.8%	22.6%	3.6%	0.9%	100%

Source: Federal Aviation Administration, Air Traffic Activity Data System (ATADS), STL Airport Operations, Report from January 1, 2019 to December 31, 2019.

Table 8.2-2: Based Aircraft

Fixed-Wing Aircraft	2019
Single-Engine Piston	12
Multi-Engine Piston	4
Jet	26
Total Fixed-Wing Aircraft	20
Helicopters	0
Military	0
Total Based Aircraft	62

Source: Federal Aviation Administration, *Form 5010, Airport Master Record*; https://adip.faa.gov/agis/public/#/airportData/STL, accessed December 2021.

8.2.2 HIGHLIGHTS OF COMMERICAL ACTIVITY FORECAST

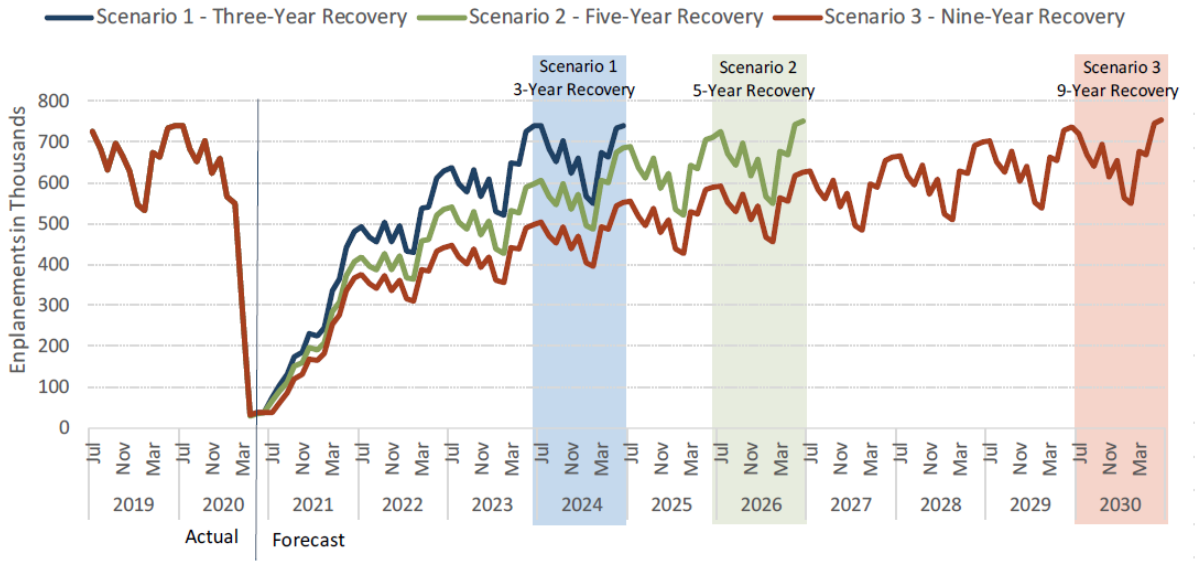
Commercial passenger traffic accounts for more than 98 percent of commercial aircraft operations at STL. The following subsection presents the results of the forecasts of commercial passenger enplanements, aircraft operations, and landed weight, which serve as an important driving force to the different future developments shown in the MP.

The 20-year MP commercial activity forecast period is comprised of three phases:

- Short-term traffic decline phase during the COVID-19 pandemic and economic recession – FY2020-2021
- Medium-term traffic recovery phase – FY2022 through the year of full recovery
- Long-term traffic growth phase – the years after full recovery through FY2040, the end of the MP planning period

Three recovery scenarios for STL passenger traffic from the 2020 COVID-19 pandemic and economic recession were developed: **Scenario 1 – Three Year Recovery, Scenario 2 – Five Year Recovery, and Scenario 3 – Nine Year Recovery**. Each recovery scenario was further broken into three time phases as follows: short-term decline, medium-term recovery, long-term growth. **Figure 8.2-1** shows the STL passenger recovery forecast scenarios.

Figure 8.2-1: Pace of STL Passenger Traffic Recovery Under Three Scenarios



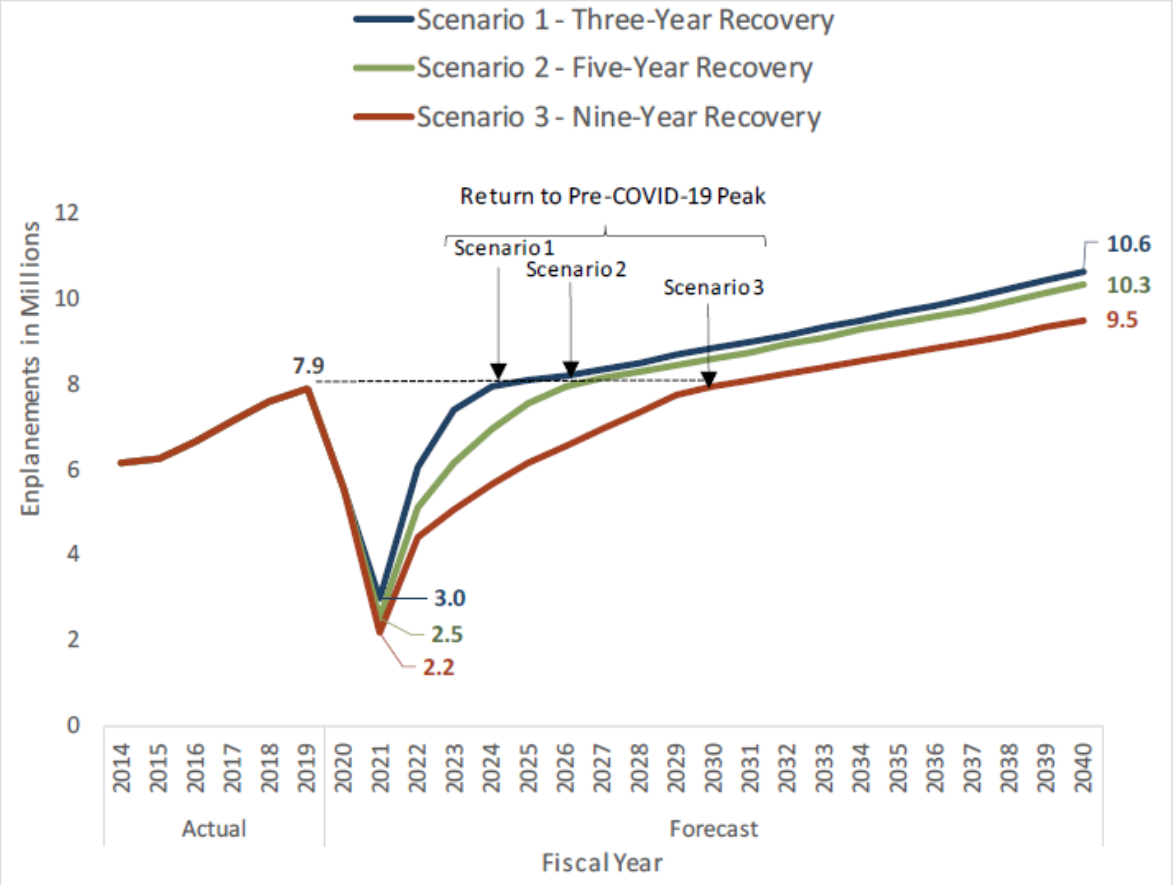
Sources: St. Louis Airport Authority, STL Traffic Reports; Transportation Security Administration (historical screening data), Unison Consulting, Inc., June 2020. (forecasts).

The long-term growth phase begins after traffic returns to pre-COVID-19 levels: in FY2024 under Scenario 1, in FY2026 under Scenario 2, and in FY2030 under Scenario 3.

From this point, the growth in air travel demand—and passenger traffic at STL—would be driven by trends in key determinants of market demand: income and price leading into a multivariate regression model to calculate a long-term forecast rate. The long-term growth has several demand drivers over the multivariate regression model including the following: St Louis Metropolitan area (MSA) real Gross Domestic Product (GDP), U.S unemployment rate, STL real passenger yield, and controls for structural changes

The multivariate time series regression model, along with the long-term projections for the key demand drivers, determines the long-term growth rates in STL enplanements after full recovery from the downturn caused by the COVID-19 pandemic and economic recession. **Figure 8.2-2** shows the long-term forecasts of STL enplanements under these three scenarios.

Figure 8.2-2: Forecast STL Enplanements Under Three Scenarios



Sources: St. Louis Airport Authority (STL airport records); Unison Consulting, Inc.(forecasts), June 2020.

Table 8.2-3 shows the results of the commercial passenger forecast. These results are divided into three recovery scenarios.

Table 8.2-3: Forecast Commercial Passenger Traffic Under Three Scenarios

Scenario 1 – Three-Year Recovery (Airport Sponsor's Best-Case Planning Scenario)

	Historical		Forecast									Compound Annual Growth Rate		
Passenger Carriers	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2019-2030	2030-2040	2019-2040
Enplanements	7,612,463	7,915,216	5,581,055	2,992,928	6,048,202	7,428,144	7,979,645	8,093,867	8,842,483	9,690,406	10,639,736	1.0%	1.9%	1.4%
Cargo (short tons)	12,454	13,492	11,503	8,836	11,842	12,743	13,058	13,245	14,470	15,858	17,325	0.6%	1.8%	1.2%
Seats	9,605,642	9,946,484	9,131,568	4,384,848	8,146,619	9,374,912	9,927,616	9,929,365	10,224,269	11,241,557	12,426,127	0.3%	2.0%	1.1%
Landings	86,561	85,966	83,331	38,563	71,231	80,393	84,118	84,046	86,186	93,354	102,241	0.0%	1.7%	0.8%
Avg. Seats Per Landing	111	116	110	114	114	117	118	118	119	120	122			
Boarding Load Factor	79.2%	79.6%	61.1%	68.3%	74.2%	79.2%	80.4%	81.5%	86.5%	86.2%	85.6%			
Operations*	173,031	171,909	166,639	77,116	142,444	160,763	168,213	168,069	172,349	186,683	204,454	0.0%	1.7%	0.8%
Landed Weight (million lbs.)	8,566	8,794	8,241	3,946	7,333	8,427	8,916	8,920	9,204	10,140	11,275	0.4%	2.1%	1.2%

Scenario 2 – Five-Year Recovery

	Historical		Forecast									Compound Annual Growth Rate		
Passenger Carriers	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2019-2030	2030-2040	2019-2040
Enplanements	7,612,463	7,915,216	5,579,101	2,547,804	5,145,131	6,149,009	6,967,636	7,558,379	8,622,476	9,449,302	10,323,905	0.8%	1.8%	1.3%
Cargo (short tons)	12,454	13,492	11,501	8,377	11,223	11,953	12,483	12,836	13,903	15,236	16,646	0.3%	1.8%	1.0%
Seats	9,605,642	9,946,484	9,296,655	3,929,268	7,365,513	8,217,009	9,160,271	9,778,663	10,385,477	10,998,467	12,014,960	0.4%	1.5%	0.9%
Landings	86,561	85,966	82,878	34,725	64,427	70,455	78,101	83,236	88,121	93,009	101,593	0.2%	1.4%	0.8%
Avg. Seats Per Landing	111	116	112	113	114	117	117	117	118	118	118			
Boarding Load Factor	79.2%	79.6%	60.0%	64.8%	69.9%	74.8%	76.1%	77.3%	83.0%	85.9%	85.9%			
Operations*	173,031	171,909	165,735	69,440	128,837	140,892	156,181	166,450	176,219	185,994	203,160	0.2%	1.4%	0.8%
Landed Weight (million lbs.)	8,566	8,794	8,235	3,495	6,559	7,311	8,153	8,710	9,290	9,930	10,939	0.5%	1.6%	1.0%

Scenario 3 – Nine-Year Recovery

	Historical		Forecast									Compound Annual Growth Rate		
Passenger Carriers	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2019-2030	2030-2040	2019-2040
Enplanements	7,612,463	7,915,216	5,581,162	2,191,950	4,414,203	5,102,591	5,698,994	6,188,762	7,948,580	8,710,784	9,517,032	0.0%	1.8%	0.9%
Cargo (short tons)	12,454	13,492	11,503	8,010	10,717	11,274	11,714	12,049	13,117	14,375	15,705	-0.3%	1.8%	0.7%
Seats	9,605,642	9,946,484	9,297,668	3,380,393	6,554,304	7,305,162	7,876,988	8,410,546	9,975,678	10,369,837	11,320,610	0.0%	1.3%	0.6%
Landings	86,561	85,966	83,290	29,883	57,589	63,755	68,339	72,604	84,627	87,822	95,876	-0.1%	1.3%	0.5%
Avg. Seats Per Landing	111	116	112	113	114	115	115	116	118	118	118			
Boarding Load Factor	79.2%	79.6%	60.0%	64.8%	67.3%	69.8%	72.3%	73.6%	79.7%	84.0%	84.1%			
Operations*	173,031	171,909	166,558	59,759	115,162	127,493	136,659	145,189	169,230	175,621	191,726	-0.1%	1.3%	0.5%
Landed Weight (million lbs.)	8,566	8,794	8,241	3,007	5,839	6,513	7,027	7,505	8,920	9,358	10,303	0.1%	1.5%	0.8%

Source: St. Louis Airport Authority (STL historical data); Unison Consulting, Inc.(forecasts), June 2020.

8.2.3 HIGHLIGHTS OF CARGO FORECAST

After the COVID-19 recovery period, the long-term growth of STL's air cargo tonnage was forecasted using regional freight growth rates from FAF, a freight modeling database and tool developed through a partnership between the U.S Bureau of Transportation Statistics (BTS) and the Federal Highway Administration (FHWA). FAF provides detailed estimates of existing freight movement, including foreign trade and domestic goods, across and within freight regions and states in the United States.

FAF provides high, mid-, and low-range projections, which are applied to the three MP forecasting scenarios, Scenario 1, Scenario 2, and Scenario 3, respectively. For MP planning purposes, the Airport sponsor designates Scenario 1 as the preferred planning scenario for air cargo activity. The strategy is to plan for fast recovery and maintain flexibility to delay planning and implementation of capital projects if actual recovery progresses slower as projected in either Scenario 2 or Scenario 3. **Table 8.2-4** shows the results of the STL cargo forecast.

Table 8.2-4: STL Forecast Air Cargo Tonnage by Scenario, FY2018-FY2040

STL Commercial Air cargo Tons - All Carriers										
	Actual		Forecast					Compund Annual Growth Rate		
Scenario	2018	2019	2020	2021	2025	2030	2040	2019-2040	2020-2040	2021-2040
1	72,810	75,386	82,985	63,743	80,438	86,496	101,570	1.4%	1.0%	2.5%
2	72,810	75,386	82,983	60,439	78,106	82,867	94,403	1.1%	0.6%	2.4%
3	72,810	75,386	82,985	57,788	73,624	79,443	87,081	0.7%	0.2%	2.2%

STL Commercial Air cargo Tons - All Cargo Carriers										
	Actual		Forecast					Compund Annual Growth Rate		
Scenario	2018	2019	2020	2021	2025	2030	2040	2019-2040	2020-2040	2021-2040
1	60,355	61,894	71,482	54,908	67,193	72,026	84,245	1.5%	0.8%	2.3%
2	60,355	61,894	71,482	52,063	65,270	68,964	77,757	1.1%	0.4%	2.1%
3	60,355	61,894	71,482	49,778	61,575	66,326	71,375	0.7%	0.0%	1.9%

STL Commercial Air cargo Tons - Passenger Carriers										
	Actual		Forecast					Compund Annual Growth Rate		
Scenario	2018	2019	2020	2021	2025	2030	2040	2019-2040	2020-2040	2021-2040
1	12,454	13,492	11,503	8,836	13,245	14,470	17,325	1.2%	2.1%	3.6%
2	12,454	13,492	11,501	8,377	12,836	13,903	16,646	1.0%	1.9%	3.7%
3	12,454	13,492	11,503	8,010	12,049	13,117	15,705	0.7%	1.6%	3.6%

Sources: St. Louis Airport Authority, STL Traffic Reports, 2020; U.S. Department of Transportation, Freight Analysis Framework V.4 (FAF4); Unison Consulting, Inc., June 2020.

8.2.4 HIGHLIGHTS OF NONCOMMERCIAL AVIATION FORECAST

Noncommercial aviation activity consists of general aviation (GA) and military operations. **Table 8.2-5** summarizes the forecasts for GA, military and air taxi operations. GA and military operations are expected to stay constant over the forecast period. Air taxi operations are projected grow at the same rates as

commercial aircraft operations, maintaining a constant share of the sum of air carrier and air taxi/commuter operations in the TAF grouping.

Table 8.2-5: Forecast GA, Military and Air Taxi Operations at STL, FY Basis

Noncommercial Aviation

	Historical						Forecast				
GA & Military	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Operations - GA Itinerant	6,713	6,416	6,110	6,110	6,110	6,110	6,416	6,416	6,416	6,416	6,416
Operations - GA Local	160	621	318	318	318	318	621	621	621	621	621
Operations - GA Subtotal	**6,873**	**7,037**	**6,428**	**6,428**	**6,428**	**6,428**	**7,037**	**7,037**	**7,037**	**7,037**	**7,037**
Operations - Military	1,718	1,625	1,779	1,779	1,779	1,779	1,779	1,779	1,779	1,779	1,779
Operations - Noncommercial Total	**8,591**	**8,662**	**8,208**	**8,208**	**8,208**	**8,208**	**8,816**	**8,816**	**8,816**	**8,816**	**8,816**
Based Aircraft	18	18	22	22	22	22	22	22	22	22	22

Air Taxi - Scenario 1

	Historical		Forecast								
Air Taxi	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Operations	10,495	11,643	11,286	5,223	9,647	10,888	11,393	11,383	11,673	12,644	13,847

Air Taxi - Scenario 2

	Historical		Forecast								
Air Taxi	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Operations	10,495	11,643	11,225	4,703	8,726	9,542	10,578	11,273	11,935	12,597	13,760

Air Taxi - Scenario 3

	Historical		Forecast								
Air Taxi	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Operations	10,495	11,643	11,281	4,047	7,800	8,635	9,256	9,833	11,462	11,894	12,985

8.2.5 CRITICAL AIRCRAFT DETERMINATION

The critical aircraft determination is an important aspect of airport planning and design for federally obligated airports. It sets dimensional requirements for an airport, such as the distance between taxiways and runways, and ensures adequate facility development at the airport.

The critical aircraft is defined as "…a single aircraft or a composite of several different aircraft composed of the most demanding characteristics of each". The characteristics include physical aircraft size (wingspan) and approach speed.

Identification of the STL existing "family" of critical aircraft is based on guidance from AC 150/5000-17 *Critical Aircraft and Regular Use Determination* and the 2020 MP fleet mix forecast. The forecasted number of aircraft operations utilized to determine the critical aircraft correspond to the MP Planning Scenario 1. **Table 8.2-6** shows the critical aircraft family forecasted to operate at STL through the planning period.

The previous Master Plan (2012) identified the STL critical aircraft as the Boeing MD-11, an ADG IV aircraft. The current FY2020 critical aircraft is the "family" of Aircraft Group D-IV aircraft, which includes the Boeing 767-300F/300ER and Boeing 757-300 passenger aircraft. This critical aircraft family is anticipated to remain unchanged through the planning horizon (FY2040), although STL is expected to have some regular service by an Airbus A330-300 starting in summer 2022.

Table 8.2-6: Most Demanding Aircraft Through 2040

	AIRCRAFT OPERATIONS				
CRITICAL AIRCRAFT FAMILY	**AIRCRAFT GROUP**	**FY 2019 ACTUAL**	**FY 2020 ESTIMATED***	**FY 2030 FORECAST**	**FY 2040 FORECAST**
Boeing 767-300F/300ER and Boeing 757-300	D-IV	890	866	1,404	1,463

Source: Unison Consulting
*Note: Projected FY2020 estimated number of operations were understated compared to actual FY2020 operations (3,038). The forecast was developed at the onset of COVID 19 and growth in air cargo throughout the country was not fully known at the time of forecast approval.

8.3 FACILITY REQUIREMENTS HIGHLIGHTS

A forecast of aviation demand can inform an analysis of physical needs for an airport. The analysis where physical needs are determined based on forecasted activity levels is referred to as facility requirements.

This section reflects the Airport's ability to accommodate the projected activity levels determined by the aviation forecast based on its existing condition. The required facilities can be identified through comparing the existing capacity at the Airport facilities to the forecasted need for additional capacity.

The Facility Requirements for the STL MP discusses the following major categories: Airfield Capacity, Runway Length Determination, Runway Exits, Taxiways, Airfield Design Standards, Lighting and Navigational Aids, Aircraft Deicing, and Airspace.

The following sub-sections present the most important findings of this effort that influence the update of the ALP.

8.3.1 AIRFIELD CAPACITY HIGHLIGHTS

Airport Cooperative Research Program's (ACRP) Airfield Capacity Spreadsheet Model was used to determine the high-level estimate of STL's airfield capacity to support the MP. Guidance and procedures were taken from ACRP Report 79 Appendix A: Prototype Airfield Capacity Spreadsheet Model User's Guide

For the purposes of this estimate, only the three parallel runways at the Airport were evaluated. Even though it is an important airfield component, the crosswind runway was not considered, given its low use during high-capacity operations.

ANNUAL SERVICE VOLUME

Annual Service Volume (ASV) is the estimate of the annual capacity of operations at an airport. It considers the hourly capacity calculated in the full MP report along with factors to adjust for the peak hours and peak days. Based on these inputs, STL's ASV was calculated to be 500,900 operations. Compared to the demand forecasts, the annual demand in 2019 was at 39 percent of ASV.

FAA guidance is to begin planning for capacity improvements when an airport reaches 60 percent of ASV. Compared to the ASV, STL's forecast annual operations through 2040 will never even exceed 50 percent of ASV, as summarized in **Table 8.3-1**

Note that if the hourly capacities of each runway use configuration were adjusted to be 50/50 arrival/departure split, the resulting ASV would be reduced to 471,100. Still, the 2040 demand forecast is just 49 percent of this lower balanced capacity ASV, again indicating that the airfield can accommodate traffic demand well beyond 2040.

Table 8.3-1: Annual Service Volume vs. Annual Demand

YEAR	ANNUAL AIRCRAFT OPERATIONS	ANNUAL SERVICE VOLUME	PERCENT OF ANNUAL SERVICE VOLUME
2019	195,242	500,900	39%
2025	191,824	500,900	38%
2030	196,394	500,900	39%
2040	230,118	500,900	46%

Sources: Unison, St. Louis Lambert International Airport (STL)Layout Plan Update, Aviation Activity Analysis and Forecasts, August 2, 2020; TransSolutions, STL Capacity Estimation Memo, September 14, 2020.

SUMMARY OF FINDINGS

The ACRP *Airfield Capacity Spreadsheet Model* was used to calculate hourly capacities for STL's four runway use configurations. These hourly capacities were then used to estimate STL's Annual Service Volume (ASV), at 500,900 aircraft operations. Comparing the 20-year MP forecasts to the ASV, the airport is expected to have adequate airfield capacity to meet the traffic demand throughout the planning horizon.

8.3.2 RUNWAY LENGTH

RUNWAY LENGTH ANALYSIS METHODOLOGY

A runway length analysis was performed to understand the adequacy of the runways and their respective lengths at STL, to accommodate the existing and projected aircraft fleet. As part of this analysis, takeoff and landing requirements were calculated according to the FAA Advisory Circular (AC) 150/5325-4B, *Runway Length Requirements for Airport Design*. These guidelines establish the process and considerations to assess existing runways and determine adequate runway length recommendations at a planning level. It should be noted that the results of these calculations can differ from more detailed analysis performed by aircraft operators.

AIRCRAFT FLEET MIX

Runway length requirements are determined for specific aircraft types, referred to as the fleet mix. The 15 most common and most critical aircraft types operating at STL were determined through the following: historical aircraft operations data for the calendar years 2016 through 2019, known aircraft orders by the predominant air carriers operating at STL, and projected aircraft fleet mix to operate at STL during the 20-year planning horizon, including destinations. The resulting fleet mix was used to determine the takeoff and landing length requirements at STL, recognizing airlines are continually evaluating specific aircraft utilization on routes.

SUMMARY OF FINDINGS

Using the methodology prescribed by FAA AC 150/5325-4B to determine the runway length requirements at STL, the following findings were determined:

- The existing airfield provides adequate runway length (11,020 feet) to accommodate nearly unrestricted departure operations by all aircraft types regularly operating at STL today and are projected to do so in the future.
- A sizable portion of the fleet mix at STL (approximately 46 percent of operations during the period of 2016 to 2019) may require more runway length for departure than is available on any parallel runway, thereby requiring the use of Runway 12R-30L.
- The existing length of all three parallel runways at STL is adequate to accommodate landing runway length requirements by all aircraft types in the fleet mix.
- Based on the benchmarking analysis presented herein, a runway length of 11,000 feet is justifiable and standard amongst metropolitan areas with a population similar to that of St. Louis. The average maximum runway length of the 20 peer metropolitan areas is 11,204 feet.

8.3.3 AIRFIELD DESIGN STANDARDS

The critical aircraft dictates the FAA standards and requirements for a runway in terms of width, length, safety areas, pavement density, etc. To determine the existing critical aircraft, independent analysis was performed for each of the four runways at STL. This analysis examined each runway's historical operational data from 2016 to 2019 to determine the most demanding aircraft type(s) that meet the threshold of "regular use" (500 annual operations).

- **Runway 12R-30L and 12L-30R -** Upon review of historical operations data and coordination with STL ATCT personnel, it was determined that the fleets operating on both Runways 12R-30L and 12L-30R are similar and can therefore be analyzed as a single runway system in terms of critical aircraft. This approach is further supported by the physical configuration of the two runways and their supporting taxiway system.
- **Runways 11-29 and 6-24 -** The same methodology was used to determine the critical aircraft of runways 11-29 and 6-24. The operations occurring during 2019 for each of the most demanding aircraft types that utilized both were analyzed.

Table 8.3-2 summarizes the critical aircraft designations for each runway at STL.

Table 8.3-2: Critical Aircraft Summary

RUNWAY	CRITICAL AIRCRAFT	AIRCRAFT APPROACH CATEGORY	AIRPLANE DESIGN GROUP
12L-30R / 12R-30L	B763	D	IV
11-29	B738	D	III
6-24	B737	C	III

Source: St. Louis Airport Authority, *L3 Harris Operations Data,* 2019 (aircraft operations); CMT, September 2020 (analysis).

COMPLIANCE WITH DESIGN STANDARDS

Ideally, all runways and taxiways are designed and constructed in accordance with FAA guidelines and requirements at the time of construction. These guidelines will stipulate basic geometric requirements that enable a runway or runway system to accommodate traffic by a certain type or size of aircraft and will assist in identifying any airfield constraints that require modification. The full MP report details the runway compliance constraints at STL based on FAA AC 150/5300-13A, *Airfield Design*, and AC 150/5000-17, *Critical Aircraft and Regular Use Determination*.

The complete ALP Narrative Report analyzes each criterion in FAA AC 150/5300-13A, *Airfield Design*, and AC 150/5000-17, *Critical Aircraft and Regular Use Determination*. Overall, several deficiencies were identified through the analysis process. Each deficiency is addressed in the Alternatives section of the ALP Narrative Report. The next section of this summary ALP Narrative Report will provide a summary of the alternatives presented in the full report.

8.4 AIRFIELD ALTERNATIVES HIGHLIGHTS

This section presents the highlights of the Alternatives Development chapter included in the Full ALP Narrative Report. The airfield alternatives process identified and evaluated scenarios and concepts (known as alternatives) needed to accommodate the facility requirements presented in the preceding chapter. As an essential component in the planning process, the alternatives section evaluates alternatives STL could develop to meet the needs of the airport users, satisfy future demand, and conform to FAA design criteria.

8.4.1 USE OF DRAFT AC 150/5300-13B

In July 2020, the FAA released DRAFT Advisory Circular (AC) 150/5300-13B, Airport Design, for industry review and comment. Within this document, there is a marked difference in geometric and dimensional standards for pavements, protection surfaces, and safety areas, in comparison with its previous version 13A. The timing of DRAFT AC 150/5300-13B offers the unique opportunity to assess airfield alternative layouts as part of the MP, in order to: 1) provide maximum benefit in terms of space use and, 2) ensure that the final deliverables are representative of the most recent criteria upon completion of the planning efforts. For this reason, standards set forth in FAA Draft AC 150/5300-13B, *Airport Design*, were applied to airfield design alternatives.

8.4.2 ALTERNATIVE AND PREFERRED ALTERNATIVE PROCESS

The Facility Requirements chapter discussed geometric issues associated with various taxiways. Some of the most common geometric issues that were addressed in the alternatives design process were: non-standard angle intersections between taxiways and runways, direct access to runways, and high-energy zone crossings. As such, individual alternatives were identified and analyzed for each individual taxiway.

Based on the different alternatives developed for each individual taxiway connector, the alternatives with the highest scores after a quantitative evaluation were utilized to design six holistic taxiway geometry alternatives. These six concepts incorporate a blend of the most desired attributes from each individual taxiway alternative.

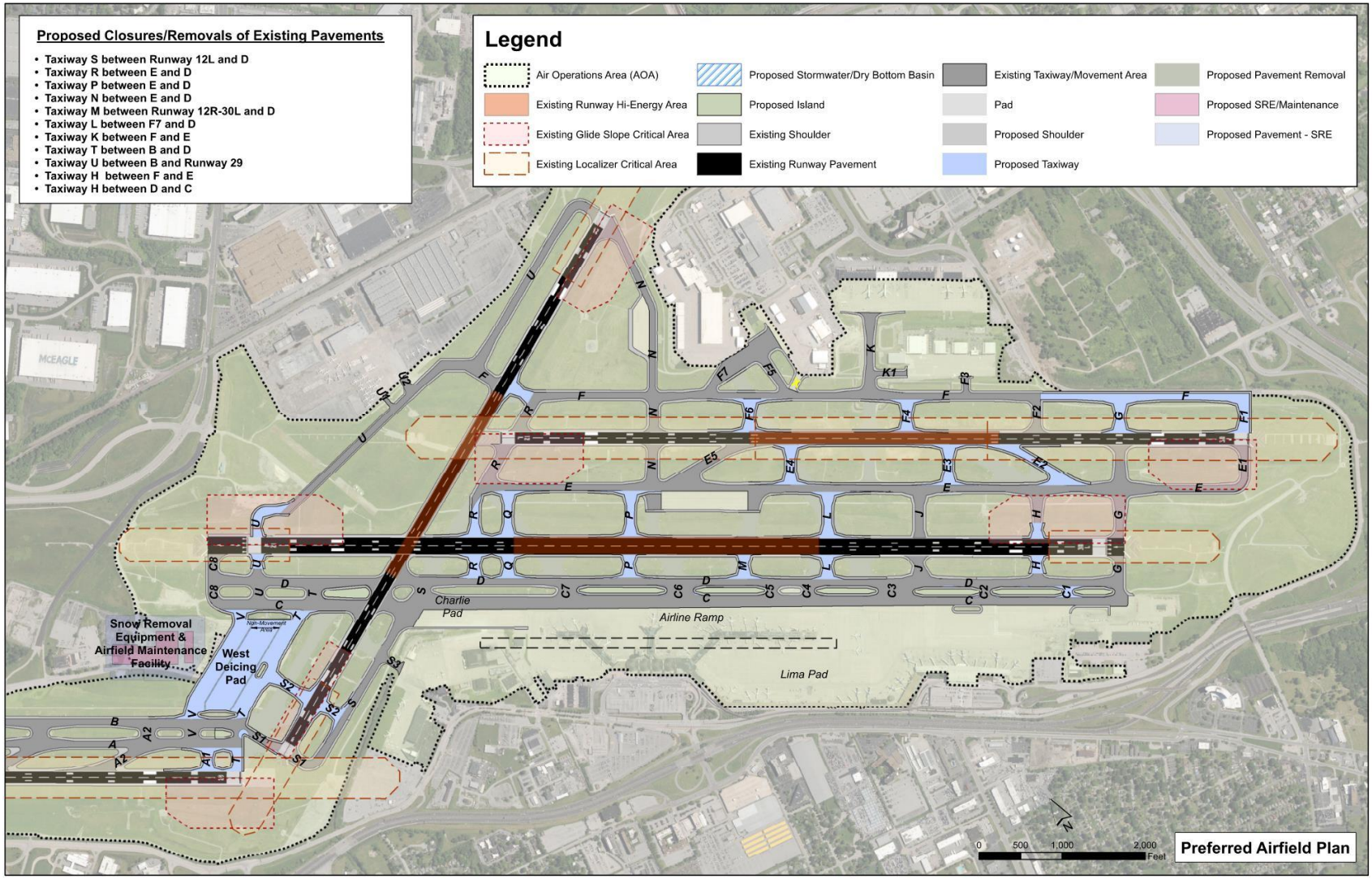
The objective of these concepts is to achieve a more effective airfield flow that complies with taxiway geometry standards and increases safety during taxing operations. The six holistic alternatives also considered input on preferred modifications received from St. Louis Lambert Airport Authority (STLAA) leadership, applicable stakeholders, and FAA partners.

Following the creation of the six holistic alternatives, further input via the Airport staff, Airport stakeholders, FAA partners, pilot community, and members of the consultancy team was evaluated to narrow the six airfield alternatives down to two consolidated composite airfield alternatives. This step allowed for comments and a rating of each alternative to find a consensus on the most effective and reasonable alternative. A survey was designed for evaluation of the final airfield concepts. The two composite alternatives seek to blend the development concepts which received the most support through the survey process and during overall engagement activities with stakeholders.

Several meetings were held with a wide range of stakeholders who have interest on the STL airfield. Overall, consensus was reached that the preferred airfield plan allows the overall ALP study effort to move forward in such a way that it brings the airfield up to standards and protects for growth throughout the planning period. The final alternative brings the airfield up to design standards, protects for long-term flexibility to accommodate future aircraft operations, and addresses the need for consolidated remote deicing facilities as part of the airports long-term vision. Ultimately, the final preferred alternative was a consolidation of several elements from the two composite alternatives presented during the Comparative Safety Assessment (CSA) engagement including consensus reached through discussions while conducting the CSA.

The preferred airfield alternative can be found below as **Figure 8.4-1**. The final designation of the Taxiways in this figure are subject to future design and AC criteria.

Figure 8.4-1: STL Airfield Preferred Alternative



Source: CMT, 2021

8.5 ALP SET INFORMATION

8.5.1 APPLICABLE ALP DESIGN INFORMATION

The following section summarizes the standards utilized to design the overall STL MP. This data informs the ALP data tables and future changes based on what the previous sections have identified as requirements for the airport. The ARP SOP 2.00 checklist for this ALP set can be found in Appendix 8A.

ALP DESIGN INFORMATION

Table 8.5-1 summarizes runway design information that was utilized to design the STL airfield in preparation for this MP. Regarding the taxiway system at STL, all taxiways are TDG 5 with the exception of Taxiway V2, which is TDG 3. However, V2 is designated to become TDG 5 in the future.

Table 8.5-1: STL ALP Runway Design Information

Runway End	Design RRC	Runway End/DT Elev.(s)	Ceiling and Visibility Minimums	Approach Category	RSA (Length) (Width)	ROFA (Length) (Width)	RPZ (Approach) (Departure)
12R	D - IV	541.2' (End) 539.6'' (DT)	(200-1/2)	PIR - CAT I	1000’ 500’	1,000’ 800’	2,500’ x 1,000’ x 1,750’ 1,700’ x 500’ x 1,010’
30L	D - IV	585.3' (End) 582.3' (DT)	(200-1/2)	PIR - CAT I	1,000' 500'	1,000' 800'	2,500' x 1,000' x 1,750' 1,700' x 500' x 1,010'
12L	D - IV	527.7'	(200-1/2)	PIR - CAT II/IIIC	1,000' 500'	1,000' 800'	2,500' x 1,000' x 1,750' 1,700' x 500' x 1,010'
30R	D - IV	604.3'	(200-1/2)	PIR - CAT II/IIIC	1,000' 500'	1,000' 800'	2,500' x 1,000' x 1,750' 1,700' x 500' x 1,010'
11	D - IV	616.8'	(200-1/2)	PIR - CAT II/IIIC	1,000' 500'	1,000' 800'	2,500' x 1,000' x 1,750' 1,700' x 500' x 1,010'
29	D - IV	555.2	(200-1/2)	PIR - CAT I	1,000' 500'	1,000' 800'	2,500' x 1,000' x 1,750' 1,700' x 500' x 1,010'
6	D - IV	550.6'	(200-1/2)	PIR - CAT I	1,000' 500'	1,000' 800'	2,500' x 1,000' x 1,750' 1,700' x 500' x 1,010'
24	D - IV	533.3	(200-3/4)	PIR - CAT I	1,000' 500'	1,000' 800'	1,700' x 1,000' x 1,510' 1,700' x 500' x 1,010'

Source: CMT, 2021

ALP SHEET DESCRIPTIONS

Table 8.5-2 presents a list of all the ALP sheets included in the STL Master Plan.

Table 8.5-2: ALP Sheet Definitions

ALP Sheet Number & Name	Description	Number of Sheets
1. Title Sheet	Title Block, location map, vicinity map, and sheet index	1
2. Existing Airport Layout Drawing	Existing airport layout and facilities	1
3. Future Airport Layout Drawing	Future airport layout and facilities	1
4. Airport Data Sheet	Existing airfield data and future data	1
5-6. Terminal Area Drawing Set	Site plan of Airport terminal and facilities	2 (1 main terminal, 1 north cargo)
7-10. Airport Airspace Drawing Set & Obstruction Tables	Imaginary Runway Airspace surfaces including Part 77, Approach, and Departure surfaces	4 (1 overall view, 1 east, 1 west, and Obstruction Tables)
11-29. Inner Approach Drawing Set	Imaginary portion of the approach surface immediately preceding the threshold viewed in plan and profile view.	19 (multiple sheets for each runway end)
30-38. Part 77 Approach Set	Imaginary Surface past the inner approach viewed in both plan and profile view.	9 (1 overall Part 77 sheet, 1 sheet per runway, 2 sheets for runway end 12L)
39-56. Obstruction Table Set	List of objects within the imaginary surface area deemed as obstructions for aircraft flight paths.	18 (multiple sheets per runway obstruction tables)
57. Runway Centerline Profiles (Existing/Future)	Profile view of runway elevations.	1
58. Land Use Drawing	Land Use map of airport.	1
59. Airport Property Map	Map of land owned by the airport.	1

Source: CMT, 2021