

Appendix H



Forecasts

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Appendix H Forecasts

A forecast of aviation activity was prepared for the purpose of developing noise exposure contours for projected future conditions for this Part 150 Noise Compatibility Study (Part 150 Study). The forecast was based upon the *Master Plan Aviation Activity Forecast, Duluth International Airport*. This forecast projected activity levels through 2038 and was submitted to the Federal Aviation Administration (FAA) for approval. The FAA approved this forecast in a letter dated June 8th, 2021. A copy of this approval letter is included at the conclusion of this appendix. This forecast was used to develop input data representative of future conditions, which was used to prepare the noise exposure contours for the Future (2026) Baseline condition.

This chapter analyzes current and future airport activity at the Duluth International Airport (DLH of Airport). Forecasting provides an airport with a general idea of the magnitude of growth, as well as fluctuations in activity anticipated over a 20-year forecast period. They assist the Airport in determining existing and planned future facility needs based on airport activity level estimates and projections. Forecasts attempt to develop a realistic estimate of future changes. When conditions dramatically change, forecasts should be reviewed and updated.

The forecasts developed for the Airport will be important to adequately plan, size, and sequence development of future facilities to meet future projected growth. Development at airports, however, is demand-based from actual numbers rather than forecasts.

To thoroughly analyze and develop a probable aviation forecast, a technical review has been completed using several methods to help quantify the potential aviation activity over the next 20 years. The forecasts for this Airport Master Plan study were prepared by Landrum & Brown.

This appendix was prepared to provide overview of the forecast development of Future (2026) aviation characteristics and operating levels based upon the Airport Master Plan Forecast, to support the requirements of the Part 150 planning process for DLH. The year 2018 was used as the base year for forecast purposes. The key benchmark year for the forecast is 2026, which corresponds to the 5-year projection from the Existing (2020) Baseline condition, per Part 150 guidelines.

The aviation forecasts are presented for the following types of activity at DLH:

- Commercial Passenger
- Air Cargo
- Air Taxi
- General Aviation
- Military

Section H.6, Forecast Summary, contains the Future (2026) Baseline condition operating levels for each activity type, based on the technical review of the Master Plan Aviation Activity Forecast.

H.1 Commercial Passenger

This section provides a summary of historical passenger enplanements at DLH, an overview of current domestic and international air service offered at DLH, passenger and operation forecasts and passenger aircraft fleet mix.

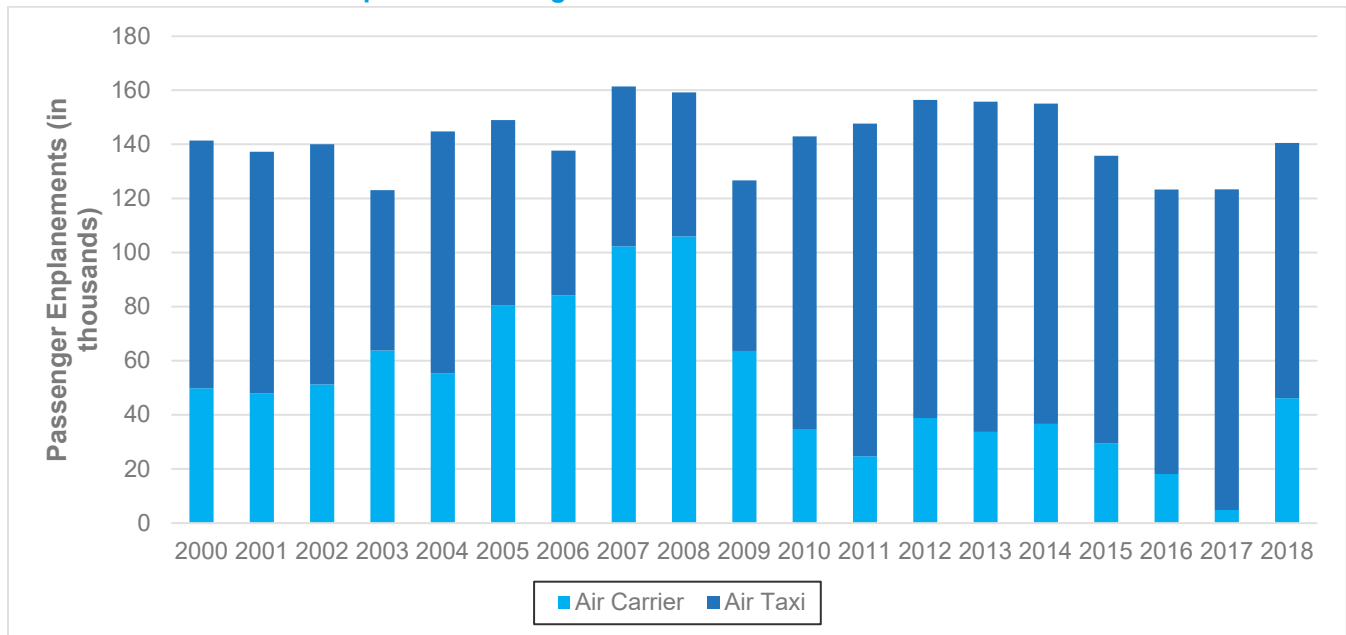
The purpose of reviewing historical enplanements and air service trends is to start building a context for the forecast. Historical data can answer questions such as who are the major airline operators from DLH and what markets are served from DLH? The past is not always a good predictor of the future; however, an analysis of historical data provides the opportunity to understand those factors which have caused traffic to increase or decrease and how those factors may change in the future, thus influencing the forecast. While the socioeconomic base is one of the fundamental underpinnings of the forecast, demand cannot be realized without air service at a price that induces demand. Ultimately, understanding the historical relationships between the economy and aviation activity at DLH will form the building blocks of the forecast. The projected aircraft fleet mix will be used in the development of the Future (2026) noise exposure contours in the Part 150 study.

H.1.1 Historical Enplanement Overview

From a historical basis, DLH has always been a market dominated by Northwest, now Delta Air Lines. For many years, Northwest was the only commercial airline, offering non-stop service to MSP (and for a time, Detroit (DTW)).

When Northwest Airlines (now Delta) closed the maintenance base in 2006, this was the beginning of a time period when Northwest/Delta significantly reduced DLH seat capacity. At about the same time, lower cost alternative ground transportation in the form of shuttles started operating between DLH and MSP. This began a long period where DLH experienced worsening “leakage” trends. **Exhibit H-1, Historical Enplaned Passengers**, illustrates the trends between Air Carrier and Air Taxi enplaned passengers.

Exhibit H-1 Historical Enplaned Passengers



Source: FAA Terminal Area Forecast, FAA Aerospace Forecasts; 2018 source for DLH: Airport Records

H.1.2 Historical Air Service Trends

In order to provide a historical context for the forecast of aircraft operations the latest Terminal Area Forecast (TAF) was analyzed to determine historical trends in air traffic activity at the Airport. The primary factors affecting these trends, were also documented.

Table H-1, Historical Commercial Service Operations and Enplaned Passengers, below presents the most current DLH TAF, illustrating historical enplaned passenger trends at the Airport between CY 2000 and CY 2017. For 2018, DLH Airport results were used. It also presents enplaned passenger activity for overall U.S. domestic activity on a federal fiscal year basis (years ending September 30) for 2000 through 2017 and presents the Airport’s share of overall U.S. activity.

Table H-1 Historical Commercial Service operations and Enplaned Passengers Trends

Fiscal Year	Air Carrier	Air Taxi & Commuter	Enplaned Passengers	% Change	Federal Fiscal Year	U.S. Domestic Enplaned Passengers	% Change	Airport Share of U.S. Domestic
2000	49,832	91,581	141,413	-	2000	641,200	-	0.022%
2001	47,849	89,404	137,253	(2.9%)	2001	625,000	(2.5%)	0.022%
2002	51,249	88,782	140,031	2.0%	2002	626,800	0.3%	0.022%
2003	63,750	59,311	123,061	(12.1%)	2003	574,500	(8.3%)	0.021%
2004	55,387	89,354	144,741	17.6%	2004	628,500	9.1%	0.023%
2005	80,531	68,442	148,973	2.9%	2005	669,500	6.5%	0.022%
2006	84,210	53,448	137,658	(7.6%)	2006	668,400	(0.2%)	0.021%
2007	102,286	59,100	161,386	17.2%	2007	690,100	3.2%	0.023%
2008	105,931	53,248	159,179	(1.4%)	2008	680,700	(1.4%)	0.023%
2009	63,588	63,086	126,674	(20.4%)	2009	630,800	(7.3%)	0.020%
2010	34,709	108,210	142,919	12.8%	2010	635,200	0.7%	0.022%
2011	24,648	122,987	147,635	3.3%	2011	650,100	2.3%	0.023%
2012	38,828	117,616	156,444	6.0%	2012	653,800	0.6%	0.024%
2013	33,651	122,087	155,738	(0.5%)	2013	654,300	0.1%	0.024%
2014	36,638	118,394	155,032	(0.5%)	2014	669,000	2.2%	0.023%
2015	29,333	106,439	135,772	(12.4%)	2015	696,000	4.0%	0.020%
2016	18,120	105,195	123,315	(9.2%)	2016	726,000	4.3%	0.017%
2017	4,811	118,552	123,363	0.0%	2017	744,000	2.48%	0.017%
2018	46,177	94,308	140,485	12.1%	2018E	781,000	4.97%	0.018%
CAGR ¹					CAGR ¹			
2000-18			(0.04%)		2000-18	1.10%		
2000-02			(0.49%)		2000-02	(1.13%)		
2002-08			2.16%		2002-08	1.38%		
2008-10			(5.25%)		2008-10	(3.40%)		
2010-15			(1.02%)		2010-15	1.85%		
2015-18			1.14%		2015-18	3.92%		

¹CAGR = Compounded annual growth rate

Source: FAA Terminal Area Forecast, FAA Aerospace Forecasts; 2018 source for DLH: Airport records

DLH passenger traffic has been relatively stable-to-flat over the past nearly twenty years, despite economic trends. This is indicative of capacity reductions over time, mostly from regionally dominant Delta Air Lines, which resulted in greater DLH demand “leaking” to MSP. Some specific time periods with relatively larger traffic changes:

- **2002-2008.** Traffic increased at a Compounded Annual Growth Rate (CAGR) of 2.16% during this time period. During this time period, Delta Air Lines added significant capacity into the market, almost doubling daily departure frequencies from 5 in 2002 to as high as 9.3 in 2004. Delta’s seat capacity almost doubled during this same time period. In addition, Allegiant entered the market in 2006 which also contributed to traffic growth.
- **2008-2010.** During the deep U.S. economic recession, DLH, like most markets across the country, experienced reductions in air service, resulting in a 5.25% CAGR traffic decline during this time period. Most of these declines were driven by Delta pullbacks. Delta pullbacks were largely due to relatively low DLH load factors, which were typically in the 50% range. To some degree, United Airlines offset these declines, by adding DLH-ORD service in late 2009, and continued growth by Allegiant Airlines, with service to Las Vegas, Phoenix-Mesa and seasonal service to Orlando.
- **2010-2018.** Delta continued to steadily reduce service at DLH during this time period, with seat capacity being reduced by approximately 40%. This was driven by the Northwest Airlines-Delta Air Lines merger integration and continued sub-par Delta load factors at DLH. Somewhat offsetting Delta’s declines was the steady growth of United Airlines, who increased enplaned passenger volume from approximately 21,000 in 2010 to almost 58,000 in 2018. Finally, Allegiant Airlines exited DLH in early 2015. Allegiant’s traffic peaked at about 36,000 enplanements in 2012.

DLH’s air traffic trends since 2000 have largely been a function of Delta steadily reducing service, with other airlines, mostly United and for a time period, Allegiant, offsetting some of those declines.

The effect of these capacity declines, in conjunction with moderately higher economic growth from the region has been sharply high load factors and airline profitability, as was noted earlier.

As of year-end 2018, carrier load factors were averaging close to 80%, as compared to load factors in the 50%-60% range in the 2000s. Specifically, Delta generated an 85% load factor for CY 2018 and was even above 80% during the seasonally slower first quarter.

To summarize DLH’s current air service situation, DLH is currently positioned better than likely anytime over the past 25+ years. This is due to: 1) Load factor increases from the 50s earlier this decade to the 80s currently. In other words, planes are full. Once load factors begin ranging from 85%-90%, carriers look at adding more capacity; 2) Mileage-adjusted RASMs are well above system averages – indicative of relative profitability and 3) Finally, there is more demand than is currently flying out of DLH, due to significant leakage to MSP.

H.1.3 Passenger Enplanement Forecast

The upcoming section forecasts DLH enplaned passenger activity for the 5, 10 and 20-year time periods. The forecast will consist of two primary steps: a short-term review and a long-term forecast as is described in the sections below. Subsequent to this, a forecast pertaining to Passenger Aircraft Operations, including by aircraft type will take place.

H.1.3.1 2018 Actual and 2019 Estimate

The Airport reported that enplaned passengers for CY 2018 were 140,485, which represented a 12.1% increase versus 2017. It was also 8.7% higher than the latest FAA TAF estimate of 129,282.

Through October 2019, DLH enplaned passenger volume was up 11.6% year-to-date, with the vast majority of the growth taking place since May (AA started new service in late May).

With seat capacity growing 32.7% in November and 47.9% in December year/year, it is estimated that for the full year 2019 that DLH enplaned passengers will increase to 158,471, which represents 14.7% year/year growth and 28.3% growth versus 2017.

This baseline forecast could be quite conservative, as most of DLH's added capacity took place during the 2nd half of 2019, particularly during the 4th Quarter. Hence, using currently published 2020 DLH airline schedules, if DLH generated a 75% load factor for 2020, this would result in over 178,000 enplaned passengers at DLH for 2020.

H.1.3.2 Long-term Forecast Review

The long-term forecast at Duluth will be done for 5, 10 and 20-year time periods, using 2018 estimates as the baseline. The enplaned passenger forecast below, will be done using a variety of forecast methodologies: 1) Historical Trends, 2) FAA Forecasts, 3) DLH market shares of industry projections and 4) Regression analysis of the Air Service Area's economic metrics.

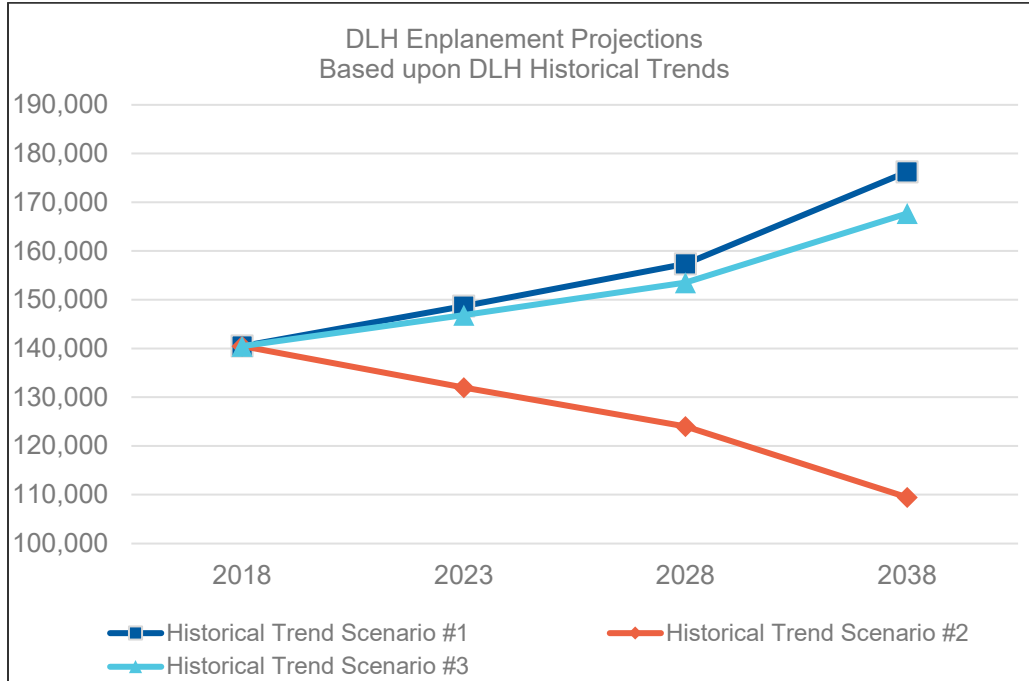
Historical Trend Analysis

Three historical trends have been considered for future projections:

1. **Short-term trend:** The first historical trend emulates the past five years (2013-2018) at DLH, using 2019 enplaned passengers as the baseline. This five year period was a time-period when the area saw moderate economic growth and increased United seat capacity in 2018. The CAGR in enplaned passenger traffic during this five-year time period was 1.14%. This is **Historical Trend Scenario #1**.
2. **10-Year trend:** The second trend uses data from the ten-year period of 2008-2018, reflecting a CAGR of (-1.24%). This time period incorporated the significant recession and subsequent economic climb back. This projection will serve as the basis for **Historical Trend Scenario #2**.
3. **20-Year trend:** The third historical trend uses a 15-year period of historical data (2003-2018) and reflects a CAGR of 0.89%. This projection will be the basis for **Historical Trend Scenario #3**.

Exhibit H-2, DLH Enplanement Projections (Historical), illustrates the results of applying these trends to 2019 estimate of 158,471 passenger enplanements.

Exhibit H-2 DLH Enplanement Projections (Historical)



Source: Landrum & Brown analysis, 2021.

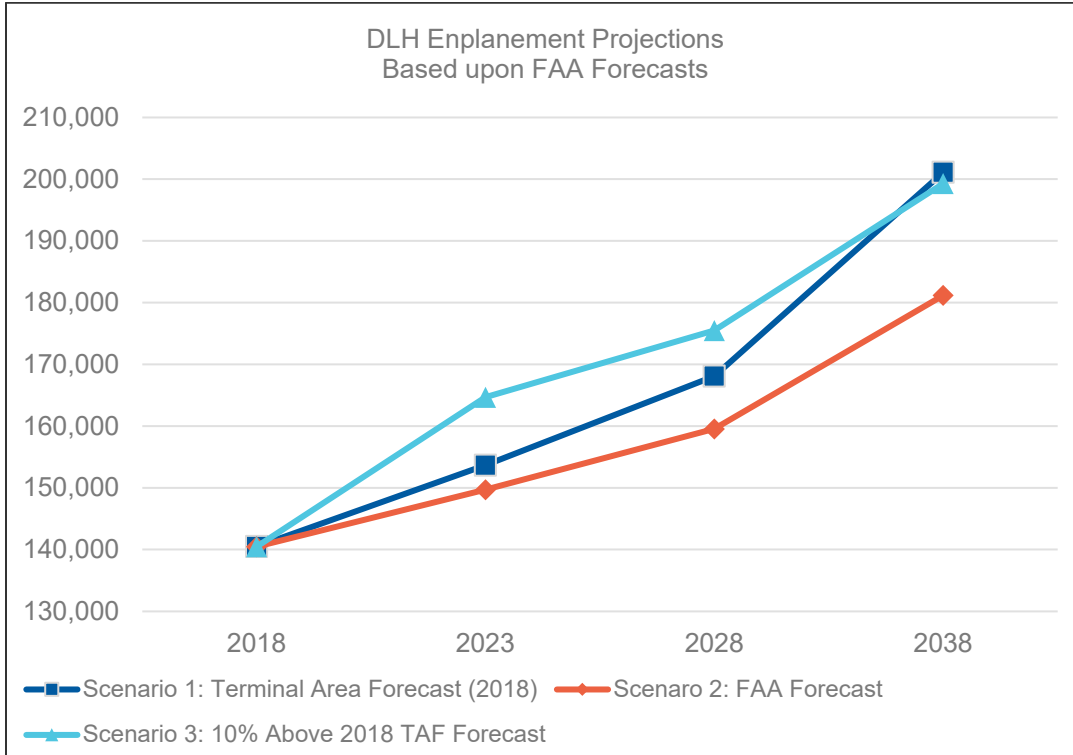
FAA Forecast Sources and Scenarios

The FAA presents aviation activity forecasts in several different sources, including the following two sources to be utilized in this forecast analysis:

- **FAA Aerospace Forecasts** - This document provides growth projections for the entire aviation industry in fiscal years, as described earlier. In this document, the FAA predicts that annual total enplanements for U.S. domestic air carriers will increase at a CAGR of approximately of 1.81% annually between 2018 and 2038. This growth rate, applied to the 2019 baseline DLH enplanements, will serve as the basis for **FAA Forecast Scenario #1**.
- **2017 FAA Terminal Area Forecast (TAF)** - The TAF utilizes national growth trends, coupled with historical local growth trends, to develop airport-specific activity forecasts on a fiscal year basis (October-September). The most recent TAF enplanement projections include a compound growth rate of approximately 1.28% annually for DLH between 2018 and 2038. This will serve as the basis for **FAA Forecast Scenario #2** (using baseline enplaned passengers of 158,471 for 2019).

Exhibit C-3, DLH Enplanement Projections (FAA Forecast), illustrates the results of applying these scenarios based upon FAA Forecast documentation to the baseline 2019 estimate of 158,471 enplanements. The figure also depicts **FAA Forecast Scenario #3**, an enplanement level at 10% above the TAF of the forecast period, typically viewed by the FAA as the level of variation from the TAF that is deemed acceptable before additional justification is required to support higher forecasted activity levels.

Exhibit H-3 DLH Enplanement Projections (FAA Forecast)



Source: Landrum & Brown analysis, 2021.

Market Share Analysis

Market share analysis for airports can provide a valid benchmark from which to assess future activity. This approach compares activity at a specific airport with a larger aviation market, such as total U.S. domestic enplanements, to develop a ratio of activity.

Applied to historical national enplanements as reported in the FAA Terminal Area Forecast (TAF), DLH’s annual market share between 2000 and 2017 ranged between a low of 0.0166% of national enplanements in 2017 to a high of 0.0239% of national enplanements in 2012. In 2018, based upon Airport actuals, DLH’s % of national enplanements was .018%. **Table H-2, Historical Market Share**, below illustrates DLH’s historical market share of national enplanements between 2000 and 2018.

Table H-2 Historical Market Share

Fiscal Year	Enplaned Passengers	U.S. Domestic Enplaned Passengers (000s)	Airport Share of U.S. Domestic
2000	141,413	641,200	0.0221%
2001	137,253	625,000	0.0220%
2002	140,031	626,800	0.0223%
2003	123,061	574,500	0.0214%
2004	144,741	628,500	0.0230%
2005	148,973	669,500	0.0223%
2006	137,658	668,400	0.0206%
2007	161,386	690,100	0.0234%
2008	159,179	680,700	0.0234%
2009	126,674	630,800	0.0201%
2010	142,919	635,200	0.0225%
2011	147,635	650,100	0.0227%
2012	156,444	653,800	0.0239%
2013	155,738	654,300	0.0238%
2014	155,032	669,000	0.0232%
2015	135,772	696,000	0.0195%
2016	123,315	726,000	0.0170%
2017	123,363	744,000	0.0166%
2018	140,485	781,000	0.0180%

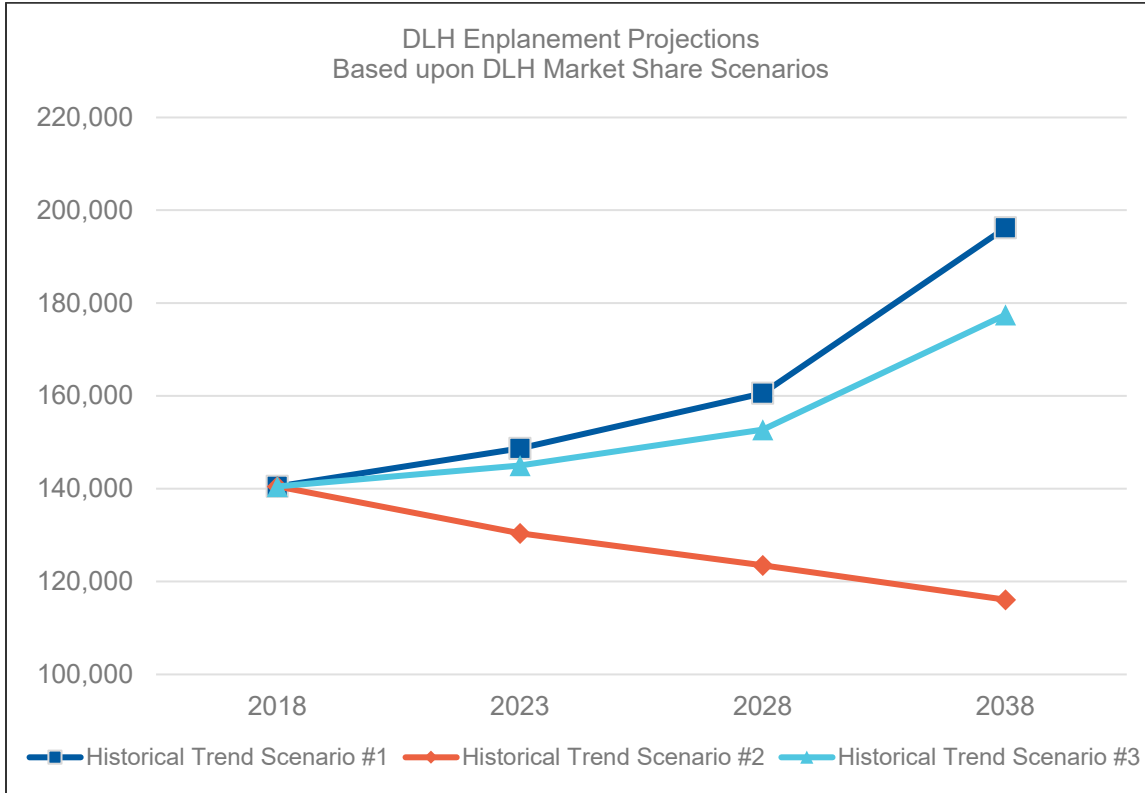
Source: FAA Terminal Area Forecast, DLH Airport Authority (2018 only for DLH).

Projections of future enplanement activity based upon market share analysis were conducted using the following scenarios:

1. Constant Market Share: DLH market share will remain constant at 2018 level of 0.0180% of national enplanements through 2038 (using FAA’s TAF Forecast of national enplaned passengers). This projection will serve as the basis for **Market Share Scenario #1**.
2. Market Share Change I: DLH market share will change at the CAGR experienced between 2008-2018 (CAGR of -2.59%) through 2038, starting with the 2018 share of 0.018% and then declining at the -2.59% rate. This projection will serve as the basis for **Market Share Scenario #2**.
3. Market Share Change II: DLH market share will change at the CAGR experienced between 2009-2015 (CAGR of -0.5%) through 2038, starting with the 2018 share of 0.018% and then decline at the 0.5% rate. This projection will serve as the basis for **Market Share Scenario #3**.

These enplanement projections are also presented below in **Exhibit H-4, DLH Enplanement Projections (Market Share)**.

Exhibit H-4 DLH Enplanement Projections (Market Share)



Source: Landrum & Brown analysis, 2021.

H.1.3.3 Regression Analysis Projections

Regression analysis, which projects values for a dependent variable on the basis of establishing a statistical relationship between one or more other independent variables, was utilized to determine if a statistically reliable relationship exists between historical passenger enplanements at DLH (dependent variable) and several local socioeconomic indicators (independent variable(s)).

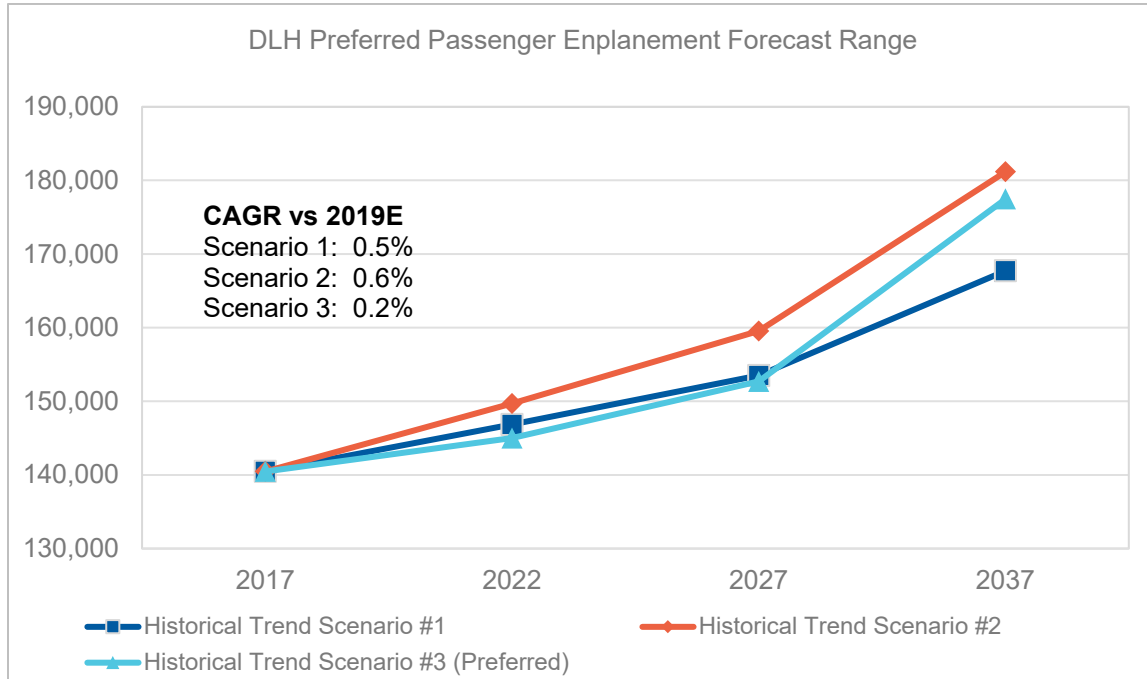
The socioeconomic indicators that were evaluated as independent variables in the projection of future passenger enplanements at DLH include MSA population, per capita personal income, total earnings, gross regional product, retail sales, median household income and non-farm payrolls. These factors are important to future air traffic forecasts as they all influence the amount of income available to support commercial air traffic demands. Finally, a multiple-regression analysis was performed combining all seven independent variables.

The statistical reliability of projections made to the dependent variable through a regression analysis is evaluated using the coefficient of determination, or R-squared value. Technically, the R-squared value explains the relative accuracy of the association between the dependent and independent variables. An R-squared value of 1.0 indicates a perfect correlation between variables; R-square values of less than 0.70 typically indicate that there is less correlation. An R-squared value of 0.90 is generally used as a threshold to depict a high level of statistical reliability. None of the studied socioeconomic factors studied resulted in an R-squared greater than 0.25, indicating little correlation between historical enplaned passenger volume and socioeconomic factors. Hence, these should not be considered reasonably reliable for planning/forecasting purposes.

H.1.3.4 Selection of the Preferred Forecast Range

The preceding sections have presented enplanement projections from several analytical sources. From these sources, a range of potential future enplanement activity can be established. Those are shown below in **Exhibit H-5, DLH Preferred Passenger Enplanement Forecast**.

Exhibit H-5 DLH Preferred Passenger Enplanement Forecast



Source: Landrum & Brown analysis, 2021.

For the 20-year forecast period, the preferred forecast CAGR is 1.14% (note: used 19-year CAGR, using 2019 enplaned passenger estimate). This compares to the FAA’s U.S. CAGR of 1.81% for all U.S. airports and is also below the latest TAF CAGR of 1.28% during this same time-period. The 2038 forecast of 196,432 is well above the TAF forecast, due to the 2019 enplaned passengers exceeding the latest TAF estimate (for 2018) by 22.5%.

The preferred forecast 5-year CAGR is 1.14% and the 10-year CAGR is also 1.14%. The TAF CAGR for this same 5-year time period is 1.28% and the 10-year CAGR is also 1.28%.

H.1.4 Commercial Passenger Operation Forecast

Below are forecasts as it pertains to passenger aircraft operations and fleet mix. This forecast was done at a macro-level and ties to earlier enplaned passenger forecast. It follows expected industry trends, of less 50-seat regional jet flying and increased larger RJ flying (64-76 seat jets).

H.1.4.1 Airline Fleet Mix

The type of passenger service aircraft that utilize the airport defines the operations needed to serve the forecasted enplanements. Flight schedules for calendar years 2015-2019 were reviewed to develop an annual schedule and current aircraft fleet mix. Projected fleet mix is developed based on known industry trends. The eventual phase-out of the 50-seat regional jet is significant to the overall fleet mix at DLH as this has historically

been the workhorse for DLH. This fleet mix is expected to begin being phased out of U.S. airline fleets starting in the early 2030's.

Table H-3, Passenger Aircraft Forecast: Operations & Operating Seats, shows aircraft detail (aircraft operations and operating seats) from 2018 through 2038. As indicated earlier, there will be an overall trend toward larger aircraft, less operations and moderate overall seat capacity growth during the forecast period.

Table H-3 Passenger Aircraft Forecast: Operations & Operating Seats

Seating	2018	2023	2028	2038
Less Than 40 Seats	-	-	-	-
40-60 Seats	76.0%	59.1%	51.7%	-
61-99 Seats	14.8%	23.7%	32.8%	76.0%
100-120 Seats	-	6.7%	6.1%	12.2%
121-150 Seats	9.1%	10.4%	9.3%	11.7%
151+ Seats	0.1%	0.1%	0.1%	0.1%

Source: Published Flight Schedules (Innovata) for 2017; Landrum & Brown analysis, 2021.

The 50-seat Embraer/Canadair regional jets are assumed to be partially phased out by 2028 and entirely phased out by 2038. While Canadair CRJ-700/900 (or comparable 76-seat jet) will backfill much of these reductions, it will not be a one for one trade off. The net result will be less operations from these aircraft types but at higher overall seat capacity levels as compared to today when much more 50-seat regional jet frequency exists.

The key operations assumptions are that 59.1% of 2023 operations will be on 50-seat regional jets, with 23.7% on CRJ-700/900s and 10.5% on A319/A320 aircraft, as it is assumed that United continues cycling aircraft through for maintenance. The shift to larger regional jets starts in the years between 2023 and 2028, with the wholesale transition to larger regional jets taking place by 2038. By 2038, it is assumed that all flying in the 61-99 seat category will be 76-seat regional jets, either in the form of CRJ-900 or E-175 aircraft. It is also assumed that United continues flying A319/A320 aircraft through DLH for maintenance during the 20-year forecast period.

H.1.4.2 Passenger Airline Operations

Passenger airline operations are determined from the average enplanements per departure from the fleet mix determinations, as shown in **Table H-4, Passengers per Departure**. An operation is considered an aircraft takeoff or landing. Forecasted operations for passenger airlines is shown in **Table H-5, Passenger Airline Operations**.

Table H-4 Passengers per Departure

Seating Capacity	2018	2023	2028	2038
Regional (<60 seats)				
Average Seats Per Departure	50.0	50.0	50	-
Average Load Factor	84.8%	77.5%	80.0%	-
Enplanements Per Departure	42.4	38.8	40.0	-
Air Carrier (60+ seats)				
Average Seats Per Departure	92.5	93.2	87.8	86.1
Average Load Factor	71.2%	69.3%	73.5%	76.2%
Enplanements Per Departure	65.8	64.6	64.5	65.6
Total				
Average Seats Per Departure	60.3	67.7	68.2	86.1
Average Load Factor	77.7%	72.9%	75.9%	76.2%
Enplanements Per Departure	48.1	49.4	51.8	65.6

Source: Diio Mi (2018), Landrum & Brown analysis, 2021.

Table H-5 Passenger Airline Operations

Metric	2018	2023	2028	2038
Departures				
Regional (< 60 Seats)	2,121	1,984	1,933	-
Air Carrier (> 60 Seats)	677	1,374	1,804	2,993
Operations				
Regional (< 60 Seats)	4,242	3,967	3,865	-
Air Carrier (> 60 Seats)	1,354	2,749	3,608	5,986
Total Operations	5,596	6,716	7,473	5,986

Source: Diio Mi (2018), Landrum & Brown Analysis, 2021.

When evaluating the passenger airline operations forecast, a key consideration is how it compares to most recent schedules that include both American Airlines new service and Delta Air Lines additional capacity in the fall of 2019.

Exhibit H-6, Passenger Airline Operations (2018–2038), illustrates how forecasts for 2023-2038 airline operations compares to published schedules for Calendar Year 2020.

Exhibit H-6 Passenger Airline Operations (2018–2038)

Passenger Airline Operations: Recent Results vs Forecasts, by aircraft type						
	2018	2019	2020	2023	2028	2038
A319	518	636	698	698	698	698
A320	-	14	8	8	8	8
B717/A220	-	-	520	452	452	730
CRJ	3,144	4,098	4,544	3,967	3,865	-
CRJ-700	666	484	16	317	730	-
CRJ-900	170	644	364	1,274	1,719	4,550
ERJ-145	-	876	1,464	-	-	-
Total	4,498	6,752	7,614	6,716	7,473	5,986

Source: Landrum & Brown analysis, 2021.

As can be seen, while passenger airline operations are forecasted to increase versus 2018 and 2019 levels, they are expected to drop versus published schedules for 2020. This will occur for 2 reasons. First, after massive growth in 2018-19, it is expected that there will be a rationalization period, where some of capacity will be reduced. In part this is also being based upon load factors late in 4th quarter, which for both United and particularly American, were weak. Second, over the long-term, as noted earlier, it is expected that CRJ flying will be reduced, and eventually be eliminated in the early 2030s. Tied to this, larger, 76-seat CRJ-900s will replace 50-seat jets.

Overall, during the nineteen year period, it is forecasted that DLH seat capacity will grow at a 1.15% CAGR, which ties closely to forecasted passenger growth of 1.14%. Much of capacity growth is forecasted to take place later in the forecast period, taking into account recent growth.

H.1.4.3 Summary

A summary of the preferred passenger aviation forecast is provided in **Table H-6, Preferred Passenger Airline Forecasts Summary, by Enplanements and Operations**. As noted earlier, it is expected that operations will drop over time, as larger aircraft replace 50-seat regional jets. Seat capacity is forecasted to grow moderately over the next 20 years, although operations will decline.

As noted earlier, the forecast indirectly is assuming that there will be a slowdown or “digestion” period over the next 10 years, as the market responds to the massive capacity increases experienced at DLH over the past 2 years.

Note that load factors will likely drop versus more recent levels, with the United Airlines overnight A319 aircraft (that is being utilized for maintenance/operational purposes) will deflate overall DLH load factors.

It should be noted that the selected forecast below pertains to the baseline forecast and does not include the passenger forecast alternatives noted earlier.

Table H-6 Preferred Passenger Airline Forecasts Summary, by Enplanements and Operations

Metric	2018	2023	2028	2033
<u>Enplanements</u>				
Regional (< 60 Seats)	69,609	76,873	59,056	-
Air Carrier (> 60 Seats)	70,876	88,844	116,325	196,411
Total Enplaned Passengers	140,485	165,717	175,381	196,411
Avg. Seats/Departure	60.3	67.7	68.2	86.1
Avg. Load Factor	77.7%	72.9%	75.9%	76.2%
<u>Operations</u>				
Regional (< 60 Seats)	4,242	3,967	3,865	-
Air Carrier (> 60 Seats)	1,354	2,749	3,608	5,986
Total Operations	5,596	6,716	7,473	5,986

Source: Landrum & Brown analysis, 2021.

H.2 Air Cargo

This section presents an overview of the historical trends in air cargo at DLH and air cargo forecasts up to the CY 2038.

H.2.1 Historical Air Cargo Traffic

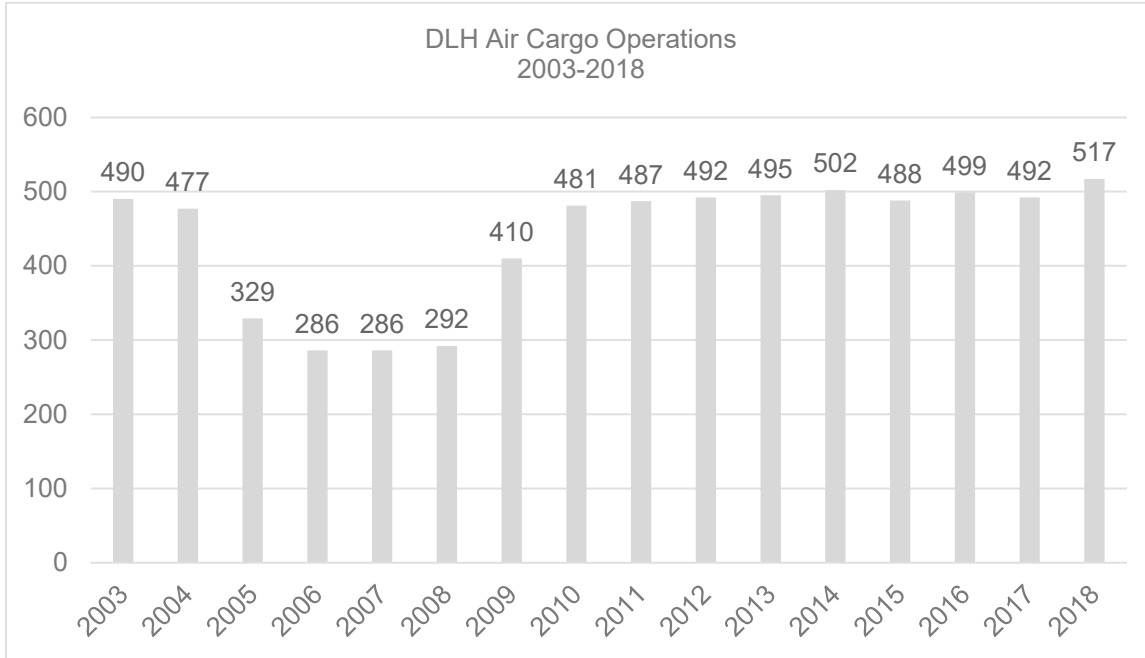
Exhibit H-7, DLH Air Cargo Operations, below illustrates annual cargo operations at DLH since 2003. While DLH cargo operations dropped preceding and during the U.S. recession in the late 2000s, they have been very stable since 2010, exhibiting a small increase in 2018. Over the 8-year period (2018 vs 2010), cargo operations grew at a CAGR of 0.91%, which is somewhat consistent with economic growth at DLH.

But, the mix of these operations have shifted materially over time. Through 2009, Federal Express flew a combination of larger cargo aircraft (B727s, A310s) and Cessna 208 Caravan aircraft. Since 2010, when operations stabilized, Federal Express has served the DLH cargo market almost exclusively with Beechcraft Beech 18 C-185 aircraft.

Early in the 2000s, Federal Express (FedEX) served the DLH air cargo market by typically flying larger aircraft directly into their Memphis (MEM) hub, with a mix of “tag” flights into nearby Grand Forks (GFK), Rochester (RST) and Minneapolis-St. Paul (MSP).

Since 2010, when FedEX’s DLH operation has stabilized, FedEX has consistently flown directly into MSP as FedEX has expanded operations at MSP.

Exhibit H-7 DLH Air Cargo Operations

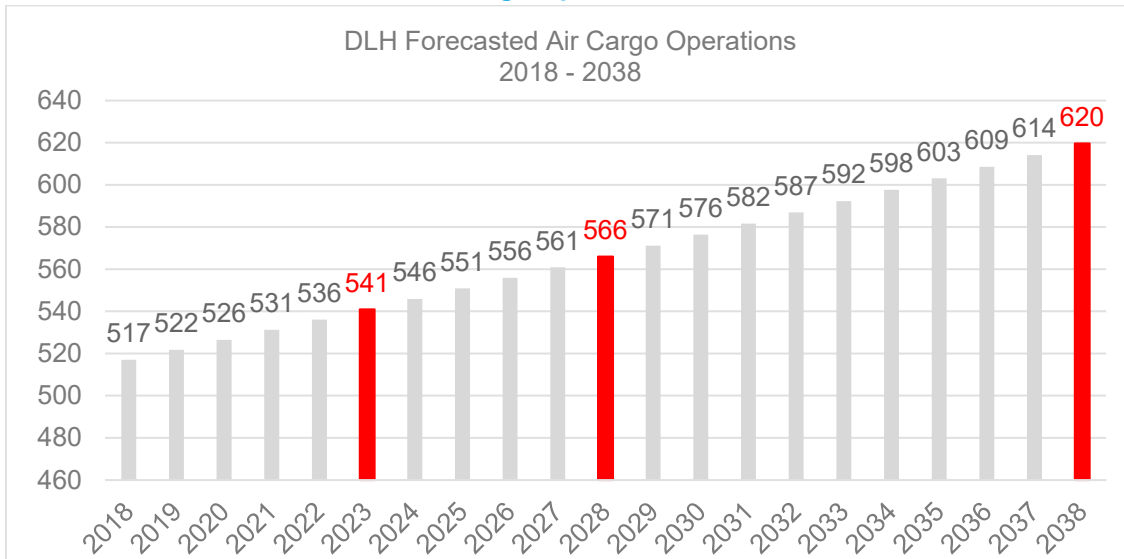


Source: Landrum & Brown analysis, 2021.

H.2.2 Air Cargo Operation Forecast

It is anticipated that the current fleet of aircraft operating at DLH (Beechcraft Beech 18 C-185 aircraft) will continue to operate in the future. It is assumed that cargo operations activity will grow at a 0.91% CAGR, which is the same rate that was generated over the past eight years. A summary of the air cargo operations forecast is provided below in **Exhibit H-8, Forecasted DLH Air Cargo Operations**.

Exhibit H-8 Forecasted DLH Air Cargo Operations



Source: Landrum & Brown analysis, 2021.

H.3 Air Taxi

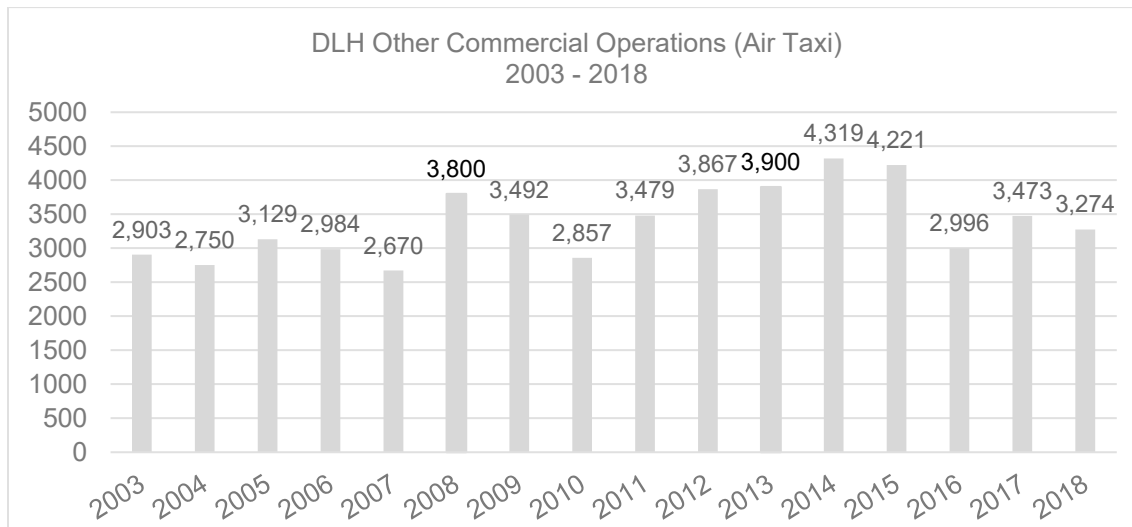
This section includes all operations which are not considered commercial, cargo, or military operations. Air taxi activity typically includes “for hire” aircraft chartered for specific trips on an on-demand basis. Air taxi operations are usually made up of larger General Aviation (GA) aircraft, such as large turboprop aircraft and an array of corporate jets

Air taxi operations can be subdivided into two major subcategories: “itinerant” and “local” based on FAA classifications. Local operations are defined by the FAA as “operations remaining in the local traffic pattern, simulated instrument approaches at the Airport...and operations to or from the Airport and a practice area within a 20-mile radius of the tower.”⁴⁰ Itinerant operations are all operations not classified as “local”.

H.3.1 Historical Air Taxi Traffic

Air taxi annual operations are illustrated below in **Exhibit H-9, DLH Air Taxi Trends**. Air taxi operations declined steadily from 2013 through 2016, then increased in 2017. The Airport historically generates good Air Taxi demand, in part driven by Duluth’s being a regional “hub” for healthcare service. For forecast purposes, and due to the fluctuating air taxi annual operation totals, it is assumed that operations will remain flat during the remainder of the forecast period.

Exhibit H-9 DLH Air Taxi Trends



Source: DLH TAF, T100, Landrum & Brown analysis, 2021.

⁴⁰ FAA Order 7210.3, Facility Operation and Administration, Section 2, Airport Operations Count

H.3.2 Air Taxi Operations Forecast

A summary of the commercial aviation forecasts, which includes forecasted Air Taxi operations, is shown in **Table H-7, Commercial Aviation Forecasts Summary**

Table H-7 Commercial Aviation Forecasts Summary

	Metric	2018	2023	2028	2038
Enplanements	Air Carrier	70,876	88,844	116,325	196,411
	Commuter/Regional	69,609	76,873	59,056	-
	Total Enplanements	140,485	165,717	175,381	196,411
Operations	Air Carrier	1,354	2,749	3,608	5,986
	Commuter/Regional	4,242	3,967	3,865	-
	Air Cargo	517	541	566	620
	Air Taxi	3,274	3,274	3,274	3,274
Total	Total Commercial Operations	9,387	10,531	11,313	9,880
	Avg. Seats/Operation	60.3	67.7	68.2	86.1
	Average Load Factor	77.7%	72.9%	75.9%	76.2%

Source: Duluth Airport Authority, Landrum & Brown analysis, 2021.

H.4 General Aviation

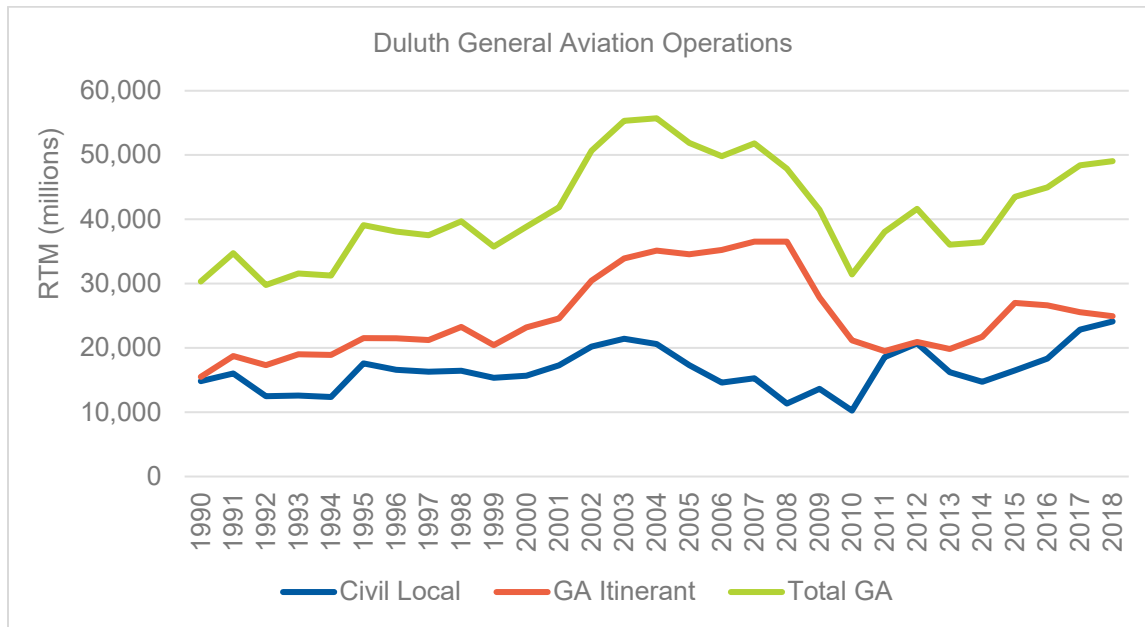
To paint the complete forecasting picture for DLH, general aviation annual operations were also developed for the 20-year planning period. General aviation operations include all aircraft operations other than the commercial service and air taxi operations described at the onset of this chapter, as well as military operations. Furthermore, these operations can be broken into either itinerant or local operations.

Like the based aircraft forecast, general aviation operations forecasts provide airports with information that can be useful for future development planning. Development of the based aircraft forecast for DLH includes the review of historical, existing, and forecasted data from the FAA and airport management records. For context, a brief discussion on general aviation operational trends at the national level is also provided.

H.4.1 Historical General Aviation Traffic

Many factors have the potential to affect general aviation activity at airports, most notably those related to local and regional socioeconomic and demographic factors. Furthermore, GA activities at an airport vary depending on its pilot base, geographic location, and services offered, just to name a few. DLH is no exception to this generality, as the Airport has experienced fluctuations in its overall GA operations, with an overall long-term moderate increase over the past 28 years. Most notably, DLH’s GA operations have experienced healthy overall growth since the end of the U.S. recession in the late 2000s, driven by strong growth in civil local operations. It should be noted that DLH’s GA trends far outpaced U.S. trends that have seen large declines in GA activity. Historical operations for DLH from 1990-2018 are illustrated in **Exhibit H-10, Duluth General Aviation Operations Breakdown**.

Exhibit H-10 Duluth General Aviation Operations Breakdown



Source: DLH Terminal Area Forecast.

DLH’s relative GA outperformance can be in-part attributed to two local entities: Lake Superior College (LSC) and Cirrus Design (dba Cirrus Aircraft).

LSC’s Center for Advanced Aviation at DLH has a training program for both mechanics and pilots. This program regularly supplies trained mechanics to AAR, who operates a major maintenance facility at DLH. The benefits of this facility were discussed earlier in the Socioeconomic and Air Traffic sections. Currently, LSC has 25 pilots in its training program and 200 mechanics. Of the 68 based GA aircraft at DLH, 12 (17.6%) are LSC dedicated aircraft. Cirrus also has a facility at Grand Forks (GFK), which regularly requires flying personnel between the two facilities. Cirrus has 7 (10.2%) GA aircraft based at DLH.

For the purposes of generating general aviation operations forecasts for DLH within the 20-year planning horizon, the local and itinerant operations data as reported on the most current TAF is illustrated on **Exhibit H-10**. This data reports 24,122 local and 24,917 itinerant operations performed at the Airport, totaling 49,039 annual GA operations in 2018.

H.4.2 General Aviation Operation Forecast

H.4.2.1 Local (Civil) Operations Forecast

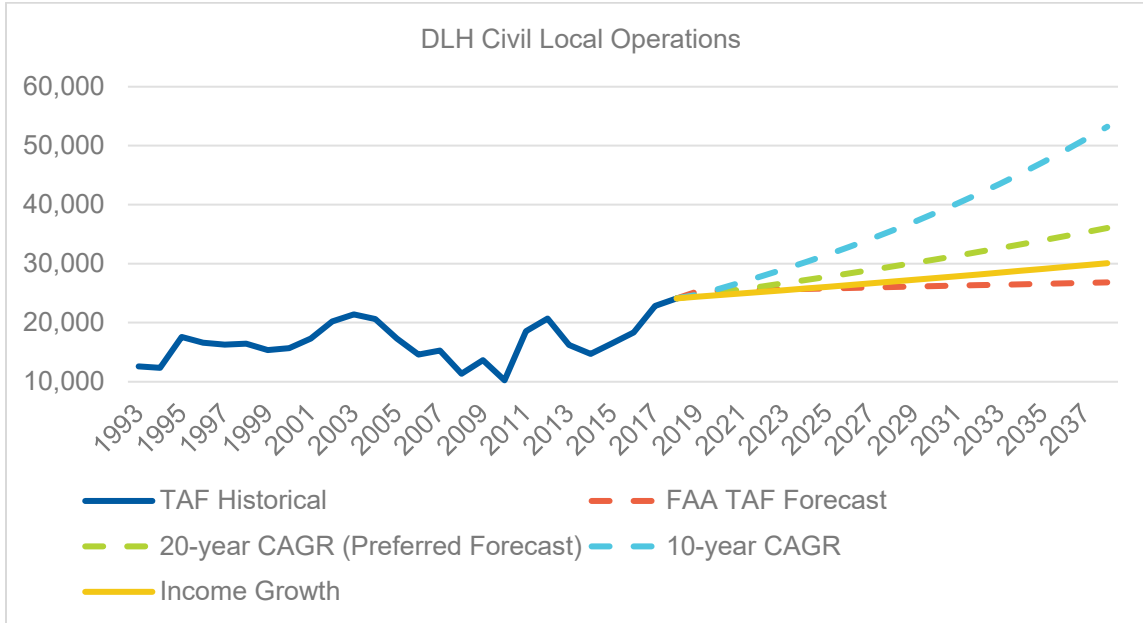
A local operation is defined as operations that are performed by aircraft that remain within the local traffic pattern. These operations typically include practice landings, touch-and-go’s, practice approaches and maneuvering in the local area. Civil local operations are usually conducted by recreational and flight training aircraft.

DLH is unique in that a large number of military local operations are performed at the Airport each year due to it being the home of the Duluth Air National Guard Base. It is home to the 148th Fighter Wing. A more detailed

discussion of projected military operations, both local and itinerant, is provided in a subsequent portion of this chapter. As such, the general aviation local forecasts only include operations within the civil category.

According to the January 2018 FAA TAF, local civil operations at DLH have varied, but generally trended higher over the past (nearly) 30 years. Note that these trends have been relatively stronger as compared to general U.S. civil operations trends, in large part due to the growth of LSC and Cirrus at the airport. Because of this (and their relative importance), this section will also include forecasts provided by LSC and Cirrus.

Exhibit H-11 Duluth Civil Local Operations Forecast Methods



Source: FAA Terminal Area Forecast, Landrum & Brown analysis, 2021.

Exhibit H-11, Duluth Civil Local Operations Forecast Methods, above illustrates both long-term trends and various forecasts for local civil operations at DLH. Over the prior 10 years (2018 vs 2008), DLH civil local operations grew at an 8.04% CAGR. Over the past 20 years, the CAGR was 2.03%. Much of DLH’s GA out-performance has occurred over the past few years. This was at a time when LSC has been growing, while at the same time other aviation-related entities have also.

Tied in part to historical trends, specific forecasting methods were applied to estimate local civil operations at DLH for the next 20 years. This included the following:

- 1) FAA TAF Forecast. CAGR: 0.53%
- 2) 20-year CAGR of 2.03%
- 3) 10-year CAGR 8.04%
- 4) Forecasted Duluth-area income growth of 1.1%

Each of these methodologies took into account a longer-term perspective that reflects different economic scenarios, as opposed to a shorter-term period that would not be as reflective of longer-term trends. Based on the analysis of these methodologies, the preferred forecast method is identified as the Local Operations 20-year CAGR forecast. This forecast assumes that DLH is at a similar point in the economic cycle, growing to the mid-range of prior year’s results. It is believed that this time 20-year time period is a good reflection of longer-term

trends. Consequently, this forecast projects that local civil operations will increase at a rate of 2.03 percent per year. This ultimately results in a forecast of 36,055 local civil operations by 2038.

Exhibit H-12 Duluth Civil Local Operations Forecast Detail

DLH Local Civil Operations by Entity 2018 - 2038					
	2018	2023	2028	2038	20-year CAGR
Lake Superior College	4,245	5,549	7,252	12,387	5.50%
Cirrus Aircraft	2,460	2,922	3,471	4,896	3.50%
All other	17,416	17,670	18,768	18,772	0.38%
Total	24,122	26,141	29,491	36,055	2.03%

Source: Lake Superior College and Cirrus Aircraft , Landrum & Brown analysis, 2021.

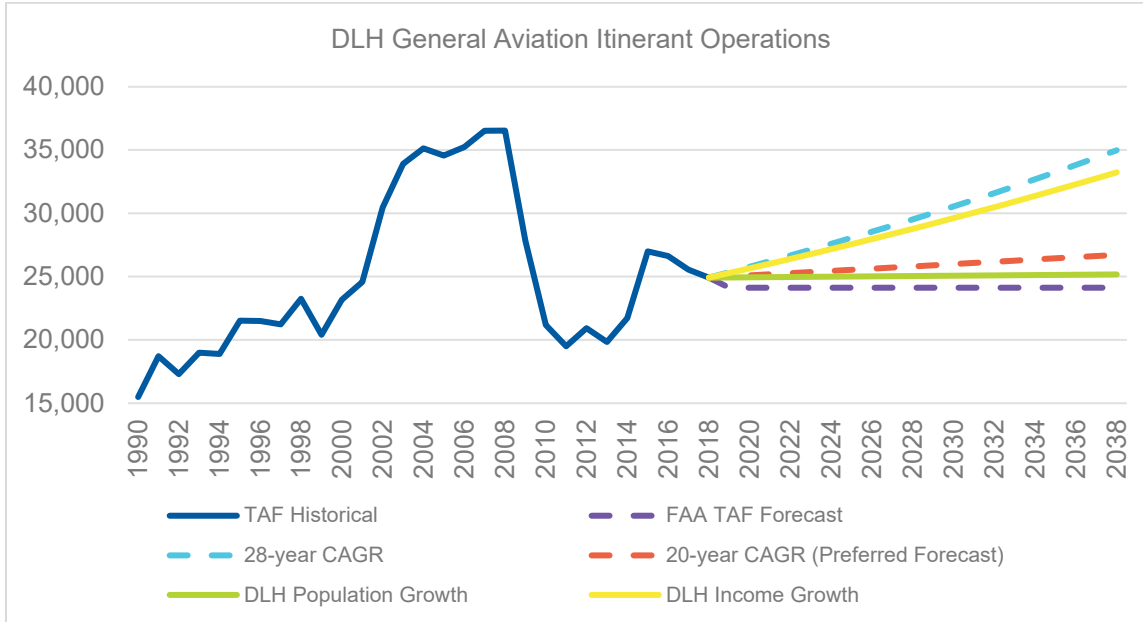
As noted earlier, LSC and Cirrus Aircraft have provided their own internal GA forecast. These forecasts are based upon the future strategic plans of each of these entities. **Exhibit H-12, Duluth Civil Local Operations Forecast Detail**, above is a summary of the LSC, Cirrus Aircraft forecasts, in conjunction with earlier forecast of local civil operations and indirectly, the forecast for all other entities (besides LSC and Cirrus Aircraft).

H.4.2.2 Itinerant Operations Forecast

An itinerant operation is defined as a landing or departure from an airport. GA itinerant operations are conducted by all types of aircraft. Again, there are several categories of itinerant operations that the FAA records; itinerant operations by air carrier, air taxi, and commuter aircraft were captured within the commercial service forecast section, and itinerant military operations are also included in a subsequent section. The forecast presented here in **Exhibit H-13, Duluth General Aviation Itinerant Operations Forecast Methods**, only reflects itinerant operations projections for GA aircraft at DLH.

According to the most recent DLH TAF, GA itinerant operations at DLH increased at a 4.88% CAGR over the 18-year period from 1990 until 2008. Starting in 2009, at the depths of the U.S. economic recession, DLH's itinerant GA operations declined sharply until 2010, then stabilizing from 2010 until 2014. Between 2014 and 2015, DLH experienced sharp growth in GA itinerant operations, and have stabilized at these higher levels since. Over the entire 28-year period, DLH's itinerant GA operations have increased at a 1.71% CAGR.

Exhibit H-13 Duluth General Aviation Itinerant Operations Forecast Methods



Source: FAA Terminal Area Forecast, Landrum & Brown analysis, 2021.

Tied in part to historical trends, specific forecasting methods were applied to estimate local civil operations at DLH for the next 20 years. This included the following:

- 1) FAA TAF Forecast. CAGR: 0%
- 2) 28-year CAGR of 1.71%
- 3) 20-year CAGR 0.35%
- 4) Forecasted Duluth population growth: 0.05%
- 5) Forecasted Duluth-area income growth of 1.1%

LSC and Cirrus aircraft have again provided their own internal forecast for itinerant GA operations. Cirrus operates more itinerant operations, as they need to transport personnel between regional offices, particularly between Grand Forks and Duluth. LSC operates more local civil operations, due to the amount of pilot training done at their school.

Exhibit H-14, Duluth General Aviation Itinerant Operations Forecast Details, below is a summary of LSC, Cirrus Aircraft and all other entities as it pertains to the GA Itinerant Operations forecast. Both LSC and Cirrus again indicate that both entities expect relatively faster growth than the rest of GA operators from DLH and across the U.S. in general. Note that forecasted CAGR for all other entities shows an actual decline versus 2018 levels and is below the TAF forecast of no growth.

Exhibit H-14 Duluth General Aviation Itinerant Operations Forecast Details

DLH GA Itinerant Operations Forecast by Entity					
2018 - 2038					
	2018	2023	2028	2038	20-year CAGR
Lake Superior College	2,492	2,819	3,609	5,913	2.50%
Cirrus Aircraft	2,865	3,403	4,042	4,801	3.50%
All other	19,560	19,134	18,152	16,006	-1.00%
Total	24,917	25,356	25,803	26,720	0.04%

Source: Landrum & Brown analysis, 2021.

H.4.2.3 General Aviation Operations Forecast Summary

A summary of the local civil and itinerant GA operations forecasts for DLH are shown in **Table H-8, General Aviation Forecast Summary**, below. It is expected that overall GA operations will grow at a 1.24% CAGR over the next 20 years. This is in line with overall expected economic growth from the region.

Key drivers for increased GA activity will be dictated by continued growth from both LSC and Cirrus Aircraft. Both entities have supplied their internal forecasts, and both expect to outpace general GA trends at both DLH and the U.S.

The share of local operations (of total GA) is forecasted to grow from 49% today to approximately 57% in 2038. This relative change is being driven by LSC, who expects continued growth in pilot training from their school as airlines continue to badly need airline pilots.

Table H-8 General Aviation Forecast Summary

Metric	2018	2023	2028	2038	CAGR
Local Operations	24,122	26,141	29,491	36,055	2.03%
Itinerant Operations	24,917	25,336	25,803	26,720	0.04%
Total Operations	49,039	51,477	55,294	62,775	1.24%
Local Share	49%	51%	53%	57%	
Itinerant Share	51%	49%	47%	43%	

Source: Landrum & Brown analysis, 2021.

H.5 Military

There are 21 military aircraft based at DLH as part of the Minnesota Air National Guard (MnANG) 148th Fighter Wing. According to FAA Form 5010-1. Year-ending August 2019 military operations totaled 5,087 based upon ATADS/OpsNet data. Of these, 4,916 were operated by the MnANG 148th Fighter Wing while the balance was operated by Military C130 and similar transient aircraft.

Interviews were conducted with the MnANG staff based at DLH. From these interviews, the MnANG supplied their internal forecasts for operations at DLH. Based upon these interviews, the ANG is forecasting 1.5% annual growth at DLH over the next 20 years. **Table H-9, Military Forecast Summary**, contains the forecasted Military operations based on the previously mentioned annual growth rate.

Table H-9 Military Forecast Summary

Metric	2026
Lockheed F-16 Fighting Falcon	5296
Lockheed 130 Hercules	354
Total Operations	5,650

Source: Landrum & Brown analysis, 2021.

H.6 Forecast Summary

The forecast summary is presented in **Exhibit H-15, Airport Master Plan Forecast Summary**. The FAA templates to compare the proposed forecasts to the 2018 published FAA Terminal Area Forecast follow in **Exhibit H-16, Airport Master Plan Forecast Comparison**.

Using the data contained in **Exhibit H-15**, Future (2026) Baseline condition annual aircraft operations were calculated. **Table H-10, Future (2026) Annual Aircraft Operations**, presents the summary of the Future (2026) annual operations by aircraft category. These operations were then distributed to each aircraft in the Future (2026) fleet.

Shortly after the development of this forecast the aviation industry experienced a drastic shutdown due to COVID-19. While it could take several months to years for aviation activity levels to return to 2018/2019 operating levels, currently pre-COVID operating conditions are still preferred for this Part 150 Study. While this downturn in commercial aviation activity will have an effect on the total operations at DLH, this traffic is not the main component of the total operations nor is it the main contributor to the noise pattern.

Exhibit H-17, Airport Master Plan Forecast Approval, presents the approval letter from the FAA for use of the DLH Airport Master Plan Forecast for planning purposes where AIP funding is used or applied for.

Exhibit H-15 Airport Master Plan Forecast Summary

Duluth International Airport: Master Plan Forecast							
	2018	2023	2028	2038	CAGR*		
					2023	2028	2038
Passenger Enplanements							
Air Carrier	70,876	36,799	53,298	177,720	-12.3%	-2.8%	4.7%
Commuter	69,609	108,201	99,412	-	9.2%	3.6%	-
Total	140,485	145,000	152,710	177,720	0.6%	0.8%	1.2%
Operations							
<u>Itinerant</u>							
Air Carrier	1,354	1,219	1,746	6,448	-2.1%	2.6%	8.1%
Commuter	4,242	6,018	5,302	-	7.2%	2.3%	-
Air Cargo	517	541	566	620	0.9%	0.9%	0.9%
Air Taxi	3,274	3,274	3,274	3,274	0.0%	0.0%	0.0%
Total Commercial	9,387	11,052	10,888	10,342	3.3%	1.5%	0.5%
General Aviation	24,917	25,356	25,803	26,720	0.3%	0.4%	0.3%
Total Itinerant	34,304	36,408	36,691	37,062	1.2%	0.7%	0.4%
<u>Local</u>							
General Aviation	24,122	26,141	29,491	36,055	1.6%	2.0%	2.0%
Military	5,087	5,480	5,904	6,851	1.5%	1.5%	1.5%
Total Operations	63,513	68,029	72,086	79,968	1.4%	1.3%	1.2%
Annual Instrument Approaches	1,364	1,387	1,413	1,463	0.3%	0.4%	0.4%
Peak Hour Operations	3	4	4	4	5.9%	2.9%	1.4%
Enplaned Air Freight (Tons)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Based Aircraft	68	72	76	85	1.1%	1.1%	1.1%
Operational Factors							
Average Aircraft Size							
Air Carrier	93	101	96	81	1.8%	0.4%	-0.7%
Commuter	50	50	50	-	0.0%	0.0%	-
Total	60	59	61	81	-0.4%	0.1%	1.5%
Enplaned Load Factor							
Air Carrier	71.2%	59.8%	63.5%	67.8%	-3.4%	-1.1%	-0.2%
Commuter	84.8%	72.0%	75.0%	-	-3.2%	-1.2%	-
Total	77.7%	68.5%	70.6%	67.8%	-2.5%	-1.0%	-0.7%
GA operations per based aircraft	721	715	728	739	-0.2%	0.1%	0.1%

Source: Landrum & Brown analysis, 2021.

Exhibit H-16 Airport Master Plan Forecast Comparison

Duluth International Airport (DLH) Airport Planning versus FAA TAF Forecast				
	Year	Airport Forecast	2016	
			FAA Terminal Area Forecast (TAF)	AF/TAF % Difference
Passenger Enplanements				
Base Yr.	2018	140,485	129,282	8.7%
Base Yr. + 5 Years	2023	145,000	135,261	7.2%
Base Yr. + 10 Years	2028	152,710	143,375	6.5%
Base Yr. + 20 Years	2038	177,720	166,790	6.6%
Total Operations				
Base Yr.	2018	63,513	62,824	1.1%
Base Yr. + 5 Years	2023	68,029	62,478	8.9%
Base Yr. + 10 Years	2028	72,086	63,285	13.9%
Base Yr. + 20 Years	2038	79,968	65,400	22.3%
Based Aircraft				
Base Yr.	2018	68	67	1.5%
Base Yr. + 5 Years	2023	72	74	-2.7%
Base Yr. + 10 Years	2028	76	79	-3.8%
Base Yr. + 20 Years	2038	85	89	-4.5%

Source: Landrum & Brown analysis, 2021.

Table H-10 Future (2026) Annual Aircraft Operations

Itinerant	2023	2026	2028
Air Carrier	2,749	3,093	3,608
Commuter	3,967	3,926	3,865
Air Cargo	541	551	566
Air Taxi	3,274	3,274	3,274
Total Commercial	10,531	10,844	11,313
General Aviation	25,356	25,535	25,803
Total Itinerant	35,887	36,379	37,116
Local	2023	2026	2028
General Aviation	26,141	27,481	29,491
Military	5,480	5,650	5,904
Total Local	31,621	33,131	35,395
Grand Total	67,508	69,510	72,511

Note: Totals may not sum due to rounding

Source: Landrum & Brown analysis, 2021.

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Exhibit H-17 Airport Master Plan Forecast Approval



**U.S. Department
 of Transportation
 Federal Aviation
 Administration**

Dakota-Minnesota Airports District Office
 Bismarck Office
 2301 University Drive, Building 23B
 Bismarck, ND 58504

Dakota-Minnesota Airports District Office
 Minneapolis Office
 6020 28th Avenue South, Suite 102
 Minneapolis, MN 55450

June 8, 2021

Mr. Mark Papko, Operations Director
 Duluth International Airport
 4701 Grinden Dr.
 Duluth, MN 55811

Duluth International Airport (DLH) – Duluth, MN
 Approval of Master Plan Forecast

Dear Mr. Papko:

This forecast was prepared at the same time as the evolving impacts of the COVID-19 public health emergency. Forecast approval is based on the methodology, data, and conclusions at the time the document was prepared. However, consideration of the impacts of the COVID-19 public health emergency on aviation activity is warranted to acknowledge the reduced confidence in growth projections using currently-available data.

Accordingly, FAA approval of this forecast does not constitute justification for future projects. Justification for future projects will be made based on activity levels at the time the project is requested for development. Documentation of actual activity levels meeting planning activity levels will be necessary to justify AIP funding for eligible projects.

This forecast approval is subject to the caveats identified above being inserted as a disclaimer at the beginning of the forecast document and applicable master plan chapters.

A summary of the Draft Master Plan’s forecast information is provided in the table below.

	Base Year (2018)	20-Year Forecast (2038)	Master Plan Source
Based Aircraft	68	85	Table 3-38
Aircraft Operations	62,600	78,739	Table 3-38
Civilian Critical Design Aircraft	C-III, A319 (TDG 3)	C-III, A319 (TDG 3)	Section 3.15.3
Military Critical Design Aircraft	D-I, F-16 Fighting Falcon (TDG 1A)	D-I, F-16 Fighting Falcon (TDG 1A)	Section 3.15.3

Source: Draft Master Plan prepared by SEH, Draft received May 6, 2021

If you have any questions or would like to discuss this information further, please feel welcome to contact me at (612) 253-4641 or gina.mitchell@faa.gov.

Sincerely,

Gina M. Mitchell, AICP, Community Planner
 Dakota-Minnesota Airports District Office, Minneapolis Office

- cc: Matt Stewart, SEH (email)
- Kaci Nowicki, SEH (email)
- Jake Martin, FAA (email)
- Kevin Carlson, MnDOT Aeronautics (email)
- Matt Lebens, MnDOT Aeronautics (email)
- Don Berre, MnDOT Aeronautics (email)
- Tom Klevan, MnDOT Aeronautics (email)

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